Appendix I: Data Validation Reports

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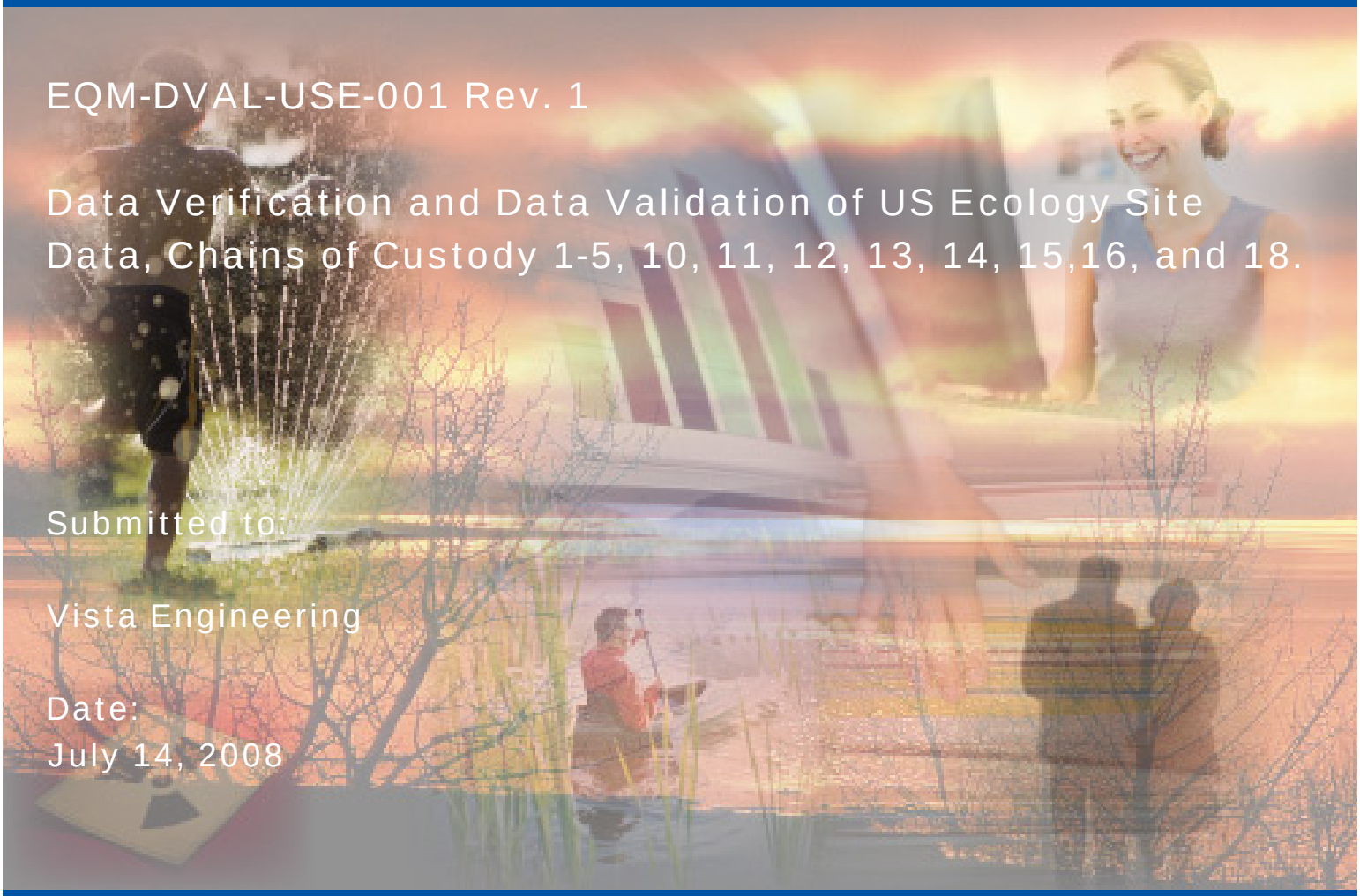
Environmental Quality Management, Inc.



EQM-DVAL-USE-001 Rev. 1

Data Verification and Data Validation of US Ecology Site Data, Chains of Custody 1-5, 10, 11, 12, 13, 14, 15,16, and 18.

Submitted to:

Vista Engineering

Date:
July 14, 2008

VISTA
ENGINEERING TECHNOLOGIES

EXECUTIVE SUMMARY

Samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's "Sampling and Analysis Plan for the US Ecology RI/FS" (VET-1405-PLN-03, Rev. 0). Samples were analyzed for metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs).

All analyses were conducted by Lionville Laboratory, Inc., Lionville, PA, following the "Specification for Analytical Laboratory Services: Soil and Water Analysis" (VET-1405-SPEC-03, Rev. 1). In addition to the printed data package, electronic data deliverables, consisting of a number of Microsoft Excel® files containing tables of results and associated quality control (QC) were also provided.

This report presents the results of validating the analysis in the samples collected under the chains of custody (COC) documents listed in Table ES-1. Validation was performed using an electronic data checker to evaluate whether batch QC met criteria. The electronic data checker identifies any QC exceeding criteria and the chemist evaluates the impact of the exceedance and adds the qualifiers.

Table ES-1. Chains Of Custody Applicable To The Data Validated In This Report.

VET-1405-COC-001	VET-1405-COC-010	VET-1405-COC-014
VET-1405-COC-002	VET-1405-COC-011	VET-1405-COC-015
VET-1405-COC-003	VET-1405-COC-012	VET-1405-COC-016
VET-1405-COC-004	VET-1405-COC-013	VET-1405-COC-018
VET-1405-COC-005		

The first section of this report descrbes the scope of results validated and discusses the validation strategy and methodology.

The second section contains a series of data validation reports. Each report presents the validation of results from a single analytical method.

In this validation, all results were found to be acceptable for decision-making in the project, except for nitrite and phosphate results for water samples G004 and G005. These samples were collected on 2/27/08. Sample G004 was analyzed for both anions on 3/3/08, and sample G005 was analyzed on 3/4/08. Thus, the holding times for the two samples were 5 and 6 days, respectively. These holding times are more than two times the 48-hour holding time limit, and the results were nondetects in all four cases. The validation rules require that nondetect results

be rejected for decision-making if they were obtained after holding times of more than twice the holding time limit. Therefore, the results were qualified as rejected and flagged "UR."

Table ES-2 summarizes the validation results for each type of analysis.

Table ES-2. Summary Validation Results by Analysis. (2 Pages)

Analysis	Number of Results	Number of Qualified Results	Summary
Metals	957	86	The majority of the qualifiers are due to unacceptable matrix spike recoveries. There were a few qualifiers placed due to poor LCS recoveries.
Mercury	31	0	None of the data was qualified during validation.
Chromium (VI)	33	2	Two sample results were qualified due to high matrix spike recovery.
Cyanide	33	0	None of the data was qualified during validation.
Sulfide	33	1	One result was qualified due to an unmet hold time.
Anions	231	46	Most qualifications were due to unacceptable MS and MSD recoveries. Four results were rejected due to unmet hold times.
Total phenols	33	0	None of the data was qualified during validation.
PCBs	231	0	None of the data was qualified during validation.
VOCs	3513	579	Results were qualified mainly for blank contamination, LCS and MS/MSD out of range.
SVOCs	2278	528	The majority of qualifiers were due to unacceptable LCS, MS and/or MSD recoveries. In a few cases, MS/MSD RPDs required qualification, as did method blank contamination.

COC - chain of custody
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
PCB - polychlorinated biphenyl
RPD - relative percent difference
SVOC - semi-volatile organic compound
VOA - volatile organic analysis
VOC - volatile organic compound

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ATTACHMENTS

Attachment A. Letter Regarding Collection Date of Trip Blank for Chain-of-Custody VET-1405-COC-002. ..... A-i

ACRONYMS

BLK	Blank (column heading)
CAS	Chemical Abstract Service (column heading)
COC	chain of custody
DUP	Duplicate sample (laboratory duplicate)
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
EQL	estimated quantitation limit (column heading)
HTAn	Holding time limit to analysis
HTEx	Holding time limit from sample collection to extraction
ICP	inductively coupled plasma
LCL	lower control limit
LCS	laboratory control sample
MB	method blank
MICE	Management Information Capability for Enforcement
MS	matrix spike
MSD	matrix spike duplicate
N/A	not applicable
PCB	polychlorinated biphenyl
PQL	practical quantitation limit
Q	Laboratory qualifier (column heading)
QC	quality control
PRD	relative percent difference
RQL	required quantitation limit
SVOA	semi-volatile organic analysis
SVOC	semi-volatile organic compound
UCL	upper control limit
V	Validation qualifier (column heading)
VOA	volatile organic analysis
VOC	volatile organic compound

Lionville Qualifiers

B	Analyte found in blank at quantity above the quantitation limit
J	Analyte detected below quantitation limit
U	Analyte is not detected, the associated quantitation limit is given

Data Validation Applied Qualifiers

UJ	Indicates the compound was analyzed for but not detected in the sample. Due to a QC deficiency identified during data validation, the associated quantitation limit is an estimate
J	Indicates the compound was analyzed for and detected in the sample. The associated concentration is an estimate, but the data are usable for decision making purposes
UR	Indicates the compound was analyzed for and not detected in the sample. Additionally the data is unusable due to an identified QC deficiency.

1. INTRODUCTION – APPROACH TO VALIDATION

Samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's "Sampling and Analysis Plan for the US Ecology RI/FS" (VET-1405-PLN-03, Rev. 0). Samples were analyzed for metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs).

All analyses were conducted by Lionville Laboratory, Inc., Lionville, PA, following the "Specification for Analytical Laboratory Services: Soil and Water Analysis" (VET-1405-SPEC-03, Rev. 1). In addition to the printed data package, electronic data deliverables (EDDs), consisting of a number of Microsoft Excel® files containing tables of results and associated quality control (QC) were also provided.

This report presents the results of validating the analysis in the samples collected under the chains of custody (COCs) documents listed in Table 1-1. The EDDs prepared by the laboratory for each COC are also listed.

Table 1-1. Chains of Custody and Electronic Data Deliverables Applicable to the Data Validated.

Chain of Custody	EDD	
	File Name	Date Received
VET-1405-COC-001	L0802535.xls	5/7/08
VET-1405-COC-002	L0802570.xls	5/7/08
VET-1405-COC-003	L0802575.xls	5/7/08
VET-1405-COC-004	L0802610.xls	5/7/08
VET-1405-COC-005	L0802613.xls	5/7/08
VET-1405-COC-010	L0802674.xls	4/24/08
VET-1405-COC-011	L0802674.xls	4/24/08
VET-1405-COC-012	L0802680.xls	5/7/08
VET-1405-COC-013	L0802679.xls	5/7/08
VET-1405-COC-014	L0803688.xls	5/7/08
VET-1405-COC-015	L0802679.xls	5/7/08
VET-1405-COC-016	L0803726.xls	5/7/08
VET-1405-COC-018	L0803755.xls	5/7/08

This validation was performed in a two-tiered approach.

1. Completeness: an assessment of the completeness is made on the pdf file of the "hard copy" data.
2. Electronic holding time and QC evaluation.

The approach is summarized in Table 1-2. The electronic review is performed on all incoming EDDs. The EDDs are evaluated to assure consistency with the hard copy data. By using electronic review of all QC, appropriate qualification of all the data can be made.

Table 1-2. Data Validation and Verification Approach.

Review item	Manually Done	Electronic	All Samples
Verification of deliverables	X		X
Requested vs reported analyses		X	X
Holding times		X	X
Blank contamination		X	X
Detection Limits		X	X
MS/MSD and LCS		X	X
Surrogates		X	X
Laboratory duplicates		X	X

LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate

The electronic data-checking tool addresses the following questions:

- Were there 20 or fewer samples in each preparation batch?
- Were a method blank (MB), a laboratory control sample (LCS), and a matrix spike sample (MS) prepared with each batch of samples?
- Were surrogates added to each sample and each batch QC sample for each method where surrogates are required?
- Was precision checked with a matrix spike duplicate (MSD) or sample duplicate (DUP)?
- Were holding time requirements for preparation and analysis satisfied?
- Were the MB results less than the required quantitation limits?
- Did the quantitation limit for nondetect results meet the required detection limit?
- Did the recoveries for the LCS, MS, MSD, and surrogates meet the accuracy criteria?
- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

After this automated checking, the “no” answers to these questions were investigated manually, the effect on each sample result was determined, and the results were qualified according to the validation rules in *Data Validation Procedure for Chemical Analyses* (HNF-20433). These evaluations are presented on the following pages.

2. DATA VALIDATION REPORTS

2.1. DATA VALIDATION REPORT FOR ICP METALS (METHOD 6010B)

Results for 29 metals (aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, molybdenum, nickel, potassium, selenium, silicon, silver, sodium, strontium, thallium, tin, titanium, uranium, vanadium and zinc) were requested for each of the 33 samples in this group. The table listing the results is too large to include here. Please refer to the Microsoft Excel® file in the accompanying CD-ROM for the analytical results for inductively coupled plasma (ICP) metals, as well as the flags applied during validation and the reasons for the flags.

2.1.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-1 shows the number of each type of sample in each preparation batch.

Table 2-1. ICP Metals Preparation Batch Summary. (6 Pages)

QC Batch ID	Matrix	Analyte	CAS	BLK	DUP	LCS	MS	MSD	Sample
08L0053	S	Aluminum, Total	7429-90-5	1	1	1	1	1	5
08L0053	S	Antimony, Total	7440-36-0	1	1	1	1	1	5
08L0053	S	Arsenic, Total	7440-38-2	1	1	1	1	1	5
08L0053	S	Barium, Total	7440-39-3	1	1	1	1	1	5
08L0053	S	Beryllium, Total	7440-41-7	1	1	1	1	1	5
08L0053	S	Boron, Total	7440-42-8	1	1	1	1	1	5
08L0053	S	Cadmium, Total	7440-43-9	1	1	1	1	1	5
08L0053	S	Calcium, Total	7440-70-2	1	1	1	1	1	5
08L0053	S	Chromium, Total	7440-47-3	1	1	1	1	1	5
08L0053	S	Cobalt, Total	7440-48-4	1	1	1	1	1	5
08L0053	S	Copper, Total	7440-50-8	1	1	1	1	1	5
08L0053	S	Iron, Total	7439-89-6	1	1	1	1	1	5
08L0053	S	Lead, Total	7439-92-1	1	1	1	1	1	5
08L0053	S	Magnesium, Total	7439-95-4	1	1	1	1	1	5
08L0053	S	Manganese, Total	7439-96-5	1	1	1	1	1	5
08L0053	S	Molybdenum, Total	7439-98-7	1	1	1	1	1	5
08L0053	S	Nickel, Total	7440-02-0	1	1	1	1	1	5
08L0053	S	Potassium, Total	7440-09-7	1	1	1	1	1	5
08L0053	S	Selenium, Total	7782-49-2	1	1	1	1	1	5
08L0053	S	Silicon, Total	7440-21-3	1	1	1	1	1	5
08L0053	S	Silver, Total	7440-22-4	1	1	1	1	1	5

Table 2-1. ICP Metals Preparation Batch Summary. (6 Pages)

QC Batch ID	Matrix	Analyte	CAS	BLK	DUP	LCS	MS	MSD	Sample
08L0053	S	Sodium, Total	7440-23-5	1	1	1	1	1	5
08L0053	S	Strontium, Total	7440-24-6	1	1	1	1	1	5
08L0053	S	Thallium, Total	7440-28-0	1	1	1	1	1	5
08L0053	S	Tin, Total	7440-31-5	1	1	1	1	1	5
08L0053	S	Titanium, Total	7440-32-6	1	1	1	1	1	5
08L0053	S	Uranium, Total	7440-61-1	1	1	1	1	1	5
08L0053	S	Vanadium, Total	7440-62-2	1	1	1	1	1	5
08L0053	S	Zinc, Total	7440-66-6	1	1	1	1	1	5
08L0061	S	Aluminum, Total	7429-90-5	1	1	1	1	1	3
08L0061	S	Antimony, Total	7440-36-0	1	1	1	1	1	3
08L0061	S	Arsenic, Total	7440-38-2	1	1	1	1	1	3
08L0061	S	Barium, Total	7440-39-3	1	1	1	1	1	3
08L0061	S	Beryllium, Total	7440-41-7	1	1	1	1	1	3
08L0061	S	Boron, Total	7440-42-8	1	1	1	1	1	3
08L0061	S	Cadmium, Total	7440-43-9	1	1	1	1	1	3
08L0061	S	Calcium, Total	7440-70-2	1	1	1	1	1	3
08L0061	S	Chromium, Total	7440-47-3	1	1	1	1	1	3
08L0061	S	Cobalt, Total	7440-48-4	1	1	1	1	1	3
08L0061	S	Copper, Total	7440-50-8	1	1	1	1	1	3
08L0061	S	Iron, Total	7439-89-6	1	1	1	1	1	3
08L0061	S	Lead, Total	7439-92-1	1	1	1	1	1	3
08L0061	S	Magnesium, Total	7439-95-4	1	1	1	1	1	3
08L0061	S	Manganese, Total	7439-96-5	1	1	1	1	1	3
08L0061	S	Molybdenum, Total	7439-98-7	1	1	1	1	1	3
08L0061	S	Nickel, Total	7440-02-0	1	1	1	1	1	3
08L0061	S	Potassium, Total	7440-09-7	1	1	1	1	1	3
08L0061	S	Selenium, Total	7782-49-2	1	1	1	1	1	3
08L0061	S	Silicon, Total	7440-21-3	1	1	1	1	1	3
08L0061	S	Silver, Total	7440-22-4	1	1	1	1	1	3
08L0061	S	Sodium, Total	7440-23-5	1	1	1	1	1	3
08L0061	S	Strontium, Total	7440-24-6	1	1	1	1	1	3
08L0061	S	Thallium, Total	7440-28-0	1	1	1	1	1	3
08L0061	S	Tin, Total	7440-31-5	1	1	1	1	1	3
08L0061	S	Titanium, Total	7440-32-6	1	1	1	1	1	3
08L0061	S	Uranium, Total	7440-61-1	1	1	1	1	1	3
08L0061	S	Vanadium, Total	7440-62-2	1	1	1	1	1	3
08L0061	S	Zinc, Total	7440-66-6	1	1	1	1	1	3
08L0066	S	Aluminum, Total	7429-90-5	1	1	1	1	1	1
08L0066	S	Antimony, Total	7440-36-0	1	1	1	1	1	1
08L0066	S	Arsenic, Total	7440-38-2	1	1	1	1	1	1
08L0066	S	Barium, Total	7440-39-3	1	1	1	1	1	1
08L0066	S	Beryllium, Total	7440-41-7	1	1	1	1	1	1
08L0066	S	Boron, Total	7440-42-8	1	1	1	1	1	1
08L0066	S	Cadmium, Total	7440-43-9	1	1	1	1	1	1

Table 2-1. ICP Metals Preparation Batch Summary. (6 Pages)

QC Batch ID	Matrix	Analyte	CAS	BLK	DUP	LCS	MS	MSD	Sample
08L0066	S	Calcium, Total	7440-70-2	1	1	1	1	1	1
08L0066	S	Chromium, Total	7440-47-3	1	1	1	1	1	1
08L0066	S	Cobalt, Total	7440-48-4	1	1	1	1	1	1
08L0066	S	Copper, Total	7440-50-8	1	1	1	1	1	1
08L0066	S	Iron, Total	7439-89-6	1	1	1	1	1	1
08L0066	S	Lead, Total	7439-92-1	1	1	1	1	1	1
08L0066	S	Magnesium, Total	7439-95-4	1	1	1	1	1	1
08L0066	S	Manganese, Total	7439-96-5	1	1	1	1	1	1
08L0066	S	Molybdenum, Total	7439-98-7	1	1	1	1	1	1
08L0066	S	Nickel, Total	7440-02-0	1	1	1	1	1	1
08L0066	S	Potassium, Total	7440-09-7	1	1	1	1	1	1
08L0066	S	Selenium, Total	7782-49-2	1	1	1	1	1	1
08L0066	S	Silicon, Total	7440-21-3	1	1	1	1	1	1
08L0066	S	Silver, Total	7440-22-4	1	1	1	1	1	1
08L0066	S	Sodium, Total	7440-23-5	1	1	1	1	1	1
08L0066	S	Strontium, Total	7440-24-6	1	1	1	1	1	1
08L0066	S	Thallium, Total	7440-28-0	1	1	1	1	1	1
08L0066	S	Tin, Total	7440-31-5	1	1	1	1	1	1
08L0066	S	Titanium, Total	7440-32-6	1	1	1	1	1	1
08L0066	S	Uranium, Total	7440-61-1	1	1	1	1	1	1
08L0066	S	Vanadium, Total	7440-62-2	1	1	1	1	1	1
08L0066	S	Zinc, Total	7440-66-6	1	1	1	1	1	1
08L0075	S	Aluminum, Total	7429-90-5	1	1	1	1	1	8
08L0075	S	Antimony, Total	7440-36-0	1	1	1	1	1	8
08L0075	S	Arsenic, Total	7440-38-2	1	1	1	1	1	8
08L0075	S	Barium, Total	7440-39-3	1	1	1	1	1	8
08L0075	S	Beryllium, Total	7440-41-7	1	1	1	1	1	8
08L0075	S	Boron, Total	7440-42-8	1	1	1	1	1	8
08L0075	S	Cadmium, Total	7440-43-9	1	1	1	1	1	8
08L0075	S	Calcium, Total	7440-70-2	1	1	1	1	1	8
08L0075	S	Chromium, Total	7440-47-3	1	1	1	1	1	8
08L0075	S	Cobalt, Total	7440-48-4	1	1	1	1	1	8
08L0075	S	Copper, Total	7440-50-8	1	1	1	1	1	8
08L0075	S	Iron, Total	7439-89-6	1	1	1	1	1	8
08L0075	S	Lead, Total	7439-92-1	1	1	1	1	1	8
08L0075	S	Magnesium, Total	7439-95-4	1	1	1	1	1	8
08L0075	S	Manganese, Total	7439-96-5	1	1	1	1	1	8
08L0075	S	Molybdenum, Total	7439-98-7	1	1	1	1	1	8
08L0075	S	Nickel, Total	7440-02-0	1	1	1	1	1	8
08L0075	S	Potassium, Total	7440-09-7	1	1	1	1	1	8
08L0075	S	Selenium, Total	7782-49-2	1	1	1	1	1	8
08L0075	S	Silicon, Total	7440-21-3	1	1	1	1	1	8
08L0075	S	Silver, Total	7440-22-4	1	1	1	1	1	8
08L0075	S	Sodium, Total	7440-23-5	1	1	1	1	1	8

Table 2-1. ICP Metals Preparation Batch Summary. (6 Pages)

QC Batch ID	Matrix	Analyte	CAS	BLK	DUP	LCS	MS	MSD	Sample
08L0075	S	Strontium, Total	7440-24-6	1	1	1	1	1	8
08L0075	S	Thallium, Total	7440-28-0	1	1	1	1	1	8
08L0075	S	Tin, Total	7440-31-5	1	1	1	1	1	8
08L0075	S	Titanium, Total	7440-32-6	1	1	1	1	1	8
08L0075	S	Uranium, Total	7440-61-1	1	1	1	1	1	8
08L0075	S	Vanadium, Total	7440-62-2	1	1	1	1	1	8
08L0075	S	Zinc, Total	7440-66-6	1	1	1	1	1	8
08L0091	W	Aluminum, Total	7429-90-5	1	1	1	1	1	5
08L0091	W	Antimony, Total	7440-36-0	1	1	1	1	1	5
08L0091	W	Arsenic, Total	7440-38-2	1	1	1	1	1	5
08L0091	W	Barium, Total	7440-39-3	1	1	1	1	1	5
08L0091	W	Beryllium, Total	7440-41-7	1	1	1	1	1	5
08L0091	W	Boron, Total	7440-42-8	1	1	1	1	1	5
08L0091	W	Cadmium, Total	7440-43-9	1	1	1	1	1	5
08L0091	W	Calcium, Total	7440-70-2	1	1	1	1	1	5
08L0091	W	Chromium, Total	7440-47-3	1	1	1	1	1	5
08L0091	W	Cobalt, Total	7440-48-4	1	1	1	1	1	5
08L0091	W	Copper, Total	7440-50-8	1	1	1	1	1	5
08L0091	W	Iron, Total	7439-89-6	1	1	1	1	1	5
08L0091	W	Lead, Total	7439-92-1	1	1	1	1	1	5
08L0091	W	Magnesium, Total	7439-95-4	1	1	1	1	1	5
08L0091	W	Manganese, Total	7439-96-5	1	1	1	1	1	5
08L0091	W	Molybdenum, Total	7439-98-7	1	1	1	1	1	5
08L0091	W	Nickel, Total	7440-02-0	1	1	1	1	1	5
08L0091	W	Potassium, Total	7440-09-7	1	1	1	1	1	5
08L0091	W	Selenium, Total	7782-49-2	1	1	1	1	1	5
08L0091	W	Silicon, Total	7440-21-3	1	1	1	1	1	5
08L0091	W	Silver, Total	7440-22-4	1	1	1	1	1	5
08L0091	W	Sodium, Total	7440-23-5	1	1	1	1	1	5
08L0091	W	Strontium, Total	7440-24-6	1	1	1	1	1	5
08L0091	W	Thallium, Total	7440-28-0	1	1	1	1	1	5
08L0091	W	Tin, Total	7440-31-5	1	1	1	1	1	5
08L0091	W	Titanium, Total	7440-32-6	1	1	1	1	1	5
08L0091	W	Uranium, Total	7440-61-1	1	1	1	1	1	5
08L0091	W	Vanadium, Total	7440-62-2	1	1	1	1	1	5
08L0091	W	Zinc, Total	7440-66-6	1	1	1	1	1	5
08L0093	S	Aluminum, Total	7429-90-5	1	1	1	1	1	5
08L0093	S	Antimony, Total	7440-36-0	1	1	1	1	1	5
08L0093	S	Arsenic, Total	7440-38-2	1	1	1	1	1	5
08L0093	S	Barium, Total	7440-39-3	1	1	1	1	1	5
08L0093	S	Beryllium, Total	7440-41-7	1	1	1	1	1	5
08L0093	S	Boron, Total	7440-42-8	1	1	1	1	1	5
08L0093	S	Cadmium, Total	7440-43-9	1	1	1	1	1	5
08L0093	S	Calcium, Total	7440-70-2	1	1	1	1	1	5

Table 2-1. ICP Metals Preparation Batch Summary. (6 Pages)

QC Batch ID	Matrix	Analyte	CAS	BLK	DUP	LCS	MS	MSD	Sample
08L0093	S	Chromium, Total	7440-47-3	1	1	1	1	1	5
08L0093	S	Cobalt, Total	7440-48-4	1	1	1	1	1	5
08L0093	S	Copper, Total	7440-50-8	1	1	1	1	1	5
08L0093	S	Iron, Total	7439-89-6	1	1	1	1	1	5
08L0093	S	Lead, Total	7439-92-1	1	1	1	1	1	5
08L0093	S	Magnesium, Total	7439-95-4	1	1	1	1	1	5
08L0093	S	Manganese, Total	7439-96-5	1	1	1	1	1	5
08L0093	S	Molybdenum, Total	7439-98-7	1	1	1	1	1	5
08L0093	S	Nickel, Total	7440-02-0	1	1	1	1	1	5
08L0093	S	Potassium, Total	7440-09-7	1	1	1	1	1	5
08L0093	S	Selenium, Total	7782-49-2	1	1	1	1	1	5
08L0093	S	Silicon, Total	7440-21-3	1	1	1	1	1	5
08L0093	S	Silver, Total	7440-22-4	1	1	1	1	1	5
08L0093	S	Sodium, Total	7440-23-5	1	1	1	1	1	5
08L0093	S	Strontium, Total	7440-24-6	1	1	1	1	1	5
08L0093	S	Thallium, Total	7440-28-0	1	1	1	1	1	5
08L0093	S	Tin, Total	7440-31-5	1	1	1	1	1	5
08L0093	S	Titanium, Total	7440-32-6	1	1	1	1	1	5
08L0093	S	Uranium, Total	7440-61-1	1	1	1	1	1	5
08L0093	S	Vanadium, Total	7440-62-2	1	1	1	1	1	5
08L0093	S	Zinc, Total	7440-66-6	1	1	1	1	1	5
08L0104	S	Aluminum, Total	7429-90-5	1		1			6
08L0104	S	Antimony, Total	7440-36-0	1		1			6
08L0104	S	Arsenic, Total	7440-38-2	1		1			6
08L0104	S	Barium, Total	7440-39-3	1		1			6
08L0104	S	Beryllium, Total	7440-41-7	1		1			6
08L0104	S	Boron, Total	7440-42-8	1		1			6
08L0104	S	Cadmium, Total	7440-43-9	1		1			6
08L0104	S	Calcium, Total	7440-70-2	1		1			6
08L0104	S	Chromium, Total	7440-47-3	1		1			6
08L0104	S	Cobalt, Total	7440-48-4	1		1			6
08L0104	S	Copper, Total	7440-50-8	1		1			6
08L0104	S	Iron, Total	7439-89-6	1		1			6
08L0104	S	Lead, Total	7439-92-1	1		1			6
08L0104	S	Magnesium, Total	7439-95-4	1		1			6
08L0104	S	Manganese, Total	7439-96-5	1		1			6
08L0104	S	Molybdenum, Total	7439-98-7	1		1			6
08L0104	S	Nickel, Total	7440-02-0	1		1			6
08L0104	S	Potassium, Total	7440-09-7	1		1			6
08L0104	S	Selenium, Total	7782-49-2	1		1			6
08L0104	S	Silicon, Total	7440-21-3	1		1			6
08L0104	S	Silver, Total	7440-22-4	1		1			6
08L0104	S	Sodium, Total	7440-23-5	1		1			6
08L0104	S	Strontium, Total	7440-24-6	1		1			6

Table 2-1. ICP Metals Preparation Batch Summary. (6 Pages)

QC Batch ID	Matrix	Analyte	CAS	BLK	DUP	LCS	MS	MSD	Sample
08L0104	S	Thallium, Total	7440-28-0	1		1			6
08L0104	S	Tin, Total	7440-31-5	1		1			6
08L0104	S	Titanium, Total	7440-32-6	1		1			6
08L0104	S	Uranium, Total	7440-61-1	1		1			6
08L0104	S	Vanadium, Total	7440-62-2	1		1			6
08L0104	S	Zinc, Total	7440-66-6	1		1			6

BLK - blank
CAS - Chemical Abstracts Service
DUP - duplicate
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
QC - quality control
S - soil
W - water

Each batch contained fewer than 20 field samples. At least one LCS and MB were analyzed in each sample batch. Also, a DUP, MS and an MSD were analyzed in each of the first six sample batches.

However, there was no DUP, MS or MSD reported with the final batch, 08L0104. The duplicate and matrix spikes for this batch were from another Vista COC that is not included in this data validation report. No data were qualified as a result of missing quality control samples.

2.1.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for metals analysis by method 6010B is 6 months from sampling to analysis. All results were generated within holding times.

2.1.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The required quantitation limits (RQLs) (VET-1405-PLN-03, Rev. 0) are shown in Table 2-2.

Table 2-2. Required Quantitation Limit for ICP Metals. (2 Pages)

Analyte	Water (ug/L)	Soil (mg/kg)
Aluminum	50	2.5
Antimony	40	2.0
Arsenic	50	2.5
Barium	5	0.25
Beryllium	5	0.25

Table 2-2. Required Quantitation Limit for ICP Metals. (2 Pages)

Analyte	Water (ug/L)	Soil (mg/kg)
Boron	50	2.5
Cadmium	5	0.25
Calcium	50	2.5
Chromium	5	0.25
Cobalt	5	0.25
Copper	5	0.25
Iron	50	2.5
Lead	50	2.5
Magnesium	50	2.5
Manganese	10	0.50
Molybdenum	5	0.25
Nickel	10	0.50
Potassium	500	2.5
Selenium	50	2.5
Silicon	50	2.5
Silver	10	0.50
Sodium	50	2.5
Strontium	5	0.25
Thallium	50	2.5
Tin	50	2.5
Titanium	10	0.50
Uranium	5	0.25
Vanadium	5	0.25
Zinc	10	0.50

ICP - inductively coupled plasma

Table 2-3 lists the metals detected in the method blanks.

Table 2-3. ICP Metals Method Blank Failures. (3 Pages)

Batch	Matrix	Analyte	Result (mg/kg for soil, ug/L for water)	Flag
08L0053	S	Calcium	5.7	B
		Tin	2.0	B
		Sodium	6.3	B

Table 2-3. ICP Metals Method Blank Failures. (3 Pages)

Batch	Matrix	Analyte	Result (mg/kg for soil, ug/L for water)	Flag
08L0061	S	Calcium	13.5	B
		Chromium	0.61	B
		Iron	6.7	B
		Manganese	0.05	B
		Potassium	4.3	B
		Sodium	15.2	None
		Strontium	0.03	B
		Tin	1.4	B
		Titanium	0.12	B
		Zinc	0.87	B
08L066	S	Barium	0.25	B
		Calcium	12.7	B
		Chromium	0.58	B
		Iron	5.8	B
		Magnesium	635	B
		Potassium	6.5	B
		Silicon	10.0	B
		Sodium	9.8	None
		Strontium	0.06	B
		Tin	2.8	None
		Titanium	0.28	B
08L0075	S	Calcium	6.4	B
		Sodium	7.8	B
		Tin	0.61	B
08L0091	W	Barium	0.62	B
		Calcium	41.3	B
		Copper	0.64	B
		Magnesium	24.2	B
		Silicon	11.6	B
		Sodium	20.8	B
		Strontium	0.52	B
		Titanium	0.48	B
		Zinc	4.6	B
08L0093	S	Barium	0.16	B
		Calcium	17.4	B
		Iron	6.2	B
		Magnesium	6.7	B
		Manganese	0.06	B
		Sodium	16	None
		Strontium	0.1	None
		Tin	1.4	B
		Titanium	1	None
		Zinc	0.63	B

Table 2-3. ICP Metals Method Blank Failures. (3 Pages)

Batch	Matrix	Analyte	Result (mg/kg for soil, ug/L for water)	Flag
08L0104	S	Barium	0.12	B
		Calcium	7.8	None
		Iron	4.8	None
		Manganese	0.06	B
		Sodium	9.3	None
		Strontium	0.06	B
		Tin	1.3	B
		Titanium	0.83	None

ICP - inductively coupled plasma W - water
S - soil

In batch 08L0053, the calcium results were not qualified because the blank result was less than three times the detection limit. Strontium results were not qualified because all results were greater than ten times the blank result. All tin results were qualified as approximate and flagged with a “J” due to blank contamination.

In batch 08L0061, the chromium, iron, manganese, potassium, strontium, tin, titanium and zinc results were not qualified because the blank result was less than three times the detection limit for each analyte. Sodium results for samples 0802L570-002 and -003 were qualified as approximate and flagged “J” due to blank contamination. The sodium result for 08L570-001 was greater than ten times the blank result, so was not qualified. Calcium results in batch 08L0061 were not qualified because the samples results were greater than ten times the blank result.

In batch 08L0066, barium, chromium, iron, magnesium, potassium, silicon, strontium, and titatnium were not qualified because the blank result was less than three times the detection limit for each analyte. The calcium and sodium results were not qualified because the sample result was greater than ten times the blank result for each analyte. The tin result was qualified as estimated and flagged with a “J” for blank contamination.

In batch 08L0075, calcium and tin results were not qualified because the blank result was lesss than three times the detection limit for each analyte. The sodium results were not qualified because the sample results were greater than ten times the blank result.

In batch 08L0091, barium, silicon and titanium results were not qualified because the blank result was less than three times the detection limit for each analyte. The calcium, magnesium, sodium, and strontium results were not qualified because the sample results were greater than ten times the blank result. Copper results for samples 0802L674-002, 0802L679-001 and -003 were qualified as approximate and flagged with a “J” due to blank contamination. All other copper results were nondetects and did not require qualification. Zinc results for samples 0802L674-001 and -002, and samples 0802L679-001 and -002 were qualified as estimated and flagged with a “J” due to blank contamination. All other zinc results were nondetects and did not require qualification.

In batch 08L0093, barium, iron, magnesium, manganese, tin, and zinc results were not qualified because the blank result was less than three times the detection limit for each analyte. The calcium, strontium and titanium results were not qualified because the sample results were greater than ten times the blank result. Sodium results for sample 0802L680-003 and 0802L688-002 were qualified as approximate and flagged with a "J" due to blank contamination. All other sodium results were greater than ten times the blank result and were not qualified.

In batch 08L0104, barium, manganese, strontium and tin results were not qualified because the balnk result was less than three times the detection limit for each analyte. The calcium, iron, sodium, and titanium results were not qualifed because the sample results were greater than ten times the blank result.

2.1.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The quantitation limit for nondetect results did not meet the required detection limit in the cases listed in Table 2-4. Per *Data Validation Procedure for Chemical Analyses* (HNF-20433, Rev. 0), no qualifiers were applied.

Table 2-4. Nondetect Results That Did Not Meet The Required Detection Limits.

Batch	Sample(s)	Analytes
08L0053	0802L535-001 through -005	U
08L0061	0802L570-001	Se, Tl and U
	0802L570-002 and -003	U
08L0066	0802L575-001	U
08L0075	0802L610-001 through -005	U
	0802L613-001 through 3	U
08L0093	0802L646-001 through -007	U
	0802L666-001 through -003	U
	0802L680-001 through -003	U
	0802L688-001 and -002	U
08L0104	0803L726-001 through -004	U
	0803L755-001 and -002	U

2.1.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, and MSD meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS/MSD recoveries must be between 75% and 125%.

Table 2-5 outlines the batches that had LCS, MS, and/or MSD failures. Dashes in the table indicate that acceptable results were obtained.

Table 2-5. Failed Metals Recoveries (In Percent) For LCS, MS And MSD

Batch	Analyte	LCS	MS	MSD
08L0053	Aluminum	---	191.9	330.7
	Antimony	---	53.2	59.3
	Calcium	---	72.2	184.6
	Iron	---	-203.5	460.3
	Manganese	---	228.5	---
	Silicon	---	-528.5	-80.4
08L0061	Aluminum	---	254.5	341.7
	Antimony	---	71.0	67.8
	Iron	---	982.3	1039.2
	Manganese	---	---	54.6
	Selenium	---	73.1	73.4
	Silicon	---	856.8	841.5
08L0066	Aluminum	---	---	-13.9
	Calcium	---	---	63.6
	Iron	---	-231.8	-1185.9
	Selenium	---	73.7	74.3
	Silicon	---	-241.8	212.6
	Titanium	---	143.2	---
08L0075	Aluminum	---	288	325.1
	Antimony	---	34.5	34.6
	Calcium	---	127.5	243.4
	Iron	---	412.4	238.1
	Manganese	---	1.9	47.2
	Silicon	0.7	139.9	240.7
08L0091	Iron	---	---	128.2
	Silicon	---	---	289.3
08L0093	Aluminum	---	483.2	507
	Antimony	---	41.7	42.5
	Calcium	---	---	126.5
	Iron	---	2038.3	1050.9
	Manganese	---	143.2	143.7
	Silicon	27.3	---	---
	Titanium	---	168.5	---
08L0104	Silicon	57.2	---	---

LCS - laboratory control sample MSD - matrix spike duplicate
MS - matrix spike

The following were qualified as estimated and flagged with “J” due to poor matrix spike recoveries: batch 08L0053 antimony and calcium; batch 08L0061 antimony and selenium; batch 08L0066 calcium and selenium; batch 08L0075 antimony, calcium, manganese and silicon; batch 08L0091 iron; and batch 08L0093 antimony and calcium.

The following were not qualified due to insufficient spike concentration: batch 08L0053 aluminum, iron, manganese and silicon; batch 08L0061 aluminum, iron, manganese, and silicon;

batch 08L0066 aluminum, iron, silicon and titanium; batch 08L0075 aluminum and iron; batch 08L0091 silicon; and batch 08L0093 aluminum, iron, manganese, silicon and titanium.

The following were qualified as approximate and flagged with "J" due to poor LCS recoveries: batch 08L0075 silicon, batch 08L0093 silicon, and batch 08L0104 silicon.

2.1.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the relative percent difference (RPD) between MS and MSD must be less than 20% for all samples. There were only three failures for RPD between matrix spike and matrix spike duplicate:

- In batch 08L0053, the RPD between MS and MSD for calcium was 87.5%.
- In batch 08L0053, the RPD between MS and MSD for magnesium was 30.5%.
- In batch 08L0066, the RPD between MS and MSD for calcium was 25.1%.
- In batch 08L0075, the RPD between MS and MSD for calcium was 51.6%
- In batch 08L0075, the RPD between MS and MSD for silicon was 41.7%.

Results for calcium and magnesium in batch 08L0053 were qualified as approximate and flagged with a "J". Results for calcium in batch 08L0066 were qualified as approximate and flagged with a "J." Results for calcium and silicon in batch 08L0075 were also qualified as approximate and flagged with a "J".

The RPD between sample and duplicate must also be less than 20%. There were no failures for RPD for sample duplicates.

2.2. DATA VALIDATION REPORT FOR MERCURY (METHODS 7470A and 7471A)

Table 2-6 is a summary of the validated results for mercury.

Table 2-6. Summary of Mercury Validation. (2 Pages)

Lab ID	Client ID	Matrix	Analyte	CAS	Batch ID	Conc.	Q	Units	EQL	V	Reason
0802L535-001	B001	S	Mercury, Total	7439-97-6	08C0025	0.01	U	mg/kg	0.01		
0802L535-002	B002	S	Mercury, Total	7439-97-6	08C0025	0.01	U	mg/kg	0.01		
0802L535-003	B003	S	Mercury, Total	7439-97-6	08C0025	0.01	B	mg/kg	0.01		
0802L535-004	B004	S	Mercury, Total	7439-97-6	08C0025	0.01	U	mg/kg	0.01		
0802L535-005	B005	S	Mercury, Total	7439-97-6	08C0025	0.01	U	mg/kg	0.01		
0802L570-001	B006	S	Mercury, Total	7439-97-6	08C0027	0.01	U	mg/kg	0.01		
0802L570-002	B007	S	Mercury, Total	7439-97-6	08C0027	0.008	U	mg/kg	0.01		
0802L570-003	B008	S	Mercury, Total	7439-97-6	08C0027	0.008	U	mg/kg	0.01		
0802L575-001	B009	S	Mercury, Total	7439-97-6	08C0027	0.01	U	mg/kg	0.01		
0802L610-001	B010	S	Mercury, Total	7439-97-6	08C0034	0.01	U	mg/kg	0.01		
0802L610-002	B011	S	Mercury, Total	7439-97-6	08C0034	0.01	U	mg/kg	0.01		
0802L610-003	B012	S	Mercury, Total	7439-97-6	08C0034	0.01	U	mg/kg	0.01		
0802L610-004	B013	S	Mercury, Total	7439-97-6	08C0034	0.01	U	mg/kg	0.01		
0802L610-005	B014	S	Mercury, Total	7439-97-6	08C0034	0.01	U	mg/kg	0.01		
0802L613-001	B016	S	Mercury, Total	7439-97-6	08C0034	0.01	U	mg/kg	0.01		
0802L613-002	B017	S	Mercury, Total	7439-97-6	08C0034	0.01	U	mg/kg	0.01		
0802L613-003	B018	S	Mercury, Total	7439-97-6	08C0034	0.01	U	mg/kg	0.01		
0802L680-001	B031	S	Mercury, Total	7439-97-6	08C0041	0.01	U	mg/kg	0.01		
0802L680-002	B032	S	Mercury, Total	7439-97-6	08C0041	0.01	U	mg/kg	0.01		
0802L680-003	B033	S	Mercury, Total	7439-97-6	08C0041	0.01	U	mg/kg	0.01		
0803L688-001	B034	S	Mercury, Total	7439-97-6	08C0041	0.01	U	mg/kg	0.01		
0803L688-002	B035	S	Mercury, Total	7439-97-6	08C0041	0.01	U	mg/kg	0.01		
0803L726-001	B036	S	Mercury, Total	7439-97-6	08C0048	0.009	U	mg/kg	0.01		
0803L726-002	B037	S	Mercury, Total	7439-97-6	08C0048	0.008	U	mg/kg	0.01		
0803L726-003	B039	S	Mercury, Total	7439-97-6	08C0048	0.03		mg/kg	0.01		

Table 2-6. Summary of Mercury Validation. (2 Pages)

Lab ID	Client ID	Matrix	Analyte	CAS	Batch ID	Conc.	Q	Units	EQL	V	Reason
0803L726-004	B040	S	Mercury, Total	7439-97-6	08C0048	0.009	U	mg/kg	0.01		
0803L755-001	B041	S	Mercury, Total	7439-97-6	08C0053	0.009	U	mg/kg	0.01		
0803L755-002	B042	S	Mercury, Total	7439-97-6	08C0053	0.01	U	mg/kg	0.01		
0802L674-001	G004	W	Mercury, Total	7439-97-6	08C0042a	0.06	U	ug/L	0.06		
0802L674-002	G005	W	Mercury, Total	7439-97-6	08C0042a	0.06	U	ug/L	0.06		
0802L679-001	G006	W	Mercury, Total	7439-97-6	08C0042b	0.08	B	ug/L	0.06		
0802L679-002	G007	W	Mercury, Total	7439-97-6	08C0042b	0.06	U	ug/L	0.06		
0802L679-003	G008	W	Mercury, Total	7439-97-6	08C0042b	0.09	B	ug/L	0.06		

CAS - Chemical Abstracts System
Q - Laboratory qualifier
S - soil
V - Validator flag
W - water

2.2.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-7 shows the number of each type of sample in each preparation batch.

Table 2-7. Mercury Preparation Batch Summary.

QC Batch ID	Matrix	Analyte	CAS	BLK	DUP	LCS	MS	MSD	Sample
08C0025	S	Mercury, Total	7439-97-6	1	1	1	1	1	5
08C0027	S	Mercury, Total	7439-97-6	1	1	1	1	1	4
08C0034	S	Mercury, Total	7439-97-6	1	1	1	1	1	8
08C0041	S	Mercury, Total	7439-97-6	1	1	1	1	1	5
08C0042	W	Mercury, Total	7439-97-6	1	1	2	1	1	5
08C0048	S	Mercury, Total	7439-97-6	1		1			4
08C0053	S	Mercury, Total	7439-97-6	1	1	1	1		2

BLK - blank
CAS - Chemical Abstracts System
DUP - duplicate
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
QC - quality control

Each batch contained fewer than 20 field samples. At least one LCS and MB were analyzed in all sample batches. Also, an MS and an MSD were analyzed in five sample batches.

However, a MS and a MSD from Vista was not prepared and analyzed with the final batch, nor was a duplicate. However, quality control samples from another client were prepared and analyzed in this batch so no results were qualified as approximate.

2.2.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for mercury analysis by method 7471A are 28 days from sampling to analysis. All results were generated within holding times.

2.2.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The RQL (VET-1405-PLN-03, Rev. 0) is shown in Table 2-8.

Table 2-8. Required Quantitation Limit for Mercury.

Analyte	Water (ug/L)	Soil (mg/kg)
Mercury	0.05	5

All method blank results were below the instrument detection limits.

2.2.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Reporting limits were not met for samples 0802L674-001, 0802L674-002 and 0802L679-002. Per *Data Validation Procedure for Chemical Analyses* (HNF-20433, Rev. 0), no results were qualified.

2.2.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, and MSD meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS recoveries must be between 75% and 125%, and MS/MSD recoveries must be between 75% and 125%, as well. All LCS and MS/MSD recoveries were within these limits.

2.2.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405- PLN-03, Rev. 0, the RPD between MS and MSD must be less than 20%. All MS/MSD RPDs met this criterion.

2.3. DATA VALIDATION REPORT FOR HEXAVALENT CHROMIUM (METHOD 7196A)

Table 2-9 is a summary of the validated results for hexavalent chromium.

Table 2-9. Summary of Hexavalent Chromium Validation. (2 Pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0802L535-001	B001	S	08LVI010	0.22	mg/kg	0.22	U		
0802L535-002	B002	S	08LVI010	0.22	mg/kg	0.22	U		
0802L535-003	B003	S	08LVI010	0.21	mg/kg	0.21	U		
0802L535-004	B004	S	08LVI010	0.20	mg/kg	0.2	U		
0802L535-005	B005	S	08LVI010	0.21	mg/kg	0.21	U		
0802L570-001	B006	S	08LVI012	0.22	mg/kg	0.22	U		
0802L570-002	B007	S	08LVI012	0.21	mg/kg	0.21	U		
0802L570-003	B008	S	08LVI012	0.27	mg/kg	0.21			

Table 2-9. Summary of Hexavalent Chromium Validation. (2 Pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0802L575-001	B009	S	08LVI012	0.24	mg/kg	0.21			
0802L610-001	B010	S	08LVI015	0.21	mg/kg	0.21	U		
0802L610-002	B011	S	08LVI015	0.76	mg/kg	0.21			
0802L610-003	B012	S	08LVI015	0.21	mg/kg	0.21	U		
0802L610-004	B013	S	08LVI015	0.21	mg/kg	0.21	U		
0802L610-005	B014	S	08LVI015	1.0	mg/kg	0.21			
0802L613-001	B016	S	08LVI015	0.49	mg/kg	0.21			
0802L613-002	B017	S	08LVI015	0.58	mg/kg	0.2			
0802L613-003	B018	S	08LVI015	0.56	mg/kg	0.2			
0802L680-001	B031	S	08LVI022	0.21	mg/kg	0.21	U		
0802L680-002	B032	S	08LVI022	0.20	mg/kg	0.2	U		
0802L680-003	B033	S	08LVI022	0.21	mg/kg	0.21	U		
0803L688-001	B034	S	08LVI022	0.21	mg/kg	0.21	U		
0803L688-002	B035	S	08LVI022	0.21	mg/kg	0.21	U		
0803L726-001	B036	S	08LVI026	0.21	mg/kg	0.21	U		
0803L726-002	B037	S	08LVI026	0.93	mg/kg	0.21			
0803L726-003	B039	S	08LVI026	0.23	mg/kg	0.21			
0803L726-004	B040	S	08LVI026	0.21	mg/kg	0.21	U		
0803L755-001	B041	S	08LVI026	0.20	mg/kg	0.2	U		
0803L755-002	B042	S	08LVI026	0.26	mg/kg	0.2			
0802L674-001	G004	W	08LVI020	0.073	mg/L	0.005		J	High MS
0802L674-002	G005	W	08LVI020	0.055	mg/L	0.005		J	High MS
0802L679-001	G006	W	08LVIA21	0.041	mg/L	0.005			
0802L679-002	G007	W	08LVIA21	0.043	mg/L	0.005			
0802L679-003	G008	W	08LVIA21	0.097	mg/L	0.005			

EQL - estimated quantitation limit
MS - matrix spike
Q - laboratory qualifier
S - soil
V - validator flag
W - water

2.3.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, and a MS sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-10 shows the number of each type of sample in each preparation batch.

Table 2-10. Hexavalent Chromium Preparation Batch Summary.

Batch ID	Matrix	BLK	DUP	LCS	MS	MSD	Sample
08LVI010	S	1	1	2	1	1	5
08LVI012	S	1	1	2	1	1	4
08LVI015	S	1		2			8
08LVI020	W	1	1	2	1		2
08LVI022	S	1	1	2	1	1	5
08LVI026	S	1		2			6
08LVIA21	W	1	1	2	1		3

BLK - blank
DUP - duplicate
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
S soil
W - water

Hexavalent chromium analysis was performed in seven batches. Each batch contained fewer than 20 field samples. At least one LCS and MB were analyzed in each sample batch. An MS and an MSD or DUP are to be analyzed with each batch. These results were reported except for two batches. Batch 08LVI015 had an MS run in the batch, but the MS was from a different client than Vista. Batch 08LVI026 had and MS and MSD run in the batch, but these also were from another client. Though a DUP and a MSD were not included in every batch, the sampling plan called for at least one DUP, MS and MSD for every 20 samples sampled. There were 33 samples and 5 DUP and 3 MSD, so the intent of the sampling plan was met and no data were qualified due to missing QC.

2.3.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for chromium (VI) analysis by method 7196A are specified in VET-1405-PLN-03, Rev. 0, as 28 days for soil samples and one day for water samples. All results were generated within these limits.

2.3.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Project documentation does not specify a required quantitation limit for chromium (VI). Chromium (VI) was not detected in the method blanks. Detection limits in the blanks were 0.2 mg/kg for soils and 0.005 mg/L for water samples.

2.3.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for chromium (VI). All detection limits were 0.22 mg/kg or less.

2.3.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, and MSD meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS, MS, MSD, and DUP recoveries must be between 75% and 125%. However, the MS recovery for batch 08LVI020 was high. Therefore, all detected sample results in this batch were qualified as approximate and flagged "J".

All other LCS and MS/MSD recoveries were within the accuracy limits.

2.3.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the MS/MSD and DUP RPDs must be less than 20%. All RPDs met this criterion.

2.4. DATA VALIDATION REPORT FOR CYANIDE (METHOD 9014)

Table 2-11 is a summary of the validated results for cyanide.

Table 2-11. Summary of Cyanide Validation. (2 Pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0802L535-001	B001	S	08LC006	0.54	mg/kg	0.54	U		
0802L535-002	B002	S	08LC006	0.52	mg/kg	0.52	U		
0802L535-003	B003	S	08LC006	0.52	mg/kg	0.52	U		
0802L535-004	B004	S	08LC006	0.50	mg/kg	0.5	U		
0802L535-005	B005	S	08LC006	0.49	mg/kg	0.49	U		
0802L570-001	B006	S	08LC006	0.53	mg/kg	0.53	U		
0802L570-002	B007	S	08LC006	0.49	mg/kg	0.49	U		
0802L570-003	B008	S	08LC006	0.48	mg/kg	0.48	U		
0802L575-001	B009	S	08LC007	0.50	mg/kg	0.5	U		
0802L610-001	B010	S	08LCA08	0.52	mg/kg	0.52	U		
0802L610-002	B011	S	08LCA08	0.51	mg/kg	0.51	U		
0802L610-003	B012	S	08LCA08	0.51	mg/kg	0.51	U		
0802L610-004	B013	S	08LCA08	0.51	mg/kg	0.51	U		
0802L610-005	B014	S	08LCA08	0.51	mg/kg	0.51	U		
0802L613-001	B016	S	08LCA09	0.48	mg/kg	0.48	U		
0802L613-002	B017	S	08LCA09	0.50	mg/kg	0.5	U		

Table 2-11. Summary of Cyanide Validation. (2 Pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0802L613-003	B018	S	08LCA09	0.49	mg/kg	0.49	U		
0802L680-001	B031	S	08LC012	0.48	mg/kg	0.48	U		
0802L680-002	B032	S	08LC012	0.49	mg/kg	0.49	U		
0802L680-003	B033	S	08LC012	0.50	mg/kg	0.5	U		
0803L688-001	B034	S	08LC015	0.51	mg/kg	0.51	U		
0803L688-002	B035	S	08LC015	0.49	mg/kg	0.49	U		
0803L726-001	B036	S	08LC016	0.51	mg/kg	0.51	U		
0803L726-002	B037	S	08LC016	0.50	mg/kg	0.5	U		
0803L726-003	B039	S	08LC016	0.51	mg/kg	0.51	U		
0803L726-004	B040	S	08LC016	0.50	mg/kg	0.5	U		
0803L755-001	B041	S	08LC017	0.49	mg/kg	0.49	U		
0803L755-002	B042	S	08LC017	0.51	mg/kg	0.51	U		
0802L674-001	G004	W	08LCB12	5.00	ug/L	5	U		
0802L674-002	G005	W	08LCB12	5.00	ug/L	5	U		
0802L679-001	G006	W	08LCB12	5.00	ug/L	5	U		
0802L679-002	G007	W	08LCB12	5.00	ug/L	5	U		
0802L679-003	G008	W	08LCB12	5.00	ug/L	5	U		

EQL - estimated quantitation limit
Q - laboratory qualifier
S soil
V - validation qualifier
W - water

2.4.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-12 shows the number of each type of sample in each preparation batch.

Table 2-12. Cyanide Preparation Batch Summary.

Batch ID	Matrix	BLK	DUP	LCS	MS	MSD	Sample
08LC006	S	1	1	2	1	0	8
08LC007	S	1	1	2	1	0	1
08LC012	S	1	1	2	1	0	3
08LC015	S	1	1	2	1	0	2
08LC016	S	1	1	2	1	0	4
08LC017	S	1	1	2	1	0	2
08LCA08	S	1	1	2	1	0	5
08LCA09	S	1	1	2	1	0	3
08LCB12	W	1	1	2	1	0	5

BLK - blank
DUP - duplicate
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
S - soil
W - water

Cyanide analysis was performed in nine batches. Each batch contained fewer than 20 field samples. At least one MB, LCS, MS, and DUP were analyzed in each sample batch. This meets all the QC frequency requirements for cyanide analysis.

2.4.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for cyanide analysis by method 9014 is specified in VET-1405-PLN-03, Rev. 0, as 14 days. All results were generated within these limits.

2.4.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Project documentation does not specify a required quantitation limit for cyanide. Cyanide was not detected in the method blanks. Detection limits in the blanks were 0.5 mg/kg for soils and 5 ug/L for the water blank.

2.4.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for cyanide. Cyanide was not detected in any of the samples. Detection limits were 5 ug/L for water samples and 0.54 mg/kg or less for soil samples.

2.4.5. QC Checks for Accuracy

- Did the LCS and MS recoveries meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS recoveries must be between 75% and 125%. All LCS and MS recoveries were within these limits.

2.4.6. QC Check for Precision

- Did the DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the RPD for DUPs must be less than 20%. All RPDs met this criterion.

2.5. DATA VALIDATION REPORT FOR SULFIDE (METHODS 9030B and 9034)

Table 2-13 is a summary of the validated results for sulfide.

Table 2-13. Summary of Sulfide Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0802L535-001	B001	S	08LSD005	36.7	mg/kg	26.2			
0802L535-002	B002	S	08LSD005	24.3	mg/kg	24.3			
0802L535-003	B003	S	08LSD005	22.1	mg/kg	22			
0802L535-004	B004	S	08LSD005	21.7	mg/kg	21.7	U		
0802L535-005	B005	S	08LSD005	22.9	mg/kg	22.9	U		
0802L570-001	B006	S	08LSD006	21.8	mg/kg	21.8	U		
0802L570-002	B007	S	08LSD006	22.2	mg/kg	22.2	U		
0802L570-003	B008	S	08LSD006	21.1	mg/kg	21.1	U		
0802L575-001	B009	S	08LSD007	21.2	mg/kg	21.2	U		
0802L610-001	B010	S	08LSDA08	22.7	mg/kg	22.7	U	UJ	Hold Time
0802L610-002	B011	S	08LSDA08	27.4	mg/kg	22.8			
0802L610-003	B012	S	08LSDA08	21.2	mg/kg	21.2	U		
0802L610-004	B013	S	08LSDA08	21.2	mg/kg	21.2	U		
0802L610-005	B014	S	08LSDA08	20.9	mg/kg	20.9	U		
0802L613-001	B016	S	08LSDA08	24.9	mg/kg	24.9	U		
0802L613-002	B017	S	08LSDA08	24.3	mg/kg	24.3	U		
0802L613-003	B018	S	08LSDA08	23.8	mg/kg	23.8	U		
0802L680-001	B031	S	08LSD011	28.8	mg/kg	28.8	U		
0802L680-002	B032	S	08LSD011	32.8	mg/kg	32.8	U		
0802L680-003	B033	S	08LSD011	34.8	mg/kg	34.8	U		
0803L688-001	B034	S	08LSD014	21.5	mg/kg	21.5	U		
0803L688-002	B035	S	08LSD014	21.3	mg/kg	21.3	U		
0803L726-001	B036	S	08LSD015	18.8	mg/kg	18.8	U		
0803L726-002	B037	S	08LSD015	21.7	mg/kg	21.7	U		
0803L726-003	B039	S	08LSD015	20.8	mg/kg	20.8	U		
0803L726-004	B040	S	08LSD015	21.1	mg/kg	21.1	U		
0803L755-001	B041	S	08LSD016	20.8	mg/kg	20.8	U		
0803L755-002	B042	S	08LSD016	19.9	mg/kg	19.9	U		
0802L674-001	G004	W	08LSDA10	5.0	ug/L	5	U		
0802L674-002	G005	W	08LSDA10	1.0	mg/L	1	U		
0802L679-001	G006	W	08LSD012	1.0	mg/L	1	U		
0802L679-002	G007	W	08LSD012	1.0	mg/L	1	U		
0802L679-003	G008	W	08LSD012	1.0	mg/L	1	U		

EQL - estimated quantitation limit
Q - laboratory qualifier
S soil
V - validation qualifier
W - water

2.5.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-14 shows the number of each type of sample in each preparation batch.

Table 2-14. Sulfide Preparation Batch Summary.

Batch ID	Matrix	BLK	DUP	LCS	MS	MSD	Sample
08LSD005	S	1	1	2	1	0	5
08LSD006	S	1	1	2	1	0	3
08LSD007	S	1	1	2	1	0	1
08LSD011	S	1	1	2	1	0	3
08LSD012	W	1	0	2	0	0	3
08LSD014	S	1	1	2	1	0	2
08LSD015	S	1	1	2	1	0	4
08LSD016	S	1	1	2	1	0	2
08LSDA08	S	1	1	2	1	0	8
08LSDA10	W	1	1	2	1	0	2

BLK - blank
DUP - duplicate
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
S - soil
W - water

Sulfide analysis was performed in ten batches. Each batch contained fewer than 20 field samples. Except for batch 08LSD012, at least one MB, LCS, MS and DUP were analyzed in each sample batch. In batch 08LSD012, neither an MS nor a DUP was performed. The intent of the sampling plan was for at least one MS per every 20 samples from the field. The intent of the sampling plan was met at 9 MS for 33 samples, so no data were qualified due to missing QC samples.

2.5.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for sulfide analysis by method 9030B and 9034 are specified in VET-1405-PLN-03, Rev. 0, as 7 days. All results were generated within these limits except for sample B010 (Lab ID 0802L610-001). The analysis for this sample was completed one day after the hold time had expired. For this reason, the result for sample B010, a nondetect, was qualified as approximate and flagged “UJ.”

2.5.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Project documentation does not specify a required quantitation limit for sulfide. Sulfide was not detected in the method blanks. Detection limits in the blanks were 1 mg/L for water and less than 40 mg/kg for soils.

2.5.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for sulfide. Sulfide was not detected in any of the samples. Detection limits were 5 mg/L or less for water samples and less than 35 mg/kg for soil samples.

2.5.5. QC Checks for Accuracy

- Did the recoveries for the LCS and MS results meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS recoveries must be between 75% and 125%. All LCS and MS recoveries were within these limits.

2.5.6. QC Check for Precision

- Did the DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, sample duplicate RPDs must be less than 20%. All RPDs met this criterion.

2.6. DATA VALIDATION REPORT FOR ANIONS (METHOD 9056)

Table 2-15 is a summary of the validated results for anions (chloride, fluoride, nitrate, nitrite, phosphate, and sulfate) determined by ion chromatography. Results for bromide were reported, but were not required by the sampling and analysis plan. Bromide results are shown in Table 2-15, but were not validated.

Table 2-15. Summary of Anion Validation. (10 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L535-001	B001	S	08LICT13	Bromide	24959-67-9	2.6	mg/kg	2.6	U		
0802L535-001	B001	S	08LICT13	Chloride	16887-00-6	6.4	mg/kg	2.6			
0802L535-001	B001	S	08LICT13	Fluoride	16984-48-8	2.6	mg/kg	2.6	U		
0802L535-001	B001	S	08LICT13	Nitrate	14797-55-8	17.0	mg/kg	2.57			
0802L535-001	B001	S	08LICT13	Nitrite	14797-65-0	2.57	mg/kg	2.57	U		
0802L535-001	B001	S	08LICT13	Phosphate	14265-44-2	2.6	mg/kg	2.6	U		
0802L535-001	B001	S	08LICT13	Sulfate	14808-79-8	41.6	mg/kg	2.6			
0802L535-002	B002	S	08LICT13	Bromide	24959-67-9	2.9	mg/kg	2.9	U		
0802L535-002	B002	S	08LICT13	Chloride	16887-00-6	9.2	mg/kg	2.9			
0802L535-002	B002	S	08LICT13	Fluoride	16984-48-8	2.9	mg/kg	2.9	U		
0802L535-002	B002	S	08LICT13	Nitrate	14797-55-8	15.3	mg/kg	2.88			
0802L535-002	B002	S	08LICT13	Nitrite	14797-65-0	2.88	mg/kg	2.88	U		
0802L535-002	B002	S	08LICT13	Phosphate	14265-44-2	2.9	mg/kg	2.9	U		
0802L535-002	B002	S	08LICT13	Sulfate	14808-79-8	50.9	mg/kg	2.9			
0802L535-003	B003	S	08LICT13	Bromide	24959-67-9	2.3	mg/kg	2.3	U		
0802L535-003	B003	S	08LICT13	Chloride	16887-00-6	4.7	mg/kg	2.3			
0802L535-003	B003	S	08LICT13	Fluoride	16984-48-8	2.3	mg/kg	2.3	U		
0802L535-003	B003	S	08LICT13	Nitrate	14797-55-8	7.03	mg/kg	2.35			
0802L535-003	B003	S	08LICT13	Nitrite	14797-65-0	2.35	mg/kg	2.35	U		
0802L535-003	B003	S	08LICT13	Phosphate	14265-44-2	2.3	mg/kg	2.3	U		
0802L535-003	B003	S	08LICT13	Sulfate	14808-79-8	30.0	mg/kg	2.3			
0802L535-004	B004	S	08LICT13	Bromide	24959-67-9	2.2	mg/kg	2.2	U		
0802L535-004	B004	S	08LICT13	Chloride	16887-00-6	4.3	mg/kg	2.2			
0802L535-004	B004	S	08LICT13	Fluoride	16984-48-8	2.2	mg/kg	2.2	U		
0802L535-004	B004	S	08LICT13	Nitrate	14797-55-8	3.82	mg/kg	2.16			

Table 2-15. Summary of Anion Validation. (10 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L535-004	B004	S	08LICT13	Nitrite	14797-65-0	2.16	mg/kg	2.16	U		
0802L535-004	B004	S	08LICT13	Phosphate	14265-44-2	2.2	mg/kg	2.2	U		
0802L535-004	B004	S	08LICT13	Sulfate	14808-79-8	20.6	mg/kg	2.2			
0802L535-005	B005	S	08LICT13	Bromide	24959-67-9	2.8	mg/kg	2.8	U		
0802L535-005	B005	S	08LICT13	Chloride	16887-00-6	2.8	mg/kg	2.8	U		
0802L535-005	B005	S	08LICT13	Fluoride	16984-48-8	2.8	mg/kg	2.8	U		
0802L535-005	B005	S	08LICT13	Nitrate	14797-55-8	7.80	mg/kg	2.81			
0802L535-005	B005	S	08LICT13	Nitrite	14797-65-0	2.81	mg/kg	2.81	U		
0802L535-005	B005	S	08LICT13	Phosphate	14265-44-2	2.8	mg/kg	2.8	U		
0802L535-005	B005	S	08LICT13	Sulfate	14808-79-8	54.3	mg/kg	2.8			
0802L570-001	B006	S	08LICT13	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0802L570-001	B006	S	08LICT13	Chloride	16887-00-6	9.7	mg/kg	2.5			
0802L570-001	B006	S	08LICT13	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0802L570-001	B006	S	08LICT13	Nitrate	14797-55-8	14.7	mg/kg	2.46			
0802L570-001	B006	S	08LICT13	Nitrite	14797-65-0	2.46	mg/kg	2.46	U		
0802L570-001	B006	S	08LICT13	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0802L570-001	B006	S	08LICT13	Sulfate	14808-79-8	42.6	mg/kg	2.5			
0802L570-002	B007	S	08LICT13	Bromide	24959-67-9	2.2	mg/kg	2.2	U		
0802L570-002	B007	S	08LICT13	Chloride	16887-00-6	10.5	mg/kg	2.2			
0802L570-002	B007	S	08LICT13	Fluoride	16984-48-8	2.2	mg/kg	2.2	U		
0802L570-002	B007	S	08LICT13	Nitrate	14797-55-8	9.16	mg/kg	2.24			
0802L570-002	B007	S	08LICT13	Nitrite	14797-65-0	2.24	mg/kg	2.24	U		
0802L570-002	B007	S	08LICT13	Phosphate	14265-44-2	2.2	mg/kg	2.2	U		
0802L570-002	B007	S	08LICT13	Sulfate	14808-79-8	25.1	mg/kg	2.2			
0802L570-003	B008	S	08LICT13	Bromide	24959-67-9	2.3	mg/kg	2.3	U		

Table 2-15. Summary of Anion Validation. (10 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L570-003	B008	S	08LICT13	Chloride	16887-00-6	13.8	mg/kg	2.3			
0802L570-003	B008	S	08LICT13	Fluoride	16984-48-8	2.3	mg/kg	2.3	U		
0802L570-003	B008	S	08LICT13	Nitrate	14797-55-8	15.9	mg/kg	2.29			
0802L570-003	B008	S	08LICT13	Nitrite	14797-65-0	2.29	mg/kg	2.29	U		
0802L570-003	B008	S	08LICT13	Phosphate	14265-44-2	2.3	mg/kg	2.3	U		
0802L570-003	B008	S	08LICT13	Sulfate	14808-79-8	17.7	mg/kg	2.3			
0802L575-001	B009	S	08LICT13	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0802L575-001	B009	S	08LICT13	Chloride	16887-00-6	2.7	mg/kg	2.5			
0802L575-001	B009	S	08LICT13	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0802L575-001	B009	S	08LICT13	Nitrate	14797-55-8	6.07	mg/kg	2.52			
0802L575-001	B009	S	08LICT13	Nitrite	14797-65-0	2.52	mg/kg	2.52	U		
0802L575-001	B009	S	08LICT13	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0802L575-001	B009	S	08LICT13	Sulfate	14808-79-8	23.2	mg/kg	2.5			
0802L610-001	B010	S	08LICS17	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0802L610-001	B010	S	08LICS17	Chloride	16887-00-6	11.0	mg/kg	2.5		J	High MS
0802L610-001	B010	S	08LICS17	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0802L610-001	B010	S	08LICS17	Nitrate	14797-55-8	9.28	mg/kg	2.54		J	High MS
0802L610-001	B010	S	08LICS17	Nitrite	14797-65-0	2.54	mg/kg	2.54	U		
0802L610-001	B010	S	08LICS17	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0802L610-001	B010	S	08LICS17	Sulfate	14808-79-8	13.8	mg/kg	2.5		J	High MS
0802L610-002	B011	S	08LICS17	Bromide	24959-67-9	2.4	mg/kg	2.4	U		
0802L610-002	B011	S	08LICS17	Chloride	16887-00-6	2.4	mg/kg	2.4	U		
0802L610-002	B011	S	08LICS17	Fluoride	16984-48-8	2.4	mg/kg	2.4	U		
0802L610-002	B011	S	08LICS17	Nitrate	14797-55-8	2.42	mg/kg	2.42	U		
0802L610-002	B011	S	08LICS17	Nitrite	14797-65-0	2.42	mg/kg	2.42	U		

Table 2-15. Summary of Anion Validation. (10 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L610-002	B011	S	08LICS17	Phosphate	14265-44-2	2.4	mg/kg	2.4	U		
0802L610-002	B011	S	08LICS17	Sulfate	14808-79-8	8.4	mg/kg	2.4		J	High MS
0802L610-003	B012	S	08LICS17	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0802L610-003	B012	S	08LICS17	Chloride	16887-00-6	2.5	mg/kg	2.5	U		
0802L610-003	B012	S	08LICS17	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0802L610-003	B012	S	08LICS17	Nitrate	14797-55-8	2.49	mg/kg	2.49	U		
0802L610-003	B012	S	08LICS17	Nitrite	14797-65-0	2.49	mg/kg	2.49	U		
0802L610-003	B012	S	08LICS17	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0802L610-003	B012	S	08LICS17	Sulfate	14808-79-8	10.5	mg/kg	2.5		J	High MS
0802L610-004	B013	S	08LICS17	Bromide	24959-67-9	2.6	mg/kg	2.6	U		
0802L610-004	B013	S	08LICS17	Chloride	16887-00-6	5.8	mg/kg	2.6		J	High MS
0802L610-004	B013	S	08LICS17	Fluoride	16984-48-8	2.6	mg/kg	2.6	U		
0802L610-004	B013	S	08LICS17	Nitrate	14797-55-8	3.12	mg/kg	2.61		J	High MS
0802L610-004	B013	S	08LICS17	Nitrite	14797-65-0	2.61	mg/kg	2.61	U		
0802L610-004	B013	S	08LICS17	Phosphate	14265-44-2	2.6	mg/kg	2.6	U		
0802L610-004	B013	S	08LICS17	Sulfate	14808-79-8	16.8	mg/kg	2.6		J	High MS
0802L610-005	B014	S	08LICS17	Bromide	24959-67-9	2.2	mg/kg	2.2	U		
0802L610-005	B014	S	08LICS17	Chloride	16887-00-6	19.2	mg/kg	2.2		J	High MS
0802L610-005	B014	S	08LICS17	Fluoride	16984-48-8	2.2	mg/kg	2.2	U		
0802L610-005	B014	S	08LICS17	Nitrate	14797-55-8	4.48	mg/kg	2.22		J	High MS
0802L610-005	B014	S	08LICS17	Nitrite	14797-65-0	2.22	mg/kg	2.22	U		
0802L610-005	B014	S	08LICS17	Phosphate	14265-44-2	2.2	mg/kg	2.2	U		
0802L610-005	B014	S	08LICS17	Sulfate	14808-79-8	15.9	mg/kg	2.2		J	High MS
0802L613-001	B016	S	08LICS17	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0802L613-001	B016	S	08LICS17	Chloride	16887-00-6	3.5	mg/kg	2.5		J	High MS

Table 2-15. Summary of Anion Validation. (10 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L613-001	B016	S	08LICS17	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0802L613-001	B016	S	08LICS17	Nitrate	14797-55-8	3.95	mg/kg	2.49		J	High MS
0802L613-001	B016	S	08LICS17	Nitrite	14797-65-0	2.49	mg/kg	2.49	U		
0802L613-001	B016	S	08LICS17	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0802L613-001	B016	S	08LICS17	Sulfate	14808-79-8	26.2	mg/kg	2.5		J	High MS
0802L613-002	B017	S	08LICS17	Bromide	24959-67-9	2.6	mg/kg	2.6	U		
0802L613-002	B017	S	08LICS17	Chloride	16887-00-6	2.6	mg/kg	2.6	U		
0802L613-002	B017	S	08LICS17	Fluoride	16984-48-8	2.6	mg/kg	2.6	U		
0802L613-002	B017	S	08LICS17	Nitrate	14797-55-8	3.25	mg/kg	2.6		J	High MS
0802L613-002	B017	S	08LICS17	Nitrite	14797-65-0	2.60	mg/kg	2.6	U		
0802L613-002	B017	S	08LICS17	Phosphate	14265-44-2	2.6	mg/kg	2.6	U		
0802L613-002	B017	S	08LICS17	Sulfate	14808-79-8	15.2	mg/kg	2.6		J	High MS
0802L613-003	B018	S	08LICS17	Bromide	24959-67-9	2.6	mg/kg	2.6	U		
0802L613-003	B018	S	08LICS17	Chloride	16887-00-6	6.2	mg/kg	2.6		J	High MS
0802L613-003	B018	S	08LICS17	Fluoride	16984-48-8	2.6	mg/kg	2.6	U		
0802L613-003	B018	S	08LICS17	Nitrate	14797-55-8	3.00	mg/kg	2.55		J	High MS
0802L613-003	B018	S	08LICS17	Nitrite	14797-65-0	2.55	mg/kg	2.55	U		
0802L613-003	B018	S	08LICS17	Phosphate	14265-44-2	2.6	mg/kg	2.6	U		
0802L613-003	B018	S	08LICS17	Sulfate	14808-79-8	29.2	mg/kg	2.6		J	High MS
0802L680-001	B031	S	08LICS18	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0802L680-001	B031	S	08LICS19	Chloride	16887-00-6	22.0	mg/kg	2.5		J	Low MS
0802L680-001	B031	S	08LICS18	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0802L680-001	B031	S	08LICS18	Nitrate	14797-55-8	6.54	mg/kg	2.54			
0802L680-001	B031	S	08LICS18	Nitrite	14797-65-0	2.54	mg/kg	2.54	U		
0802L680-001	B031	S	08LICS18	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		

Table 2-15. Summary of Anion Validation. (10 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L680-001	B031	S	08LICS19	Sulfate	14808-79-8	45.2	mg/kg	2.5		J	Low MS
0802L680-002	B032	S	08LICS18	Bromide	24959-67-9	2.6	mg/kg	2.6	U		
0802L680-002	B032	S	08LICS19	Chloride	16887-00-6	20.7	mg/kg	2.6		J	Low MS
0802L680-002	B032	S	08LICS18	Fluoride	16984-48-8	2.6	mg/kg	2.6	U		
0802L680-002	B032	S	08LICS18	Nitrate	14797-55-8	2.56	mg/kg	2.56	U		
0802L680-002	B032	S	08LICS18	Nitrite	14797-65-0	2.56	mg/kg	2.56	U		
0802L680-002	B032	S	08LICS18	Phosphate	14265-44-2	2.6	mg/kg	2.6	U		
0802L680-002	B032	S	08LICS19	Sulfate	14808-79-8	24.7	mg/kg	2.6		J	Low MS
0802L680-003	B033	S	08LICS18	Bromide	24959-67-9	2.4	mg/kg	2.4	U		
0802L680-003	B033	S	08LICS19	Chloride	16887-00-6	3.5	mg/kg	2.4		J	Low MS
0802L680-003	B033	S	08LICS18	Fluoride	16984-48-8	2.4	mg/kg	2.4	U		
0802L680-003	B033	S	08LICS18	Nitrate	14797-55-8	2.40	mg/kg	2.4	U		
0802L680-003	B033	S	08LICS18	Nitrite	14797-65-0	2.40	mg/kg	2.4	U		
0802L680-003	B033	S	08LICS18	Phosphate	14265-44-2	2.4	mg/kg	2.4	U		
0802L680-003	B033	S	08LICS19	Sulfate	14808-79-8	24.6	mg/kg	2.4		J	Low MS
0803L688-001	B034	S	08LICS18	Bromide	24959-67-9	2.3	mg/kg	2.3	U		
0803L688-001	B034	S	08LICS19	Chloride	16887-00-6	75.6	mg/kg	2.3		J	Low MS
0803L688-001	B034	S	08LICS18	Fluoride	16984-48-8	2.3	mg/kg	2.3	U		
0803L688-001	B034	S	08LICS18	Nitrate	14797-55-8	2.32	mg/kg	2.32	U		
0803L688-001	B034	S	08LICS18	Nitrite	14797-65-0	2.32	mg/kg	2.32	U		
0803L688-001	B034	S	08LICS18	Phosphate	14265-44-2	2.3	mg/kg	2.3	U		
0803L688-001	B034	S	08LICS19	Sulfate	14808-79-8	27.3	mg/kg	2.3		J	Low MS
0803L688-002	B035	S	08LICS18	Bromide	24959-67-9	2.6	mg/kg	2.6	U		
0803L688-002	B035	S	08LICS19	Chloride	16887-00-6	21.8	mg/kg	2.6		J	Low MS
0803L688-002	B035	S	08LICS18	Fluoride	16984-48-8	2.6	mg/kg	2.6	U		

Table 2-15. Summary of Anion Validation. (10 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0803L688-002	B035	S	08LICS18	Nitrate	14797-55-8	5.00	mg/kg	2.61			
0803L688-002	B035	S	08LICS18	Nitrite	14797-65-0	2.61	mg/kg	2.61	U		
0803L688-002	B035	S	08LICS18	Phosphate	14265-44-2	2.6	mg/kg	2.6	U		
0803L688-002	B035	S	08LICS19	Sulfate	14808-79-8	44.4	mg/kg	2.6		J	Low MS
0803L726-001	B036	S	08LICS20	Bromide	24959-67-9	2.3	mg/kg	2.3	U		
0803L726-001	B036	S	08LICS20	Chloride	16887-00-6	4.1	mg/kg	2.3			
0803L726-001	B036	S	08LICS20	Fluoride	16984-48-8	2.3	mg/kg	2.3	U		
0803L726-001	B036	S	08LICS20	Nitrate	14797-55-8	4.53	mg/kg	4.53	U		
0803L726-001	B036	S	08LICS20	Nitrite	14797-65-0	4.53	mg/kg	4.53	U		
0803L726-001	B036	S	08LICS20	Phosphate	14265-44-2	4.5	mg/kg	4.5	U		
0803L726-001	B036	S	08LICS20	Sulfate	14808-79-8	28.2	mg/kg	2.3			
0803L726-002	B037	S	08LICS20	Bromide	24959-67-9	2.4	mg/kg	2.4	U		
0803L726-002	B037	S	08LICS20	Chloride	16887-00-6	10.4	mg/kg	2.4			
0803L726-002	B037	S	08LICS20	Fluoride	16984-48-8	2.4	mg/kg	2.4	U		
0803L726-002	B037	S	08LICS20	Nitrate	14797-55-8	15.4	mg/kg	4.72			
0803L726-002	B037	S	08LICS20	Nitrite	14797-65-0	4.72	mg/kg	4.72	U		
0803L726-002	B037	S	08LICS20	Phosphate	14265-44-2	4.7	mg/kg	4.7	U		
0803L726-002	B037	S	08LICS20	Sulfate	14808-79-8	14.8	mg/kg	2.4			
0803L726-003	B039	S	08LICS20	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0803L726-003	B039	S	08LICS20	Chloride	16887-00-6	41.4	mg/kg	2.5			
0803L726-003	B039	S	08LICS20	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0803L726-003	B039	S	08LICS20	Nitrate	14797-55-8	19.8	mg/kg	5			
0803L726-003	B039	S	08LICS20	Nitrite	14797-65-0	5.00	mg/kg	5	U		
0803L726-003	B039	S	08LICS20	Phosphate	14265-44-2	5.0	mg/kg	5	U		
0803L726-003	B039	S	08LICS20	Sulfate	14808-79-8	19.7	mg/kg	2.5			

Table 2-15. Summary of Anion Validation. (10 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0803L726-004	B040	S	08LICS20	Bromide	24959-67-9	2.4	mg/kg	2.4	U		
0803L726-004	B040	S	08LICS20	Chloride	16887-00-6	9.5	mg/kg	2.4			
0803L726-004	B040	S	08LICS20	Fluoride	16984-48-8	2.4	mg/kg	2.4	U		
0803L726-004	B040	S	08LICS20	Nitrate	14797-55-8	6.23	mg/kg	4.71			
0803L726-004	B040	S	08LICS20	Nitrite	14797-65-0	4.71	mg/kg	4.71	U		
0803L726-004	B040	S	08LICS20	Phosphate	14265-44-2	4.7	mg/kg	4.7	U		
0803L726-004	B040	S	08LICS20	Sulfate	14808-79-8	12.0	mg/kg	2.4			
0803L755-001	B041	S	08LICS22	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0803L755-001	B041	S	08LICS22	Chloride	16887-00-6	2.5	mg/kg	2.5	U		
0803L755-001	B041	S	08LICS22	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0803L755-001	B041	S	08LICS22	Nitrate	14797-55-8	2.47	mg/kg	2.47	U		
0803L755-001	B041	S	08LICS22	Nitrite	14797-65-0	2.47	mg/kg	2.47	U		
0803L755-001	B041	S	08LICS22	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0803L755-001	B041	S	08LICS22	Sulfate	14808-79-8	17.0	mg/kg	2.5		J	Low MS
0803L755-002	B042	S	08LICS22	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0803L755-002	B042	S	08LICS22	Chloride	16887-00-6	4.2	mg/kg	2.5			
0803L755-002	B042	S	08LICS22	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0803L755-002	B042	S	08LICS22	Nitrate	14797-55-8	3.02	mg/kg	2.46			
0803L755-002	B042	S	08LICS22	Nitrite	14797-65-0	2.46	mg/kg	2.46	U		
0803L755-002	B042	S	08LICS22	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0803L755-002	B042	S	08LICS22	Sulfate	14808-79-8	16.7	mg/kg	2.5		J	Low MS
0802L674-001	G004	W	08LICC17	Bromide	24959-67-9	0.25	mg/L	0.25	U		
0802L674-001	G004	W	08LICA17	Chloride	16887-00-6	9.3	mg/L	0.25			
0802L674-001	G004	W	08LIC017	Fluoride	16984-48-8	0.30	mg/L	0.25			
0802L674-001	G004	W	08LICD17	Nitrate	14797-55-8	17.7	mg/L	1.25		J	Hold Time

Table 2-15. Summary of Anion Validation. (10 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L674-001	G004	W	08LICB17	Nitrite	14797-65-0	0.25	mg/L	0.25	U	UR	Hold Time
0802L674-001	G004	W	08LICE17	Phosphate	14265-44-2	0.25	mg/L	0.25	U	UR	Hold Time
0802L674-001	G004	W	08LICF17	Sulfate	14808-79-8	23.3	mg/L	1.2			
0802L674-002	G005	W	08LICC17	Bromide	24959-67-9	0.25	mg/L	0.25	U		
0802L674-002	G005	W	08LICA17	Chloride	16887-00-6	8.9	mg/L	0.25			
0802L674-002	G005	W	08LIC017	Fluoride	16984-48-8	0.29	mg/L	0.25			
0802L674-002	G005	W	08LICD17	Nitrate	14797-55-8	18.1	mg/L	1.25		J	Hold Time
0802L674-002	G005	W	08LICB17	Nitrite	14797-65-0	0.25	mg/L	0.25	U	UR	Hold Time
0802L674-002	G005	W	08LICE17	Phosphate	14265-44-2	0.25	mg/L	0.25	U	UR	Hold Time
0802L674-002	G005	W	08LICF17	Sulfate	14808-79-8	25.0	mg/L	1.2			
0802L679-001	G006	W	08LICC17	Bromide	24959-67-9	0.25	mg/L	0.25	U		
0802L679-001	G006	W	08LICA17	Chloride	16887-00-6	9.4	mg/L	0.25			
0802L679-001	G006	W	08LIC017	Fluoride	16984-48-8	0.26	mg/L	0.25			
0802L679-001	G006	W	08LICD17	Nitrate	14797-55-8	16.7	mg/L	1.25		J	Hold Time
0802L679-001	G006	W	08LICB17	Nitrite	14797-65-0	0.25	mg/L	0.25	U	UJ	Hold Time
0802L679-001	G006	W	08LICE17	Phosphate	14265-44-2	0.25	mg/L	0.25	U	UJ	Hold Time
0802L679-001	G006	W	08LICF17	Sulfate	14808-79-8	23.5	mg/L	1.2			
0802L679-002	G007	W	08LICC17	Bromide	24959-67-9	0.25	mg/L	0.25	U		
0802L679-002	G007	W	08LICA17	Chloride	16887-00-6	9.5	mg/L	0.25			
0802L679-002	G007	W	08LIC017	Fluoride	16984-48-8	0.29	mg/L	0.25			
0802L679-002	G007	W	08LICD17	Nitrate	14797-55-8	17.6	mg/L	1.25		J	Hold Time
0802L679-002	G007	W	08LICB17	Nitrite	14797-65-0	0.25	mg/L	0.25	U	UJ	Hold Time
0802L679-002	G007	W	08LICE17	Phosphate	14265-44-2	0.25	mg/L	0.25	U	UJ	Hold Time
0802L679-002	G007	W	08LICF17	Sulfate	14808-79-8	23.3	mg/L	1.2			
0802L679-003	G008	W	08LICC17	Bromide	24959-67-9	0.25	mg/L	0.25	U		

Table 2-15. Summary of Anion Validation. (10 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L679-003	G008	W	08LICA17	Chloride	16887-00-6	9.3	mg/L	0.25			
0802L679-003	G008	W	08LIC017	Fluoride	16984-48-8	0.29	mg/L	0.25			
0802L679-003	G008	W	08LICD17	Nitrate	14797-55-8	18.4	mg/L	1.25		J	Hold Time
0802L679-003	G008	W	08LICB17	Nitrite	14797-65-0	0.25	mg/L	0.25	U	UJ	Hold Time
0802L679-003	G008	W	08LICE17	Phosphate	14265-44-2	0.25	mg/L	0.25	U	UJ	Hold Time
0802L679-003	G008	W	08LICF17	Sulfate	14808-79-8	23.6	mg/L	1.2			

CAS - Chemical Abstracts System
EQL - estimated quantitation limit
MS - matrix spike
Q - laboratory qualifier
S soil
V - validation qualifier
W - water

2.6.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-16 shows the number of each type of sample in each preparation batch.

Table 2-16. Anion Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
08LIC017	W	Fluoride	16984-48-8	1	1	1	1	0	5
08LICA17	W	Chloride	16887-00-6	1	1	1	1	0	5
08LICB17	W	Nitrite	14797-65-0	1	1	1	1	0	5
08LICC17	W	Bromide	24959-67-9	1	1	1	1	0	5
08LICD17	W	Nitrate	14797-55-8	1	1	1	1	0	5
08LICE17	W	Phosphate	14265-44-2	1	1	1	1	0	5
08LICF17	W	Sulfate	14808-79-8	1	1	1	1	0	5
08LICS17	S	Bromide	24959-67-9	1	1	1	1	0	8
08LICS17	S	Chloride	16887-00-6	1	1	1	1	0	8
08LICS17	S	Fluoride	16984-48-8	1	1	1	1	0	8
08LICS17	S	Nitrate	14797-55-8	1	1	1	1	0	8
08LICS17	S	Nitrite	14797-65-0	1	1	1	1	0	8
08LICS17	S	Phosphate	14265-44-2	1	1	1	1	0	8
08LICS17	S	Sulfate	14808-79-8	1	1	1	1	0	8
08LICS18	S	Bromide	24959-67-9	1	1	1	1	0	5
08LICS18	S	Fluoride	16984-48-8	1	1	1	1	0	5
08LICS18	S	Nitrate	14797-55-8	1	1	1	1	0	5
08LICS18	S	Nitrite	14797-65-0	1	1	1	1	0	5
08LICS18	S	Phosphate	14265-44-2	1	1	1	1	0	5
08LICS19	S	Chloride	16887-00-6	1	1	1	1	0	5
08LICS19	S	Sulfate	14808-79-8	1	1	1	1	0	5
08LICS20	S	Bromide	24959-67-9	1		1		0	4
08LICS20	S	Chloride	16887-00-6	1		1		0	4
08LICS20	S	Fluoride	16984-48-8	1		1		0	4
08LICS20	S	Nitrate	14797-55-8	1		1		0	4
08LICS20	S	Nitrite	14797-65-0	1		1		0	4
08LICS20	S	Phosphate	14265-44-2	1		1		0	4
08LICS20	S	Sulfate	14808-79-8	1		1		0	4
08LICS22	S	Bromide	24959-67-9	1	1	1	1	0	2
08LICS22	S	Chloride	16887-00-6	1	1	1	1	0	2
08LICS22	S	Fluoride	16984-48-8	1	1	1	1	0	2
08LICS22	S	Nitrate	14797-55-8	1	1	1	1	0	2
08LICS22	S	Nitrite	14797-65-0	1	1	1	1	0	2
08LICS22	S	Phosphate	14265-44-2	1	1	1	1	0	2

Table 2-16. Anion Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
08LICS22	S	Sulfate	14808-79-8	1	1	1	1	0	2
08LICT13	S	Bromide	24959-67-9	1	1	1	1	0	9
08LICT13	S	Chloride	16887-00-6	1	1	1	1	0	9
08LICT13	S	Fluoride	16984-48-8	1	1	1	1	0	9
08LICT13	S	Nitrate	14797-55-8	1	1	1	1	0	9
08LICT13	S	Nitrite	14797-65-0	1	1	1	1	0	9
08LICT13	S	Phosphate	14265-44-2	1	1	1	1	0	9
08LICT13	S	Sulfate	14808-79-8	1	1	1	1	0	9

CAS - Chemical Abstracts System
DUP - duplicate
LCS - laboratory control sample
MB - method blank
MS - matrix spike
MSD - matrix spike duplicate
S - soil
W - water

Anion analysis was performed in seven batches for water samples (one batch for each anion), and six batches for solid samples. Each batch contained fewer than 20 field samples. Except for batch 08LICS20, at least one MB, LCS, MS and DUP were analyzed in each sample batch. In batch 08LICS20, neither an MS nor a DUP was performed. The project goal for MS and DUP is to obtain one MS and one DUP result for every 20 samples of each matrix type. One of each was obtained for the five water samples. For solid samples, four MS results and four DUP results were obtained for each anion. This is more than sufficient for the 28 field sample results obtained for each anion.

2.6.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for analysis by method 9056 is specified in VET-1405-PLN-03, Rev. 0, as 48 hours. Since holding times for these samples range from 4 days to 22 days, this limit would result in rejection of all the nondetect data. Normally, the 48-hour limit is applied only to nitrate, nitrite, and phosphate (SW-846, Method 9056A, Rev. 1, and Chapter 3, Rev. 4, Table 3-2). The limit for other ion chromatography analytes is 28 days. In addition, the U.S. Environmental Protection Agency (EPA) Management Information Capability for Enforcement (MICE) team has made the reasonable recommendation (e-mail to M. Miller 7/13/07) that the 48-hour limit for nitrate, nitrite, and phosphate be applied only to water samples and solid samples containing enough free liquid to analyze. Under this recommendation, analysis of nitrate, nitrite, and phosphate in normal soil samples would be allowed 28 days to extraction, and another 48 hours for analysis. The holding time limits recommended by the MICE team are summarized in Table 2-17. Holding times for all soil samples satisfied these limits.

Using the MICE team recommendation, nitrite and phosphate in samples G004 and G005, all nondetects in groundwater with hold times of 5 days, were rejected, and flagged “UR.” Nitrite and phosphate in the other groundwater samples (G006, G007, and G008) were nondetects with 4 days (two times the hold time limit), so they were qualified as approximate and flagged “J.”

Nitrate in all groundwater samples (G004, G005, G006, G007, and G008) were detects with hold times ranging from 4 to 6 days; they were all qualified as approximate and flagged "J."

Table 2-17. Holding Time Limits Used to Validate Anion Data.

Analyte	Solid Samples		Water Samples
	HTEx	HTAn	HTAn
Chloride	N/A	28 d	28 d
Fluoride	N/A	28 d	28 d
Nitrate	28 d	48 h	48 h
Nitrite	28 d	48 h	48 h
Phosphate	28 d	48 h	48 h
Sulfate	N/A	28 d	28 d

N/A: Not applicable
HTEx: Holding time limit from sample collection to extraction
HTAn: Holding time limit to analysis. This period is measured from the time of extraction, if specified, otherwise from time of collection.

2.6.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Project documentation does not specify required quantitation limits for anions by ion chromatography in soil samples. Required quantitation limits for water sample method blanks were achieved except for fluoride, chloride, and nitrite. In these cases, the analyte was not detected in the blank, but the detection limit of 0.25 mg/L exceeded the required detection limit of 0.1 mg/L. No qualification of sample results was required.

2.6.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify required quantitation limits for anions by ion chromatography in soil samples. The required quantitation limit was exceeded for all nitrite sample results. The validation criteria do not require that these results be qualified. Other nondetect anion results met the required quantitation limit.

2.6.5. QC Checks for Accuracy

- Did the recoveries for the LCS and MS meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS recoveries must be between 75% and 125%. All LCS recoveries were within these limits, except for phosphate in batch 08LICS18, which exceeded the upper QC limit. Since phosphate results for all samples in this batch were nondetects, no qualification of results was required.

MS recoveries for all anions exceeded the upper QC limit in batch 08LICS17. Therefore, all detects in this batch were qualified as approximate and flagged "J." Nondetect results do not require qualification.

MS recoveries for sulfate and chloride fell below the lower QC limit in batch 08LICS19. Accordingly, all sulfate and chloride results in this batch were qualified as approximate and flagged "J."

The MS recovery for sulfate fell below the lower QC limit in batch 08LICS22. Accordingly, sulfate results for the two samples in this batch were qualified as approximate and flagged "J."

2.6.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, sample duplicate RPDs must be less than 20%. All RPDs met this requirement except for nitrate in batch 08LICS22. However, the RPD (20.8%) exceeded the criterion only slightly, and the results were very close to the detection limit, so results were not qualified for precision.

2.7. DATA VALIDATION REPORT FOR TOTAL PHENOLS (METHOD 9066)

Table 2-18 is a summary of the validated results for analysis of total phenols.

Table 2-18. Summary of Total Phenols Validation. (2 Pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0802L535-001	B001	S	08LPL001	0.09	mg/kg	0.07			
0802L535-002	B002	S	08LPL001	0.27	mg/kg	0.27			
0802L535-003	B003	S	08LPL001	0.13	mg/kg	0.13	U		
0802L535-004	B004	S	08LPL001	0.66	mg/kg	0.26			
0802L535-005	B005	S	08LPL001	0.26	mg/kg	0.26	U		
0802L570-001	B006	S	08LPL002	0.27	mg/kg	0.27	U		
0802L570-002	B007	S	08LPL002	0.35	mg/kg	0.26			
0802L570-003	B008	S	08LPL002	0.26	mg/kg	0.26	U		
0802L575-001	B009	S	08LPL003	0.26	mg/kg	0.26	U		
0802L610-001	B010	S	08LPL003	0.26	mg/kg	0.26	U		
0802L610-002	B011	S	08LPL003	0.26	mg/kg	0.26	U		
0802L610-003	B012	S	08LPL003	0.31	mg/kg	0.26			
0802L610-004	B013	S	08LPL003	0.26	mg/kg	0.26	U		
0802L610-005	B014	S	08LPL003	0.26	mg/kg	0.26	U		
0802L613-001	B016	S	08LPL003	0.26	mg/kg	0.26	U		
0802L613-002	B017	S	08LPL003	0.26	mg/kg	0.26	U		
0802L613-003	B018	S	08LPL003	0.26	mg/kg	0.26	U		
0802L680-001	B031	S	08LPLA06	0.26	mg/kg	0.26	U		
0802L680-002	B032	S	08LPLA06	0.26	mg/kg	0.26	U		

Table 2-18. Summary of Total Phenols Validation. (2 Pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0802L680-003	B033	S	08LPLA06	0.45	mg/kg	0.26			
0803L688-001	B034	S	08LPLA06	0.26	mg/kg	0.26	U		
0803L688-002	B035	S	08LPLA06	0.26	mg/kg	0.26	U		
0803L726-001	B036	S	08LPN007	0.26	mg/kg	0.26	U		
0803L726-002	B037	S	08LPN007	0.26	mg/kg	0.26	U		
0803L726-003	B039	S	08LPN007	0.26	mg/kg	0.26	U		
0803L726-004	B040	S	08LPN007	0.26	mg/kg	0.26	U		
0803L755-001	B041	S	08LPN007	0.25	mg/kg	0.25	U		
0803L755-002	B042	S	08LPN007	0.26	mg/kg	0.26	U		
0802L674-001	G004	W	08LPLA05	5.0	ug/L	5	U		
0802L674-002	G005	W	08LPLA05	5.0	ug/L	5	U		
0802L679-001	G006	W	08LPL006	5.0	ug/L	5	U		
0802L679-002	G007	W	08LPL006	5.0	ug/L	5	U		
0802L679-003	G008	W	08LPL006	5.0	ug/L	5	U		

EQL - estimated quantitation limit
Q - laboratory qualifier
S soil
V - validation qualifier
W - water

2.7.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-19 shows the number of each type of sample in each preparation batch.

Table 2-19. Total Phenols Preparation Batch Summary.

Batch ID	Matrix	BLK	DUP	LCS	MS	MSD	Sample
08LPL001	S	1	0	2	1	0	5
08LPL002	S	1	0	2	1	0	3
08LPL003	S	1	0	2	1	0	9
08LPLA06	S	1	0	2	1	0	5
08LPN007	S	1	0	1	1	0	6
08LPL006	W	1	0	2	1	0	3
08LPLA05	W	1	0	2	1	0	2

BLK - blank
DUP - duplicate
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
S - soil
W - water

Total phenol analysis was performed in seven batches. Each batch contained fewer than 20 field samples. At least one MB, LCS, and MS were analyzed in each sample batch.

According to procedure 9066, a "duplicate spike sample" is to be analyzed with each batch. The duplicate is not required to be performed on a sample matrix. The duplicate was performed on the LCS for all but one batch. Although this is not a matrix spike, it does provide a demonstration of precision. The frequency of duplicate analysis satisfies the project requirement of one per 20 samples of each matrix type, averaged over the project, so no sample results were qualified for lack of duplicate analysis.

2.7.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for total phenol analysis is specified in VET-1405-PLN-03, Rev. 0, as 28 days. All results were generated within these limits.

2.7.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Project documentation does not specify a required quantitation limit for total phenol. Phenols were not detected in the method blanks. Detection limits in the blanks were 5 ug/L for water and 0.25 mg/kg for soils.

2.7.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for total phenol. Detection limits for phenols were 5 ug/L for water samples and 0.27 mg/kg or less for soil samples.

2.7.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, and MSD, meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS, MS, and MSD recoveries must be between 75% and 125%. All LCS and MS/MSD recoveries were within these limits.

2.7.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the RPD must be less than 20%. All LCS/LCSD RPDs met this criterion.

2.8. DATA VALIDATION REPORT FOR POLYCHLORINATED BIPHENYL COMPOUNDS (METHOD 8082)

Table 2-20 is a summary of the validated results for the PCBs.

Table 2-20. Summary of PCB Validation. (10 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L535-001	B001	S	08LE0058	Aroclor-1016	12674-11-2	15	ug/kg	15	U		
0802L535-001	B001	S	08LE0058	Aroclor-1221	11104-28-2	15	ug/kg	15	U		
0802L535-001	B001	S	08LE0058	Aroclor-1232	11141-16-5	15	ug/kg	15	U		
0802L535-001	B001	S	08LE0058	Aroclor-1242	53469-21-9	15	ug/kg	15	U		
0802L535-001	B001	S	08LE0058	Aroclor-1248	12672-29-6	15	ug/kg	15	U		
0802L535-001	B001	S	08LE0058	Aroclor-1254	11097-69-1	15	ug/kg	15	U		
0802L535-001	B001	S	08LE0058	Aroclor-1260	11096-82-5	15	ug/kg	15	U		
0802L535-002	B002	S	08LE0058	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0802L535-002	B002	S	08LE0058	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0802L535-002	B002	S	08LE0058	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0802L535-002	B002	S	08LE0058	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0802L535-002	B002	S	08LE0058	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0802L535-002	B002	S	08LE0058	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0802L535-002	B002	S	08LE0058	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0802L535-003	B003	S	08LE0058	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0802L535-003	B003	S	08LE0058	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0802L535-003	B003	S	08LE0058	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0802L535-003	B003	S	08LE0058	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0802L535-003	B003	S	08LE0058	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0802L535-003	B003	S	08LE0058	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0802L535-003	B003	S	08LE0058	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0802L535-004	B004	S	08LE0058	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0802L535-004	B004	S	08LE0058	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0802L535-004	B004	S	08LE0058	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0802L535-004	B004	S	08LE0058	Aroclor-1242	53469-21-9	14	ug/kg	14	U		

Table 2-20. Summary of PCB Validation. (10 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L535-004	B004	S	08LE0058	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0802L535-004	B004	S	08LE0058	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0802L535-004	B004	S	08LE0058	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0802L535-005	B005	S	08LE0058	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0802L535-005	B005	S	08LE0058	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0802L535-005	B005	S	08LE0058	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0802L535-005	B005	S	08LE0058	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0802L535-005	B005	S	08LE0058	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0802L535-005	B005	S	08LE0058	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0802L535-005	B005	S	08LE0058	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0802L570-001	B006	S	08LE0071	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0802L570-001	B006	S	08LE0071	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0802L570-001	B006	S	08LE0071	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0802L570-001	B006	S	08LE0071	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0802L570-001	B006	S	08LE0071	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0802L570-001	B006	S	08LE0071	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0802L570-001	B006	S	08LE0071	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0802L570-002	B007	S	08LE0071	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0802L570-002	B007	S	08LE0071	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0802L570-002	B007	S	08LE0071	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0802L570-002	B007	S	08LE0071	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0802L570-002	B007	S	08LE0071	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0802L570-002	B007	S	08LE0071	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0802L570-002	B007	S	08LE0071	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0802L570-003	B008	S	08LE0071	Aroclor-1016	12674-11-2	14	ug/kg	14	U		

Table 2-20. Summary of PCB Validation. (10 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L570-003	B008	S	08LE0071	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0802L570-003	B008	S	08LE0071	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0802L570-003	B008	S	08LE0071	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0802L570-003	B008	S	08LE0071	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0802L570-003	B008	S	08LE0071	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0802L570-003	B008	S	08LE0071	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0802L575-001	B009	S	08LE0083	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0802L575-001	B009	S	08LE0083	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0802L575-001	B009	S	08LE0083	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0802L575-001	B009	S	08LE0083	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0802L575-001	B009	S	08LE0083	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0802L575-001	B009	S	08LE0083	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0802L575-001	B009	S	08LE0083	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0802L610-001	B010	S	08LE0097	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0802L610-001	B010	S	08LE0097	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0802L610-001	B010	S	08LE0097	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0802L610-001	B010	S	08LE0097	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0802L610-001	B010	S	08LE0097	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0802L610-001	B010	S	08LE0097	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0802L610-001	B010	S	08LE0097	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0802L610-002	B011	S	08LE0097	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0802L610-002	B011	S	08LE0097	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0802L610-002	B011	S	08LE0097	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0802L610-002	B011	S	08LE0097	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0802L610-002	B011	S	08LE0097	Aroclor-1248	12672-29-6	14	ug/kg	14	U		

Table 2-20. Summary of PCB Validation. (10 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L610-002	B011	S	08LE0097	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0802L610-002	B011	S	08LE0097	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0802L610-003	B012	S	08LE0097	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0802L610-003	B012	S	08LE0097	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0802L610-003	B012	S	08LE0097	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0802L610-003	B012	S	08LE0097	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0802L610-003	B012	S	08LE0097	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0802L610-003	B012	S	08LE0097	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0802L610-003	B012	S	08LE0097	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0802L610-004	B013	S	08LE0097	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0802L610-004	B013	S	08LE0097	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0802L610-004	B013	S	08LE0097	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0802L610-004	B013	S	08LE0097	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0802L610-004	B013	S	08LE0097	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0802L610-004	B013	S	08LE0097	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0802L610-004	B013	S	08LE0097	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0802L610-005	B014	S	08LE0097	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0802L610-005	B014	S	08LE0097	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0802L610-005	B014	S	08LE0097	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0802L610-005	B014	S	08LE0097	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0802L610-005	B014	S	08LE0097	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0802L610-005	B014	S	08LE0097	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0802L610-005	B014	S	08LE0097	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0802L613-001	B016	S	08LE0097	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0802L613-001	B016	S	08LE0097	Aroclor-1221	11104-28-2	14	ug/kg	14	U		

Table 2-20. Summary of PCB Validation. (10 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L613-001	B016	S	08LE0097	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0802L613-001	B016	S	08LE0097	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0802L613-001	B016	S	08LE0097	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0802L613-001	B016	S	08LE0097	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0802L613-001	B016	S	08LE0097	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0802L613-002	B017	S	08LE0097	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0802L613-002	B017	S	08LE0097	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0802L613-002	B017	S	08LE0097	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0802L613-002	B017	S	08LE0097	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0802L613-002	B017	S	08LE0097	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0802L613-002	B017	S	08LE0097	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0802L613-002	B017	S	08LE0097	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0802L613-003	B018	S	08LE0097	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0802L613-003	B018	S	08LE0097	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0802L613-003	B018	S	08LE0097	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0802L613-003	B018	S	08LE0097	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0802L613-003	B018	S	08LE0097	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0802L613-003	B018	S	08LE0097	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0802L613-003	B018	S	08LE0097	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0802L680-001	B031	S	08LE0114	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0802L680-001	B031	S	08LE0114	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0802L680-001	B031	S	08LE0114	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0802L680-001	B031	S	08LE0114	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0802L680-001	B031	S	08LE0114	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0802L680-001	B031	S	08LE0114	Aroclor-1254	11097-69-1	14	ug/kg	14	U		

Table 2-20. Summary of PCB Validation. (10 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L680-001	B031	S	08LE0114	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0802L680-002	B032	S	08LE0114	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0802L680-002	B032	S	08LE0114	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0802L680-002	B032	S	08LE0114	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0802L680-002	B032	S	08LE0114	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0802L680-002	B032	S	08LE0114	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0802L680-002	B032	S	08LE0114	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0802L680-002	B032	S	08LE0114	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0802L680-003	B033	S	08LE0114	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0802L680-003	B033	S	08LE0114	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0802L680-003	B033	S	08LE0114	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0802L680-003	B033	S	08LE0114	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0802L680-003	B033	S	08LE0114	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0802L680-003	B033	S	08LE0114	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0802L680-003	B033	S	08LE0114	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0803L688-001	B034	S	08LE0114	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0803L688-001	B034	S	08LE0114	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0803L688-001	B034	S	08LE0114	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0803L688-001	B034	S	08LE0114	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0803L688-001	B034	S	08LE0114	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0803L688-001	B034	S	08LE0114	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0803L688-001	B034	S	08LE0114	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0803L688-002	B035	S	08LE0114	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0803L688-002	B035	S	08LE0114	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0803L688-002	B035	S	08LE0114	Aroclor-1232	11141-16-5	14	ug/kg	14	U		

Table 2-20. Summary of PCB Validation. (10 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0803L688-002	B035	S	08LE0114	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0803L688-002	B035	S	08LE0114	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0803L688-002	B035	S	08LE0114	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0803L688-002	B035	S	08LE0114	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0803L726-001	B036	S	08LE0126	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0803L726-001	B036	S	08LE0126	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0803L726-001	B036	S	08LE0126	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0803L726-001	B036	S	08LE0126	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0803L726-001	B036	S	08LE0126	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0803L726-001	B036	S	08LE0126	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0803L726-001	B036	S	08LE0126	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0803L726-002	B037	S	08LE0126	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0803L726-002	B037	S	08LE0126	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0803L726-002	B037	S	08LE0126	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0803L726-002	B037	S	08LE0126	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0803L726-002	B037	S	08LE0126	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0803L726-002	B037	S	08LE0126	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0803L726-002	B037	S	08LE0126	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0803L726-003	B039	S	08LE0126	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0803L726-003	B039	S	08LE0126	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0803L726-003	B039	S	08LE0126	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0803L726-003	B039	S	08LE0126	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0803L726-003	B039	S	08LE0126	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0803L726-003	B039	S	08LE0126	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0803L726-003	B039	S	08LE0126	Aroclor-1260	11096-82-5	14	ug/kg	14	U		

Table 2-20. Summary of PCB Validation. (10 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0803L726-004	B040	S	08LE0126	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0803L726-004	B040	S	08LE0126	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0803L726-004	B040	S	08LE0126	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0803L726-004	B040	S	08LE0126	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0803L726-004	B040	S	08LE0126	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0803L726-004	B040	S	08LE0126	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0803L726-004	B040	S	08LE0126	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0803L755-001	B041	S	08LE0134	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0803L755-001	B041	S	08LE0134	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0803L755-001	B041	S	08LE0134	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0803L755-001	B041	S	08LE0134	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0803L755-001	B041	S	08LE0134	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0803L755-001	B041	S	08LE0134	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0803L755-001	B041	S	08LE0134	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0803L755-002	B042	S	08LE0134	Aroclor-1016	12674-11-2	14	ug/kg	14	U		
0803L755-002	B042	S	08LE0134	Aroclor-1221	11104-28-2	14	ug/kg	14	U		
0803L755-002	B042	S	08LE0134	Aroclor-1232	11141-16-5	14	ug/kg	14	U		
0803L755-002	B042	S	08LE0134	Aroclor-1242	53469-21-9	14	ug/kg	14	U		
0803L755-002	B042	S	08LE0134	Aroclor-1248	12672-29-6	14	ug/kg	14	U		
0803L755-002	B042	S	08LE0134	Aroclor-1254	11097-69-1	14	ug/kg	14	U		
0803L755-002	B042	S	08LE0134	Aroclor-1260	11096-82-5	14	ug/kg	14	U		
0802L674-001	G004	W	08LE0109	Aroclor-1016	12674-11-2	0.40	ug/L	0.4	U		
0802L674-001	G004	W	08LE0109	Aroclor-1221	11104-28-2	0.40	ug/L	0.4	U		
0802L674-001	G004	W	08LE0109	Aroclor-1232	11141-16-5	0.40	ug/L	0.4	U		
0802L674-001	G004	W	08LE0109	Aroclor-1242	53469-21-9	0.40	ug/L	0.4	U		

Table 2-20. Summary of PCB Validation. (10 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L674-001	G004	W	08LE0109	Aroclor-1248	12672-29-6	0.40	ug/L	0.4	U		
0802L674-001	G004	W	08LE0109	Aroclor-1254	11097-69-1	0.40	ug/L	0.4	U		
0802L674-001	G004	W	08LE0109	Aroclor-1260	11096-82-5	0.40	ug/L	0.4	U		
0802L674-002	G005	W	08LE0109	Aroclor-1016	12674-11-2	0.40	ug/L	0.4	U		
0802L674-002	G005	W	08LE0109	Aroclor-1221	11104-28-2	0.40	ug/L	0.4	U		
0802L674-002	G005	W	08LE0109	Aroclor-1232	11141-16-5	0.40	ug/L	0.4	U		
0802L674-002	G005	W	08LE0109	Aroclor-1242	53469-21-9	0.40	ug/L	0.4	U		
0802L674-002	G005	W	08LE0109	Aroclor-1248	12672-29-6	0.40	ug/L	0.4	U		
0802L674-002	G005	W	08LE0109	Aroclor-1254	11097-69-1	0.40	ug/L	0.4	U		
0802L674-002	G005	W	08LE0109	Aroclor-1260	11096-82-5	0.40	ug/L	0.4	U		
0802L679-001	G006	W	08LE0111	Aroclor-1016	12674-11-2	0.40	ug/L	0.4	U		
0802L679-001	G006	W	08LE0111	Aroclor-1221	11104-28-2	0.40	ug/L	0.4	U		
0802L679-001	G006	W	08LE0111	Aroclor-1232	11141-16-5	0.40	ug/L	0.4	U		
0802L679-001	G006	W	08LE0111	Aroclor-1242	53469-21-9	0.40	ug/L	0.4	U		
0802L679-001	G006	W	08LE0111	Aroclor-1248	12672-29-6	0.40	ug/L	0.4	U		
0802L679-001	G006	W	08LE0111	Aroclor-1254	11097-69-1	0.40	ug/L	0.4	U		
0802L679-001	G006	W	08LE0111	Aroclor-1260	11096-82-5	0.40	ug/L	0.4	U		
0802L679-002	G007	W	08LE0111	Aroclor-1016	12674-11-2	0.40	ug/L	0.4	U		
0802L679-002	G007	W	08LE0111	Aroclor-1221	11104-28-2	0.40	ug/L	0.4	U		
0802L679-002	G007	W	08LE0111	Aroclor-1232	11141-16-5	0.40	ug/L	0.4	U		
0802L679-002	G007	W	08LE0111	Aroclor-1242	53469-21-9	0.40	ug/L	0.4	U		
0802L679-002	G007	W	08LE0111	Aroclor-1248	12672-29-6	0.40	ug/L	0.4	U		
0802L679-002	G007	W	08LE0111	Aroclor-1254	11097-69-1	0.40	ug/L	0.4	U		
0802L679-002	G007	W	08LE0111	Aroclor-1260	11096-82-5	0.40	ug/L	0.4	U		
0802L679-003	G008	W	08LE0111	Aroclor-1016	12674-11-2	0.40	ug/L	0.4	U		

Table 2-20. Summary of PCB Validation. (10 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L679-003	G008	W	08LE0111	Aroclor-1221	11104-28-2	0.40	ug/L	0.4	U		
0802L679-003	G008	W	08LE0111	Aroclor-1232	11141-16-5	0.40	ug/L	0.4	U		
0802L679-003	G008	W	08LE0111	Aroclor-1242	53469-21-9	0.40	ug/L	0.4	U		
0802L679-003	G008	W	08LE0111	Aroclor-1248	12672-29-6	0.40	ug/L	0.4	U		
0802L679-003	G008	W	08LE0111	Aroclor-1254	11097-69-1	0.40	ug/L	0.4	U		
0802L679-003	G008	W	08LE0111	Aroclor-1260	11096-82-5	0.40	ug/L	0.4	U		

CAS - Chemical Abstracts System
EQL - estimated quantitation limit
Q - laboratory qualifier
S soil
V - validation qualifier
W - water

2.8.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each field sample and each QC sample?
- Was precision checked with an MSD?

Table 2-21 shows the number of each type of sample in each preparation batch.

Table 2-21. PCB Preparation Batch Summary. (3 Pages)

Matrix	Batch ID	Analyte	CAS	MB	LCS	MS	MSD	Sample	Surr
S	08LE0058	Aroclor-1016	12674-11-2	1	1	1	1	5	
S	08LE0058	Aroclor-1221	11104-28-2	1		1	1	5	
S	08LE0058	Aroclor-1232	11141-16-5	1		1	1	5	
S	08LE0058	Aroclor-1242	53469-21-9	1		1	1	5	
S	08LE0058	Aroclor-1248	12672-29-6	1		1	1	5	
S	08LE0058	Aroclor-1254	11097-69-1	1		1	1	5	
S	08LE0058	Aroclor-1260	11096-82-5	1	1	1	1	5	
S	08LE0058	Decachlorobiphenyl	2051-24-3						9
S	08LE0058	Tetrachloro-m-xylene	877-09-8						9
S	08LE0071	Aroclor-1016	12674-11-2	1	1	1	1	3	
S	08LE0071	Aroclor-1221	11104-28-2	1				3	
S	08LE0071	Aroclor-1232	11141-16-5	1				3	
S	08LE0071	Aroclor-1242	53469-21-9	1				3	
S	08LE0071	Aroclor-1248	12672-29-6	1				3	
S	08LE0071	Aroclor-1254	11097-69-1	1				3	
S	08LE0071	Aroclor-1260	11096-82-5	1	1	1	1	3	
S	08LE0071	Decachlorobiphenyl	2051-24-3						7
S	08LE0071	Tetrachloro-m-xylene	877-09-8						7
S	08LE0083	Aroclor-1016	12674-11-2	1	1	1	1	1	
S	08LE0083	Aroclor-1221	11104-28-2	1		1	1	1	
S	08LE0083	Aroclor-1232	11141-16-5	1		1	1	1	
S	08LE0083	Aroclor-1242	53469-21-9	1		1	1	1	
S	08LE0083	Aroclor-1248	12672-29-6	1		1	1	1	
S	08LE0083	Aroclor-1254	11097-69-1	1		1	1	1	
S	08LE0083	Aroclor-1260	11096-82-5	1	1	1	1	1	
S	08LE0083	Decachlorobiphenyl	2051-24-3						5
S	08LE0083	Tetrachloro-m-xylene	877-09-8						5
S	08LE0097	Aroclor-1016	12674-11-2	1	1	1	1	8	
S	08LE0097	Aroclor-1221	11104-28-2	1				8	

Table 2-21. PCB Preparation Batch Summary. (3 Pages)

Matrix	Batch ID	Analyte	CAS	MB	LCS	MS	MSD	Sample	Surr
S	08LE0097	Aroclor-1232	11141-16-5	1				8	
S	08LE0097	Aroclor-1242	53469-21-9	1				8	
S	08LE0097	Aroclor-1248	12672-29-6	1				8	
S	08LE0097	Aroclor-1254	11097-69-1	1				8	
S	08LE0097	Aroclor-1260	11096-82-5	1	1	1	1	8	
S	08LE0097	Decachlorobiphenyl	2051-24-3						12
S	08LE0097	Tetrachloro-m-xylene	877-09-8						12
S	08LE0114	Aroclor-1016	12674-11-2	1	1	1	1	5	
S	08LE0114	Aroclor-1221	11104-28-2	1				5	
S	08LE0114	Aroclor-1232	11141-16-5	1				5	
S	08LE0114	Aroclor-1242	53469-21-9	1				5	
S	08LE0114	Aroclor-1248	12672-29-6	1				5	
S	08LE0114	Aroclor-1254	11097-69-1	1				5	
S	08LE0114	Aroclor-1260	11096-82-5	1	1	1	1	5	
S	08LE0114	Decachlorobiphenyl	2051-24-3						9
S	08LE0114	Tetrachloro-m-xylene	877-09-8						9
S	08LE0126	Aroclor-1016	12674-11-2	1	1			4	
S	08LE0126	Aroclor-1221	11104-28-2	1				4	
S	08LE0126	Aroclor-1232	11141-16-5	1				4	
S	08LE0126	Aroclor-1242	53469-21-9	1				4	
S	08LE0126	Aroclor-1248	12672-29-6	1				4	
S	08LE0126	Aroclor-1254	11097-69-1	1				4	
S	08LE0126	Aroclor-1260	11096-82-5	1	1			4	
S	08LE0126	Decachlorobiphenyl	2051-24-3						6
S	08LE0126	Tetrachloro-m-xylene	877-09-8						6
S	08LE0134	Aroclor-1016	12674-11-2	1	1	1	1	2	
S	08LE0134	Aroclor-1221	11104-28-2	1				2	
S	08LE0134	Aroclor-1232	11141-16-5	1				2	
S	08LE0134	Aroclor-1242	53469-21-9	1				2	
S	08LE0134	Aroclor-1248	12672-29-6	1				2	
S	08LE0134	Aroclor-1254	11097-69-1	1				2	
S	08LE0134	Aroclor-1260	11096-82-5	1	1	1	1	2	
S	08LE0134	Decachlorobiphenyl	2051-24-3						6
S	08LE0134	Tetrachloro-m-xylene	877-09-8						6
W	08LE0109	Aroclor-1016	12674-11-2	1	2	1	1	2	
W	08LE0109	Aroclor-1221	11104-28-2	1				2	
W	08LE0109	Aroclor-1232	11141-16-5	1				2	
W	08LE0109	Aroclor-1242	53469-21-9	1				2	
W	08LE0109	Aroclor-1248	12672-29-6	1				2	

Table 2-21. PCB Preparation Batch Summary. (3 Pages)

Matrix	Batch ID	Analyte	CAS	MB	LCS	MS	MSD	Sample	Surr
W	08LE0109	Aroclor-1254	11097-69-1	1				2	
W	08LE0109	Aroclor-1260	11096-82-5	1	2	1	1	2	
W	08LE0109	Decachlorobiphenyl	2051-24-3						7
W	08LE0109	Tetrachloro-m-xylene	877-09-8						7
W	08LE0111	Aroclor-1016	12674-11-2	1	2			3	
W	08LE0111	Aroclor-1221	11104-28-2	1				3	
W	08LE0111	Aroclor-1232	11141-16-5	1				3	
W	08LE0111	Aroclor-1242	53469-21-9	1				3	
W	08LE0111	Aroclor-1248	12672-29-6	1				3	
W	08LE0111	Aroclor-1254	11097-69-1	1				3	
W	08LE0111	Aroclor-1260	11096-82-5	1	2			3	
W	08LE0111	Decachlorobiphenyl	2051-24-3						6
W	08LE0111	Tetrachloro-m-xylene	877-09-8						6

CAS - Chemical Abstracts System
DUP - duplicate
LCS - laboratory control sample
MB - method blank
MS - matrix spike
MSD - matrix spike duplicate
S - soil
Surr - Surrogate
W - water

PCB analysis was performed on seven batches of soil samples and two batches of water samples. Each batch contained fewer than 20 field samples. An MB was analyzed in each sample batch, and at least one LCS containing Aroclor-1016 and Aroclor-1260 was analyzed in each sample batch.

An MS and an MSD containing at least Aroclor-1016 and Aroclor-1260 are to be prepared and analyzed with each batch. These MS and MSD results were reported for every batch except 08LE0126 (soil samples) and 08LE0111 (water samples). The intent of the sampling plan was for one MS and MSD to be included per every 20 samples in the field. This guideline was met in that there were 35 samples and 7 MS.

Surrogates were added to and analyzed in every sample, LCS, MB, MS, and MSD.

2.8.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for PCB analysis by method 8082 are specified in VET-1405-PLN-03, Rev. 0, as 14 days for soil and water samples. Results for one sample (soil sample B010 in batch 08LE0097) were obtained one day past this limit.

EPA (SW-846, Chapters 2 and 4) does not provide guidance for holding time for extraction of PCBs. Method 8082 indicates that samples should be analyzed within 40 days after extraction. Usually accepted hold times for PCBs in soil samples are 14 days to extraction and an additional 40 days for analysis. Since PCBs are quite stable in soils, the usually accepted hold time limit was applied in this data validation, and no PCB results were qualified for hold time.

2.8.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The required quantitation limits (VET-1405-PLN-03, Rev. 0) are 1 ug/L in groundwater samples and 5 mg/kg for soil samples.

PCBs were not detected in the MBs. Detection limits were below the required quantitation limits.

2.8.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

All results were nondetects. Detection limits met the requirements.

2.8.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, MSD, and surrogates meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS/MSD recoveries must be within the statistical limits set by the lab. These limits are shown in Table 2-22.

Table 2-22. LCS, MS/MSD, and Surrogate Limits for PCBs.

Matrix	Analyte	CAS	LCL (%)	UCL (%)
Water	Aroclor-1016	12674-11-2	49	119
Water	Aroclor-1260	11096-82-5	53	128
Water	Decachlorobiphenyl	2051-24-3	22	131
Water	Tetrachloro-m-xylene	877-09-8	45	117
Soil	Aroclor-1016	12674-11-2	50	138
Soil	Aroclor-1260	11096-82-5	50	148
Soil	Decachlorobiphenyl	2051-24-3	43	144
Soil	Tetrachloro-m-xylene	877-09-8	52	141

CAS - Chemical Abstracts System
LCL - lower control limit
UCL - upper control limit

All LCS, MS, MSD, and surrogate recoveries were within these limits.

2.8.6. QC Check for Precision

- Did the MS/MSD relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the RPD between MS and MSD must be less than 20%. All MS/MSD RPDs met this criterion.

2.9. DATA VALIDATION REPORT FOR VOLATILE ORGANIC COMPOUNDS (METHOD 8260B)

Results for 80 compounds were requested for each of the 45 samples (including 10 trip blanks) in this group. The table gives results for the 78 compounds that the laboratory commonly reports. The remaining two, 1,4-difluorobenzene and tetrahydrofuran, are not expected to be detected regularly. The laboratory is performing a spectral search for those, and is reporting the results in the data package narrative. The table listing the results is too large to include here. Please refer to the Microsoft Excel® file in the accompanying CD-ROM for the volatile organic analysis (VOA) results, as well as the flags applied during validation and the reasons for the flags.

2.9.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each sample and each batch QC sample?
- Was precision checked with a MSD or DUP?

Volatile organic analysis was performed in 16 batches. Each batch contained fewer than 20 field samples. Results for 78 compounds were reported for each of the 45 samples (including trip blanks). An MB result was reported for each of the 78 compounds in each of the 16 batches. An LCS containing 48 of the compounds of interest was prepared and analyzed with 13 of the batches. For the three batches without LCS results (batches 08LVG023, 08LVG025, and 08LVG027), the sample results were qualified as approximate and flagged “J.”

MS and MSD results were obtained for five of the batches; these spikes contained the same 48 compounds of interest. The narratives for batches 80LVG027, 80LVG047, 08LVK033 state that MS and MSD results were not obtained because of insufficient sample. No data was qualified for lack of MS and MSD, as the intent of the sampling plan was met. There was at least one MS and MSD per every 20 samples from the field.

Surrogates (1,2-dichloroethane-d4, bromofluorobenzene, and toluene-d8) were added to each sample, MB, LCS, MS, and MSD.

2.9.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for VOA by method 8260B are specified in VET-1405-PLN-03, Rev. 0, as 14 days for water and soil samples.

One of the two trip blanks in batch 08LVG027 (LVL ID #0802L570-004) had a collection date of 12/21/07, according to the chain of custody document (VET-1405-COC-002). It had an analysis date of 2/13/08, yielding a holding time of 54 days, far greater than the allowed holding time, which would have resulted in rejection of all nondetect data. However, on further investigation (see Attachment A), the date on the chain of custody was determined to actually be the laboratory preparation date of the trip blank, rather than the date of field sampling.

Trip blanks are stored with the sample containers to monitor the effects of ambient contamination that may occur during storage of the clean containers before use, during the sampling operation, and during shipment of the sample to the laboratory. Holding time limits are established to minimize the extent to which the volatile compounds in the samples dissipate due to imperfect sample containment or to chemical degradation. The date of field sampling is the appropriate "collection" date for trip blanks, because dissipation of volatiles from the trip blank before the sampling date is immaterial to the quality of the field samples. Therefore, the trip sample "collection" date was corrected to the collection date for the related field samples (2/6/08). Using this date, the holding time to analysis for the trip blank was 7 days, well within the allotted time.

All other results were also generated within the hold time limits.

2.9.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The RQLs (VET-1405-PLN-03, Rev. 0) for all VOCs are 5 ug/L for water samples and 20 ug/kg for soil samples. The compounds detected in the MBs are shown in Table 2-23.

Table 2-23. VOCs Found in Method Blanks. (2 Pages)

Batch ID	Matrix	Sample ID	Analyte	CAS	Result	Units	Q
08LVG022	S	08LVG022-MB1MB	1,2,4-Trichlorobenzene	120-82-1	110	ug/kg	J
08LVG022	S	08LVG022-MB1MB	Methylene Chloride	75-09-2	180	ug/kg	J
08LVG028	S	08LVG028-MB1MB	Methylene Chloride	75-09-2	70	ug/kg	J
08LVG034	S	08LVG034-MB1MB	1,2,4-Trichlorobenzene	120-82-1	190	ug/kg	J
08LVG034	S	08LVG034-MB1MB	Methylene Chloride	75-09-2	170	ug/kg	J
08LVK033	S	08LVK033-MB1MB	1,2,4-Trichlorobenzene	120-82-1	2	ug/kg	J
08LVK033	S	08LVK033-MB1MB	2-hexanone	591-78-6	2	ug/kg	J
08LVK033	S	08LVK033-MB1MB	Methylene Chloride	75-09-2	5	ug/kg	J

Table 2-23. VOCs Found in Method Blanks. (2 Pages)

Batch ID	Matrix	Sample ID	Analyte	CAS	Result	Units	Q
08LVK035	S	08LVK035-MB1MB	Methylene Chloride	75-09-2	3	ug/kg	J
08LVK050	S	08LVK050-MB1MB	2-hexanone	591-78-6	2	ug/kg	J
08LVK050	S	08LVK050-MB1MB	Methylene Chloride	75-09-2	4	ug/kg	J
08LVK053	S	08LVK053-MB1MB	1,2,4-Trichlorobenzene	120-82-1	1	ug/kg	J
08LVK053	S	08LVK053-MB1MB	Methylene Chloride	75-09-2	14	ug/kg	
08LVK059	S	08LVK059-MB1MB	1,2,4-Trichlorobenzene	120-82-1	1	ug/kg	J
08LVK059	S	08LVK059-MB1MB	Methylene Chloride	75-09-2	3	ug/kg	J

CAS - Chemical Abstracts System
Q - laboratory qualifier
S - soil
VOC - volatile organic compound

In batch 08LVK033, 2-hexanone was detected in the blank and in sample B016. The result for sample B016 was less than the required quantitation limit and less than five times the blank result. In accordance with the validation rules, the sample result was raised to the required quantitation limit, qualified as a nondetect, and flagged "U." All other 2-hexanone results were nondetects in batches where 2-hexanone was detected in the blank. Nondetects do not require qualification for blank contamination.

Methylene chloride was detected in the MBs for eight batches. Most methylene chloride results for samples in these batches were detects. Methylene chloride is a common laboratory contaminant, so any detections less than ten times the concentration found in the blank were qualified as nondetects and were flagged "U." In addition, any of these detected concentrations less than the required quantitation limit were raised to the level of the required quantitation limit. Furthermore, any detect for methylene chloride in batches with blank contamination was qualified as approximate and flagged "J" if it was less than 20 times the concentration in the blank. There were two nondetect results for methylene chloride in batches affected by blank contamination. These were not qualified.

For all batches where 1,2,4-trichlorobenzene was detected in the blank, all sample results for 1,2,4-trichlorobenzene were nondetects and were not qualified for blank contamination.

2.9.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Of 2262 results reported for soil samples, 770 were nondetects exceeding the required detection limit of 20 ug/kg. Of 1251 results reported for water samples, 286 were nondetects exceeding the required detection limit of 5 ug/L. These exceedances are not required to be qualified.

2.9.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, MSD, and surrogates meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS/MSD recoveries must be within the statistical limits set by the laboratory. These limits are shown in Table 2-24.

Table 2-24. Lionville Laboratory VOA Limits for LCS, MS, and MSD Recovery (Water and Soil Samples). (2 Pages)

Analyte	CAS	LCL	UCL
1,1,1-Trichloroethane	71-55-6	65	130
1,1,2,2-Tetrachloroethane	79-34-5	65	130
1,1,2-Trichloroethane	79-00-5	75	125
1,1-Dichloroethane	75-34-3	70	135
1,1-Dichloroethene	75-35-4	70	130
1,2,4-Trichlorobenzene	120-82-1	65	135
1,2-Dibromo-3-chloropropane	96-12-8	50	130
1,2-Dibromoethane	106-93-4	80	120
1,2-Dichlorobenzene	95-50-1	70	120
1,2-Dichloroethane	107-06-2	70	130
1,2-Dichloroethene (total)	540-59-0	60	140
1,2-Dichloropropane	78-87-5	75	150
1,3-Dichlorobenzene	541-73-1	75	125
1,4-Dichlorobenzene	106-46-7	75	125
2-Butanone	78-93-3	30	150
2-hexanone	591-78-6	55	130
4-Methyl-2-pentanone	108-10-1	60	135
Acetone	67-64-1	40	140
Benzene	71-43-2	80	120
Bromodichloromethane	75-27-4	75	120
Bromoform	75-25-2	70	130
Bromomethane	74-83-9	30	145
Carbon Disulfide	75-15-0	35	160
Carbon Tetrachloride	56-23-5	65	140
Chlorobenzene	108-90-7	80	120
Chloroethane	75-00-3	60	135
Chloroform	67-66-3	65	135
Chloromethane	74-87-3	40	125
Cis-1,2-dichloroethene	156-59-2	70	125
cis-1,3-Dichloropropene	10061-01-5	70	130
Dibromochloromethane	124-48-1	75	120

Table 2-24. Lionville Laboratory VOA Limits for LCS, MS, and MSD Recovery (Water and Soil Samples). (2 Pages)

Analyte	CAS	LCL	UCL
Dichlorodifluoromethane	75-71-8	30	155
Ethylbenzene	100-41-4	75	125
Freon 113	76-13-1	60	140
Isopropylbenzene	98-82-8	75	125
m- and p-Xylene	M+P_XYLENE	75	130
Methylene Chloride	75-09-2	55	140
Methyl-T-Butylether	1634-04-4	65	125
O-Xylene	95-47-6	80	120
Styrene	100-42-5	65	135
Tetrachloroethene	127-18-4	45	150
Toluene	108-88-3	75	120
Trans-1,2-dichloroethene	156-60-5	60	140
Trans-1,3-Dichloropropene	10061-02-6	55	140
Trichloroethene	79-01-6	70	125
Trichlorofluoromethane	75-69-4	60	145
Vinyl Chloride	75-01-4	50	145
Xylene (total)	1330-20-7	75	130

CAS - Chemical Abstracts System
LCL - lower control limit
UCL - upper control limit

Table 2-25 shows the LCS failures for the VOC. The following were qualified as estimated and marked with a "J" flag due to LCS failures: 2-butanone in batches 08LVK033, 08LVK035, 08LVK050 and 08LVK053; 2-hexanone in batches 08LVK035, 08LVK050 and 08LVK 053; acetone in batches 08LVG044, 08LVK033, 08LVK035, 08LVK050 and 08LVK053; chloroethane in batches 08LVK033 and 08LVK035; and methylene chloride in batch 08LVG045.

Table 2-25. Laboratory Control Sample Failures.

Analyte	CAS	Batch					
		08LVG044	08LVG045	08LVK033	08LVK035	08LVK050	08LVK053
2-Butanone	78-93-3			159.0%	193.0%	167.0%	165.0%
2-hexanone	591-78-6				158.0%	161.0%	138.0%
Acetone	67-64-1	160.2%		183.0%	239.0%	204.0%	199.0%
Chloroethane	75-00-3			151.0%	144.0%		
Methylene Chloride	75-09-2		253.0%				

CAS - Chemical Abstracts System

Table 2-26 shows the matrix spike and matrix spike duplicate failures for the VOC. The m- and p-xylene results in batch 08LVK050 were qualified as estimated and marked with a "J" flag due to low MSD recovery. No other results were qualified due to MS and/or MSD failure as all other failures were high and all results for those analytes were non-detects.

Table 2-26. MS and MSD Recovery Failures.

Analyte	CAS	Batch			
		08LVG022		08LVK050	
		MS	MSD	MS	MSD
1,1,2,2-Tetrachloroethane	79-34-5			132.0%	143.5%
1,2-Dibromo-3-chloropropane	96-12-8			168.8%	188.7%
1,2-Dibromoethane	106-93-4	121.0%			
2-Butanone	78-93-3			210.3%	220.0%
2-hexanone	591-78-6	136.0%		219.4%	231.5%
4-Methyl-2-pentanone	108-10-1	139.0%	137.0%	198.1%	200.0%
Acetone	67-64-1			292.5%	430.6%
Bromodichloromethane	75-27-4	123.0%	121.0%		
Bromomethane	74-83-9	192.0%	186.0%		
Chloroethane	75-00-3	320.0%	309.0%		
Dibromochloromethane	124-48-1	123.0%			
m- and p-Xylene	M+P_XYLENE				74.2%

CAS - Chemical Abstracts System
MS - matrix spike
MSD - matrix spike duplicate

There were no surrogate failures in the data validated.

2.9.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PRO-03, Rev. 1, the RPD between MS and MSD must be less than limits set by the laboratory. RPD limits were set at 20% for all analytes. There was one RPD failure in this group of data. Batch 08LVK050 had an MS/MSD RPD of 38% for acetone. Acetone results for batch 08LVK050 were qualified as approximate and marked with a "J" flag.

All other MS/MSD RPD and sample/duplicate RPD met acceptance criteria.

2.10. DATA VALIDATION REPORT FOR SEMIVOLATILE ORGANIC COMPOUNDS (METHOD 8270)

Eighty-four compounds were requested for each sample. Of these, 70 are reported in the EDDs. The remaining fourteen, 2,6-dimethylnaphthalene, 1,6,7-trimethylnaphthalene, 1-methyl-9H-fluorene,, dibenzothiophene, 2-methylphenanthrene, 1-methylphenanthrene, 4,6-dimethyldibenzothiophene, 3,6-dimethylphenanthrene, 2-methylfluoranthene, retene, 5-methylchrysene, benzo(e)pyrene, perylene, and tetrahydrofuran, are not expected to be detected regularly. The laboratory is performing a spectral search for those, and is reporting the results in the data package narrative. The table listing the results for the 33 samples in this set is too large to include here. Please refer to the Microsoft Excel® file in the accompanying CD-ROM.

2.10.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each sample and each batch QC sample?
- Was precision checked with a MSD or DUP?

A total of 9 batches were analyzed for SVOCs with a total of 33 samples, 9 blanks, 0 DUP, 11 LCS, 7 MS and 7 MSD.

Each batch contained fewer than 20 field samples. At least one LCS and MB were analyzed in each sample batch.

An MS and an MSD were analyzed in all sample batches with the exception of 08LE0110 and 08LE0125. Sample batch 08LE0110 had matrix spike samples prepared and analyzed from another client's samples. Therefore, no results from this batch were qualified. Sample batch 08LE0125 had matrix spike samples prepared and analyzed from a different Vista COC that is not included in this data validation report. Therefore no results from batch 08LE0125 were qualified.

2.10.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for semi-volatile analysis by method 8270C are 7 days from sampling to extraction and an additional 40 days to analysis for water samples and 14 days from sampling to extraction and an addition 40 days to analysis for soil samples. All results were generated within the holding time limits.

2.10.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The RQLs (VET-1405-PLN-03, Rev. 0) were 0.2 ug/L in water and 2 ug/kg in soil for the polyaromatic hydrocarbons. The required quantitation limits were 5 ug/L in water and 200 mg/kg in soil for all other analytes. Table 2-27 shows the instances where contamination was detected in the method blanks.

Table 2-27. Contaminants Detected in Method Blanks for SVOCs.

Batch ID	Matrix	Analyte	CAS	Result	Q	EQL	PQL	Units
08LE0072	S	bis(2-Ethylhexyl)phthalate	117-81-7	71	J	330	200	ug/kg
08LE0110	W	Benzo(b)fluoranthene	205-99-2	10	J	10	0.2	ug/L
08LE0112	S	bis(2-Ethylhexyl)phthalate	117-81-7	400		330	200	ug/kg
08LE0125	S	bis(2-Ethylhexyl)phthalate	117-81-7	79	J	330	200	ug/kg
08LE0125	S	Di-n-butylphthalate	84-74-2	28	J	330	200	ug/kg

CAS - Chemical Abstracts System
EQL - estimated quantitation limit
PQL - practical quantitation limit
Q - laboratory qualifier
SVOC - semi-volatile organic compound
S - soil
W - water

Bis(2-ethylhexyl)phthalate is a common laboratory contaminant. All bis(2-ethylhexyl)phthalate results in batches 08LE0072 and 08LE0112 were detects above the RQL, but less than 20 times the blank concentration. They were qualified as approximate nondetect values, and were flagged "UJ."

There were four samples in batch 08LE0125. The results for bis(2-ethylhexyl)phthalate and di-n-butylphthalate were all nondetects except for sample B040. Both compounds in sample B040 were detected at levels greater than the RQL, but less than 20 times the blank concentration, so they also were qualified as approximate nondetect values and were flagged "UJ." The other bis(2-ethylhexyl)phthalate and di-n-butylphthalate results in batch 08LE0125 were not qualified.

All benzo(b)fluoranthene results in batch 08LE0110 were nondetects and were not qualified.

2.10.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

None of the nondetect results met the quantitation limits. However, following the *Data Validation Procedure for Chemical Analyses* (HNF-20433, Rev. 0), no data was qualified.

2.10.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, MSD, and surrogates meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS recoveries and MS/MSD recoveries are specified by the laboratory. Table 2-28 shows the acceptance criteria for LCS, MS and MSD. As specified in *Data Validation Procedure for Chemical Analyses*, (HNF-20433, Rev. 0), surrogate recoveries must be within the limits specified in Table 2-29.

Table 2-28. Lionville Laboratory SVOA Limits for LCS, MS, and MSD. (3 Pages)

Analyte	CAS	Solid Samples		Water Samples	
		LCL (%)	UCL (%)	LCL (%)	UCL (%)
1,2,4-Trichlorobenzene	120-82-1	60	120	40	100
1,2-Diphenylhydrazine	122-66-7	50	110	50	110
1-Methylnaphthalene	90-12-0	50	110	40	110
2,2'-oxybis(1-Chloropropane)	108-60-1	50	120	40	110
2,4,5-Trichlorophenol	95-95-4	40	140	50	110
2,4,6-Trichlorophenol	88-06-2	10	140	50	110
2,4-Dichlorophenol	120-83-2	50	130	45	110
2,4-Dimethylphenol	105-67-9	50	120	30	110
2,4-Dinitrophenol	51-28-5	20	120	15	130
2,4-Dinitrotoluene	121-14-2	60	130	50	120
2,6-Dinitrotoluene	606-20-2	50	140	50	110
2-Chloronaphthalene	91-58-7	50	130	50	110
2-Chlorophenol	95-57-8	50	130	40	140
2-Methylnaphthalene	91-57-6	60	100	40	110
2-Methylphenol	95-48-7	60	120	40	110
2-Nitroaniline	88-74-4	60	130	50	110
2-Nitrophenol	88-75-5	50	130	40	110
3,3'-Dichlorobenzidine	91-94-1	20	140	0	120
3-and/or 4-Methylphenol	1319-77-3	60	130	40	110
3-Nitroaniline	99-09-2	40	130	10	120
4,6-Dinitro-2-Methylphenol	534-52-1	40	140	40	130
4-Bromophenyl phenyl ether	101-55-3	50	120	50	110
4-Chloro-3-Methylphenol	59-50-7	60	130	40	110
4-Chloroaniline	106-47-8	20	120	10	100
4-Chlorophenyl phenyl ether	7005-72-3	50	120	50	120
4-Nitroaniline	100-01-6	50	120	10	100
4-Nitrophenol	100-02-7	40	140	10	110
Acenaphthene	83-32-9	60	130	50	110
Acenaphthylene	208-96-8	60	130	50	110

Table 2-28. Lionville Laboratory SVOA Limits for LCS, MS, and MSD. (3 Pages)

Analyte	CAS	Solid Samples		Water Samples	
		LCL (%)	UCL (%)	LCL (%)	UCL (%)
Aniline	62-53-3	20	100	5	120
Anthracene	120-12-7	60	130	50	120
Benzidine	92-87-5	0	110	0	110
Benzo(a)anthracene	56-55-3	50	130	50	120
Benzo(a)pyrene	50-32-8	50	130	50	140
Benzo(b)fluoranthene	205-99-2	60	130	50	140
Benzo(g,h,i)perylene	191-24-2	50	140	50	140
Benzo(k)fluoranthene	207-08-9	50	130	50	140
Benzoic Acid	65-85-0	10	110	0	112
Benzyl Alcohol	100-51-6	50	100	40	110
Bis(2-Chloroethoxy)methane	111-91-1	40	140	45	105
Bis(2-Chloroethyl) ether	111-44-4	50	130	40	120
Bis(2-Ethylhexyl) phthalate	117-81-7	50	150	50	140
Butylbenzylphthalate	85-68-7	50	150	40	140
Carbazole	86-74-8	20	120	20	120
Chrysene	218-01-9	50	130	50	120
Dibenzo(a,h)anthracene	53-70-3	50	140	50	140
Dibenzofuran	132-64-9	60	130	60	110
Diethyl phthalate	84-66-2	50	130	40	130
Dimethyl phthalate	131-11-3	50	140	55	120
Di-n-Butyl phthalate	84-74-2	40	150	40	130
Di-n-octyl phthalate	117-84-0	50	150	40	140
Fluoranthene	206-44-0	50	130	50	120
Fluorene	86-73-7	60	130	60	110
Hexachloro-1,3-butadiene	87-68-3	40	130	40	100
Hexachlorobenzene	118-74-1	60	130	50	110
Hexachlorocyclopentadiene	77-47-4	20	100	20	100
Hexachloroethane	67-72-1	50	110	35	110
Indeno(1,2,3-cd)pyrene	193-39-5	60	140	50	140
Isophorone	78-59-1	60	120	40	110
Naphthalene	91-20-3	40	130	40	105
Nitrobenzene	98-95-3	50	110	40	100
N-Nitroso-Di-N-Propylamine	621-64-7	50	130	40	120
N-Nitrosodiphenylamine	86-30-6	50	130	50	110
Pentachlorophenol	87-86-5	30	130	15	130
Phenanthrene	85-01-8	60	130	50	120
Phenol	108-95-2	50	130	30	110

Table 2-28. Lionville Laboratory SVOA Limits for LCS, MS, and MSD. (3 Pages)

Analyte	CAS	Solid Samples		Water Samples	
		LCL (%)	UCL (%)	LCL (%)	UCL (%)
Pyrene	129-00-0	50	140	50	130
Pyridine	110-86-1	40	110	15	100

CAS - Chemical Abstracts System
LCL - lower control limit
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
SVOA - semi-volatile organic analysis
UCL - upper control limit

Table 2-29. Semi-Volatile Surrogate Recovery Limits

Compound	Water (%)	Soil (%)
Nitrobenzene-d5	35 to 114	23 to 120
2-fluorobiphenyl	43 to 116	30 to 115
Terphenyl-d14	33 to 141	18 to 137
Phenol-d6	10 to 94	24 to 113
2-fluorophenol	21 to 100	25 to 121
2,4,6-tribromophenol	10 to 123	19 to 122

Table 2-30 lists the LCS failures for all batches. Table 2-31 lists the MS and MSD failures for all batches. Table 2-32 lists the surrogate failures for all batches.

Table 2-30. Failed Laboratory Control Sample Results.

Analyte	CAS	Batch Numbers							
		08LE0057	08LE0072	08LE0084	08LE0098	08LE0108	08LE0108	08LE0110	08LE0112
1,2,4-Trichlorobenzene	120-82-1								56.0%
1,2-Diphenylhydrazine	122-66-7					48.5%	46.3%		
2,4-Dimethylphenol	105-67-9								49.0%
2,4-Dinitrophenol	51-28-5				17.0%				
2-Nitroaniline	88-74-4					44.7%			
3-Nitroaniline	99-09-2	134.0%				1.2%	1.4%	9.0%	
4,6-Dinitro-2-methylphenol	534-52-1				31.0%				35.0%
4-Chloroaniline	106-47-8					1.2%	4.2%	7.0%	
4-Nitroaniline	100-01-6			136.0%	150.0%	2.7%	7.1%	101.0%	
Acenaphthylene	208-96-8					47.0%	41.7%		
BENZOIC ACID	65-85-0	2.0%			0.0%				0.0%
Benzyl alcohol	100-51-6	191.0%			101.0%		35.5%		
bis(2-Chloroethoxy)methane	111-91-1					20.3%	3.6%		
bis(2-Ethylhexyl)phthalate	117-81-7								229.0%
Carbazole	86-74-8			127.0%	134.0%				
Dibenzo(a,h)anthracene	53-70-3				148.0%				
Dibenzofuran	132-64-9					55.8%			
Fluorene	86-73-7					54.0%			
N-Nitrosodiphenylamine	86-30-6					16.5%	21.0%	31.0%	
Pentachlorophenol	87-86-5		27.0%						
Pyridine	110-86-1		34.0%	33.0%	37.0%				

CAS - Chemical Abstracts System

Table 2-31. Failed Matrix Spike and Matrix Spike Duplicate Results. (2 pages)

Analyte	CAS	Batch Number											
		08LE0057		08LE0072		08LE0084		08LE0098		08LE0108		08LE0112	
		MS	MSD	MS	MSD	MS	MSD	MS	MSD	MS	MSD	MS	MSD
1,2,4-Trichlorobenzene	120-82-1		58.0%		44.0%			52.0%	51.0%			54.0%	58.0%
1,2-Diphenylhydrazine	122-66-7	140.0%	146.0%		46.0%								
1-Methylnaphthalene	90-12-0				46.0%								
2,2'-oxybis(1-Chloropropane)	108-60-1				29.0%	49.0%							
2,4-Dimethylphenol	105-67-9				37.0%			48.0%				42.0%	39.0%
2,4-Dinitrophenol	51-28-5				11.0%				19.0%				
2,4-Dinitrotoluene	121-14-2				59.0%			59.0%					
2-Chloronaphthalene	91-58-7				47.0%								
2-Chlorophenol	95-57-8				42.0%								
2-Methylnaphthalene	91-57-6				49.0%			55.0%	58.0%			58.0%	54.0%
2-Methylphenol	95-48-7				38.0%			57.0%	59.0%				
2-Nitroaniline	88-74-4		143.0%		48.0%								
2-Nitrophenol	88-75-5				43.0%								
3-and/or 4-Methylphenol	1319-77-3				41.0%			58.0%					
3-Nitroaniline	99-09-2									2.2%	7.4%		
4,6-Dinitro-2-methylphenol	534-52-1				23.0%	36.0%			31.0%				
4-Bromophenyl-phenylether	101-55-3				49.0%			49.0%					
4-Chloro-3-methylphenol	59-50-7				54.0%								0.0%
4-Chloroaniline	106-47-8									1.4%	5.7%		
4-Nitroaniline	100-01-6		124.0%										
4-Nitrophenol	100-02-7				38.0%								
Acenaphthene	83-32-9				47.0%			52.0%	56.0%				
Acenaphthylene	208-96-8				49.0%			53.0%	55.0%				
Anthracene	120-12-7				57.0%			55.0%					

Table 2-31. Failed Matrix Spike and Matrix Spike Duplicate Results. (2 pages)

Analyte	CAS	Batch Number											
		08LE0057		08LE0072		08LE0084		08LE0098		08LE0108		08LE0112	
		MS	MSD	MS	MSD	MS	MSD	MS	MSD	MS	MSD	MS	MSD
Benzo(b)fluoranthene	205-99-2				56.0%								
BENZOIC ACID	65-85-0								9.0%			0.0%	
Benzyl alcohol	100-51-6	106.0%	102.0%		41.0%								
bis(2-Chloroethoxy)methane	111-91-1				36.0%								
bis(2-Chloroethyl)ether	111-44-4				28.0%	46.0%							
Carbazole	86-74-8			121.0%									
Dibenzofuran	132-64-9				55.0%			54.0%					
Fluorene	86-73-7				47.0%			51.0%	58.0%				
Hexachlorobenzene	118-74-1							57.0%					
Hexachlorocyclopentadiene	77-47-4								2.0%				
Hexachloroethane	67-72-1				34.0%				39.0%			47.0%	48.0%
Indeno(1,2,3-cd)pyrene	193-39-5				58.0%								
Isophorone	78-59-1				39.0%							57.0%	57.0%
Naphthalene	91-20-3				39.0%								
Nitrobenzene	98-95-3				34.0%								49.0%
N-Nitroso-di-n-propylamine	621-64-7				35.0%								
N-Nitrosodiphenylamine	86-30-6				45.0%			46.0%	49.0%	30.8%	31.2%		
Pentachlorophenol	87-86-5				21.0%								
Phenanthrene	85-01-8				53.0%			55.0%					
Phenol	108-95-2				35.0%								
Pyridine	110-86-1		39.0%	38.0%	17.0%	31.0%	27.0%	37.0%	33.0%			37.0%	39.0%

CAS - Chemical Abstracts System
MS - matrix spike
MSD - matrix spike duplicate

Table 2-32. Surrogate Results That did Not Meet Criteria .

Analyte	CAS	08LE0072	08LE0084	08LE0108	08LE0135
		0802L570-001	08LE0084-MB1MB	08LE0108-MB1MB	08LE0135-MB1MB
2-Fluorobiphenyl	321-60-8				
2-Fluorophenol	367-12-4				
2,4,6-Tribromophenol	118-79-6	15.0%	10.0%		11.0%
Nitrobenzene-d5	4165-60-0				
Phenol-d5	4165-62-2			547.0%	
p-Terphenyl-d14	1718-51-0				

CAS Chemical Abstracts System

Data was qualified as approximate due to noncompliant LCS recoveries for the analytes and batches indicated in Table 2-30. Detect results were flagged “J,” and nondetects were flagged “UJ.”

Data was qualified as approximate due to noncompliant MS/MSD recoveries for the analytes and batches indicated in Table 2-31. For low MS or MSD recoveries, detect results were flagged “J,” and nondetects were flagged “UJ.” For high MS or MSD recoveries, detect results were flagged “J,” and nondetects were not flagged.

Due to the low recovery of the 2,4,6-tribromophenol surrogate in sample 0802L570-001 (client ID B006), results for polyhalogenated phenols and phenyl ethers in this sample were qualified as approximate and were flagged “UJ.” (All results were nondetects.) All other surrogate failures were for method blanks. These were considered as isolated occurrences affecting the blank result only, and associated sample data was not qualified.

2.10.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the RPD between MS and MSD must be less than the criteria set by the laboratory. These criteria are listed in Table 2-33. Table 2-34 lists the RPD failures in this batch of data. The lab has not set criteria for all analytes; RPDs were evaluated only for those compounds for which an RPD limit is specified.

Table 2-33. Relative Percent Difference Limits Set by Lionville Laboratory for SVOA MS/MSDs. (2 Pages)

Analyte	CAS	RPD (%)	
		For Solid Matrix	For Water Matrix
1,2,4-Trichlorobenzene	120-82-1	40	20
1,2-Diphenylhydrazine	122-66-7	40	20
1-Methylnaphthalene	90-12-0	40	20
2,2'-oxybis(1-Chloropropane)	108-60-1	40	20
2,4,5-Trichlorophenol	95-95-4	40	20
2,4,6-Trichlorophenol	88-06-2	40	20
2,4-Dichlorophenol	120-83-2	40	20
2,4-Dimethylphenol	105-67-9	40	20
2,4-Dinitrophenol	51-28-5	40	20
2,4-Dinitrotoluene	121-14-2	40	20
2,6-Dinitrotoluene	606-20-2	40	20
2-Chloronaphthalene	91-58-7	40	20
2-Chlorophenol	95-57-8	40	20
2-Methylnaphthalene	91-57-6	40	20
2-Methylphenol	95-48-7	40	20
2-Nitroaniline	88-74-4	40	20
2-Nitrophenol	88-75-5	40	20
3,3'-Dichlorobenzidine	91-94-1	40	100
3-and/or 4-Methylphenol	1319-77-3	40	20
3-Nitroaniline	99-09-2	40	20
4,6-Dinitro-2-Methylphenol	534-52-1	40	20
4-Bromophenyl phenyl ether	101-55-3	40	20
4-Chloro-3-Methylphenol	59-50-7	40	20
4-Chloroaniline	106-47-8	40	20
4-Chlorophenyl phenyl ether	7005-72-3	40	20
4-Nitroaniline	100-01-6	40	20
4-Nitrophenol	100-02-7	40	20
Acenaphthene	83-32-9	40	20
Acenaphthylene	208-96-8	40	20
Aniline	62-53-3	40	20
Anthracene	120-12-7	40	20
Benzidine	92-87-5	100	100
Benzo(a)anthracene	56-55-3	40	20
Benzo(a)pyrene	50-32-8	40	20
Benzo(b)fluoranthene	205-99-2	40	20

Table 2-33. Relative Percent Difference Limits Set by Lionville Laboratory for SVOA MS/MSDs. (2 Pages)

Analyte	CAS	RPD (%)	
		For Solid Matrix	For Water Matrix
Benzo(g,h,i)perylene	191-24-2	40	20
Benzo(k)fluoranthene	207-08-9	40	20
Benzoic Acid	65-85-0	40	60
Benzyl Alcohol	100-51-6	40	20
Bis(2-Chloroethoxy)methane	111-91-1	80	20
Bis(2-Chloroethyl) ether	111-44-4	40	20
Bis(2-Ethylhexyl) phthalate	117-81-7	40	20
Butylbenzylphthalate	85-68-7	100	20
Carbazole	86-74-8	40	20
Chrysene	218-01-9	40	20
Dibenzo(a,h)anthracene	53-70-3	40	20
Dibenzofuran	132-64-9	40	20
Diethyl phthalate	84-66-2	40	20
Dimethyl phthalate	131-11-3	40	20
Di-n-Butyl phthalate	84-74-2	40	20
Di-n-octyl phthalate	117-84-0	40	20
Fluoranthene	206-44-0	40	20
Fluorene	86-73-7	40	20
Hexachloro-1,3-butadiene	87-68-3	40	20
Hexachlorobenzene	118-74-1	40	20
Hexachlorocyclopentadiene	77-47-4	40	20
Hexachloroethane	67-72-1	40	20
Indeno(1,2,3-cd)pyrene	193-39-5	40	20
Isophorone	78-59-1	40	20
Naphthalene	91-20-3	40	20
Nitrobenzene	98-95-3	40	20
N-Nitroso-Di-N-Propylamine	621-64-7	40	60
N-Nitrosodiphenylamine	86-30-6	80	60
Pentachlorophenol	87-86-5	60	40
Phenanthrene	85-01-8	40	20
Phenol	108-95-2	40	20
Pyrene	129-00-0	40	20
Pyridine	110-86-1	60	40

CAS - Chemical Abstracts System
MS - matrix spike
MSD - matrix spike duplicate
RPD - relative percent difference
SVOA - semi-volatile organic analysis

Table 2-34. MS/MSD Failures for RPD. (3 Pages)

Analyte	CAS	Batch Numbers						
		08LE0057	08LE0072	08LE0084	08LE0098	08LE0108	08LE0112	08LE0135
1,2,4-Trichlorobenzene	120-82-1		56.9%					
1,2-Diphenylhydrazine	122-66-7		58.5%					
1-Methylnaphthalene	90-12-0		57.4%					
2,2'-oxybis(1-Chloropropane)	108-60-1		87.4%					
2,4,5-Trichlorophenol	95-95-4		46.9%					61.5%
2,4,6-Trichlorophenol	88-06-2							128.4%
2,4-Dichlorophenol	120-83-2		44.0%					
2,4-Dimethylphenol	105-67-9		57.7%					
2,4-Dinitrophenol	51-28-5		130.2%		87.0%	32.2%		
2,4-Dinitrotoluene	121-14-2		60.4%					
2,6-Dinitrotoluene	606-20-2		54.1%					
2-Chloronaphthalene	91-58-7		62.8%					
2-Chlorophenol	95-57-8		70.8%					
2-Methylnaphthalene	91-57-6		58.0%					
2-Methylphenol	95-48-7		79.4%					
2-Nitroaniline	88-74-4		67.6%					
2-Nitrophenol	88-75-5		63.5%					
3,3-Dichlorobenzidine	91-94-1		39.0%			200.0%		
3-and/or 4-Methylphenol	1319-77-3		73.8%					
3-Nitroaniline	99-09-2		69.8%			108.3%		
4,6-Dinitro-2-methylphenol	534-52-1		103.2%		58.0%			
4-Bromophenyl-phenylether	101-55-3		44.4%					
4-Chloro-3-methylphenol	59-50-7		54.1%				200.0%	
4-Chloroaniline	106-47-8		58.8%			121.1%		

Table 2-34. MS/MSD Failures for RPD. (3 Pages)

Analyte	CAS	Batch Numbers						
		08LE0057	08LE0072	08LE0084	08LE0098	08LE0108	08LE0112	08LE0135
4-Chlorophenyl-phenylether	7005-72-3		53.8%					
4-Nitroaniline	100-01-6		81.7%					
4-Nitrophenol	100-02-7		83.1%			26.8%		
Acenaphthene	83-32-9		59.7%					
Acenaphthylene	208-96-8		60.0%					
Aniline	62-53-3		75.7%			76.8%		
Anthracene	120-12-7		53.8%					
Benzidine	92-87-5			200.0%		200.0%		200.0%
Benzo(a)anthracene	56-55-3		57.9%					
Benzo(a)pyrene	50-32-8		55.3%					
Benzo(b)fluoranthene	205-99-2		49.7%					
Benzo(g,h,i)perylene	191-24-2		67.5%					
Benzo(k)fluoranthene	207-08-9		46.6%					
BENZOIC ACID	65-85-0	48.0%			45.0%		200.0%	108.3%
Benzyl alcohol	100-51-6		77.6%					
bis(2-Chloroethyl)ether	111-44-4		89.1%					
bis(2-Ethylhexyl)phthalate	117-81-7		63.5%					
Carbazole	86-74-8		65.9%					
Chrysene	218-01-9		58.1%					
Dibenzo(a,h)anthracene	53-70-3		67.4%					
Dibenzofuran	132-64-9		59.9%					
Diethylphthalate	84-66-2		59.5%					
Dimethylphthalate	131-11-3		53.1%					
Di-n-butylphthalate	84-74-2		65.8%					
Di-n-octyl phthalate	117-84-0		42.2%					

Table 2-34. MS/MSD Failures for RPD. (3 Pages)

Analyte	CAS	Batch Numbers						
		08LE0057	08LE0072	08LE0084	08LE0098	08LE0108	08LE0112	08LE0135
Fluoranthene	206-44-0		67.5%					
Fluorene	86-73-7		61.8%					
Hexachlorobenzene	118-74-1		50.6%					
Hexachlorocyclopentadiene	77-47-4		77.2%		184.0%			
Hexachloroethane	67-72-1		82.8%					
Indeno(1,2,3-cd)pyrene	193-39-5		66.7%					
Isophorone	78-59-1		71.1%					
Naphthalene	91-20-3		67.8%					
Nitrobenzene	98-95-3		71.7%					
N-Nitroso-di-n-propylamine	621-64-7		79.3%					
Pentachlorophenol	87-86-5		93.7%					
Phenanthrene	85-01-8		56.8%					
Phenol	108-95-2		84.3%					
Pyridine	110-86-1		76.4%					

CAS - Chemical Abstracts System
MS - matrix spike
MSD - matrix spike duplicate
RPD - relative percent difference

Data was qualified as approximate due to noncompliant LCS recoveries for the analytes and batches indicated in Table 2-34. Detect results were flagged "J," and nondetects were flagged "UJ."

Attachment A.

Letter Regarding Collection Date of Trip Blank for Chain-of-Custody VET-1405-COC-002.

VISTA
ENGINEERING TECHNOLOGIES

8 July 2008

Environmental Quality
Management Attn: Ms.
Mitzi Miller
1777 Terminal Dr
Richland, Washington 993 54-4952

Dear Ms. Miller,
Upon further review of EQM-DVAL-USE-001 Rev. 0, the VOA trip blank included in VET-1405-COC-002 was placed into the sample cooler and shipped on 2/6/08. The trip blank was created by Lionville Laboratory Incorporated on 12/21/07. The Chain of Custody (VET-1405-COC-002) provided by Vista Engineering Technologies, LLC does not specify a collection date for the trip blank.

The purpose of the trip blank is to assess potential contamination during bottle storage. Vista Engineering Technologies, LLC received bottles for the US Ecology Site Remedial Investigation/Feasibility Study in December 2007 from Lionville Laboratory Incorporated in anticipation for sampling to start January 2008. The trip blank in question was stored for awhile before use; however the date of collection should be 2/6/0 8 when the trip blank was placed into an empty cooler the day of sample collection, and subsequently shipped. The extended storage since 12/21/07 would represent a worst case scenario. If contaminants were being added, the trip blank would have picked these up before the bottles were used in the sampling process. Please use 2/6/08 for the collection date of the VOA trip blank included in VET-1405-COC-002 for data validation purposes.

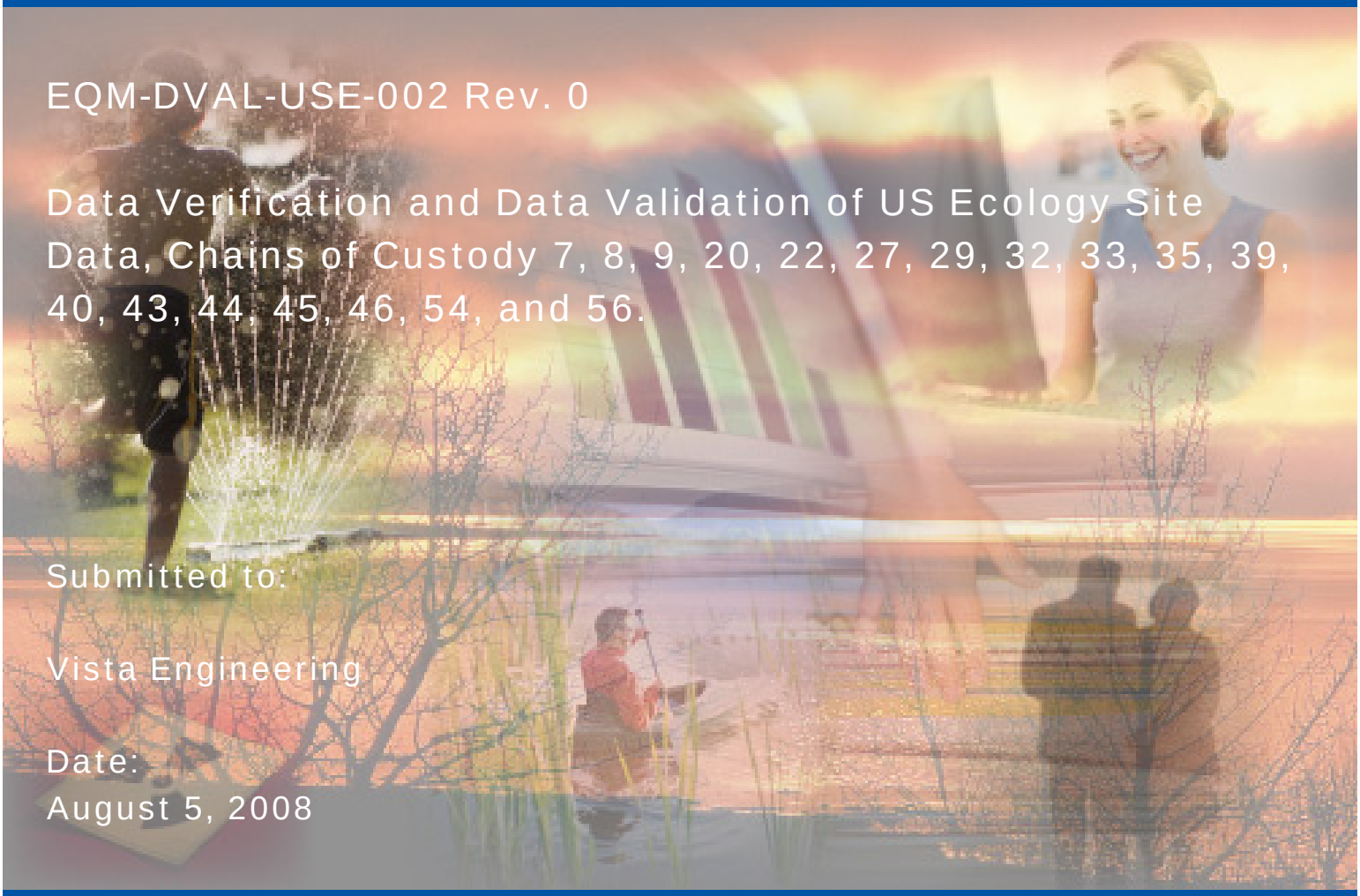
If you have any questions please don't hesitate to contact myself, or Fred Biebesheimer, US Ecology RI/FS Project Manager.

Sincerely,

Rochelle Holm

VISTA ENGINEERING TECHNOLOGIES, L.L.C.
1355 Columbia Park Trail • Richland, WA 99352 • (509) 737-1377 • Fax (509) 737-1383 • www.vistaengr.com

Environmental Quality Management, Inc.



EQM-DVAL-USE-002 Rev. 0

Data Verification and Data Validation of US Ecology Site Data, Chains of Custody 7, 8, 9, 20, 22, 27, 29, 32, 33, 35, 39, 40, 43, 44, 45, 46, 54, and 56.

Submitted to:

Vista Engineering

Date:
August 5, 2008

VISTA
ENGINEERING TECHNOLOGIES

EXECUTIVE SUMMARY

Samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's "Sampling and Analysis Plan for the US Ecology RI/FS" (VET-1405-PLN-03, Rev. 0). Samples were analyzed for metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, volatile organic compounds, semi-volatile organic compounds, and polychlorinated biphenyls.

All analyses were conducted by Lionville Laboratory, Inc. (LVL), Lionville, Pennsylvania, following the "Specification for Analytical Laboratory Services: Soil and Water Analysis" (VET-1405-SPEC-03, Rev. 1). In addition to printed data packages for each sample delivery group, the laboratory provided electronic data deliverables (EDDs), consisting of a number of Microsoft® Excel files containing tables of results and associated quality control (QC).

This data validation report presents the results of validating the analyses reported in the second group of EDDs prepared by the laboratory. This group of EDDs provided the results and QC data for the samples delivered to the laboratory under the chain-of custody (COC) documents listed in Table ES-1.

Table ES-1. Chains Of Custody Applicable To The Data Validated In This Report.

VET-1405-COC-007	VET-1405-COC-029	VET-1405-COC-040
VET-1405-COC-008	VET-1405-COC-032	VET-1405-COC-043
VET-1405-COC-009	VET-1405-COC-033	VET-1405-COC-044
VET-1405-COC-020	VET-1405-COC-035	VET-1405-COC-045
VET-1405-COC-022	VET-1405-COC-039	VET-1405-COC-046
VET-1405-COC-027		

The data validation was performed using an electronic data checker to evaluate whether batch QC met criteria. The electronic data checker identifies any QC results that exceed applicable criteria. The data validation process is completed by the data validation chemist, who evaluates the impacts of the exceedances and adds data validation qualifiers.

Asterisks (*) that were used as qualifiers in the volatile organic compounds and semi-volatile organic compounds sections were removed. As stated in an email from Orlette Johnson of LVL (7/30/2008), these qualifiers were hold-overs from other LVL projects that request a flag for each time a spike sample recovery is outside limits

As a result of this validation process, less than 10% of the data were qualified, and less than 0.5% of the data were rejected. Rejected data included semi-volatile organic analysis (SVOAs) and metals.

- SVOAs: Nine polychlorinated phenols and chlorinated ethers in each of samples B049 and B085 were rejected. These results were rejected due to recoveries of less than 10% for the surrogate compound 2,4,6-tribromophenol. All rejected results were nondetects.

- Metals: Results for silicon in fifty-two samples in batches 08L0093, 08L0125, 08L0146, 08L0163, 08L0166, 08L0178, and 08L0200 were rejected due to extremely low laboratory control sample (LCS) recoveries, less than 50%. All rejected results were detects.

Table ES-2 summarizes the validation results by analysis.

Table ES-2. Summary Validation Results by Analysis. (2 Pages)

Analysis	Number of Results	Number of Qualified Results	Summary
Metals	2054	107	The majority of the qualifiers apply to silicon in soils due to low LCS. Fifty-two silicon results were rejected due to extremely low LCS recoveries. A majority of the zinc data are estimated. Other qualification was due to out-of-specification MS/MSD recoveries for antimony, calcium, and iron, and contamination of blanks with sodium and zinc.
Mercury	61	0	Mercury was not detected in most samples.
Chromium (VI)	61	8	All water sample results were qualified due to low MS recoveries. No data were rejected.
Cyanide	64	0	Cyanide was not detected in the samples.
Sulfide	63	1	One result was qualified as estimated due to holding time. Sulfide was not detected in the samples.
Anions	481	59	The qualification of anion results was primarily due to low MS recoveries for chloride and sulfate. No data were rejected.
Total phenols	63	0	Phenols were detected in only three samples.
PCBs	476	63	All qualification of data was due to RPDs not meeting the 20% limit. No data were rejected.
VOCs	5694	172	Results were qualified due to high LCS recoveries and contamination of blanks with laboratory contaminants. No data were rejected.

Table ES-2. Summary Validation Results by Analysis. (2 Pages)

Analysis	Number of Results	Number of Qualified Results	Summary
SVOCs	4347	604	Surrogate recoveries of less than 10% caused 18 nondetect results for polychlorinated compounds to be rejected. Other results were qualified as estimates due to high RPDs and low LCS, MS, and MSD recoveries.

LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
PCB - polychlorinated biphenyl
RPD - relative percent difference
SVOC - semi-volatile organic compound
VOC - volatile organic compound

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ACRONYMS

BLK	Blank (column heading)
CAS	Chemical Abstracts Service (column heading)
COC	chain of custody
DUP	Duplicate sample (laboratory duplicate)
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
EQL	estimated quantitation limit (column heading)
ICP	inductively coupled plasma
LCL	lower control limit
LCS	laboratory control sample
LVL	Lionville Laboratory, Inc.
MB	method blank
MICE	Management Information Capability for Enforcement
MS	matrix spike
MSD	matrix spike duplicate
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PQL	practical quantitation limit
Q	Laboratory qualifier (column heading)
QC	quality control
RDL	reliable detection level
RPD	relative percent difference
RQL	required quantitation limit
Surr	surrogate
SVOA	semi-volatile organic analysis
SVOC	semi-volatile organic compound
UCL	upper control limit
V	Validation qualifier (column heading)
VOA	volatile organic analysis
VOC	volatile organic compound

Lionville Qualifiers

B (Metals Only)	Indicates that the parameter was between the Instrument Detection Limit (IDL) and the Contract Required Detection Limit (CRDL)
B (All Others)	Analyte is found in the associated blank as well as in the sample. It indicates possible/probably blank contamination. This flag is also used for a TIC as well as for a positively identified TCL compound.
J	Analyte detected below quantitation limit
U	Analyte is not detected, the associated quantitation limit is given

Data Validation Applied Qualifiers

UJ	Indicates the compound was analyzed for but not detected in the sample. Due to a QC deficiency identified during data validation, the associated quantitation limit is an estimate
J	Indicates the compound was analyzed for and detected in the sample. The associated concentration is an estimate, but the data are usable for decision making purposes

1. INTRODUCTION – APPROACH TO VALIDATION

Soil and groundwater samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's "Sampling and Analysis Plan for the US Ecology RI/FS" (VET-1405-PLN-03, Rev. 0). Samples were analyzed for metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and polychlorinated biphenyls (PCBs).

All analyses were conducted by Lionville Laboratory, Inc. (LVL), Lionville, Pennsylvania, following the "Specification for Analytical Laboratory Services: Soil and Water Analysis" (VET-1405-SPEC-03, Rev. 1). The results of these analyses were presented in a printed data package for each sample delivery group. In addition, the laboratory provided an electronic data deliverable (EDD) for each sample delivery group. The EDDs are Microsoft® Excel files containing tables of results and associated quality control (QC).

Asterisks (*) that were used as qualifiers in the sections for VOCs and SVOCs were removed. As was stated in an email from Orlette Johnson of LVL (7/30/2008) these qualifiers were a hold over from other LVL projects and did not apply to Vista samples.

This data validation report presents the results of validating the analyses reported in the second group of EDDs received from the laboratory. This group of EDDs and the corresponding chain-of-custody documents are identified in Table 1-1 below. The data contained in these EDDs includes the analysis of metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, VOCs, SVOCs, and PCBs

Table 1-1. Chains of Custody and Electronic Data Deliverables Applicable to the Data Validated.

Chain of Custody	EDD	
	File Name	Date Received
VET-1405-COC-007	L0802646.xls	6/6/2008
VET-1405-COC-008	L0802666.xls	6/6/2008
VET-1405-COC-009	L0802665.xls	6/6/2008
VET-1405-COC-020	L0803798.xls	6/6/2008
VET-1405-COC-022	L0803816.xls	6/6/2008
VET-1405-COC-027	L0804873.xls	6/6/2008
VET-1405-COC-029	L0804904.xls	6/6/2008
VET-1405-COC-032	L0804911.xls	6/6/2008
VET-1405-COC-033	L0804957.xls	6/6/2008
VET-1405-COC-035	L0804967.xls	6/6/2008
VET-1405-COC-039	L0804026.xls	6/6/2008
VET-1405-COC-040	L0805043.xls	6/6/2008
VET-1405-COC-043	L0805068.xls	6/6/2008
VET-1405-COC-044	L0805072.xls	6/6/2008
VET-1405-COC-045	L0805068.xls	6/6/2008
VET-1405-COC-046	L0805068.xls	6/6/2008

EDD - electronic data deliverable

This validation was performed in a two-tiered approach.

1. Completeness: an assessment of the completeness is made on the pdf file of the "hard copy" data.
2. Electronic holding time and QC evaluation.

The approach is summarized in Table 1-2. The electronic review is performed on all incoming EDDs. The EDDs are evaluated to assure consistency with the hard copy data. By using electronic review of all QC, appropriate qualification of all the data can be made

Table 1-2. Data Validation and Verification Approach.

Review item	Manually Done	Electronic	All Samples
Verification of deliverables	X		X
Requested vs reported analyses		X	X
Holding times		X	X
Blank contamination		X	X
Detection Limits		X	X
MS/MSD and LCS		X	X
Surrogates		X	X
Laboratory duplicates		X	X

LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate

The remainder of this report consists of several chapters, with each chapter providing the details for data validation of a particular method of analysis. Each chapter begins with a summary table of the analytical results validated and the validation qualifiers that have been applied. (The contents of this table are also provided in an accompanying Excel file.) After the summary table, each chapter explains the details of the validation process and provides reasons for any data qualifiers that may have been applied. The automated data validation process determines whether the following facets of laboratory quality control have been achieved

- Were there 20 or fewer samples in each preparation batch?
- Were a method blank (MB), a laboratory control sample (LCS), and a matrix spike sample (MS) prepared with each batch of samples?
- Were surrogates added to each sample and batch QC samples for each method where surrogates are required?
- Was precision checked with a matrix spike duplicate (MSD) or sample duplicate (DUP)?
- Were holding time requirements for preparation and analysis satisfied?
- Were the MB results less than the required quantitation limits?
- Did the quantitation limit for nondetect results meet the required detection limit?
- Did the recoveries for the LCS, MS, MSD, and surrogates meet the accuracy criteria?

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

After this automated checking, the "no" answers to these questions were investigated manually, the effect on each sample result was determined, and the results were qualified according to the validation rules in *Data Validation Procedure for Chemical Analyses* (HNF-20433). These evaluations are presented on the following pages.

2. DATA VALIDATION REPORTS

2.1. DATA VALIDATION REPORT FOR ICP METALS (METHOD 6010A)

Results for 29 metals (aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, molybdenum, nickel, potassium, selenium, silicon, silver, sodium, strontium, thallium, tin, titanium, uranium, vanadium and zinc) were requested for each of the 71 samples in this group. The table listing the results is too large to include here. Please refer to the Microsoft Excel® file in the accompanying CD-ROM for the analytical results for inductively coupled plasma (ICP) metals, as well as the flags applied during validation and the reasons for the flags.

2.1.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-1 shows the number of each type of sample in each preparation batch.

Table 2-1. ICP Metals Preparation Batch Summary. (9 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
08L0093	S	Aluminum	7429-90-5	1	1	1	1	1	15
08L0093	S	Iron	7439-89-6	1	1	1	1	1	15
08L0093	S	Lead	7439-92-1	1	1	1	1	1	15
08L0093	S	Magnesium	7439-95-4	1	1	1	1	1	15
08L0093	S	Manganese	7439-96-5	1	1	1	1	1	15
08L0093	S	Molybdenum	7439-98-7	1	1	1	1	1	15
08L0093	S	Nickel	7440-02-0	1	1	1	1	1	15
08L0093	S	Potassium	7440-09-7	1	1	1	1	1	15
08L0093	S	Silicon	7440-21-3	1	1	1	1	1	15
08L0093	S	Silver	7440-22-4	1	1	1	1	1	15
08L0093	S	Sodium	7440-23-5	1	1	1	1	1	15
08L0093	S	Strontium	7440-24-6	1	1	1	1	1	15
08L0093	S	Thallium	7440-28-0	1	1	1	1	1	15
08L0093	S	Tin	7440-31-5	1	1	1	1	1	15
08L0093	S	Titanium	7440-32-6	1	1	1	1	1	15
08L0093	S	Antimony	7440-36-0	1	1	1	1	1	15
08L0093	S	Arsenic	7440-38-2	1	1	1	1	1	15
08L0093	S	Barium	7440-39-3	1	1	1	1	1	15

Table 2-1. ICP Metals Preparation Batch Summary. (9 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
08L0093	S	Beryllium	7440-41-7	1	1	1	1	1	15
08L0093	S	Boron	7440-42-8	1	1	1	1	1	15
08L0093	S	Cadmium	7440-43-9	1	1	1	1	1	15
08L0093	S	Chromium	7440-47-3	1	1	1	1	1	15
08L0093	S	Cobalt	7440-48-4	1	1	1	1	1	15
08L0093	S	Copper	7440-50-8	1	1	1	1	1	15
08L0093	S	Uranium	7440-61-1	1	1	1	1	1	15
08L0093	S	Vanadium	7440-62-2	1	1	1	1	1	15
08L0093	S	Zinc	7440-66-6	1	1	1	1	1	15
08L0093	S	Calcium	7440-70-2	1	1	1	1	1	15
08L0093	S	Selenium	7782-49-2	1	1	1	1	1	15
08L0125	S	Aluminum	7429-90-5	1		1			7
08L0125	S	Iron	7439-89-6	1		1			7
08L0125	S	Lead	7439-92-1	1		1			7
08L0125	S	Magnesium	7439-95-4	1		1			7
08L0125	S	Manganese	7439-96-5	1		1			7
08L0125	S	Molybdenum	7439-98-7	1		1			7
08L0125	S	Nickel	7440-02-0	1		1			7
08L0125	S	Potassium	7440-09-7	1		1			7
08L0125	S	Silicon	7440-21-3	1		1			7
08L0125	S	Silver	7440-22-4	1		1			7
08L0125	S	Sodium	7440-23-5	1		1			7
08L0125	S	Strontium	7440-24-6	1		1			7
08L0125	S	Thallium	7440-28-0	1		1			7
08L0125	S	Tin	7440-31-5	1		1			7
08L0125	S	Titanium	7440-32-6	1		1			7
08L0125	S	Antimony	7440-36-0	1		1			7
08L0125	S	Arsenic	7440-38-2	1		1			7
08L0125	S	Barium	7440-39-3	1		1			7
08L0125	S	Beryllium	7440-41-7	1		1			7
08L0125	S	Boron	7440-42-8	1		1			7
08L0125	S	Cadmium	7440-43-9	1		1			7
08L0125	S	Chromium	7440-47-3	1		1			7
08L0125	S	Cobalt	7440-48-4	1		1			7
08L0125	S	Copper	7440-50-8	1		1			7
08L0125	S	Uranium	7440-61-1	1		1			7
08L0125	S	Vanadium	7440-62-2	1		1			7
08L0125	S	Zinc	7440-66-6	1		1			7

Table 2-1. ICP Metals Preparation Batch Summary. (9 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
08L0125	S	Calcium	7440-70-2	1		1			7
08L0125	S	Selenium	7782-49-2	1		1			7
08L0146	S	Aluminum	7429-90-5	1		1			3
08L0146	S	Iron	7439-89-6	1		1			3
08L0146	S	Lead	7439-92-1	1		1			3
08L0146	S	Magnesium	7439-95-4	1		1			3
08L0146	S	Manganese	7439-96-5	1		1			3
08L0146	S	Molybdenum	7439-98-7	1		1			3
08L0146	S	Nickel	7440-02-0	1		1			3
08L0146	S	Potassium	7440-09-7	1		1			3
08L0146	S	Silicon	7440-21-3	1		1			3
08L0146	S	Silver	7440-22-4	1		1			3
08L0146	S	Sodium	7440-23-5	1		1			3
08L0146	S	Strontium	7440-24-6	1		1			3
08L0146	S	Thallium	7440-28-0	1		1			3
08L0146	S	Tin	7440-31-5	1		1			3
08L0146	S	Titanium	7440-32-6	1		1			3
08L0146	S	Antimony	7440-36-0	1		1			3
08L0146	S	Arsenic	7440-38-2	1		1			3
08L0146	S	Barium	7440-39-3	1		1			3
08L0146	S	Beryllium	7440-41-7	1		1			3
08L0146	S	Boron	7440-42-8	1		1			3
08L0146	S	Cadmium	7440-43-9	1		1			3
08L0146	S	Chromium	7440-47-3	1		1			3
08L0146	S	Cobalt	7440-48-4	1		1			3
08L0146	S	Copper	7440-50-8	1		1			3
08L0146	S	Uranium	7440-61-1	1		1			3
08L0146	S	Vanadium	7440-62-2	1		1			3
08L0146	S	Zinc	7440-66-6	1		1			3
08L0146	S	Calcium	7440-70-2	1		1			3
08L0146	S	Selenium	7782-49-2	1		1			3
08L0163	S	Aluminum	7429-90-5	1		1			7
08L0163	S	Iron	7439-89-6	1		1			7
08L0163	S	Lead	7439-92-1	1		1			7
08L0163	S	Magnesium	7439-95-4	1		1			7
08L0163	S	Manganese	7439-96-5	1		1			7
08L0163	S	Molybdenum	7439-98-7	1		1			7
08L0163	S	Nickel	7440-02-0	1		1			7

Table 2-1. ICP Metals Preparation Batch Summary. (9 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
08L0163	S	Potassium	7440-09-7	1		1			7
08L0163	S	Silicon	7440-21-3	1		1			7
08L0163	S	Sodium	7440-23-5	1		1			7
08L0163	S	Strontium	7440-24-6	1		1			7
08L0163	S	Thallium	7440-28-0	1		1			7
08L0163	S	Tin	7440-31-5	1		1			7
08L0163	S	Titanium	7440-32-6	1		1			7
08L0163	S	Antimony	7440-36-0	1		1			7
08L0163	S	Arsenic	7440-38-2	1		1			7
08L0163	S	Barium	7440-39-3	1		1			7
08L0163	S	Beryllium	7440-41-7	1		1			7
08L0163	S	Boron	7440-42-8	1		1			7
08L0163	S	Cadmium	7440-43-9	1		1			7
08L0163	S	Chromium	7440-47-3	1		1			7
08L0163	S	Cobalt	7440-48-4	1		1			7
08L0163	S	Copper	7440-50-8	1		1			7
08L0163	S	Uranium	7440-61-1	1		1			7
08L0163	S	Vanadium	7440-62-2	1		1			7
08L0163	S	Zinc	7440-66-6	1		1			7
08L0163	S	Calcium	7440-70-2	1		1			7
08L0163	S	Selenium	7782-49-2	1		1			7
08L0166	S	Aluminum	7429-90-5	1		1			4
08L0166	S	Iron	7439-89-6	1		1			4
08L0166	S	Lead	7439-92-1	1		1			4
08L0166	S	Magnesium	7439-95-4	1		1			4
08L0166	S	Manganese	7439-96-5	1		1			4
08L0166	S	Molybdenum	7439-98-7	1		1			4
08L0166	S	Nickel	7440-02-0	1		1			4
08L0166	S	Potassium	7440-09-7	1		1			4
08L0166	S	Silicon	7440-21-3	1		1			4
08L0166	S	Silver	7440-22-4	1		1			4
08L0166	S	Sodium	7440-23-5	1		1			4
08L0166	S	Strontium	7440-24-6	1		1			4
08L0166	S	Thallium	7440-28-0	1		1			4
08L0166	S	Tin	7440-31-5	1		1			4
08L0166	S	Titanium	7440-32-6	1		1			4
08L0166	S	Antimony	7440-36-0	1		1			4
08L0166	S	Arsenic	7440-38-2	1		1			4
08L0166	S	Barium	7440-39-3	1		1			4

Table 2-1. ICP Metals Preparation Batch Summary. (9 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
08L0166	S	Beryllium	7440-41-7	1		1			4
08L0166	S	Boron	7440-42-8	1		1			4
08L0166	S	Cadmium	7440-43-9	1		1			4
08L0166	S	Chromium	7440-47-3	1		1			4
08L0166	S	Cobalt	7440-48-4	1		1			4
08L0166	S	Copper	7440-50-8	1		1			4
08L0166	S	Uranium	7440-61-1	1		1			4
08L0166	S	Vanadium	7440-62-2	1		1			4
08L0166	S	Zinc	7440-66-6	1		1			4
08L0166	S	Calcium	7440-70-2	1		1			4
08L0166	S	Selenium	7782-49-2	1		1			4
08L0177	S	Silver	7440-22-4	1		1			7
08L0178	S	Aluminum	7429-90-5	1		1			10
08L0178	S	Iron	7439-89-6	1		1			10
08L0178	S	Lead	7439-92-1	1		1			10
08L0178	S	Magnesium	7439-95-4	1		1			10
08L0178	S	Manganese	7439-96-5	1		1			10
08L0178	S	Molybdenum	7439-98-7	1		1			10
08L0178	S	Nickel	7440-02-0	1		1			10
08L0178	S	Potassium	7440-09-7	1		1			10
08L0178	S	Silicon	7440-21-3	1		1			10
08L0178	S	Silver	7440-22-4	1		1			10
08L0178	S	Sodium	7440-23-5	1		1			10
08L0178	S	Strontium	7440-24-6	1		1			10
08L0178	S	Thallium	7440-28-0	1		1			10
08L0178	S	Tin	7440-31-5	1		1			10
08L0178	S	Titanium	7440-32-6	1		1			10
08L0178	S	Antimony	7440-36-0	1		1			10
08L0178	S	Arsenic	7440-38-2	1		1			10
08L0178	S	Barium	7440-39-3	1		1			10
08L0178	S	Beryllium	7440-41-7	1		1			10
08L0178	S	Boron	7440-42-8	1		1			10
08L0178	S	Cadmium	7440-43-9	1		1			10
08L0178	S	Chromium	7440-47-3	1		1			10
08L0178	S	Cobalt	7440-48-4	1		1			10
08L0178	S	Copper	7440-50-8	1		1			10
08L0178	S	Uranium	7440-61-1	1		1			10
08L0178	S	Vanadium	7440-62-2	1		1			10
08L0178	S	Zinc	7440-66-6	1		1			10

Table 2-1. ICP Metals Preparation Batch Summary. (9 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
08L0178	S	Calcium	7440-70-2	1		1			10
08L0178	S	Selenium	7782-49-2	1		1			10
08L0193	S	Aluminum	7429-90-5	1		1			6
08L0193	S	Iron	7439-89-6	1		1			6
08L0193	S	Lead	7439-92-1	1		1			6
08L0193	S	Magnesium	7439-95-4	1		1			6
08L0193	S	Manganese	7439-96-5	1		1			6
08L0193	S	Molybdenum	7439-98-7	1		1			6
08L0193	S	Nickel	7440-02-0	1		1			6
08L0193	S	Potassium	7440-09-7	1		1			6
08L0193	S	Silicon	7440-21-3	1		1			6
08L0193	S	Silver	7440-22-4	1		1			6
08L0193	S	Sodium	7440-23-5	1		1			6
08L0193	S	Strontium	7440-24-6	1		1			6
08L0193	S	Thallium	7440-28-0	1		1			6
08L0193	S	Tin	7440-31-5	1		1			6
08L0193	S	Titanium	7440-32-6	1		1			6
08L0193	S	Antimony	7440-36-0	1		1			6
08L0193	S	Arsenic	7440-38-2	1		1			6
08L0193	S	Barium	7440-39-3	1		1			6
08L0193	S	Beryllium	7440-41-7	1		1			6
08L0193	S	Boron	7440-42-8	1		1			6
08L0193	S	Cadmium	7440-43-9	1		1			6
08L0193	S	Chromium	7440-47-3	1		1			6
08L0193	S	Cobalt	7440-48-4	1		1			6
08L0193	S	Copper	7440-50-8	1		1			6
08L0193	S	Uranium	7440-61-1	1		1			6
08L0193	S	Vanadium	7440-62-2	1		1			6
08L0193	S	Zinc	7440-66-6	1		1			6
08L0193	S	Calcium	7440-70-2	1		1			6
08L0193	S	Selenium	7782-49-2	1		1			6
08L0200	S	Aluminum	7429-90-5	1		1			6
08L0200	S	Iron	7439-89-6	1		1			6
08L0200	S	Lead	7439-92-1	1		1			6
08L0200	S	Magnesium	7439-95-4	1		1			6
08L0200	S	Manganese	7439-96-5	1		1			6
08L0200	S	Molybdenum	7439-98-7	1		1			6
08L0200	S	Nickel	7440-02-0	1		1			6
08L0200	S	Potassium	7440-09-7	1		1			6

Table 2-1. ICP Metals Preparation Batch Summary. (9 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
08L0200	S	Silicon	7440-21-3	1		1			6
08L0200	S	Silver	7440-22-4	1		1			6
08L0200	S	Sodium	7440-23-5	1		1			6
08L0200	S	Strontium	7440-24-6	1		1			6
08L0200	S	Thallium	7440-28-0	1		1			6
08L0200	S	Tin	7440-31-5	1		1			6
08L0200	S	Titanium	7440-32-6	1		1			6
08L0200	S	Antimony	7440-36-0	1		1			6
08L0200	S	Arsenic	7440-38-2	1		1			6
08L0200	S	Barium	7440-39-3	1		1			6
08L0200	S	Beryllium	7440-41-7	1		1			6
08L0200	S	Boron	7440-42-8	1		1			6
08L0200	S	Cadmium	7440-43-9	1		1			6
08L0200	S	Chromium	7440-47-3	1		1			6
08L0200	S	Cobalt	7440-48-4	1		1			6
08L0200	S	Copper	7440-50-8	1		1			6
08L0200	S	Uranium	7440-61-1	1		1			6
08L0200	S	Vanadium	7440-62-2	1		1			6
08L0200	S	Zinc	7440-66-6	1		1			6
08L0200	S	Calcium	7440-70-2	1		1			6
08L0200	S	Selenium	7782-49-2	1		1			6
08L0091	W	Aluminum	7429-90-5	1	1	1	1	1	8
08L0091	W	Iron	7439-89-6	1	1	1	1	1	8
08L0091	W	Lead	7439-92-1	1	1	1	1	1	8
08L0091	W	Magnesium	7439-95-4	1	1	1	1	1	8
08L0091	W	Manganese	7439-96-5	1	1	1	1	1	8
08L0091	W	Molybdenum	7439-98-7	1	1	1	1	1	8
08L0091	W	Nickel	7440-02-0	1	1	1	1	1	8
08L0091	W	Potassium	7440-09-7	1	1	1	1	1	8
08L0091	W	Silicon	7440-21-3	1	1	1	1	1	8
08L0091	W	Silver	7440-22-4	1	1	1	1	1	8
08L0091	W	Sodium	7440-23-5	1	1	1	1	1	8
08L0091	W	Strontium	7440-24-6	1	1	1	1	1	8
08L0091	W	Thallium	7440-28-0	1	1	1	1	1	8
08L0091	W	Tin	7440-31-5	1	1	1	1	1	8
08L0091	W	Titanium	7440-32-6	1	1	1	1	1	8
08L0091	W	Antimony	7440-36-0	1	1	1	1	1	8
08L0091	W	Arsenic	7440-38-2	1	1	1	1	1	8

Table 2-1. ICP Metals Preparation Batch Summary. (9 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
08L0091	W	Barium	7440-39-3	1	1	1	1	1	8
08L0091	W	Beryllium	7440-41-7	1	1	1	1	1	8
08L0091	W	Boron	7440-42-8	1	1	1	1	1	8
08L0091	W	Cadmium	7440-43-9	1	1	1	1	1	8
08L0091	W	Chromium	7440-47-3	1	1	1	1	1	8
08L0091	W	Cobalt	7440-48-4	1	1	1	1	1	8
08L0091	W	Copper	7440-50-8	1	1	1	1	1	8
08L0091	W	Uranium	7440-61-1	1	1	1	1	1	8
08L0091	W	Vanadium	7440-62-2	1	1	1	1	1	8
08L0091	W	Zinc	7440-66-6	1	1	1	1	1	8
08L0091	W	Calcium	7440-70-2	1	1	1	1	1	8
08L0091	W	Selenium	7782-49-2	1	1	1	1	1	8
08L0202	W	Aluminum	7429-90-5	1		1			5
08L0202	W	Iron	7439-89-6	1		1			5
08L0202	W	Lead	7439-92-1	1		1			5
08L0202	W	Magnesium	7439-95-4	1		1			5
08L0202	W	Manganese	7439-96-5	1		1			5
08L0202	W	Molybdenum	7439-98-7	1		1			5
08L0202	W	Nickel	7440-02-0	1		1			5
08L0202	W	Potassium	7440-09-7	1		1			5
08L0202	W	Silicon	7440-21-3	1		1			5
08L0202	W	Silver	7440-22-4	1		1			5
08L0202	W	Sodium	7440-23-5	1		1			5
08L0202	W	Strontium	7440-24-6	1		1			5
08L0202	W	Thallium	7440-28-0	1		1			5
08L0202	W	Tin	7440-31-5	1		1			5
08L0202	W	Titanium	7440-32-6	1		1			5
08L0202	W	Antimony	7440-36-0	1		1			5
08L0202	W	Arsenic	7440-38-2	1		1			5
08L0202	W	Barium	7440-39-3	1		1			5
08L0202	W	Beryllium	7440-41-7	1		1			5
08L0202	W	Boron	7440-42-8	1		1			5
08L0202	W	Cadmium	7440-43-9	1		1			5
08L0202	W	Chromium	7440-47-3	1		1			5
08L0202	W	Cobalt	7440-48-4	1		1			5
08L0202	W	Copper	7440-50-8	1		1			5
08L0202	W	Uranium	7440-61-1	1		1			5
08L0202	W	Vanadium	7440-62-2	1		1			5
08L0202	W	Zinc	7440-66-6	1		1			5

Table 2-1. ICP Metals Preparation Batch Summary. (9 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
08L0202	W	Calcium	7440-70-2	1		1			5
08L0202	W	Selenium	7782-49-2	1		1			5

CAS - Chemical Abstracts Service
DUP - duplicate
LCS - laboratory control sample
MB - method blank
MS - matrix spike
MSD - matrix spike duplicate
S - soil
W - water

ICP metals analysis was performed in eleven batches. Nine batches had all analytes included. Batch 08L0163 included all analytes with the exception of silver. Batch 08L0177 included only silver. Each batch contained fewer than 20 field samples. At least one LCS and MB were analyzed in each sample batch.

An MS and an MSD or DUP are to be analyzed with every 20 samples from the field, per Sampling and Analysis Plan for the US Ecology RI/FS (VET-1405-PLN-03, Rev. 0). For the 13 water samples, there was one DUP, one MS and one MSD, so the intent of the sampling plan was met. For the soil samples, only one DUP, one MS and one MSD were analyzed with the 58 samples in this group. However, when added with the 23 samples from the previous data validation report and their corresponding QC, there are a total of 81 samples with 6 DUPs, 6 MS and 6 MSDs. Therefore, the intent of the sampling plan was met, and no data is qualified due to missing QC samples.

2.1.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for ICP metals analysis by method 6010A are specified in VET-1405-PLN-03, Rev. 0, as 180 days from sampling to analysis. All results were generated within these limits.

2.1.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The required quantitation limits (RQLs) (VET-1405-PLN-03, Rev. 0) are shown in Table 2-2.

Table 2-2. Required Quantitation Limit for ICP Metals.

Analyte	Water (µg/L)	Soil (mg/kg)
Aluminum	50	2.5
Antimony	40	2.0
Arsenic	50	2.5
Barium	5	0.25
Beryllium	5	0.25
Boron	50	2.5
Cadmium	5	0.25
Calcium	50	2.5
Chromium	5	0.25
Cobalt	5	0.25
Copper	5	0.25
Iron	50	2.5
Lead	50	2.5
Magnesium	50	2.5
Manganese	10	0.50
Molybdenum	5	0.25
Nickel	10	0.50
Potassium	500	2.5
Selenium	50	2.5
Silicon	50	2.5
Silver	10	0.50
Sodium	50	2.5
Strontium	5	0.25
Thallium	50	2.5
Tin	50	2.5
Titanium	10	0.50
Uranium	5	0.25
Vanadium	5	0.25
Zinc	10	0.50

ICP - inductively coupled plasma

All method blank failures are included in Table 2-3

Table 2-3. ICP Metals Method Blank Failures. (2 Pages)

Batch ID	Matrix	Analyte	CAS	Result (µg/L for water, mg/kg for soil)	Q
08L0091	W	Barium	7440-39-3	0.62	B
08L0091	W	Calcium	7440-70-2	41.3	B
08L0091	W	Copper	7440-50-8	0.64	B
08L0091	W	Magnesium	7439-95-4	24.2	B
08L0091	W	Silicon	7440-21-3	11.6	B
08L0091	W	Sodium	7440-23-5	20.8	B
08L0091	W	Strontium	7440-24-6	0.52	B
08L0091	W	Titanium	7440-32-6	0.48	B
08L0091	W	Zinc	7440-66-6	4.6	B
08L0093	S	Barium	7440-39-3	0.16	B
08L0093	S	Calcium	7440-70-2	17.4	B
08L0093	S	Iron	7439-89-6	6.2	B
08L0093	S	Magnesium	7439-95-4	6.7	B
08L0093	S	Manganese	7439-96-5	0.06	B
08L0093	S	Sodium	7440-23-5	16	
08L0093	S	Strontium	7440-24-6	0.1	
08L0093	S	Tin	7440-31-5	1.4	B
08L0093	S	Titanium	7440-32-6	1	
08L0093	S	Zinc	7440-66-6	0.63	B
08L0125	S	Calcium	7440-70-2	4.9	B
08L0125	S	Sodium	7440-23-5	12.3	
08L0125	S	Tin	7440-31-5	0.67	B
08L0146	S	Barium	7440-39-3	0.25	B
08L0146	S	Calcium	7440-70-2	11	B
08L0146	S	Iron	7439-89-6	22.3	
08L0146	S	Magnesium	7439-95-4	10.7	
08L0146	S	Manganese	7439-96-5	0.18	B
08L0146	S	Silicon	7440-21-3	5	B
08L0146	S	Sodium	7440-23-5	18.7	
08L0146	S	Strontium	7440-24-6	0.18	
08L0146	S	Titanium	7440-32-6	1.1	
08L0163	S	Aluminum	7429-90-5	23.4	
08L0163	S	Barium	7440-39-3	0.18	B
08L0163	S	Calcium	7440-70-2	4.3	B
08L0163	S	Manganese	7439-96-5	0.06	B
08L0163	S	Selenium	7782-49-2	0.65	B
08L0163	S	Sodium	7440-23-5	7.3	B
08L0163	S	Strontium	7440-24-6	0.04	B
08L0163	S	Titanium	7440-32-6	0.16	B
08L0166	S	Tin	7440-31-5	0.8	B
08L0178	S	Barium	7440-39-3	0.21	B
08L0178	S	Calcium	7440-70-2	11.1	B

Table 2-3. ICP Metals Method Blank Failures. (2 Pages)

Batch ID	Matrix	Analyte	CAS	Result (µg/L for water, mg/kg for soil)	Q
08L0178	S	Copper	7440-50-8	0.21	B
08L0178	S	Iron	7439-89-6	7.6	B
08L0178	S	Lead	7439-92-1	0.3	B
08L0178	S	Magnesium	7439-95-4	3.3	B
08L0178	S	Manganese	7439-96-5	0.16	B
08L0178	S	Sodium	7440-23-5	16.8	
08L0178	S	Strontium	7440-24-6	0.07	B
08L0178	S	Titanium	7440-32-6	0.32	B
08L0193	S	Barium	7440-39-3	0.1	B
08L0193	S	Calcium	7440-70-2	5.6	B
08L0193	S	Manganese	7439-96-5	0.05	B
08L0193	S	Nickel	7440-02-0	0.84	B
08L0193	S	Sodium	7440-23-5	7.4	B
08L0193	S	Strontium	7440-24-6	0.04	B
08L0200	S	Calcium	7440-70-2	5.1	B
08L0200	S	Sodium	7440-23-5	7.7	B
08L0202	W	Barium	7440-39-3	0.34	B
08L0202	W	Sodium	7440-23-5	10.8	B

CAS - Chemicat Abstract Service
ICP - inductively coupled plasma
Q - laboratory qualifier
S - soil
W - water

In batch 08L0091 barium, copper, silicon, and titanium results were not qualified due to blank contamination as the blank concentrations were less than three times the instrument detection limit. Results for calcium, magnesium, sodium and strontium were not qualified as all results were greater than ten times the blank concentration. Results for zinc were qualified as estimated due to blank contamination and flagged with a “J” for detects and “UJ” for nondetects.

In batch 08L0093, barium, iron, magnesium, manganese, tin and zinc were not qualified due to blank contamination as the blank concentrations were less than three times the instrument detection limit. Results for calcium, strontium, and titanium were not qualified as all results were greater than ten times the blank concentration. Results for sodium in samples 0802L680-003 and 0802L688-002 were qualified as estimated and flagged with a “J” due to blank contamination. All other sodium results were not qualified as they were greater than ten times the blank concentration.

In batch 08L0125, calcium and tin were not qualified due to blank contamination as the blank concentrations were less than three times the instrument detection limit. Sodium results were not qualified as all results were greater than ten times the blank concentration.

In batch 08L0146, barium, calcium and silicon were not qualified due to blank contamination as the blank concentrations were less than three times the instrument detection limit. Results for iron, magnesium, manganese, strontium, and titanium were not qualified as all results were greater than 10 times the blank concentration. The sodium result for sample 0804L873-001 was qualified as estimated and flagged with a "J" due to blank contamination. All other sodium results were not qualified as they were greater than ten times the blank concentration.

In batch 08L0163, barium, calcium, manganese, selenium, strontium and titanium were not qualified due to blank contamination as the blank concentrations were less than three times the instrument detection limit. Results for aluminum and sodium were not qualified as all results were greater than ten times the blank concentration.

In batch 08L0166, tin results were not qualified due to blank contamination as the blank concentration was less than three times the instrument detection limit. The sodium result for sample 0804L873-005 was qualified as estimated and flagged with a "J". All other results for sodium were not qualified as the results were greater than ten times the blank concentration.

In batch 08L0178, barium, calcium, copper, iron, lead, magnesium, and strontium results were not qualified due to blank contamination as the blank concentrations were less than three times the instrument detection limit. Results for manganese and titanium were not qualified as all results were greater than ten times the blank concentration. Sodium results for samples 0804L957-001 thru -004 and sample 0804L967-004 were qualified as estimated and flagged with a "J". All other results for sodium were not qualified as the results were greater than ten times the blank concentration.

In batch 08L0193, barium, calcium, manganese, and strontium results were not qualified due to blank contamination as the blank concentrations were less than three times the instrument detection limit. Results for nickel and sodium were not qualified as all results were greater than ten times the blank concentration.

In batch 08L0200, calcium results were not qualified due to blank contamination as the blank concentration was less than three times the instrument detection limit. Results for sodium were not qualified as all results were greater than ten times the blank concentration.

In batch 08L0202, barium and sodium results were not qualified due to blank contamination as the blank concentrations were less than three times the instrument detection limit.

2.1.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The quantitation limit for nondetect results did not meet the required detection limit in the cases listed in Table 2-4. Per *Data Validation Procedure for Chemical Analyses* (HNF-20433, Rev. 0), no qualifiers were applied.

Table 2-4. Nondetect Results That Did Not Meet The Required Detection Limits. (2 Pages)

Batch	Matrix	Lab Sample ID	Analytes	Reporting Limit (mg/kg)	RDL (mg/kg)
08L0093	S	0802L646-002	Uranium, Total	2	0.25
08L0093	S	0802L646-003	Uranium, Total	2	0.25
08L0093	S	0802L680-003	Uranium, Total	2	0.25
08L0166	S	0804L904-001	Uranium, Total	2	0.25
08L0093	S	0802L680-002	Uranium, Total	2	0.25
08L0093	S	0802L666-003	Uranium, Total	1.9	0.25
08L0125	S	0803L798-004	Uranium, Total	1.9	0.25
08L0093	S	0803L688-002	Uranium, Total	1.8	0.25
08L0093	S	0802L680-001	Uranium, Total	1.9	0.25
08L0163	S	0804L911-002	Uranium, Total	1.8	0.25
08L0093	S	0802L666-001	Uranium, Total	1.9	0.25
08L0178	S	0804L967-002	Uranium, Total	1.9	0.25
08L0093	S	0802L646-004	Uranium, Total	1.9	0.25
08L0200	S	0805L107-002	Uranium, Total	1.9	0.25
08L0200	S	0805L102-001	Uranium, Total	1.9	0.25
08L0178	S	0804L967-004	Uranium, Total	1.9	0.25
08L0093	S	0802L646-005	Uranium, Total	1.9	0.25
08L0093	S	0802L646-006	Uranium, Total	1.9	0.25
08L0193	S	0804L026-001	Uranium, Total	1.9	0.25
08L0093	S	0802L646-007	Uranium, Total	1.9	0.25
08L0166	S	0804L873-004	Uranium, Total	1.8	0.25
08L0125	S	0803L816-002	Uranium, Total	1.8	0.25
08L0146	S	0804L873-002	Uranium, Total	1.8	0.25
08L0125	S	0803L816-001	Uranium, Total	1.8	0.25
08L0178	S	0804L967-003	Uranium, Total	1.8	0.25
08L0163	S	0804L904-003	Uranium, Total	1.8	0.25
08L0125	S	0803L798-003	Uranium, Total	1.8	0.25
08L0093	S	0802L646-001	Uranium, Total	1.8	0.25
08L0093	S	0803L688-001	Uranium, Total	1.8	0.25
08L0200	S	0805L107-003	Uranium, Total	1.8	0.25
08L0178	S	0804L957-003	Uranium, Total	1.8	0.25
08L0178	S	0804L967-001	Uranium, Total	1.8	0.25
08L0178	S	0804L957-005	Uranium, Total	1.8	0.25
08L0193	S	0805L043-002	Uranium, Total	1.8	0.25
08L0178	S	0804L957-002	Uranium, Total	1.8	0.25
08L0125	S	0803L816-004	Uranium, Total	1.8	0.25
08L0193	S	0804L026-002	Uranium, Total	1.8	0.25
08L0093	S	0802L666-002	Uranium, Total	1.7	0.25
08L0125	S	0803L798-002	Uranium, Total	1.7	0.25
08L0125	S	0803L798-001	Uranium, Total	1.7	0.25
08L0178	S	0804L957-001	Uranium, Total	1.7	0.25
08L0200	S	0805L107-001	Uranium, Total	1.7	0.25
08L0200	S	0805L072-001	Uranium, Total	1.7	0.25

Table 2-4. Nondetect Results That Did Not Meet The Required Detection Limits. (2 Pages)

Batch	Matrix	Lab Sample ID	Analytes	Reporting Limit (mg/kg)	RDL (mg/kg)
08L0193	S	0805L043-004	Uranium, Total	1.7	0.25
08L0163	S	0804L904-006	Uranium, Total	1.7	0.25
08L0178	S	0804L957-004	Uranium, Total	1.7	0.25
08L0146	S	0804L873-001	Uranium, Total	1.7	0.25
08L0166	S	0804L873-006	Uranium, Total	1.7	0.25
08L0166	S	0804L873-005	Uranium, Total	1.7	0.25
08L0163	S	0804L911-001	Uranium, Total	1.7	0.25
08L0163	S	0804L904-002	Uranium, Total	1.7	0.25
08L0146	S	0804L873-003	Uranium, Total	1.7	0.25
08L0163	S	0804L904-005	Uranium, Total	1.6	0.25
08L0178	S	0804L967-005	Uranium, Total	1.6	0.25
08L0193	S	0805L043-001	Uranium, Total	1.6	0.25
08L0163	S	0804L904-004	Uranium, Total	1.6	0.25
08L0193	S	0805L043-003	Uranium, Total	1.5	0.25
08L0178	S	0804L957-005	Thallium, Total	0.56	2.5
08L0178	S	0804L957-005	Tin, Total	0.56	2.5
08L0178	S	0804L957-005	Selenium, Total	0.56	2.5
08L0166	S	0804L873-005	Silver, Total	0.08	0.5

S - soil

2.1.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, and MSD meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS, MS, and MSD recoveries must be between 75% and 125%.

Table 2-5 outlines the batches that had LCS failures. Silicon results in batches 08L0093, 08L0125, 08L0146, 08L0163, 08L0166, 08L0178, and 08L0200 were rejected and flagged with an “R” due to extremely low LCS recoveries below 50%. Silicon results in batch 08L0193 were flagged with a “J” due to low LCS recovery. Uranium results in batch 08L0146 were not qualified as all results were less than the instrument detection limit and the LCS recovery was high.

Table 2-5. ICP-Metals LCS Failures.

Batch ID	Matrix	Analyte	CAS	Percent Recovery	LCL (%)	UCL (%)
08L0093	S	Silicon	7440-21-3	27.3	75	125
08L0125	S	Silicon	7440-21-3	10.7	75	125
08L0146	S	Silicon	7440-21-3	5.5	75	125
08L0146	S	Uranium	7440-61-1	193	75	125
08L0163	S	Silicon	7440-21-3	30.8	75	125
08L0166	S	Silicon	7440-21-3	46.1	75	125
08L0178	S	Silicon	7440-21-3	26.1	75	125
08L0193	S	Silicon	7440-21-3	52.9	75	125
08L0200	S	Silicon	7440-21-3	26.6	75	125

CAS - Chemical Abstracts Service
ICP - inductively coupled plasma
LCL - lower control limit
S - soil
UCL - upper control limit

Table 2-6 outlines the batches that had MS and/or MSD failures. Silicon results in batch 08L0091 was not qualified due to insufficient spike concentration. Iron results in batch 08L0091 were qualified as estimated and flagged with a "J" due to high MSD recovery.

Aluminum, iron, manganese and titanium results in batch 08L0093 were not qualified because the spike concentrations were insufficient. Antimony results in batch 08L0093 were qualified as estimated and flagged with "UJ" due to low MS/MSD recoveries. Calcium results in batch 08L0093 were qualified as estimated and flagged with "J" due to a high MSD recovery.

Table 2-6. ICP-Metals MS and MSD Failures.

Batch ID	Matrix	QCCode	Analyte	CAS	Percent Recovery	LCL (%)	UCL (%)
08L0091	W	MSD	Iron	7439-89-6	128.2	75	125
08L0091	W	MSD	Silicon	7440-21-3	292	75	125
08L0093	S	MS	Aluminum	7429-90-5	483.2	75	125
08L0093	S	MSD	Aluminum	7429-90-5	507	75	125
08L0093	S	MS	Antimony	7440-36-0	41.7	75	125
08L0093	S	MSD	Antimony	7440-36-0	42.5	75	125
08L0093	S	MSD	Calcium	7440-70-2	126.5	75	125
08L0093	S	MS	Iron	7439-89-6	2038.3	75	125
08L0093	S	MSD	Iron	7439-89-6	1050.9	75	125
08L0093	S	MS	Manganese	7439-96-5	143.2	75	125
08L0093	S	MSD	Manganese	7439-96-5	143.7	75	125
08L0093	S	MS	Titanium	7440-32-6	168.5	75	125

CAS - Chemical Abstracts Service
ICP - inductively coupled plasma
LCL - lower control limit
MS - matrix spike
MSD - matrix spike duplicate
S - soil
UCL - upper control limit
W - water

2.1.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the relative percent difference (RPD) between MS and MSD, as well as sample and duplicate, must be less than 20% for all samples. Table 2-7 shows the MS and MSD failures for RPD. Iron results in batch 08L0091 were qualified as estimated and flagged with a "J". Silicon results in batch 08L0091 and iron results in batch 08L0093 were not qualified as the spike concentration was insufficient.

Table 2-7. ICP-Metals MS/MSD RPD Failures.

Batch ID	Matrix	Analyte	CAS	RPD	RPD Limit
08L0091	W	Iron	7439-89-6	24.8	20
08L0091	W	Silicon	7440-21-3	93.2	20
08L0093	S	Iron	7439-89-6	67.3	20

CAS - Chemical Abstracts Service
ICP - inductively coupled plasma
MS - matrix spike
MSD - matrix spike duplicate
RPD - relative percent difference
S - soil
W - water

Table 2-8 shows the duplicate failures for RPD. Silicon results in batch 08L0093 were qualified as estimated and flagged with a "J".

Table 2-8. ICP-Metals Sample/Duplicate RPD Failures.

Batch ID	Matrix	Analyte	CAS	Original Sample	Duplicate Sample	RPD	RPD Limit
08L0093	S	Silicon	7440-21-3	0802L680-002	0802L680-002DUP	27.7	20

CAS - Chemical Abstracts Service
ICP - inductively coupled plasma
RPD - relative percent difference
S - soil

2.2. DATA VALIDATION REPORT FOR MERCURY (METHODS 7470A and 7471A)

Table 2-9 is a summary of the validated results for mercury.

Table 2-9. Summary of Mercury Validation. (3 Pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0802L646-001	B020	S	08C0039	0.01	mg/kg	0.01	U		
0802L646-002	B021	S	08C0039	0.01	mg/kg	0.01	U		
0802L646-003	B022	S	08C0039	0.01	mg/kg	0.01	U		
0802L646-004	B023	S	08C0039	0.01	mg/kg	0.01	U		

Table 2-9. Summary of Mercury Validation. (3 Pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0802L646-005	B024	S	08C0039	0.01	mg/kg	0.01	U		
0802L646-006	B025	S	08C0039	0.01	mg/kg	0.01	U		
0802L646-007	B026	S	08C0039	0.01	mg/kg	0.01	B		
0802L666-001	B028	S	08C0040	0.01	mg/kg	0.01	U		
0802L666-002	B029	S	08C0040	0.01	mg/kg	0.01	U		
0802L666-003	B030	S	08C0040	0.01	mg/kg	0.009	B		
0803L798-001	B046	S	08C0054	0.01	mg/kg	0.01	U		
0803L798-002	B047	S	08C0054	0.01	mg/kg	0.01	U		
0803L798-003	B048	S	08C0054	0.01	mg/kg	0.01	U		
0803L798-004	B049	S	08C0054	0.01	mg/kg	0.01	U		
0803L816-001	B051	S	08C0054	0.01	mg/kg	0.01	U		
0803L816-002	B052	S	08C0054	0.01	mg/kg	0.01	U		
0803L816-004	B054	S	08C0054	0.01	mg/kg	0.01	U		
0804L873-001	B064	S	08C0067	0.01	mg/kg	0.01	U		
0804L873-002	B065	S	08C0067	0.01	mg/kg	0.01	U		
0804L873-003	B066	S	08C0067	0.01	mg/kg	0.01	U		
0804L873-004	B068	S	08C0067	0.01	mg/kg	0.01	U		
0804L873-005	B069	S	08C0067	0.01	mg/kg	0.01	U		
0804L873-006	B070	S	08C0067	0.01	mg/kg	0.01	U		
0804L904-001	B071	S	08C0072	0.01	mg/kg	0.01	U		
0804L904-002	B072	S	08C0072	0.01	mg/kg	0.01	U		
0804L904-003	B073	S	08C0072	0.02	mg/kg	0.009	B		
0804L904-004	B075	S	08C0072	0.01	mg/kg	0.01	U		
0804L904-005	B077	S	08C0072	0.01	mg/kg	0.01	U		
0804L904-006	B078	S	08C0072	0.01	mg/kg	0.01	U		
0804L911-001	B082	S	08C0072	0.01	mg/kg	0.01	U		
0804L911-002	B083	S	08C0072	0.01	mg/kg	0.01	U		
0804L957-001	B084	S	08C0076	0.01	mg/kg	0.01	U		
0804L957-002	B085	S	08C0076	0.01	mg/kg	0.01	U		
0804L957-003	B087	S	08C0076	0.01	mg/kg	0.01	U		
0804L957-004	B088	S	08C0076	0.01	mg/kg	0.01	U		
0804L957-005	B089	S	08C0076	0.01	mg/kg	0.01	U		
0804L967-001	B090	S	08C0076	0.01	mg/kg	0.01	U		
0804L967-002	B091	S	08C0076	0.01	mg/kg	0.01	U		
0804L967-003	B093	S	08C0076	0.01	mg/kg	0.01	U		
0804L967-004	B094	S	08C0076	0.01	mg/kg	0.01	U		

Table 2-9. Summary of Mercury Validation. (3 Pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0804L967-005	B095	S	08C0076	0.01	mg/kg	0.01	U		
0804L026-001	B102	S	08C0078	0.01	mg/kg	0.01	U		
0804L026-002	B103	S	08C0078	0.01	mg/kg	0.01	U		
0805L043-001	B104	S	08C0084	0.01	mg/kg	0.01	U		
0805L043-002	B105	S	08C0084	0.01	mg/kg	0.009			
0805L043-003	B107	S	08C0084	0.01	mg/kg	0.01	U		
0805L043-004	B108	S	08C0084	0.01	mg/kg	0.01	U		
0805L072-001	B109	S	08C0084	0.01	mg/kg	0.01	U		
0802L665-001	G001	W	08C0042	0.06	µg/L	0.06	U		
0802L665-002	G002	W	08C0042	0.06	µg/L	0.06	U		
0802L665-003	G003	W	08C0042	0.08	µg/L	0.06	B		
0802L674-001	G004	W	08C0042	0.06	µg/L	0.06	U		
0802L674-002	G005	W	08C0042	0.06	µg/L	0.06	U		
0802L679-001	G006	W	08C0042	0.08	µg/L	0.06	B		
0802L679-002	G007	W	08C0042	0.06	µg/L	0.06	U		
0802L679-003	G008	W	08C0042	0.09	µg/L	0.06	B		
0805L068-001	G009	W	08C0086	0.06	µg/L	0.06	U		
0805L068-002	G010	W	08C0086	0.06	µg/L	0.06	U		
0805L068-003	G011	W	08C0086	0.06	µg/L	0.06	U		
0805L068-004	G012	W	08C0086	0.06	µg/L	0.06	U		
0805L068-005	G013	W	08C0086	0.06	µg/L	0.06	U		

EQL - estimated quantitation limit
Q - laboratory qualifier
S - soil
V - validation flag
W - water

2.2.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-10 shows the number of each type of sample in each preparation batch.

Table 2-10. Mercury Preparation Batch Summary.

Batch ID	Matrix	BLK	DUP	LCS	MS	MSD	Sample
08C0042	W	1	1	2	1	1	8

Table 2-10. Mercury Preparation Batch Summary.

Batch ID	Matrix	BLK	DUP	LCS	MS	MSD	Sample
08C0086	W	1		1			5
08C0039	S	1	1	1	1	1	7
08C0040	S	1	1	1	1		3
08C0054	S	1		1			7
08C0067	S	1		1			6
08C0072	S	1		1			8
08C0076	S	1	1	1	1		10
08C0078	S	1		1			2
08C0084	S	1		1			5

BLK - blank
DUP - duplicate
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
S - soil
W - water

Mercury analysis was performed in ten batches. Each batch contained fewer than 20 field samples. At least one method blank and LCS were analyzed in each sample batch. According to the sampling plan, a DUP, MS and an MSD are to be analyzed with every 20 field samples. For the 13 water samples there is one DUP, MS and MSD so the intent of the sampling plan is met. For the 48 soil samples, there are three DUP and three MS, but only one MSD. However, when the samples from this data validation report are combined with the previous data validation report, there are 76 total samples and 4 MSD, so the intent of the sampling plan has been met. No data were qualified for missing quality control samples.

2.2.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for mercury analysis by methods 7470A and 7471A are specified in VET-1405-PLN-03, Rev. 0, as 28 days. All results were generated within these limits.

2.2.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The RQL (VET-1405-PLN-03, Rev. 0) is shown in Table 2-11.

Table 2-11. Required Quantitation Limit for Mercury.

Analyte	Water (µg/L)	Soil (mg/kg)
Mercury	0.05	5

All method blank results were below the instrument detection limits.

2.2.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

None of the quantitation limits for the nondetect results met the required detection limit. Per *Data Validation Procedure for Chemical Analyses* (HNF-20433, Rev.0), no data were qualified.

2.2.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, and MSD meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS, MS, and MSD recoveries must be between 75% and 125%. All LCS and MS/MSD recoveries were within the accuracy limits.

2.2.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the RPD between MS and MSD, as well as sample and duplicate, must be less than 20% for all samples. All RPDs met this criterion.

2.3. DATA VALIDATION REPORT FOR HEXAVALENT CHROMIUM (METHOD 7196A)

Table 2-12 is a summary of the validated results for hexavalent chromium.

Table 2-12. Summary of Hexavalent Chromium Validation. (3 Pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0802L646-001	B020	S	08LVI019	0.21	mg/kg	0.21	U		
0802L646-002	B021	S	08LVI019	0.31	mg/kg	0.2			
0802L646-003	B022	S	08LVI019	1.4	mg/kg	0.21			
0802L646-004	B023	S	08LVI019	0.20	mg/kg	0.2	U		
0802L646-005	B024	S	08LVI019	0.74	mg/kg	0.2			
0802L646-006	B025	S	08LVI019	0.22	mg/kg	0.21			
0802L646-007	B026	S	08LVI019	0.20	mg/kg	0.2	U		
0802L666-001	B028	S	08LVI021	0.26	mg/kg	0.21			
0802L666-002	B029	S	08LVI021	0.20	mg/kg	0.2	U		
0802L666-003	B030	S	08LVI021	0.21	mg/kg	0.21			
0803L798-001	B046	S	08LVI030	0.20	mg/kg	0.2	U		
0803L798-002	B047	S	08LVI030	0.21	mg/kg	0.21	U		
0803L798-003	B048	S	08LVI030	0.20	mg/kg	0.2	U		
0803L798-004	B049	S	08LVI030	0.20	mg/kg	0.2	U		
0803L816-001	B051	S	08LVI030	0.21	mg/kg	0.21	U		
0803L816-002	B052	S	08LVI030	0.20	mg/kg	0.2	U		
0803L816-004	B054	S	08LVI030	0.20	mg/kg	0.2	U		

Table 2-12. Summary of Hexavalent Chromium Validation. (3 Pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0804L873-001	B064	S	08LVI034	0.21	mg/kg	0.21	U		
0804L873-002	B065	S	08LVI034	0.22	mg/kg	0.22	U		
0804L873-003	B066	S	08LVI034	0.21	mg/kg	0.21	U		
0804L873-004	B068	S	08LVI034	0.84	mg/kg	0.21			
0804L873-005	B069	S	08LVI034	0.21	mg/kg	0.21	U		
0804L873-006	B070	S	08LVI034	0.21	mg/kg	0.21	U		
0804L904-001	B071	S	08LVI035	0.22	mg/kg	0.22	U		
0804L904-002	B072	S	08LVI035	0.21	mg/kg	0.21	U		
0804L904-003	B073	S	08LVI035	0.22	mg/kg	0.22	U		
0804L904-004	B075	S	08LVI035	0.21	mg/kg	0.21	U		
0804L904-005	B077	S	08LVI035	0.33	mg/kg	0.21			
0804L904-006	B078	S	08LVI035	0.20	mg/kg	0.2	U		
0804L911-001	B082	S	08LVI036	0.21	mg/kg	0.21	U		
0804L911-002	B083	S	08LVI036	0.85	mg/kg	0.23			
0804L957-001	B084	S	08LVI038	0.21	mg/kg	0.21	U		
0804L957-002	B085	S	08LVI038	0.21	mg/kg	0.21	U		
0804L957-003	B087	S	08LVI038	0.21	mg/kg	0.21	U		
0804L957-004	B088	S	08LVI038	0.20	mg/kg	0.2	U		
0804L957-005	B089	S	08LVI038	0.20	mg/kg	0.2	U		
0804L967-001	B090	S	08LVI039	0.22	mg/kg	0.22	U		
0804L967-002	B091	S	08LVI039	0.21	mg/kg	0.21	U		
0804L967-003	B093	S	08LVI039	0.20	mg/kg	0.2	U		
0804L967-004	B094	S	08LVI039	0.21	mg/kg	0.21	U		
0804L967-005	B095	S	08LVI039	0.20	mg/kg	0.2	U		
0804L026-001	B102	S	08LVI042	0.21	mg/kg	0.21	U		
0804L026-002	B103	S	08LVI042	0.21	mg/kg	0.21	U		
0805L043-001	B104	S	08LVI043	0.21	mg/kg	0.21	U		
0805L043-002	B105	S	08LVI043	0.22	mg/kg	0.22	U		
0805L043-003	B107	S	08LVI043	0.83	mg/kg	0.2			
0805L043-004	B108	S	08LVI043	0.31	mg/kg	0.21			
0805L072-001	B109	S	08LVI045	0.21	mg/kg	0.21	U		
0805L102-001	B121	S	08LVI045	0.22	mg/kg	0.21			
0805L102-002	B122	S	08LVI045	0.21	mg/kg	0.21	U		
0805L107-001	B125	S	08LVI046	0.38	mg/kg	0.21			
0805L107-002	B126	S	08LVI046	0.32	mg/kg	0.21			
0805L107-003	B127	S	08LVI046	0.22	mg/kg	0.22	U		
0802L665-001	G001	W	08LVIA19	0.070	mg/L	0.005		J	Low MS
0802L665-002	G002	W	08LVIA19	0.075	mg/L	0.005		J	Low MS
0802L665-003	G003	W	08LVIA19	0.084	mg/L	0.005		J	Low MS
0805L068-001	G009	W	08LVIA43	0.071	mg/L	0.005		J	Low MS
0805L068-002	G010	W	08LVIA43	0.078	mg/L	0.005		J	Low MS

Table 2-12. Summary of Hexavalent Chromium Validation. (3 Pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0805L068-003	G011	W	08LVIA43	0.090	mg/L	0.005		J	Low MS
0805L068-004	G012	W	08LVIA43	0.075	mg/L	0.005		J	Low MS
0805L068-005	G013	W	08LVIA43	0.072	mg/L	0.005		J	Low MS

EQL - estimated quantitation limit
MS - matrix spike
Q - laboratory qualifier
S - soil
V - validator flag
W - water

2.3.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, and a MS sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-13 shows the number of each type of sample in each preparation batch.

Table 2-13. Hexavalent Chromium Preparation Batch Summary.

Batch ID	Matrix	BLK	LCS	DUP	MS	MSD	Sample
08LVI019	S	1	2				7
08LVI021	S	1	2				3
08LVI030	S	1	2				7
08LVI034	S	1	2				6
08LVI035	S	1	2				6
08LVI036	S	1	2				2
08LVI038	S	1	2	1	1	1	5
08LVI039	S	1	2				5
08LVI042	S	1	2				2
08LVI043	S	1	2				4
08LVI045	S	1	2				3
08LVI046	S	1	2				3
08LVIA19	W	1	2	1	1		3
08LVIA43	W	1	1	1	1		5

BLK - blank
DUP - duplicate
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
S soil
W - water

Hexavalent chromium analysis was performed in 14 batches. Each batch contained fewer than 20 field samples. At least one LCS and MB were analyzed in each sample batch.

An MS/MSD or an MS and a DUP are to be analyzed for every 20 sample results of each matrix type, averaged over the project. A duplicate result was obtained for each of the batches of water samples.

However, a duplicate analysis was performed in only one of the solid-sample batches. Since 53 solid samples were analyzed, this is less than the desired one-in-twenty average. Since all sample results have not yet been reported for the project, it cannot be determined as of this writing whether the one-in-twenty goal will be met. Therefore, the results were not qualified for lack of MS/MSD or duplicate.

2.3.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for chromium (VI) analysis by method 7196A are specified in VET-1405-PLN-03, Rev. 0, as 28 days for soil samples and one day for water samples. All results were generated within these limits.

2.3.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Holding time limits for chromium (VI) analysis by method 7196A are specified in VET-1405-PLN-03, Rev. 0, as 28 days for soil samples and one day for water samples. All results were generated within these limits.

2.3.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for chromium (VI). All detection limits were 0.22 mg/kg or less.

2.3.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, and MSD meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS, MS, and MSD recoveries must be between 75% and 125%. However, the MS recoveries for the two water-sample batches, 08LVIA19 and 08LVIA43, were low (40% and 49%, respectively). Therefore, all water sample results were qualified as approximate and flagged “J”.

All other LCS and MS/MSD recoveries were within the accuracy limits.

2.3.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the MS/MSD and DUP RPDs must be less than 20%. The RPD, as defined in the validation instructions, cannot be evaluated if the reliable detection level (RDL) is not specified. Therefore, no results were qualified for precision.

2.4. DATA VALIDATION REPORT FOR CYANIDE (METHOD 9014)

Table 2-14 is a summary of the validated results for cyanide.

Table 2-14. Summary of Cyanide Validation. (2 Pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0802L646-001	B020	S	08LC011	0.50	mg/kg	0.5	U		
0802L646-002	B021	S	08LC011	0.49	mg/kg	0.49	U		
0802L646-003	B022	S	08LC011	0.52	mg/kg	0.52	U		
0802L646-004	B023	S	08LC011	0.48	mg/kg	0.48	U		
0802L646-005	B024	S	08LC011	0.49	mg/kg	0.49	U		
0802L646-006	B025	S	08LC011	0.51	mg/kg	0.51	U		
0802L646-007	B026	S	08LC011	0.50	mg/kg	0.5	U		
0802L666-001	B028	S	08LC012	0.51	mg/kg	0.51	U		
0802L666-002	B029	S	08LC012	0.51	mg/kg	0.51	U		
0802L666-003	B030	S	08LC012	0.50	mg/kg	0.5	U		
0802L680-001	B031	S	08LC012	0.48	mg/kg	0.48	U		
0802L680-002	B032	S	08LC012	0.49	mg/kg	0.49	U		
0802L680-003	B033	S	08LC012	0.50	mg/kg	0.5	U		
0803L798-001	B046	S	08LC020	0.50	mg/kg	0.5	U		
0803L798-002	B047	S	08LC020	0.50	mg/kg	0.5	U		
0803L798-003	B048	S	08LC020	0.49	mg/kg	0.49	U		
0803L798-004	B049	S	08LC020	0.49	mg/kg	0.49	U		
0803L816-001	B051	S	08LC020	0.45	mg/kg	0.45	U		
0803L816-002	B052	S	08LC020	0.49	mg/kg	0.49	U		
0803L816-004	B054	S	08LC020	0.47	mg/kg	0.47	U		
0804L873-001	B064	S	08LC022	0.50	mg/kg	0.5	U		
0804L873-002	B065	S	08LC022	0.54	mg/kg	0.54	U		
0804L873-003	B066	S	08LC022	0.51	mg/kg	0.51	U		
0804L873-004	B068	S	08LC022	0.51	mg/kg	0.51	U		
0804L873-005	B069	S	08LC022	0.51	mg/kg	0.51	U		
0804L873-006	B070	S	08LC022	0.48	mg/kg	0.48	U		
0804L904-001	B071	S	08LC023	0.54	mg/kg	0.54	U		
0804L904-002	B072	S	08LC023	0.49	mg/kg	0.49	U		
0804L904-003	B073	S	08LC023	0.53	mg/kg	0.53	U		
0804L904-004	B075	S	08LC023	0.51	mg/kg	0.51	U		
0804L904-005	B077	S	08LC023	0.51	mg/kg	0.51	U		

Table 2-14. Summary of Cyanide Validation. (2 Pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0804L904-006	B078	S	08LC023	0.49	mg/kg	0.49	U		
0804L911-001	B082	S	08LC024	0.50	mg/kg	0.5	U		
0804L911-002	B083	S	08LC024	0.54	mg/kg	0.54	U		
0804L957-001	B084	S	08LCA25	0.49	mg/kg	0.49	U		
0804L957-002	B085	S	08LCA25	0.51	mg/kg	0.51	U		
0804L957-003	B087	S	08LCA25	0.51	mg/kg	0.51	U		
0804L957-004	B088	S	08LCA25	0.51	mg/kg	0.51	U		
0804L957-005	B089	S	08LCA25	0.51	mg/kg	0.51	U		
0804L967-001	B090	S	08LC026	0.55	mg/kg	0.55	U		
0804L967-002	B091	S	08LC026	0.52	mg/kg	0.52	U		
0804L967-003	B093	S	08LC026	0.51	mg/kg	0.51	U		
0804L967-004	B094	S	08LC026	0.51	mg/kg	0.51	U		
0804L967-005	B095	S	08LC026	0.49	mg/kg	0.49	U		
0804L026-001	B102	S	08LC027	0.49	mg/kg	0.49	U		
0804L026-002	B103	S	08LC027	0.47	mg/kg	0.47	U		
0805L043-001	B104	S	08LC028	0.50	mg/kg	0.5	U		
0805L043-002	B105	S	08LC028	0.51	mg/kg	0.51	U		
0805L043-003	B107	S	08LC028	0.49	mg/kg	0.49	U		
0805L043-004	B108	S	08LC028	0.51	mg/kg	0.51	U		
0805L072-001	B109	S	08LC029	0.48	mg/kg	0.48	U		
0805L102-001	B121	S	08LC031	0.43	mg/kg	0.43	U		
0805L102-002	B122	S	08LC031	0.47	mg/kg	0.47	U		
0805L107-001	B125	S	08LC031	0.45	mg/kg	0.45	U		
0805L107-002	B126	S	08LC031	0.49	mg/kg	0.49	U		
0805L107-003	B127	S	08LC031	0.51	mg/kg	0.51	U		
0802L665-001	G001	W	08LCA11	5.00	µg/L	5	U		
0802L665-002	G002	W	08LCA11	5.00	µg/L	5	U		
0802L665-003	G003	W	08LCA11	5.00	µg/L	5	U		
0805L068-001	G009	W	08LC030	5.00	µg/L	5	U		
0805L068-002	G010	W	08LC030	5.00	µg/L	5	U		
0805L068-003	G011	W	08LC030	5.00	µg/L	5	U		
0805L068-004	G012	W	08LC030	5.00	µg/L	5	U		
0805L068-005	G013	W	08LC030	5.00	µg/L	5	U		

EQL - estimated quantitation limit
Q - laboratory qualifier
S soil
V - validation qualifier
W - water

2.4.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-15 shows the number of each type of sample in each preparation batch.

Table 2-15. Cyanide Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	DUP	MS	MSD	Sample
08LC011	S	1	2	1	1		7
08LC012	S	1	2	1	1		6
08LC020	S	1	2				7
08LC022	S	1	2	1	1		6
08LC023	S	1	2				6
08LC024	S	1	2				2
08LC026	S	1	2	1	1		5
08LC027	S	1	2	1	1		2
08LC028	S	1	2				4
08LC029	S	1	2				1
08LC030	W	1	2				5
08LC031	S	1	2	1	1		5
08LCA11	W	1	2		1		3
08LCA25	S	1	2	1	1		5

DUP - duplicate
LCS - laboratory control sample
MB - method blank
MS - matrix spike
MSD - matrix spike duplicate
S - soil
W - water

Cyanide analysis was performed in 14 batches. Each batch contained fewer than 20 field samples. At least one MB and LCS were analyzed in each sample batch.

The project goal for duplicate and MS frequency is to analyze at least one duplicate and one MS for every 20 samples of each matrix type, averaged over the project. A duplicate and an MS were analyzed in seven of the 12 batches of solid samples. There were 56 solid samples analyzed, so the average frequency requirement was surpassed for solid samples.

Similarly, one MS was analyzed for the ten water samples, so the one-in-twenty goal was met for MS in water samples. However, no duplicates were analyzed. Since it cannot be determined as of this writing whether the overall project goal will be met for frequency of duplicate analysis for cyanide in water samples, no sample results were qualified for duplicate frequency.

2.4.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for cyanide analysis by method 9014 is specified in VET-1405-PLN-03, Rev. 0, as 14 days. All results were generated within these limits.

2.4.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Project documentation does not specify a required quantitation limit for cyanide. Cyanide was not detected in the method blanks. Detection limits in the blanks were 0.5 mg/kg for soils and 5 µg/L for the water blank.

2.4.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for cyanide. Cyanide was not detected in any of the samples. Detection limits were 5 µg/L for water samples and 0.55 mg/kg or less for soil samples.

2.4.5. QC Checks for Accuracy

- Did the LCS and MS recoveries meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS recoveries must be between 75% and 125%. All LCS and MS recoveries were within these limits.

2.4.6. QC Check for Precision

- Did the DUP relative percent differences meet the precision criteria?

As specified in VET-1332-PRO-004, Rev. 0, the MS/MSD and DUP RPDs must be less than 20%. The RPD, as defined in the validation instructions, cannot be evaluated if the RDL is not specified. Therefore, no results were qualified for precision.

2.5. DATA VALIDATION REPORT FOR SULFIDE (METHODS 9030B and 9034)

Table 2-16 is a summary of the validated results for sulfide.

Table 2-16. Summary of Sulfide Validation. (3 Pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0802L646-001	B020	S	08LSD009	20.3	mg/kg	20.3	U		
0802L646-002	B021	S	08LSD009	20.8	mg/kg	20.8	U		
0802L646-003	B022	S	08LSD009	21.4	mg/kg	21.4	U		
0802L646-004	B023	S	08LSD009	20.8	mg/kg	20.8	U		

Table 2-16. Summary of Sulfide Validation. (3 Pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0802L646-005	B024	S	08LSD009	21.1	mg/kg	21.1	U		
0802L646-006	B025	S	08LSD009	20.7	mg/kg	20.7	U		
0802L646-007	B026	S	08LSD009	20.2	mg/kg	20.2	U		
0802L666-001	B028	S	08LSD010	19.7	mg/kg	19.7	U		
0802L666-002	B029	S	08LSD010	21.0	mg/kg	21	U		
0802L666-003	B030	S	08LSD010	22.3	mg/kg	22.3	U		
0803L798-001	B046	S	08LSD018	20.2	mg/kg	20.2	U	UJ	Hold Time
0803L798-002	B047	S	08LSD018	20.7	mg/kg	20.7	U		
0803L798-003	B048	S	08LSD018	20.2	mg/kg	20.2	U		
0803L798-004	B049	S	08LSD018	20.2	mg/kg	20.2	U		
0803L816-001	B051	S	08LSD019	21.2	mg/kg	21.2	U		
0803L816-002	B052	S	08LSD019	21.1	mg/kg	21.1	U		
0803L816-004	B054	S	08LSD019	22.3	mg/kg	22.3	U		
0804L873-001	B064	S	08LSD023	22.5	mg/kg	22.5	U		
0804L873-002	B065	S	08LSD023	21.5	mg/kg	21.5	U		
0804L873-003	B066	S	08LSD023	21.4	mg/kg	21.4	U		
0804L873-004	B068	S	08LSD023	21.0	mg/kg	21	U		
0804L873-005	B069	S	08LSD023	21.2	mg/kg	21.2	U		
0804L873-006	B070	S	08LSD023	20.8	mg/kg	20.8	U		
0804L904-001	B071	S	08LSD025	23.6	mg/kg	23.6	U		
0804L904-002	B072	S	08LSD025	22.8	mg/kg	22.8	U		
0804L904-003	B073	S	08LSD025	22.1	mg/kg	22.1	U		
0804L904-004	B075	S	08LSD025	22.8	mg/kg	22.8	U		
0804L904-005	B077	S	08LSD025	22.8	mg/kg	22.8	U		
0804L904-006	B078	S	08LSD025	20.5	mg/kg	20.5	U		
0804L911-001	B082	S	08LSD026	20.4	mg/kg	20.4	U		
0804L911-002	B083	S	08LSD026	20.9	mg/kg	20.9	U		
0804L957-001	B084	S	08LSD029	21.0	mg/kg	21	U		
0804L957-002	B085	S	08LSD029	21.2	mg/kg	21.2	U		
0804L957-003	B087	S	08LSD029	21.0	mg/kg	21	U		
0804L957-004	B088	S	08LSD029	20.5	mg/kg	20.5	U		
0804L957-005	B089	S	08LSD029	20.7	mg/kg	20.7	U		
0804L967-001	B090	S	08LSD030	23.8	mg/kg	23.8	U		
0804L967-002	B091	S	08LSD030	21.6	mg/kg	21.6	U		
0804L967-003	B093	S	08LSD030	20.8	mg/kg	20.8	U		
0804L967-004	B094	S	08LSD030	21.1	mg/kg	21.1	U		
0804L967-005	B095	S	08LSD030	22.2	mg/kg	22.2	U		
0804L026-001	B102	S	08LSD033	21.5	mg/kg	21.5	U		
0804L026-002	B103	S	08LSD033	22.9	mg/kg	22.9	U		
0805L043-001	B104	S	08LSD034	21.1	mg/kg	21.1	U		
0805L043-002	B105	S	08LSD034	23.5	mg/kg	23.5	U		

Table 2-16. Summary of Sulfide Validation. (3 Pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0805L043-003	B107	S	08LSD034	22.7	mg/kg	22.7	U		
0805L043-004	B108	S	08LSD034	21.1	mg/kg	21.1	U		
0805L072-001	B109	S	08LSD036	21.2	mg/kg	21.2	U		
0805L102-001	B121	S	08LSD039	20.3	mg/kg	20.3	U		
0805L102-002	B122	S	08LSD039	20.0	mg/kg	20	U		
0805L107-001	B125	S	08LSDA40	20.1	mg/kg	20.1	U		
0805L107-002	B126	S	08LSDA40	21.5	mg/kg	21.5	U		
0805L107-003	B127	S	08LSDA40	22.6	mg/kg	22.6	U		
0802L665-001	G001	W	08LSDA10	1.0	mg/L	1	U		
0802L665-002	G002	W	08LSDA10	1.0	mg/L	1	U		
0802L665-003	G003	W	08LSDA10	1.0	mg/L	1	U		
0802L674-001	G004	W	08LSDA10	5.0	µg/L	5	U		
0802L674-002	G005	W	08LSDA10	1.0	mg/L	1	U		
0805L068-001	G009	W	08LSDA35	1.0	mg/L	1	U		
0805L068-002	G010	W	08LSDA35	1.0	mg/L	1	U		
0805L068-003	G011	W	08LSDA35	1.0	mg/L	1	U		
0805L068-004	G012	W	08LSDA35	1.0	mg/L	1	U		
0805L068-005	G013	W	08LSDA35	1.0	mg/L	1	U		

EQL - estimated quantitation limit
Q - laboratory qualifier
S soil
V - validation qualifier
W - water

2.5.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-17 shows the number of each type of sample in each preparation batch.

Table 2-17. Sulfide Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	MB	LCS	DUP	MS	MSD	Sample
08LSD009	S	1	2	1	1		7
08LSD010	S	1	2				3
08LSD018	S	1	1				4
08LSD019	S	1	2				3
08LSD023	S	1	2				6
08LSD025	S	1	2				6
08LSD026	S	1	2	1	1		2
08LSD029	S	1	2	1	1		5
08LSD030	S	1	2				5

Table 2-17. Sulfide Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	MB	LCS	DUP	MS	MSD	Sample
08LSD033	S	1	2				2
08LSD034	S	1	2				4
08LSD036	S	1	2	1			1
08LSD039	S	1	2	1	1		2
08LSDA40	S	1	2				3
08LSDA10	W	1	2	1	1		5
08LSDA35	W	1	2				5

DUP - duplicate
LCS - laboratory control sample
MB - method blank
MS - matrix spike
MSD - matrix spike duplicate
S - soil
W - water

Sulfide analysis was performed in 16 batches. Each batch contained fewer than 20 field samples. At least one MB and LCS were analyzed in each sample batch.

An MS was analyzed in three of the 14 solid sample batches, and a DUP was analyzed in four of those batches. Since there were 53 solid samples analyzed in these batches, the MS and DUP frequency supports the average goal for the project of one MS and one DUP for every 20 field samples.

Similarly, one MS and one DUP were analyzed for the ten water samples, so the one-in-twenty goal was met for MS and DUP in water samples.

2.5.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for sulfide analysis by method 9030B and 9034 are specified in VET-1405-PLN-03, Rev. 0, as 7 days. All results were generated within these limits except for sample B046 (Lab ID 0803L798-001). The analysis for this sample was completed one day after the hold time had expired. For this reason, the result for sample B046 (a nondetect) was qualified as approximate and flagged “UJ.”

2.5.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Project documentation does not specify a required quantitation limit for sulfide. Sulfide was not detected in the method blanks. Detection limits in the blanks were 1 mg/L for water and less than 40 mg/kg for soils.

2.5.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for sulfide. Sulfide was not detected in any of the samples. Detection limits were 5 mg/L or less for water samples and less than 25 mg/kg for soil samples.

2.5.5. QC Checks for Accuracy

- Did the recoveries for the LCS and MS results meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS recoveries must be between 75% and 125%. All LCS and MS recoveries were within these limits.

2.5.6. QC Check for Precision

- Did the DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, sample duplicate RPDs must be less than 20%. All sample results were nondetects, so RPDs were not relevant .

2.6. DATA VALIDATION REPORT FOR ANIONS (METHOD 9056)

Table 2-18 is a summary of the validated results for anions (chloride, fluoride, nitrate, nitrite, phosphate, and sulfate) determined by ion chromatography. Results for bromide were reported, but were not required by the sampling and analysis plan. Bromide results are shown in Table 2-18, but were not validated.

Table 2-18. Summary of Anion Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L646-001	B020	S	08LICS18	Bromide	24959-67-9	2.3	mg/kg	2.3	U		
0802L646-001	B020	S	08LICS18	Fluoride	16984-48-8	2.3	mg/kg	2.3	U		
0802L646-001	B020	S	08LICS18	Nitrate	14797-55-8	6.17	mg/kg	2.32			
0802L646-001	B020	S	08LICS18	Nitrite	14797-65-0	2.32	mg/kg	2.32	U		
0802L646-001	B020	S	08LICS18	Phosphate	14265-44-2	2.3	mg/kg	2.3	U		
0802L646-002	B021	S	08LICS18	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0802L646-002	B021	S	08LICS18	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0802L646-002	B021	S	08LICS18	Nitrate	14797-55-8	4.20	mg/kg	2.47			
0802L646-002	B021	S	08LICS18	Nitrite	14797-65-0	2.47	mg/kg	2.47	U		
0802L646-002	B021	S	08LICS18	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0802L646-003	B022	S	08LICS18	Bromide	24959-67-9	2.4	mg/kg	2.4	U		
0802L646-003	B022	S	08LICS18	Fluoride	16984-48-8	2.4	mg/kg	2.4	U		
0802L646-003	B022	S	08LICS18	Nitrate	14797-55-8	10.0	mg/kg	2.37			
0802L646-003	B022	S	08LICS18	Nitrite	14797-65-0	2.37	mg/kg	2.37	U		
0802L646-003	B022	S	08LICS18	Phosphate	14265-44-2	2.4	mg/kg	2.4	U		
0802L646-004	B023	S	08LICS18	Bromide	24959-67-9	2.6	mg/kg	2.6	U		
0802L646-004	B023	S	08LICS18	Fluoride	16984-48-8	2.6	mg/kg	2.6	U		
0802L646-004	B023	S	08LICS18	Nitrate	14797-55-8	3.38	mg/kg	2.57			
0802L646-004	B023	S	08LICS18	Nitrite	14797-65-0	2.57	mg/kg	2.57	U		
0802L646-004	B023	S	08LICS18	Phosphate	14265-44-2	2.6	mg/kg	2.6	U		
0802L646-005	B024	S	08LICS18	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0802L646-005	B024	S	08LICS18	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0802L646-005	B024	S	08LICS18	Nitrate	14797-55-8	2.49	mg/kg	2.49	U		
0802L646-005	B024	S	08LICS18	Nitrite	14797-65-0	2.49	mg/kg	2.49	U		
0802L646-005	B024	S	08LICS18	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		

Table 2-18. Summary of Anion Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L646-006	B025	S	08LICS18	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0802L646-006	B025	S	08LICS18	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0802L646-006	B025	S	08LICS18	Nitrate	14797-55-8	2.48	mg/kg	2.48	U		
0802L646-006	B025	S	08LICS18	Nitrite	14797-65-0	2.48	mg/kg	2.48	U		
0802L646-006	B025	S	08LICS18	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0802L646-007	B026	S	08LICS18	Bromide	24959-67-9	2.4	mg/kg	2.4	U		
0802L646-007	B026	S	08LICS18	Fluoride	16984-48-8	2.4	mg/kg	2.4	U		
0802L646-007	B026	S	08LICS18	Nitrate	14797-55-8	2.42	mg/kg	2.42	U		
0802L646-007	B026	S	08LICS18	Nitrite	14797-65-0	2.42	mg/kg	2.42	U		
0802L646-007	B026	S	08LICS18	Phosphate	14265-44-2	2.4	mg/kg	2.4	U		
0802L666-001	B028	S	08LICS18	Bromide	24959-67-9	2.6	mg/kg	2.6	U		
0802L666-001	B028	S	08LICS18	Fluoride	16984-48-8	2.6	mg/kg	2.6	U		
0802L666-001	B028	S	08LICS18	Nitrate	14797-55-8	2.63	mg/kg	2.63	U		
0802L666-001	B028	S	08LICS18	Nitrite	14797-65-0	2.63	mg/kg	2.63	U		
0802L666-001	B028	S	08LICS18	Phosphate	14265-44-2	2.6	mg/kg	2.6	U		
0802L666-002	B029	S	08LICS18	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0802L666-002	B029	S	08LICS18	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0802L666-002	B029	S	08LICS18	Nitrate	14797-55-8	2.48	mg/kg	2.48	U		
0802L666-002	B029	S	08LICS18	Nitrite	14797-65-0	2.48	mg/kg	2.48	U		
0802L666-002	B029	S	08LICS18	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0802L666-003	B030	S	08LICS18	Bromide	24959-67-9	2.4	mg/kg	2.4	U		
0802L666-003	B030	S	08LICS18	Fluoride	16984-48-8	2.4	mg/kg	2.4	U		
0802L666-003	B030	S	08LICS18	Nitrate	14797-55-8	3.38	mg/kg	2.4			
0802L666-003	B030	S	08LICS18	Nitrite	14797-65-0	2.40	mg/kg	2.4	U		
0802L666-003	B030	S	08LICS18	Phosphate	14265-44-2	2.4	mg/kg	2.4	U		

Table 2-18. Summary of Anion Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L680-001	B031	S	08LICS18	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0802L680-001	B031	S	08LICS18	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0802L680-001	B031	S	08LICS18	Nitrate	14797-55-8	6.54	mg/kg	2.54			
0802L680-001	B031	S	08LICS18	Nitrite	14797-65-0	2.54	mg/kg	2.54	U		
0802L680-001	B031	S	08LICS18	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0802L680-002	B032	S	08LICS18	Bromide	24959-67-9	2.6	mg/kg	2.6	U		
0802L680-002	B032	S	08LICS18	Fluoride	16984-48-8	2.6	mg/kg	2.6	U		
0802L680-002	B032	S	08LICS18	Nitrate	14797-55-8	2.56	mg/kg	2.56	U		
0802L680-002	B032	S	08LICS18	Nitrite	14797-65-0	2.56	mg/kg	2.56	U		
0802L680-002	B032	S	08LICS18	Phosphate	14265-44-2	2.6	mg/kg	2.6	U		
0802L680-003	B033	S	08LICS18	Bromide	24959-67-9	2.4	mg/kg	2.4	U		
0802L680-003	B033	S	08LICS18	Fluoride	16984-48-8	2.4	mg/kg	2.4	U		
0802L680-003	B033	S	08LICS18	Nitrate	14797-55-8	2.40	mg/kg	2.4	U		
0802L680-003	B033	S	08LICS18	Nitrite	14797-65-0	2.40	mg/kg	2.4	U		
0802L680-003	B033	S	08LICS18	Phosphate	14265-44-2	2.4	mg/kg	2.4	U		
0803L688-001	B034	S	08LICS18	Bromide	24959-67-9	2.3	mg/kg	2.3	U		
0803L688-001	B034	S	08LICS18	Fluoride	16984-48-8	2.3	mg/kg	2.3	U		
0803L688-001	B034	S	08LICS18	Nitrate	14797-55-8	2.32	mg/kg	2.32	U		
0803L688-001	B034	S	08LICS18	Nitrite	14797-65-0	2.32	mg/kg	2.32	U		
0803L688-001	B034	S	08LICS18	Phosphate	14265-44-2	2.3	mg/kg	2.3	U		
0803L688-002	B035	S	08LICS18	Bromide	24959-67-9	2.6	mg/kg	2.6	U		
0803L688-002	B035	S	08LICS18	Fluoride	16984-48-8	2.6	mg/kg	2.6	U		
0803L688-002	B035	S	08LICS18	Nitrate	14797-55-8	5.00	mg/kg	2.61			
0803L688-002	B035	S	08LICS18	Nitrite	14797-65-0	2.61	mg/kg	2.61	U		
0803L688-002	B035	S	08LICS18	Phosphate	14265-44-2	2.6	mg/kg	2.6	U		

Table 2-18. Summary of Anion Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L646-001	B020	S	08LICS19	Chloride	16887-00-6	32.5	mg/kg	2.3		J	Low MS
0802L646-001	B020	S	08LICS19	Sulfate	14808-79-8	52.8	mg/kg	2.3		J	Low MS
0802L646-002	B021	S	08LICS19	Chloride	16887-00-6	13.1	mg/kg	2.5		J	Low MS
0802L646-002	B021	S	08LICS19	Sulfate	14808-79-8	50.7	mg/kg	2.5		J	Low MS
0802L646-003	B022	S	08LICS19	Chloride	16887-00-6	11.2	mg/kg	2.4		J	Low MS
0802L646-003	B022	S	08LICS19	Sulfate	14808-79-8	56.9	mg/kg	2.4		J	Low MS
0802L646-004	B023	S	08LICS19	Chloride	16887-00-6	10.4	mg/kg	2.6		J	Low MS
0802L646-004	B023	S	08LICS19	Sulfate	14808-79-8	33.5	mg/kg	2.6		J	Low MS
0802L646-005	B024	S	08LICS19	Chloride	16887-00-6	24.0	mg/kg	2.5		J	Low MS
0802L646-005	B024	S	08LICS19	Sulfate	14808-79-8	55.1	mg/kg	2.5		J	Low MS
0802L646-006	B025	S	08LICS19	Chloride	16887-00-6	19.0	mg/kg	2.5		J	Low MS
0802L646-006	B025	S	08LICS19	Sulfate	14808-79-8	41.5	mg/kg	2.5		J	Low MS
0802L646-007	B026	S	08LICS19	Chloride	16887-00-6	29.8	mg/kg	2.4		J	Low MS
0802L646-007	B026	S	08LICS19	Sulfate	14808-79-8	38.1	mg/kg	2.4		J	Low MS
0802L666-001	B028	S	08LICS19	Chloride	16887-00-6	20.1	mg/kg	2.6		J	Low MS
0802L666-001	B028	S	08LICS19	Sulfate	14808-79-8	38.3	mg/kg	2.6		J	Low MS
0802L666-002	B029	S	08LICS19	Chloride	16887-00-6	13.1	mg/kg	2.5		J	Low MS
0802L666-002	B029	S	08LICS19	Sulfate	14808-79-8	28.3	mg/kg	2.5		J	Low MS
0802L666-003	B030	S	08LICS19	Chloride	16887-00-6	6.1	mg/kg	2.4		J	Low MS
0802L666-003	B030	S	08LICS19	Sulfate	14808-79-8	18.0	mg/kg	2.4		J	Low MS
0802L680-001	B031	S	08LICS19	Chloride	16887-00-6	22.0	mg/kg	2.5		J	Low MS
0802L680-001	B031	S	08LICS19	Sulfate	14808-79-8	45.2	mg/kg	2.5		J	Low MS
0802L680-002	B032	S	08LICS19	Chloride	16887-00-6	20.7	mg/kg	2.6		J	Low MS
0802L680-002	B032	S	08LICS19	Sulfate	14808-79-8	24.7	mg/kg	2.6		J	Low MS
0802L680-003	B033	S	08LICS19	Chloride	16887-00-6	3.5	mg/kg	2.4		J	Low MS

Table 2-18. Summary of Anion Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L680-003	B033	S	08LICS19	Sulfate	14808-79-8	24.6	mg/kg	2.4		J	Low MS
0803L688-001	B034	S	08LICS19	Chloride	16887-00-6	75.6	mg/kg	2.3		J	Low MS
0803L688-001	B034	S	08LICS19	Sulfate	14808-79-8	27.3	mg/kg	2.3		J	Low MS
0803L688-002	B035	S	08LICS19	Chloride	16887-00-6	21.8	mg/kg	2.6		J	Low MS
0803L688-002	B035	S	08LICS19	Sulfate	14808-79-8	44.4	mg/kg	2.6		J	Low MS
0803L755-001	B041	S	08LICS22	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0803L755-001	B041	S	08LICS22	Chloride	16887-00-6	2.5	mg/kg	2.5	U		
0803L755-001	B041	S	08LICS22	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0803L755-001	B041	S	08LICS22	Nitrate	14797-55-8	2.47	mg/kg	2.47	U		
0803L755-001	B041	S	08LICS22	Nitrite	14797-65-0	2.47	mg/kg	2.47	U		
0803L755-001	B041	S	08LICS22	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0803L755-001	B041	S	08LICS22	Sulfate	14808-79-8	17.0	mg/kg	2.5		J	Low MS
0803L755-002	B042	S	08LICS22	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0803L755-002	B042	S	08LICS22	Chloride	16887-00-6	4.2	mg/kg	2.5			
0803L755-002	B042	S	08LICS22	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0803L755-002	B042	S	08LICS22	Nitrate	14797-55-8	3.02	mg/kg	2.46			
0803L755-002	B042	S	08LICS22	Nitrite	14797-65-0	2.46	mg/kg	2.46	U		
0803L755-002	B042	S	08LICS22	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0803L755-002	B042	S	08LICS22	Sulfate	14808-79-8	16.7	mg/kg	2.5		J	Low MS
0803L798-001	B046	S	08LICS22	Bromide	24959-67-9	2.4	mg/kg	2.4	U		
0803L798-001	B046	S	08LICS22	Chloride	16887-00-6	2.4	mg/kg	2.4	U		
0803L798-001	B046	S	08LICS22	Fluoride	16984-48-8	2.4	mg/kg	2.4	U		
0803L798-001	B046	S	08LICS22	Nitrate	14797-55-8	2.41	mg/kg	2.41	U		
0803L798-001	B046	S	08LICS22	Nitrite	14797-65-0	2.41	mg/kg	2.41	U		
0803L798-001	B046	S	08LICS22	Phosphate	14265-44-2	2.4	mg/kg	2.4	U		

Table 2-18. Summary of Anion Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0803L798-001	B046	S	08LICS22	Sulfate	14808-79-8	9.6	mg/kg	2.4		J	Low MS
0803L798-002	B047	S	08LICS22	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0803L798-002	B047	S	08LICS22	Chloride	16887-00-6	3.4	mg/kg	2.5			
0803L798-002	B047	S	08LICS22	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0803L798-002	B047	S	08LICS22	Nitrate	14797-55-8	7.47	mg/kg	2.55			
0803L798-002	B047	S	08LICS22	Nitrite	14797-65-0	2.55	mg/kg	2.55	U		
0803L798-002	B047	S	08LICS22	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0803L798-002	B047	S	08LICS22	Sulfate	14808-79-8	7.0	mg/kg	2.5		J	Low MS
0803L798-003	B048	S	08LICS22	Bromide	24959-67-9	2.6	mg/kg	2.6	U		
0803L798-003	B048	S	08LICS22	Chloride	16887-00-6	4.8	mg/kg	2.6			
0803L798-003	B048	S	08LICS22	Fluoride	16984-48-8	2.6	mg/kg	2.6	U		
0803L798-003	B048	S	08LICS22	Nitrate	14797-55-8	2.80	mg/kg	2.59			
0803L798-003	B048	S	08LICS22	Nitrite	14797-65-0	2.59	mg/kg	2.59	U		
0803L798-003	B048	S	08LICS22	Phosphate	14265-44-2	2.6	mg/kg	2.6	U		
0803L798-003	B048	S	08LICS22	Sulfate	14808-79-8	15.1	mg/kg	2.6		J	Low MS
0803L798-004	B049	S	08LICS22	Bromide	24959-67-9	2.2	mg/kg	2.2	U		
0803L798-004	B049	S	08LICS22	Chloride	16887-00-6	4.7	mg/kg	2.2			
0803L798-004	B049	S	08LICS22	Fluoride	16984-48-8	2.2	mg/kg	2.2	U		
0803L798-004	B049	S	08LICS22	Nitrate	14797-55-8	2.23	mg/kg	2.23	U		
0803L798-004	B049	S	08LICS22	Nitrite	14797-65-0	2.23	mg/kg	2.23	U		
0803L798-004	B049	S	08LICS22	Phosphate	14265-44-2	2.2	mg/kg	2.2	U		
0803L798-004	B049	S	08LICS22	Sulfate	14808-79-8	18.7	mg/kg	2.2		J	Low MS
0804L873-001	B064	S	08LICS26	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0804L873-001	B064	S	08LICS26	Chloride	16887-00-6	3.6	mg/kg	2.5		J	Low MS
0804L873-001	B064	S	08LICS26	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		

Table 2-18. Summary of Anion Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0804L873-001	B064	S	08LICS26	Nitrate	14797-55-8	3.65	mg/kg	2.5			
0804L873-001	B064	S	08LICS26	Nitrite	14797-65-0	2.50	mg/kg	2.5	U		
0804L873-001	B064	S	08LICS26	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0804L873-001	B064	S	08LICS26	Sulfate	14808-79-8	19.1	mg/kg	2.5		J	Low MS
0804L873-002	B065	S	08LICS26	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0804L873-002	B065	S	08LICS26	Chloride	16887-00-6	18.2	mg/kg	2.5		J	Low MS
0804L873-002	B065	S	08LICS26	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0804L873-002	B065	S	08LICS26	Nitrate	14797-55-8	10.9	mg/kg	2.5			
0804L873-002	B065	S	08LICS26	Nitrite	14797-65-0	2.50	mg/kg	2.5	U		
0804L873-002	B065	S	08LICS26	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0804L873-002	B065	S	08LICS26	Sulfate	14808-79-8	26.4	mg/kg	2.5		J	Low MS
0804L873-003	B066	S	08LICS26	Bromide	24959-67-9	2.4	mg/kg	2.4	U		
0804L873-003	B066	S	08LICS26	Chloride	16887-00-6	20.1	mg/kg	2.4		J	Low MS
0804L873-003	B066	S	08LICS26	Fluoride	16984-48-8	2.4	mg/kg	2.4	U		
0804L873-003	B066	S	08LICS26	Nitrate	14797-55-8	5.85	mg/kg	2.36			
0804L873-003	B066	S	08LICS26	Nitrite	14797-65-0	2.36	mg/kg	2.36	U		
0804L873-003	B066	S	08LICS26	Phosphate	14265-44-2	2.4	mg/kg	2.4	U		
0804L873-003	B066	S	08LICS26	Sulfate	14808-79-8	19.0	mg/kg	2.4		J	Low MS
0804L873-004	B068	S	08LICS26	Bromide	24959-67-9	2.4	mg/kg	2.4	U		
0804L873-004	B068	S	08LICS26	Chloride	16887-00-6	11.8	mg/kg	2.4		J	Low MS
0804L873-004	B068	S	08LICS26	Fluoride	16984-48-8	2.4	mg/kg	2.4	U		
0804L873-004	B068	S	08LICS26	Nitrate	14797-55-8	6.96	mg/kg	2.4			
0804L873-004	B068	S	08LICS26	Nitrite	14797-65-0	2.40	mg/kg	2.4	U		
0804L873-004	B068	S	08LICS26	Phosphate	14265-44-2	2.4	mg/kg	2.4	U		
0804L873-004	B068	S	08LICS26	Sulfate	14808-79-8	28.2	mg/kg	2.4		J	Low MS

Table 2-18. Summary of Anion Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0804L873-005	B069	S	08LICS26	Bromide	24959-67-9	2.4	mg/kg	2.4	U		
0804L873-005	B069	S	08LICS26	Chloride	16887-00-6	10.8	mg/kg	2.4		J	Low MS
0804L873-005	B069	S	08LICS26	Fluoride	16984-48-8	2.4	mg/kg	2.4	U		
0804L873-005	B069	S	08LICS26	Nitrate	14797-55-8	2.38	mg/kg	2.38	U		
0804L873-005	B069	S	08LICS26	Nitrite	14797-65-0	2.38	mg/kg	2.38	U		
0804L873-005	B069	S	08LICS26	Phosphate	14265-44-2	2.4	mg/kg	2.4	U		
0804L873-005	B069	S	08LICS26	Sulfate	14808-79-8	22.7	mg/kg	2.4		J	Low MS
0804L873-006	B070	S	08LICS26	Bromide	24959-67-9	2.3	mg/kg	2.3	U		
0804L873-006	B070	S	08LICS26	Chloride	16887-00-6	23.0	mg/kg	2.3		J	Low MS
0804L873-006	B070	S	08LICS26	Fluoride	16984-48-8	2.3	mg/kg	2.3	U		
0804L873-006	B070	S	08LICS26	Nitrate	14797-55-8	6.23	mg/kg	2.34			
0804L873-006	B070	S	08LICS26	Nitrite	14797-65-0	2.34	mg/kg	2.34	U		
0804L873-006	B070	S	08LICS26	Phosphate	14265-44-2	2.3	mg/kg	2.3	U		
0804L873-006	B070	S	08LICS26	Sulfate	14808-79-8	14.0	mg/kg	2.3		J	Low MS
0804L904-001	B071	S	08LICS27	Bromide	24959-67-9	2.4	mg/kg	2.4	U		
0804L904-001	B071	S	08LICS27	Chloride	16887-00-6	54.6	mg/kg	2.4			
0804L904-001	B071	S	08LICS27	Fluoride	16984-48-8	2.4	mg/kg	2.4	U		
0804L904-001	B071	S	08LICS27	Nitrate	14797-55-8	24.7	mg/kg	2.42		J	Low MS
0804L904-001	B071	S	08LICS27	Nitrite	14797-65-0	2.42	mg/kg	2.42	U		
0804L904-001	B071	S	08LICS27	Phosphate	14265-44-2	2.4	mg/kg	2.4	U		
0804L904-001	B071	S	08LICS27	Sulfate	14808-79-8	115	mg/kg	2.4			
0804L904-002	B072	S	08LICS27	Bromide	24959-67-9	2.6	mg/kg	2.6	U		
0804L904-002	B072	S	08LICS27	Chloride	16887-00-6	26.7	mg/kg	2.6			
0804L904-002	B072	S	08LICS27	Fluoride	16984-48-8	2.6	mg/kg	2.6	U		
0804L904-002	B072	S	08LICS27	Nitrate	14797-55-8	7.32	mg/kg	2.63		J	Low MS

Table 2-18. Summary of Anion Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0804L904-002	B072	S	08LICS27	Nitrite	14797-65-0	2.63	mg/kg	2.63	U		
0804L904-002	B072	S	08LICS27	Phosphate	14265-44-2	2.6	mg/kg	2.6	U		
0804L904-002	B072	S	08LICS27	Sulfate	14808-79-8	20.6	mg/kg	2.6			
0804L904-003	B073	S	08LICS27	Bromide	24959-67-9	2.7	mg/kg	2.7	U		
0804L904-003	B073	S	08LICS27	Chloride	16887-00-6	111	mg/kg	2.7			
0804L904-003	B073	S	08LICS27	Fluoride	16984-48-8	2.7	mg/kg	2.7	U		
0804L904-003	B073	S	08LICS27	Nitrate	14797-55-8	22.7	mg/kg	2.71		J	Low MS
0804L904-003	B073	S	08LICS27	Nitrite	14797-65-0	2.71	mg/kg	2.71	U		
0804L904-003	B073	S	08LICS27	Phosphate	14265-44-2	2.7	mg/kg	2.7	U		
0804L904-003	B073	S	08LICS27	Sulfate	14808-79-8	22.5	mg/kg	2.7			
0804L904-004	B075	S	08LICS27	Bromide	24959-67-9	2.6	mg/kg	2.6	U		
0804L904-004	B075	S	08LICS27	Chloride	16887-00-6	26.1	mg/kg	2.6			
0804L904-004	B075	S	08LICS27	Fluoride	16984-48-8	2.6	mg/kg	2.6	U		
0804L904-004	B075	S	08LICS27	Nitrate	14797-55-8	6.52	mg/kg	2.59		J	Low MS
0804L904-004	B075	S	08LICS27	Nitrite	14797-65-0	2.59	mg/kg	2.59	U		
0804L904-004	B075	S	08LICS27	Phosphate	14265-44-2	2.6	mg/kg	2.6	U		
0804L904-004	B075	S	08LICS27	Sulfate	14808-79-8	16.9	mg/kg	2.6			
0804L904-005	B077	S	08LICS27	Bromide	24959-67-9	2.4	mg/kg	2.4	U		
0804L904-005	B077	S	08LICS27	Chloride	16887-00-6	19.3	mg/kg	2.4			
0804L904-005	B077	S	08LICS27	Fluoride	16984-48-8	2.4	mg/kg	2.4	U		
0804L904-005	B077	S	08LICS27	Nitrate	14797-55-8	14.0	mg/kg	2.4		J	Low MS
0804L904-005	B077	S	08LICS27	Nitrite	14797-65-0	2.40	mg/kg	2.4	U		
0804L904-005	B077	S	08LICS27	Phosphate	14265-44-2	2.4	mg/kg	2.4	U		
0804L904-005	B077	S	08LICS27	Sulfate	14808-79-8	18.3	mg/kg	2.4			
0804L904-006	B078	S	08LICS27	Bromide	24959-67-9	2.5	mg/kg	2.5	U		

Table 2-18. Summary of Anion Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0804L904-006	B078	S	08LICS27	Chloride	16887-00-6	2.5	mg/kg	2.5	U		
0804L904-006	B078	S	08LICS27	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0804L904-006	B078	S	08LICS27	Nitrate	14797-55-8	4.53	mg/kg	2.5		J	Low MS
0804L904-006	B078	S	08LICS27	Nitrite	14797-65-0	2.50	mg/kg	2.5	U		
0804L904-006	B078	S	08LICS27	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0804L904-006	B078	S	08LICS27	Sulfate	14808-79-8	12.2	mg/kg	2.5			
0804L911-001	B082	S	08LICS28	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0804L911-001	B082	S	08LICS28	Chloride	16887-00-6	23.9	mg/kg	2.5			
0804L911-001	B082	S	08LICS28	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0804L911-001	B082	S	08LICS28	Nitrate	14797-55-8	6.19	mg/kg	2.53			
0804L911-001	B082	S	08LICS28	Nitrite	14797-65-0	2.53	mg/kg	2.53	U		
0804L911-001	B082	S	08LICS28	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0804L911-001	B082	S	08LICS28	Sulfate	14808-79-8	9.8	mg/kg	2.5			
0804L911-002	B083	S	08LICS28	Bromide	24959-67-9	2.3	mg/kg	2.3	U		
0804L911-002	B083	S	08LICS28	Chloride	16887-00-6	64.0	mg/kg	2.3			
0804L911-002	B083	S	08LICS28	Fluoride	16984-48-8	2.3	mg/kg	2.3	U		
0804L911-002	B083	S	08LICS28	Nitrate	14797-55-8	21.3	mg/kg	2.29			
0804L911-002	B083	S	08LICS28	Nitrite	14797-65-0	2.29	mg/kg	2.29	U		
0804L911-002	B083	S	08LICS28	Phosphate	14265-44-2	2.3	mg/kg	2.3	U		
0804L911-002	B083	S	08LICS28	Sulfate	14808-79-8	48.6	mg/kg	2.3			
0804L957-001	B084	S	08LICS34	Bromide	24959-67-9	2.3	mg/kg	2.3	U		
0804L957-001	B084	S	08LICS34	Chloride	16887-00-6	24.5	mg/kg	2.3			
0804L957-001	B084	S	08LICS34	Fluoride	16984-48-8	2.3	mg/kg	2.3	U		
0804L957-001	B084	S	08LICS34	Nitrate	14797-55-8	6.16	mg/kg	2.35			
0804L957-001	B084	S	08LICS34	Nitrite	14797-65-0	2.35	mg/kg	2.35	U		

Table 2-18. Summary of Anion Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0804L957-001	B084	S	08LICS34	Phosphate	14265-44-2	2.3	mg/kg	2.3	U		
0804L957-001	B084	S	08LICS34	Sulfate	14808-79-8	9.7	mg/kg	2.3			
0804L957-002	B085	S	08LICS34	Bromide	24959-67-9	2.6	mg/kg	2.6	U		
0804L957-002	B085	S	08LICS34	Chloride	16887-00-6	16.8	mg/kg	2.6			
0804L957-002	B085	S	08LICS34	Fluoride	16984-48-8	2.6	mg/kg	2.6	U		
0804L957-002	B085	S	08LICS34	Nitrate	14797-55-8	5.69	mg/kg	2.57			
0804L957-002	B085	S	08LICS34	Nitrite	14797-65-0	2.57	mg/kg	2.57	U		
0804L957-002	B085	S	08LICS34	Phosphate	14265-44-2	2.6	mg/kg	2.6	U		
0804L957-002	B085	S	08LICS34	Sulfate	14808-79-8	11.1	mg/kg	2.6			
0804L957-003	B087	S	08LICS34	Bromide	24959-67-9	2.6	mg/kg	2.6	U		
0804L957-003	B087	S	08LICS34	Chloride	16887-00-6	15.0	mg/kg	2.6			
0804L957-003	B087	S	08LICS34	Fluoride	16984-48-8	2.6	mg/kg	2.6	U		
0804L957-003	B087	S	08LICS34	Nitrate	14797-55-8	3.54	mg/kg	2.59			
0804L957-003	B087	S	08LICS34	Nitrite	14797-65-0	2.59	mg/kg	2.59	U		
0804L957-003	B087	S	08LICS34	Phosphate	14265-44-2	2.6	mg/kg	2.6	U		
0804L957-003	B087	S	08LICS34	Sulfate	14808-79-8	15.7	mg/kg	2.6			
0804L957-004	B088	S	08LICS34	Bromide	24959-67-9	2.4	mg/kg	2.4	U		
0804L957-004	B088	S	08LICS34	Chloride	16887-00-6	2.4	mg/kg	2.4	U		
0804L957-004	B088	S	08LICS34	Fluoride	16984-48-8	2.4	mg/kg	2.4	U		
0804L957-004	B088	S	08LICS34	Nitrate	14797-55-8	2.38	mg/kg	2.38	U		
0804L957-004	B088	S	08LICS34	Nitrite	14797-65-0	2.38	mg/kg	2.38	U		
0804L957-004	B088	S	08LICS34	Phosphate	14265-44-2	2.4	mg/kg	2.4	U		
0804L957-004	B088	S	08LICS34	Sulfate	14808-79-8	12.9	mg/kg	2.4			
0804L957-005	B089	S	08LICS34	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0804L957-005	B089	S	08LICS34	Chloride	16887-00-6	2.5	mg/kg	2.5	U		

Table 2-18. Summary of Anion Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0804L957-005	B089	S	08LICS34	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0804L957-005	B089	S	08LICS34	Nitrate	14797-55-8	2.51	mg/kg	2.51	U		
0804L957-005	B089	S	08LICS34	Nitrite	14797-65-0	2.51	mg/kg	2.51	U		
0804L957-005	B089	S	08LICS34	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0804L957-005	B089	S	08LICS34	Sulfate	14808-79-8	12.2	mg/kg	2.5			
0804L967-001	B090	S	08LICS34	Bromide	24959-67-9	2.7	mg/kg	2.7	U		
0804L967-001	B090	S	08LICS34	Chloride	16887-00-6	3.7	mg/kg	2.7			
0804L967-001	B090	S	08LICS34	Fluoride	16984-48-8	2.7	mg/kg	2.7	U		
0804L967-001	B090	S	08LICS34	Nitrate	14797-55-8	15.5	mg/kg	2.71			
0804L967-001	B090	S	08LICS34	Nitrite	14797-65-0	2.71	mg/kg	2.71	U		
0804L967-001	B090	S	08LICS34	Phosphate	14265-44-2	2.7	mg/kg	2.7	U		
0804L967-001	B090	S	08LICS34	Sulfate	14808-79-8	29.4	mg/kg	2.7			
0804L967-002	B091	S	08LICS34	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0804L967-002	B091	S	08LICS34	Chloride	16887-00-6	2.9	mg/kg	2.5			
0804L967-002	B091	S	08LICS34	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0804L967-002	B091	S	08LICS34	Nitrate	14797-55-8	6.54	mg/kg	2.48			
0804L967-002	B091	S	08LICS34	Nitrite	14797-65-0	2.48	mg/kg	2.48	U		
0804L967-002	B091	S	08LICS34	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0804L967-002	B091	S	08LICS34	Sulfate	14808-79-8	20.2	mg/kg	2.5			
0804L967-003	B093	S	08LICS34	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0804L967-003	B093	S	08LICS34	Chloride	16887-00-6	9.4	mg/kg	2.5			
0804L967-003	B093	S	08LICS34	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0804L967-003	B093	S	08LICS34	Nitrate	14797-55-8	11.5	mg/kg	2.47			
0804L967-003	B093	S	08LICS34	Nitrite	14797-65-0	2.47	mg/kg	2.47	U		
0804L967-003	B093	S	08LICS34	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		

Table 2-18. Summary of Anion Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0804L967-003	B093	S	08LICS34	Sulfate	14808-79-8	20.9	mg/kg	2.5			
0804L967-004	B094	S	08LICS34	Bromide	24959-67-9	2.4	mg/kg	2.4	U		
0804L967-004	B094	S	08LICS34	Chloride	16887-00-6	11.8	mg/kg	2.4			
0804L967-004	B094	S	08LICS34	Fluoride	16984-48-8	2.4	mg/kg	2.4	U		
0804L967-004	B094	S	08LICS34	Nitrite	14797-65-0	2.37	mg/kg	2.37	U		
0804L967-004	B094	S	08LICS34	Phosphate	14265-44-2	2.4	mg/kg	2.4	U		
0804L967-004	B094	S	08LICS34	Sulfate	14808-79-8	15.1	mg/kg	2.4			
0804L967-005	B095	S	08LICS34	Bromide	24959-67-9	2.3	mg/kg	2.3	U		
0804L967-005	B095	S	08LICS34	Chloride	16887-00-6	2.3	mg/kg	2.3	U		
0804L967-005	B095	S	08LICS34	Fluoride	16984-48-8	2.3	mg/kg	2.3	U		
0804L967-005	B095	S	08LICS34	Nitrate	14797-55-8	2.34	mg/kg	2.34	U		
0804L967-005	B095	S	08LICS34	Nitrite	14797-65-0	2.34	mg/kg	2.34	U		
0804L967-005	B095	S	08LICS34	Phosphate	14265-44-2	2.3	mg/kg	2.3	U		
0804L967-005	B095	S	08LICS34	Sulfate	14808-79-8	12.8	mg/kg	2.3			
0804L026-001	B102	S	08LICS34	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0804L026-001	B102	S	08LICS34	Chloride	16887-00-6	4.1	mg/kg	2.5			
0804L026-001	B102	S	08LICS34	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0804L026-001	B102	S	08LICS34	Nitrate	14797-55-8	3.21	mg/kg	2.49			
0804L026-001	B102	S	08LICS34	Nitrite	14797-65-0	2.49	mg/kg	2.49	U		
0804L026-001	B102	S	08LICS34	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0804L026-001	B102	S	08LICS34	Sulfate	14808-79-8	25.5	mg/kg	2.5			
0804L026-002	B103	S	08LICS34	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0804L026-002	B103	S	08LICS34	Chloride	16887-00-6	12.1	mg/kg	2.5			
0804L026-002	B103	S	08LICS34	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0804L026-002	B103	S	08LICS34	Nitrate	14797-55-8	3.23	mg/kg	2.47			

Table 2-18. Summary of Anion Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0804L026-002	B103	S	08LICS34	Nitrite	14797-65-0	2.47	mg/kg	2.47	U		
0804L026-002	B103	S	08LICS34	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0804L026-002	B103	S	08LICS34	Sulfate	14808-79-8	21.7	mg/kg	2.5			
0805L043-001	B104	S	08LICS35	Bromide	24959-67-9	2.4	mg/kg	2.4	U		
0805L043-001	B104	S	08LICS35	Chloride	16887-00-6	38.7	mg/kg	2.4			
0805L043-001	B104	S	08LICS35	Fluoride	16984-48-8	2.4	mg/kg	2.4	U		
0805L043-001	B104	S	08LICS35	Nitrite	14797-65-0	2.42	mg/kg	2.42	U		
0805L043-001	B104	S	08LICS35	Phosphate	14265-44-2	2.4	mg/kg	2.4	U		
0805L043-001	B104	S	08LICS35	Sulfate	14808-79-8	8.7	mg/kg	2.4			
0805L043-002	B105	S	08LICS35	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0805L043-002	B105	S	08LICS35	Chloride	16887-00-6	50.1	mg/kg	2.5			
0805L043-002	B105	S	08LICS35	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0805L043-002	B105	S	08LICS35	Nitrite	14797-65-0	2.48	mg/kg	2.48	U		
0805L043-002	B105	S	08LICS35	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0805L043-002	B105	S	08LICS35	Sulfate	14808-79-8	25.7	mg/kg	2.5			
0805L043-003	B107	S	08LICS35	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0805L043-003	B107	S	08LICS35	Chloride	16887-00-6	25.5	mg/kg	2.5			
0805L043-003	B107	S	08LICS35	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0805L043-003	B107	S	08LICS35	Nitrite	14797-65-0	2.50	mg/kg	2.5	U		
0805L043-003	B107	S	08LICS35	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0805L043-003	B107	S	08LICS35	Sulfate	14808-79-8	8.7	mg/kg	2.5			
0805L043-004	B108	S	08LICS35	Bromide	24959-67-9	2.4	mg/kg	2.4	U		
0805L043-004	B108	S	08LICS35	Chloride	16887-00-6	6.9	mg/kg	2.4			
0805L043-004	B108	S	08LICS35	Fluoride	16984-48-8	2.4	mg/kg	2.4	U		
0805L043-004	B108	S	08LICS35	Nitrite	14797-65-0	2.35	mg/kg	2.35	U		

Table 2-18. Summary of Anion Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0805L043-004	B108	S	08LICS35	Phosphate	14265-44-2	2.4	mg/kg	2.4	U		
0805L043-004	B108	S	08LICS35	Sulfate	14808-79-8	13.0	mg/kg	2.4			
0803L816-001	B051	S	08LICT22	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0803L816-001	B051	S	08LICT22	Chloride	16887-00-6	5.5	mg/kg	2.5			
0803L816-001	B051	S	08LICT22	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0803L816-001	B051	S	08LICT22	Nitrate	14797-55-8	2.52	mg/kg	2.52	U		
0803L816-001	B051	S	08LICT22	Nitrite	14797-65-0	2.52	mg/kg	2.52	U		
0803L816-001	B051	S	08LICT22	Sulfate	14808-79-8	26.2	mg/kg	2.5			
0803L816-002	B052	S	08LICT22	Bromide	24959-67-9	2.3	mg/kg	2.3	U		
0803L816-002	B052	S	08LICT22	Chloride	16887-00-6	2.3	mg/kg	2.3	U		
0803L816-002	B052	S	08LICT22	Fluoride	16984-48-8	2.3	mg/kg	2.3	U		
0803L816-002	B052	S	08LICT22	Nitrate	14797-55-8	2.29	mg/kg	2.29	U		
0803L816-002	B052	S	08LICT22	Nitrite	14797-65-0	2.29	mg/kg	2.29	U		
0803L816-002	B052	S	08LICT22	Sulfate	14808-79-8	10	mg/kg	2.3			
0803L816-004	B054	S	08LICT22	Bromide	24959-67-9	2.2	mg/kg	2.2	U		
0803L816-004	B054	S	08LICT22	Chloride	16887-00-6	2.2	mg/kg	2.2	U		
0803L816-004	B054	S	08LICT22	Fluoride	16984-48-8	2.2	mg/kg	2.2	U		
0803L816-004	B054	S	08LICT22	Nitrate	14797-55-8	2.24	mg/kg	2.24	U		
0803L816-004	B054	S	08LICT22	Nitrite	14797-65-0	2.24	mg/kg	2.24	U		
0803L816-004	B054	S	08LICT22	Sulfate	14808-79-8	5.9	mg/kg	2.2			
0803L816-001	B051	S	08LICT24	Phosphate	14265-44-2	2.6	mg/kg	2.6	U		
0803L816-002	B052	S	08LICT24	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0803L816-004	B054	S	08LICT24	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0804L967-004	B094	S	08LICT35	Nitrate	14797-55-8	127	mg/kg	2.56			
0805L043-001	B104	S	08LICT35	Nitrate	14797-55-8	4.19	mg/kg	2.42			

Table 2-18. Summary of Anion Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0805L043-002	B105	S	08LICT35	Nitrate	14797-55-8	3.27	mg/kg	2.48			
0805L043-003	B107	S	08LICT35	Nitrate	14797-55-8	2.50	mg/kg	2.5	U		
0805L043-004	B108	S	08LICT35	Nitrate	14797-55-8	2.35	mg/kg	2.35	U		
0805L072-001	B109	S	08LICT36	Bromide	24959-67-9	2.4	mg/kg	2.4	U		
0805L072-001	B109	S	08LICT36	Chloride	16887-00-6	6.6	mg/kg	2.4			
0805L072-001	B109	S	08LICT36	Fluoride	16984-48-8	2.4	mg/kg	2.4	U		
0805L072-001	B109	S	08LICT36	Nitrate	14797-55-8	2.37	mg/kg	2.37	U		
0805L072-001	B109	S	08LICT36	Nitrite	14797-65-0	2.37	mg/kg	2.37	U		
0805L072-001	B109	S	08LICT36	Phosphate	14265-44-2	2.4	mg/kg	2.4	U		
0805L072-001	B109	S	08LICT36	Sulfate	14808-79-8	14.8	mg/kg	2.4			
0805L102-001	B121	S	08LICT36	Bromide	24959-67-9	2.6	mg/kg	2.6	U		
0805L102-001	B121	S	08LICT36	Chloride	16887-00-6	2.9	mg/kg	2.6			
0805L102-001	B121	S	08LICT36	Fluoride	16984-48-8	2.6	mg/kg	2.6	U		
0805L102-001	B121	S	08LICT36	Nitrate	14797-55-8	5.14	mg/kg	2.58			
0805L102-001	B121	S	08LICT36	Nitrite	14797-65-0	2.58	mg/kg	2.58	U		
0805L102-001	B121	S	08LICT36	Phosphate	14265-44-2	2.6	mg/kg	2.6	U		
0805L102-001	B121	S	08LICT36	Sulfate	14808-79-8	15.0	mg/kg	2.6			
0805L102-002	B122	S	08LICT36	Bromide	24959-67-9	2.4	mg/kg	2.4	U		
0805L102-002	B122	S	08LICT36	Chloride	16887-00-6	2.8	mg/kg	2.4			
0805L102-002	B122	S	08LICT36	Fluoride	16984-48-8	2.4	mg/kg	2.4	U		
0805L102-002	B122	S	08LICT36	Nitrate	14797-55-8	5.27	mg/kg	2.44			
0805L102-002	B122	S	08LICT36	Nitrite	14797-65-0	2.44	mg/kg	2.44	U		
0805L102-002	B122	S	08LICT36	Phosphate	14265-44-2	2.4	mg/kg	2.4	U		
0805L102-002	B122	S	08LICT36	Sulfate	14808-79-8	13.9	mg/kg	2.4			
0805L107-001	B125	S	08LICT36	Bromide	24959-67-9	2.3	mg/kg	2.3	U		

Table 2-18. Summary of Anion Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0805L107-001	B125	S	08LICT36	Chloride	16887-00-6	5.1	mg/kg	2.3			
0805L107-001	B125	S	08LICT36	Fluoride	16984-48-8	2.3	mg/kg	2.3	U		
0805L107-001	B125	S	08LICT36	Nitrate	14797-55-8	28.7	mg/kg	2.35			
0805L107-001	B125	S	08LICT36	Nitrite	14797-65-0	2.35	mg/kg	2.35	U		
0805L107-001	B125	S	08LICT36	Phosphate	14265-44-2	2.3	mg/kg	2.3	U		
0805L107-001	B125	S	08LICT36	Sulfate	14808-79-8	28.3	mg/kg	2.3			
0805L107-002	B126	S	08LICT36	Bromide	24959-67-9	2.4	mg/kg	2.4	U		
0805L107-002	B126	S	08LICT36	Chloride	16887-00-6	9.6	mg/kg	2.4			
0805L107-002	B126	S	08LICT36	Fluoride	16984-48-8	2.4	mg/kg	2.4	U		
0805L107-002	B126	S	08LICT36	Nitrate	14797-55-8	38.4	mg/kg	2.42			
0805L107-002	B126	S	08LICT36	Nitrite	14797-65-0	2.42	mg/kg	2.42	U		
0805L107-002	B126	S	08LICT36	Phosphate	14265-44-2	2.4	mg/kg	2.4	U		
0805L107-002	B126	S	08LICT36	Sulfate	14808-79-8	40.7	mg/kg	2.4			
0805L107-003	B127	S	08LICT36	Bromide	24959-67-9	2.5	mg/kg	2.5	U		
0805L107-003	B127	S	08LICT36	Chloride	16887-00-6	2.5	mg/kg	2.5	U		
0805L107-003	B127	S	08LICT36	Fluoride	16984-48-8	2.5	mg/kg	2.5	U		
0805L107-003	B127	S	08LICT36	Nitrate	14797-55-8	3.56	mg/kg	2.54			
0805L107-003	B127	S	08LICT36	Nitrite	14797-65-0	2.54	mg/kg	2.54	U		
0805L107-003	B127	S	08LICT36	Phosphate	14265-44-2	2.5	mg/kg	2.5	U		
0805L107-003	B127	S	08LICT36	Sulfate	14808-79-8	6.8	mg/kg	2.5			
0802L665-001	G001	W	08LIC015	Fluoride	16984-48-8	0.31	mg/L	0.25			
0802L665-002	G002	W	08LIC015	Fluoride	16984-48-8	0.30	mg/L	0.25			
0802L665-003	G003	W	08LIC015	Fluoride	16984-48-8	0.30	mg/L	0.25			
0805L068-001	G009	W	08LIC034	Fluoride	16984-48-8	0.28	mg/L	0.25			
0805L068-001	G009	W	08LIC034	Nitrate	14797-55-8	19.5	mg/L	1.25			

Table 2-18. Summary of Anion Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0805L068-001	G009	W	08LIC034	Nitrite	14797-65-0	1.25	mg/L	1.25	U		
0805L068-001	G009	W	08LIC034	Sulfate	14808-79-8	24.8	mg/L	1.2		J	No MB or LCS
0805L068-002	G010	W	08LIC034	Fluoride	16984-48-8	0.32	mg/L	0.25			
0805L068-002	G010	W	08LIC034	Nitrate	14797-55-8	20.0	mg/L	1.25			
0805L068-002	G010	W	08LIC034	Nitrite	14797-65-0	1.25	mg/L	1.25	U		
0805L068-002	G010	W	08LIC034	Sulfate	14808-79-8	23.6	mg/L	1.2		J	No MB or LCS
0805L068-003	G011	W	08LIC034	Fluoride	16984-48-8	0.36	mg/L	0.25			
0805L068-003	G011	W	08LIC034	Nitrate	14797-55-8	19.2	mg/L	1.25			
0805L068-003	G011	W	08LIC034	Nitrite	14797-65-0	1.25	mg/L	1.25	U		
0805L068-003	G011	W	08LIC034	Sulfate	14808-79-8	23.3	mg/L	1.2		J	No MB or LCS
0805L068-004	G012	W	08LIC034	Fluoride	16984-48-8	0.29	mg/L	0.25			
0805L068-004	G012	W	08LIC034	Nitrate	14797-55-8	19.5	mg/L	1.25			
0805L068-004	G012	W	08LIC034	Nitrite	14797-65-0	1.25	mg/L	1.25	U		
0805L068-004	G012	W	08LIC034	Sulfate	14808-79-8	23.9	mg/L	1.2		J	No MB or LCS
0805L068-005	G013	W	08LIC034	Fluoride	16984-48-8	0.28	mg/L	0.25			
0805L068-005	G013	W	08LIC034	Nitrate	14797-55-8	19.7	mg/L	1.25			
0805L068-005	G013	W	08LIC034	Nitrite	14797-65-0	1.25	mg/L	1.25	U		
0805L068-005	G013	W	08LIC034	Sulfate	14808-79-8	23.3	mg/L	1.2		J	No MB or LCS
0802L665-001	G001	W	08LICA15	Chloride	16887-00-6	9.9	mg/L	0.25			
0802L665-001	G001	W	08LICA15	Nitrate	14797-55-8	21.7	mg/L	2.5			
0802L665-001	G001	W	08LICA15	Nitrite	14797-65-0	0.25	mg/L	0.25	U		
0802L665-001	G001	W	08LICA15	Phosphate	14265-44-2	0.25	mg/L	0.25	U		
0802L665-001	G001	W	08LICA15	Sulfate	14808-79-8	22.9	mg/L	2.5			
0802L665-002	G002	W	08LICA15	Chloride	16887-00-6	9.0	mg/L	0.25			
0802L665-002	G002	W	08LICA15	Nitrate	14797-55-8	16.0	mg/L	2.5			

Table 2-18. Summary of Anion Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L665-002	G002	W	08LICA15	Nitrite	14797-65-0	0.25	mg/L	0.25	U		
0802L665-002	G002	W	08LICA15	Phosphate	14265-44-2	0.25	mg/L	0.25	U		
0802L665-002	G002	W	08LICA15	Sulfate	14808-79-8	21.2	mg/L	2.5			
0802L665-003	G003	W	08LICA15	Chloride	16887-00-6	8.9	mg/L	0.25			
0802L665-003	G003	W	08LICA15	Nitrate	14797-55-8	17.4	mg/L	2.5			
0802L665-003	G003	W	08LICA15	Nitrite	14797-65-0	0.25	mg/L	0.25	U		
0802L665-003	G003	W	08LICA15	Phosphate	14265-44-2	0.25	mg/L	0.25	U		
0802L665-003	G003	W	08LICA15	Sulfate	14808-79-8	24.5	mg/L	2.5			
0805L068-001	G009	W	08LICA34	Chloride	16887-00-6	10.5	mg/L	0.25			
0805L068-002	G010	W	08LICA34	Chloride	16887-00-6	9.7	mg/L	0.25			
0805L068-003	G011	W	08LICA34	Chloride	16887-00-6	8.7	mg/L	0.25			
0805L068-004	G012	W	08LICA34	Chloride	16887-00-6	9.6	mg/L	0.25			
0805L068-005	G013	W	08LICA34	Chloride	16887-00-6	9.8	mg/L	0.25			
0805L068-001	G009	W	08LICB34	Bromide	24959-67-9	0.25	mg/L	0.25	U		
0805L068-001	G009	W	08LICB34	Phosphate	14265-44-2	0.25	mg/L	0.25	U		
0805L068-002	G010	W	08LICB34	Bromide	24959-67-9	0.25	mg/L	0.25	U		
0805L068-002	G010	W	08LICB34	Phosphate	14265-44-2	0.25	mg/L	0.25	U		
0805L068-003	G011	W	08LICB34	Bromide	24959-67-9	0.25	mg/L	0.25	U		
0805L068-003	G011	W	08LICB34	Phosphate	14265-44-2	0.25	mg/L	0.25	U		
0805L068-004	G012	W	08LICB34	Bromide	24959-67-9	0.25	mg/L	0.25	U		
0805L068-004	G012	W	08LICB34	Phosphate	14265-44-2	0.25	mg/L	0.25	U		
0805L068-005	G013	W	08LICB34	Bromide	24959-67-9	0.25	mg/L	0.25	U		
0805L068-005	G013	W	08LICB34	Phosphate	14265-44-2	0.25	mg/L	0.25	U		
0802L665-001	G001	W	08LICC17	Bromide	24959-67-9	0.25	mg/L	0.25	U		
0802L665-002	G002	W	08LICC17	Bromide	24959-67-9	0.25	mg/L	0.25	U		

Table 2-18. Summary of Anion Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L665-003	G003	W	08LICC17	Bromide	24959-67-9	0.25	mg/L	0.25	U		
0802L674-001	G004	W	08LICC17	Bromide	24959-67-9	0.25	mg/L	0.25	U		
0802L674-002	G005	W	08LICC17	Bromide	24959-67-9	0.25	mg/L	0.25	U		
0802L679-001	G006	W	08LICC17	Bromide	24959-67-9	0.25	mg/L	0.25	U		
0802L679-002	G007	W	08LICC17	Bromide	24959-67-9	0.25	mg/L	0.25	U		
0802L679-003	G008	W	08LICC17	Bromide	24959-67-9	0.25	mg/L	0.25	U		

CAS - Chemical Abstracts System
EQL - estimated quantitation limit
MS - matrix spike
Q - laboratory qualifier
S soil
V - validation qualifier
W - water

2.6.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-19 shows the number of each type of sample in each preparation batch.

Table 2-19. Anion Preparation Batch Summary. (3 Pages)

Batch ID	Matrix	Analyte	CAS	MB	LCS	DUP	MS	MSD	Sample
08LICS18	S	Bromide	24959-67-9	1	1	1	1		15
08LICS18	S	Fluoride	16984-48-8	1	1	1	1		15
08LICS18	S	Nitrate	14797-55-8	1	1	1	1		15
08LICS18	S	Nitrite	14797-65-0	1	1	1	1		15
08LICS18	S	Phosphate	14265-44-2	1	1	1	1		15
08LICS19	S	Chloride	16887-00-6	1	1	1	1		15
08LICS19	S	Sulfate	14808-79-8	1	1	1	1		15
08LICS22	S	Bromide	24959-67-9	1	1	1	1		6
08LICS22	S	Chloride	16887-00-6	1	1	1	1		6
08LICS22	S	Fluoride	16984-48-8	1	1	1	1		6
08LICS22	S	Nitrate	14797-55-8	1	1	1	1		6
08LICS22	S	Nitrite	14797-65-0	1	1	1	1		6
08LICS22	S	Phosphate	14265-44-2	1	1	1	1		6
08LICS22	S	Sulfate	14808-79-8	1	1	1	1		6
08LICS26	S	Bromide	24959-67-9	1	1	1	1		6
08LICS26	S	Chloride	16887-00-6	1	1	1	1		6
08LICS26	S	Fluoride	16984-48-8	1	1	1	1		6
08LICS26	S	Nitrate	14797-55-8	1	1	1	1		6
08LICS26	S	Nitrite	14797-65-0	1	1	1	1		6
08LICS26	S	Phosphate	14265-44-2	1	1	1	1		6
08LICS26	S	Sulfate	14808-79-8	1	1	1	1		6
08LICS27	S	Bromide	24959-67-9	1	1	1	1		6
08LICS27	S	Chloride	16887-00-6	1	1	1			6
08LICS27	S	Fluoride	16984-48-8	1	1	1	1		6
08LICS27	S	Nitrate	14797-55-8	1	1	1	1		6
08LICS27	S	Nitrite	14797-65-0	1	1	1	1		6
08LICS27	S	Phosphate	14265-44-2	1	1	1	1		6
08LICS27	S	Sulfate	14808-79-8	1	1	1	1		6
08LICS28	S	Bromide	24959-67-9	1	1				2
08LICS28	S	Chloride	16887-00-6	1	1				2

Table 2-19. Anion Preparation Batch Summary. (3 Pages)

Batch ID	Matrix	Analyte	CAS	MB	LCS	DUP	MS	MSD	Sample
08LICS28	S	Fluoride	16984-48-8	1	1				2
08LICS28	S	Nitrate	14797-55-8	1	1				2
08LICS28	S	Nitrite	14797-65-0	1	1				2
08LICS28	S	Phosphate	14265-44-2	1	1				2
08LICS28	S	Sulfate	14808-79-8	1	1				2
08LICS34	S	Bromide	24959-67-9	1	1				12
08LICS34	S	Chloride	16887-00-6	1	1				12
08LICS34	S	Fluoride	16984-48-8	1	1				12
08LICS34	S	Nitrate	14797-55-8	1	1				11
08LICS34	S	Nitrite	14797-65-0	1	1				12
08LICS34	S	Phosphate	14265-44-2	1	1				12
08LICS34	S	Sulfate	14808-79-8	1	1				12
08LICS35	S	Bromide	24959-67-9	1	1				4
08LICS35	S	Chloride	16887-00-6	1	1				4
08LICS35	S	Fluoride	16984-48-8	1	1				4
08LICS35	S	Nitrite	14797-65-0	1	1				4
08LICS35	S	Phosphate	14265-44-2	1	1				4
08LICS35	S	Sulfate	14808-79-8	1	1				4
08LICT22	S	Bromide	24959-67-9	1	1				3
08LICT22	S	Chloride	16887-00-6	1	1				3
08LICT22	S	Fluoride	16984-48-8	1	1				3
08LICT22	S	Nitrate	14797-55-8	1	1				3
08LICT22	S	Nitrite	14797-65-0	1	1				3
08LICT22	S	Sulfate	14808-79-8	1	1				3
08LICT24	S	Phosphate	14265-44-2	1	1				3
08LICT35	S	Nitrate	14797-55-8	1	1				5
08LICT36	S	Bromide	24959-67-9	1	1				6
08LICT36	S	Chloride	16887-00-6	1	1				6
08LICT36	S	Fluoride	16984-48-8	1	1				6
08LICT36	S	Nitrate	14797-55-8	1	1				6
08LICT36	S	Nitrite	14797-65-0	1	1				6
08LICT36	S	Phosphate	14265-44-2	1	1				6
08LICT36	S	Sulfate	14808-79-8	1	1				6
08LIC015	W	Fluoride	16984-48-8	1	1				3
08LIC034	W	Fluoride	16984-48-8	1	1				5
08LIC034	W	Nitrate	14797-55-8	1	1				5
08LIC034	W	Nitrite	14797-65-0	1	1				5
08LIC034	W	Sulfate	14808-79-8						5
08LICA15	W	Chloride	16887-00-6	1	1				3

Table 2-19. Anion Preparation Batch Summary. (3 Pages)

Batch ID	Matrix	Analyte	CAS	MB	LCS	DUP	MS	MSD	Sample
08LICA15	W	Nitrate	14797-55-8	1	1				3
08LICA15	W	Nitrite	14797-65-0	1	1				3
08LICA15	W	Phosphate	14265-44-2	1	1				3
08LICA15	W	Sulfate	14808-79-8	1	1				3
08LICA34	W	Chloride	16887-00-6	1	1				5
08LICB34	W	Bromide	24959-67-9	1	1				5
08LICB34	W	Phosphate	14265-44-2	1	1				5
08LICC17	W	Bromide	24959-67-9	1	1	1	1		8

CAS - Chemical Abstracts System
DUP - duplicate
LCS - laboratory control sample
MB - method blank
MS - matrix spike
MSD - matrix spike duplicate
S - soil
W - water

Anion analysis was performed on 60 solid samples in 12 batches and on eight water samples in two batches for each anion. (Not all anions were analyzed in each batch.) Each batch contained fewer than 20 field samples. At least one MB and one LCS were analyzed in each sample batch, except in batch 08LIC034 neither an MB or LCS result were obtained for sulfate. Therefore, all sulfate results in that batch were qualified as approximate and flagged "J."

Table 2-20 shows the number of batches and the numbers of MS and DUP samples analyzed on a per-analyte basis. Sufficient MSs and DUPs were analyzed for solid samples to support the project-average goal of analyzing one MS and one DUP for every 20 samples of each matrix type.

No DUPs or MSs were analyzed for water samples in this group of samples. However, in the first group of sample validated (*Data V&V - USE Data, COCs 1-5, 11, 12, 14, 15, 16, & 18*, EQM-DVAL-USE--001 Rev. 1), one MS and one MSD were analyzed for five water samples. Therefore, we have a total of one MS and one MSD for the 13 samples in the two groups validated. This supports the project-average goal of analyzing one MS and one DUP for every 20 samples.

Table 2-20. Number of Batches, Duplicates, and Matrix Spike Samples for Each Analyte.

Analyte	Solid Samples			Water Samples		
	Batches	DUPs	MSs	Batches	DUPs	MSs
Chloride	9	4	3	2	0	0
Fluoride	9	3	3	2	0	0
Nitrate	9	4	4	2	0	0
Nitrite	9	4	4	2	0	0
Phosphate	9	4	4	2	0	0
Sulfate	9	4	4	2	0	0

DUP - duplicate MS - matrix spike

2.6.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for analysis by method 9056 is specified in VET-1405-PLN-03, Rev. 0, as 48 hours. However, since holding times for chloride, fluoride, and sulfate in these samples range up to 22 days, this limit would result in rejection of most of the nondetect data. Normally, the 48-hour limit is applied only to nitrate, nitrite, and phosphate (SW-846, Method 9056A, Rev. 1, and Chapter 3, Rev. 4, Table 3-2). The limit for other ion chromatography analytes is 28 days. In addition, the U.S. Environmental Protection Agency (EPA) Methods Information Communication Exchange Service (MICE) has made the reasonable recommendation that the 48-hour limit for nitrate, nitrite, and phosphate be applied only to water samples and solid samples containing enough free liquid to analyze (e-mail to M. Miller, 7/13/07). Under this recommendation, analysis of nitrate, nitrite, and phosphate in normal soil samples would be allowed 28 days to extraction, and another 48 hours for analysis. Holding times for all samples met the criteria as interpreted by MICE.

2.6.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Project documentation does not specify required quantitation limits for anions by ion chromatography in soil samples. Required quantitation limits for water sample method blanks were achieved except for fluoride, chloride, and nitrite in some batches, as indicated in Table 2-21. Analytes were not detected in any of the method blanks. No qualification of sample results was required.

Table 2-21. Anion Method Blanks That Exceeded the Required Detection Limits for Water Samples.

Batch ID	Matrix	Analyte	CAS	Result	Q	RDL	Units
08LIC015	W	Fluoride	16984-48-8	0.25	U	0.1	mg/L
08LIC034	W	Fluoride	16984-48-8	0.25	U	0.1	mg/L
08LIC034	W	Nitrite	14797-65-0	0.25	U	0.1	mg/L
08LICA15	W	Chloride	16887-00-6	0.25	U	0.1	mg/L
08LICA15	W	Nitrite	14797-65-0	0.25	U	0.1	mg/L
08LICA34	W	Chloride	16887-00-6	0.25	U	0.1	mg/L

CAS - duplicate RDL - reliable detection level
Q - laboratory qualifier W - water

2.6.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify required quantitation limits for anions by ion chromatography in soil samples. The required quantitation limit was exceeded for nitrite in all water samples. The validation criteria do not require that these results be qualified. Other nondetect anion results met the required quantitation limit

2.6.5. QC Checks for Accuracy

- Did the recoveries for the LCS and MS meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS recoveries must be between 75% and 125%. All LCS recoveries were within these limits. MS recoveries for chloride, nitrate, and sulfate in several batches fell below the lower QC limits, as shown in Table 2-22. Therefore, all associated sample results for the indicated analytes in the respective batches were qualified as approximate and flagged "J."

Table 2-22. Matrix Spike Results That Did Not Satisfy QC Criteria.

Batch ID	Matrix	Analyte	CAS	Original Sample	Original Result	Q	Spiked Result	Q	Spike Level	Units	Recovery (%)
08LICS26	S	Chloride	16887-00-6	0804L873-006	23.0		46.17		45.0	mg/kg	51.5
08LICS19	S	Chloride	16887-00-6	0802L680-002	20.7		53.244		51.0	mg/kg	63.8
08LICS27	S	Nitrate	14797-55-8	0804L904-003	22.7		56.64		54.2	mg/kg	62.6
08LICS27	S	Sulfate	14808-79-8	0804L904-003	22.5		55.61		54.2	mg/kg	61.1
08LICS26	S	Sulfate	14808-79-8	0804L873-006	14.0		44.91		45.0	mg/kg	68.7
08LICS22	S	Sulfate	14808-79-8	0803L755-002	16.7		50.33		49.2	mg/kg	68.4
08LICS19	S	Sulfate	14808-79-8	0802L680-002	24.7		60.639		51.0	mg/kg	70.5

CAS - duplicate
Q - laboratory qualifier
QC - quality control
S - soil

2.6.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PRO-03, Rev. 0, the MS/MSD and DUP RPDs must be less than 20%. The RPD, as defined in the validation instructions, cannot be evaluated if the RDL is not specified. No RDL was specified for solid samples and no DUP samples were analyzed for water samples. Therefore, no results were qualified for precision.

2.7. DATA VALIDATION REPORT FOR TOTAL PHENOLS (METHOD 9066)

Table 2-23 is a summary of the validated results for analysis of total phenols.

Table 2-23. Summary of Total Phenols Validation. (2 Pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0802L646-001	B020	S	08LPL004	0.26	mg/kg	0.26			
0802L646-002	B021	S	08LPL004	0.26	mg/kg	0.26	U		
0802L646-003	B022	S	08LPL004	0.27	mg/kg	0.27	U		
0802L646-004	B023	S	08LPL004	0.26	mg/kg	0.26	U		
0802L646-005	B024	S	08LPL004	0.26	mg/kg	0.26	U		
0802L646-006	B025	S	08LPL004	0.26	mg/kg	0.26	U		
0802L646-007	B026	S	08LPL004	0.26	mg/kg	0.26	U		
0802L666-001	B028	S	08LPL005	0.26	mg/kg	0.26	U		
0802L666-002	B029	S	08LPL005	0.26	mg/kg	0.26	U		
0802L666-003	B030	S	08LPL005	0.26	mg/kg	0.26	U		
0803L798-001	B046	S	08LPL008	0.25	mg/kg	0.25	U		
0803L798-002	B047	S	08LPL008	0.26	mg/kg	0.26	U		
0803L798-003	B048	S	08LPL008	0.26	mg/kg	0.26	U		
0803L798-004	B049	S	08LPL008	0.25	mg/kg	0.25	U		
0803L816-001	B051	S	08LPL008	0.26	mg/kg	0.26	U		
0803L816-002	B052	S	08LPL008	0.25	mg/kg	0.25	U		
0803L816-004	B054	S	08LPL008	0.25	mg/kg	0.25	U		
0804L873-001	B064	S	08LPL009	0.26	mg/kg	0.26	U		
0804L873-002	B065	S	08LPL009	0.27	mg/kg	0.27	U		
0804L873-003	B066	S	08LPL009	0.26	mg/kg	0.26	U		
0804L873-004	B068	S	08LPL009	0.26	mg/kg	0.26	U		
0804L873-005	B069	S	08LPL009	0.26	mg/kg	0.26	U		
0804L873-006	B070	S	08LPL009	0.26	mg/kg	0.26	U		
0804L904-001	B071	S	08LPL010	0.27	mg/kg	0.27	U		
0804L904-002	B072	S	08LPL010	0.26	mg/kg	0.26	U		
0804L904-003	B073	S	08LPL010	0.27	mg/kg	0.27	U		
0804L904-004	B075	S	08LPL010	0.26	mg/kg	0.26	U		
0804L904-005	B077	S	08LPL010	0.26	mg/kg	0.26	U		
0804L904-006	B078	S	08LPL010	0.25	mg/kg	0.25	U		
0804L911-001	B082	S	08LPL010	0.26	mg/kg	0.26	U		
0804L911-002	B083	S	08LPL010	0.28	mg/kg	0.28	U		
0804L957-001	B084	S	08LPL010	0.25	mg/kg	0.25	U		
0804L957-002	B085	S	08LPL010	0.26	mg/kg	0.26	U		
0804L957-003	B087	S	08LPL010	0.26	mg/kg	0.26	U		
0804L957-004	B088	S	08LPL010	0.25	mg/kg	0.25	U		
0804L957-005	B089	S	08LPL010	0.25	mg/kg	0.25	U		
0804L967-001	B090	S	08LPL011	0.28	mg/kg	0.28	U		
0804L967-002	B091	S	08LPL011	0.26	mg/kg	0.26	U		
0804L967-003	B093	S	08LPL011	0.25	mg/kg	0.25	U		
0804L967-004	B094	S	08LPL011	0.26	mg/kg	0.26	U		
0804L967-005	B095	S	08LPL011	0.30	mg/kg	0.25			

Table 2-23. Summary of Total Phenols Validation. (2 Pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0804L026-001	B102	S	08LPL011	0.27	mg/kg	0.27	U		
0804L026-002	B103	S	08LPL011	0.26	mg/kg	0.26	U		
0805L043-001	B104	S	08LPL012	0.26	mg/kg	0.26	U		
0805L043-002	B105	S	08LPL012	0.27	mg/kg	0.27	U		
0805L043-003	B107	S	08LPL012	0.26	mg/kg	0.26	U		
0805L043-004	B108	S	08LPL012	0.27	mg/kg	0.26			
0805L072-001	B109	S	08LPLA13	0.26	mg/kg	0.26	U		
0805L102-001	B121	S	08LPL014	0.26	mg/kg	0.26	U		
0805L102-002	B122	S	08LPL014	0.26	mg/kg	0.26	U		
0805L107-001	B125	S	08LPL014	0.26	mg/kg	0.26	U		
0805L107-002	B126	S	08LPL014	0.26	mg/kg	0.26	U		
0805L107-003	B127	S	08LPL014	0.27	mg/kg	0.27	U		
0802L665-001	G001	W	08LPLA05	5.0	µg/L	5	U		
0802L665-002	G002	W	08LPLA05	5.0	µg/L	5	U		
0802L665-003	G003	W	08LPLA05	5.0	µg/L	5	U		
0802L674-001	G004	W	08LPLA05	5.0	µg/L	5	U		
0802L674-002	G005	W	08LPLA05	5.0	µg/L	5	U		
0805L068-001	G009	W	08LPL013	5.0	µg/L	5	U		
0805L068-002	G010	W	08LPL013	5.0	µg/L	5	U		
0805L068-003	G011	W	08LPL013	5.0	µg/L	5	U		
0805L068-004	G012	W	08LPL013	5.0	µg/L	5	U		
0805L068-005	G013	W	08LPL013	5.0	µg/L	5	U		

EQL - estimated quantitation limit
Q - laboratory qualifier
S soil
V - validation qualifier
W - water

2.7.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-24 shows the number of each type of sample in each preparation batch.

Table 2-24. Total Phenols Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	DUP	MS	MSD	Sample
08LPL004	S	1	2	1	1		7
08LPL005	S	1	2	1	1		3
08LPL008	S	1	2				7
08LPL009	S	1	2				6
08LPL010	S	1	2				13
08LPL011	S	1	2	1	1		7
08LPL012	S	1	2				4
08LPL014	S	1	2				5
08LPLA13	S	1	2				1
08LPL013	W	1	2				5
08LPLA05	W	1	2	1	1		5

DUP - duplicate
LCS - laboratory control sample
MB - method blank
MS - matrix spike
MSD - matrix spike duplicate
S - soil
W - water

Total phenol analysis was performed in nine batches of solid samples and two batches of water samples. Each batch contained fewer than 20 field samples. One MB and two LCS were analyzed for each batch.

MS samples were analyzed in only three solid batches and one of the water batches. According to procedure 9066, a "duplicate spike sample" is to be analyzed with each batch. The duplicate is not required to be performed on a sample matrix. The duplicate was performed on the LCS for all but one batch. Although this is not a matrix spike, it does provide a demonstration of precision. No results were qualified for missing QC

2.7.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for total phenol analysis is specified in VET-1405-PLN-03, Rev. 0, as 28 days. All results were generated within these limits.

2.7.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Project documentation does not specify a required quantitation limit for total phenol. Phenols were not detected in the method blanks. Detection limits in the blanks were 5 µg/L or less for water and 0.5 mg/kg or less for soils.

2.7.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for total phenol. Detection limits for phenols were 5 µg/L for water samples and 0.28 mg/kg or less for soil samples.

2.7.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, and MSD, meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS, MS, and MSD recoveries must be between 75% and 125%. All LCS and MS/MSD recoveries were within these limits.

2.7.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the RPD must be less than 20%. All LCS/LCSD RPDs met this criterion.

2.8. DATA VALIDATION REPORT FOR POLYCHLORINATED BIPHENYL COMPOUNDS (METHOD 8082)

Table 2-25 is a summary of the validated results for the PCBs.

Table 2-25. Summary of PCB Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L646-001	B020	S	08LE0106	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0802L646-001	B020	S	08LE0106	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0802L646-001	B020	S	08LE0106	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0802L646-001	B020	S	08LE0106	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0802L646-001	B020	S	08LE0106	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0802L646-001	B020	S	08LE0106	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0802L646-001	B020	S	08LE0106	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0802L646-002	B021	S	08LE0106	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0802L646-002	B021	S	08LE0106	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0802L646-002	B021	S	08LE0106	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0802L646-002	B021	S	08LE0106	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0802L646-002	B021	S	08LE0106	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0802L646-002	B021	S	08LE0106	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0802L646-002	B021	S	08LE0106	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0802L646-003	B022	S	08LE0106	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0802L646-003	B022	S	08LE0106	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0802L646-003	B022	S	08LE0106	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0802L646-003	B022	S	08LE0106	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0802L646-003	B022	S	08LE0106	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0802L646-003	B022	S	08LE0106	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0802L646-003	B022	S	08LE0106	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0802L646-004	B023	S	08LE0106	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0802L646-004	B023	S	08LE0106	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0802L646-004	B023	S	08LE0106	Aroclor-1232	11141-16-5	14	µg/kg	14	U		

Table 2-25. Summary of PCB Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L646-004	B023	S	08LE0106	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0802L646-004	B023	S	08LE0106	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0802L646-004	B023	S	08LE0106	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0802L646-004	B023	S	08LE0106	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0802L646-005	B024	S	08LE0106	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0802L646-005	B024	S	08LE0106	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0802L646-005	B024	S	08LE0106	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0802L646-005	B024	S	08LE0106	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0802L646-005	B024	S	08LE0106	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0802L646-005	B024	S	08LE0106	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0802L646-005	B024	S	08LE0106	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0802L646-006	B025	S	08LE0106	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0802L646-006	B025	S	08LE0106	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0802L646-006	B025	S	08LE0106	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0802L646-006	B025	S	08LE0106	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0802L646-006	B025	S	08LE0106	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0802L646-006	B025	S	08LE0106	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0802L646-006	B025	S	08LE0106	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0802L646-007	B026	S	08LE0106	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0802L646-007	B026	S	08LE0106	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0802L646-007	B026	S	08LE0106	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0802L646-007	B026	S	08LE0106	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0802L646-007	B026	S	08LE0106	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0802L646-007	B026	S	08LE0106	Aroclor-1254	11097-69-1	14	µg/kg	14	U		

Table 2-25. Summary of PCB Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L646-007	B026	S	08LE0106	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0802L665-001	G001	W	08LE0109	Aroclor-1016	12674-11-2	0.40	µg/L	0.4	U		
0802L665-001	G001	W	08LE0109	Aroclor-1221	11104-28-2	0.40	µg/L	0.4	U		
0802L665-001	G001	W	08LE0109	Aroclor-1232	11141-16-5	0.40	µg/L	0.4	U		
0802L665-001	G001	W	08LE0109	Aroclor-1242	53469-21-9	0.40	µg/L	0.4	U		
0802L665-001	G001	W	08LE0109	Aroclor-1248	12672-29-6	0.40	µg/L	0.4	U		
0802L665-001	G001	W	08LE0109	Aroclor-1254	11097-69-1	0.40	µg/L	0.4	U		
0802L665-001	G001	W	08LE0109	Aroclor-1260	11096-82-5	0.40	µg/L	0.4	U		
0802L665-002	G002	W	08LE0109	Aroclor-1016	12674-11-2	0.40	µg/L	0.4	U		
0802L665-002	G002	W	08LE0109	Aroclor-1221	11104-28-2	0.40	µg/L	0.4	U		
0802L665-002	G002	W	08LE0109	Aroclor-1232	11141-16-5	0.40	µg/L	0.4	U		
0802L665-002	G002	W	08LE0109	Aroclor-1242	53469-21-9	0.40	µg/L	0.4	U		
0802L665-002	G002	W	08LE0109	Aroclor-1248	12672-29-6	0.40	µg/L	0.4	U		
0802L665-002	G002	W	08LE0109	Aroclor-1254	11097-69-1	0.40	µg/L	0.4	U		
0802L665-002	G002	W	08LE0109	Aroclor-1260	11096-82-5	0.40	µg/L	0.4	U		
0802L665-003	G003	W	08LE0109	Aroclor-1016	12674-11-2	0.40	µg/L	0.4	U		
0802L665-003	G003	W	08LE0109	Aroclor-1221	11104-28-2	0.40	µg/L	0.4	U		
0802L665-003	G003	W	08LE0109	Aroclor-1232	11141-16-5	0.40	µg/L	0.4	U		
0802L665-003	G003	W	08LE0109	Aroclor-1242	53469-21-9	0.40	µg/L	0.4	U		
0802L665-003	G003	W	08LE0109	Aroclor-1248	12672-29-6	0.40	µg/L	0.4	U		
0802L665-003	G003	W	08LE0109	Aroclor-1254	11097-69-1	0.40	µg/L	0.4	U		
0802L665-003	G003	W	08LE0109	Aroclor-1260	11096-82-5	0.40	µg/L	0.4	U		
0802L674-001	G004	W	08LE0109	Aroclor-1016	12674-11-2	0.40	µg/L	0.4	U		
0802L674-001	G004	W	08LE0109	Aroclor-1221	11104-28-2	0.40	µg/L	0.4	U		

Table 2-25. Summary of PCB Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L674-001	G004	W	08LE0109	Aroclor-1232	11141-16-5	0.40	µg/L	0.4	U		
0802L674-001	G004	W	08LE0109	Aroclor-1242	53469-21-9	0.40	µg/L	0.4	U		
0802L674-001	G004	W	08LE0109	Aroclor-1248	12672-29-6	0.40	µg/L	0.4	U		
0802L674-001	G004	W	08LE0109	Aroclor-1254	11097-69-1	0.40	µg/L	0.4	U		
0802L674-001	G004	W	08LE0109	Aroclor-1260	11096-82-5	0.40	µg/L	0.4	U		
0802L674-002	G005	W	08LE0109	Aroclor-1016	12674-11-2	0.40	µg/L	0.4	U		
0802L674-002	G005	W	08LE0109	Aroclor-1221	11104-28-2	0.40	µg/L	0.4	U		
0802L674-002	G005	W	08LE0109	Aroclor-1232	11141-16-5	0.40	µg/L	0.4	U		
0802L674-002	G005	W	08LE0109	Aroclor-1242	53469-21-9	0.40	µg/L	0.4	U		
0802L674-002	G005	W	08LE0109	Aroclor-1248	12672-29-6	0.40	µg/L	0.4	U		
0802L674-002	G005	W	08LE0109	Aroclor-1254	11097-69-1	0.40	µg/L	0.4	U		
0802L674-002	G005	W	08LE0109	Aroclor-1260	11096-82-5	0.40	µg/L	0.4	U		
0802L666-001	B028	S	08LE0114	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0802L666-001	B028	S	08LE0114	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0802L666-001	B028	S	08LE0114	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0802L666-001	B028	S	08LE0114	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0802L666-001	B028	S	08LE0114	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0802L666-001	B028	S	08LE0114	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0802L666-001	B028	S	08LE0114	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0802L666-002	B029	S	08LE0114	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0802L666-002	B029	S	08LE0114	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0802L666-002	B029	S	08LE0114	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0802L666-002	B029	S	08LE0114	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0802L666-002	B029	S	08LE0114	Aroclor-1248	12672-29-6	14	µg/kg	14	U		

Table 2-25. Summary of PCB Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L666-002	B029	S	08LE0114	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0802L666-002	B029	S	08LE0114	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0802L666-003	B030	S	08LE0114	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0802L666-003	B030	S	08LE0114	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0802L666-003	B030	S	08LE0114	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0802L666-003	B030	S	08LE0114	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0802L666-003	B030	S	08LE0114	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0802L666-003	B030	S	08LE0114	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0802L666-003	B030	S	08LE0114	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0802L680-001	B031	S	08LE0114	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0802L680-001	B031	S	08LE0114	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0802L680-001	B031	S	08LE0114	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0802L680-001	B031	S	08LE0114	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0802L680-001	B031	S	08LE0114	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0802L680-001	B031	S	08LE0114	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0802L680-001	B031	S	08LE0114	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0802L680-002	B032	S	08LE0114	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0802L680-002	B032	S	08LE0114	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0802L680-002	B032	S	08LE0114	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0802L680-002	B032	S	08LE0114	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0802L680-002	B032	S	08LE0114	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0802L680-002	B032	S	08LE0114	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0802L680-002	B032	S	08LE0114	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0802L680-003	B033	S	08LE0114	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0802L680-003	B033	S	08LE0114	Aroclor-1221	11104-28-2	14	µg/kg	14	U		

Table 2-25. Summary of PCB Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0802L680-003	B033	S	08LE0114	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0802L680-003	B033	S	08LE0114	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0802L680-003	B033	S	08LE0114	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0802L680-003	B033	S	08LE0114	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0802L680-003	B033	S	08LE0114	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0803L688-001	B034	S	08LE0114	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0803L688-001	B034	S	08LE0114	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0803L688-001	B034	S	08LE0114	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0803L688-001	B034	S	08LE0114	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0803L688-001	B034	S	08LE0114	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0803L688-001	B034	S	08LE0114	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0803L688-001	B034	S	08LE0114	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0803L688-002	B035	S	08LE0114	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0803L688-002	B035	S	08LE0114	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0803L688-002	B035	S	08LE0114	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0803L688-002	B035	S	08LE0114	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0803L688-002	B035	S	08LE0114	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0803L688-002	B035	S	08LE0114	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0803L688-002	B035	S	08LE0114	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0803L798-001	B046	S	08LE0142	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0803L798-001	B046	S	08LE0142	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0803L798-001	B046	S	08LE0142	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0803L798-001	B046	S	08LE0142	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0803L798-001	B046	S	08LE0142	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0803L798-001	B046	S	08LE0142	Aroclor-1254	11097-69-1	14	µg/kg	14	U		

Table 2-25. Summary of PCB Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0803L798-001	B046	S	08LE0142	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0803L798-002	B047	S	08LE0142	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0803L798-002	B047	S	08LE0142	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0803L798-002	B047	S	08LE0142	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0803L798-002	B047	S	08LE0142	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0803L798-002	B047	S	08LE0142	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0803L798-002	B047	S	08LE0142	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0803L798-002	B047	S	08LE0142	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0803L798-003	B048	S	08LE0142	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0803L798-003	B048	S	08LE0142	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0803L798-003	B048	S	08LE0142	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0803L798-003	B048	S	08LE0142	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0803L798-003	B048	S	08LE0142	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0803L798-003	B048	S	08LE0142	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0803L798-003	B048	S	08LE0142	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0803L798-004	B049	S	08LE0142	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0803L798-004	B049	S	08LE0142	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0803L798-004	B049	S	08LE0142	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0803L798-004	B049	S	08LE0142	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0803L798-004	B049	S	08LE0142	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0803L798-004	B049	S	08LE0142	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0803L798-004	B049	S	08LE0142	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0803L816-001	B051	S	08LE0145	Aroclor-1016	12674-11-2	14	µg/kg	14	U	UJ	RPD
0803L816-001	B051	S	08LE0145	Aroclor-1221	11104-28-2	14	µg/kg	14	U	UJ	RPD
0803L816-001	B051	S	08LE0145	Aroclor-1232	11141-16-5	14	µg/kg	14	U	UJ	RPD

Table 2-25. Summary of PCB Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0803L816-001	B051	S	08LE0145	Aroclor-1242	53469-21-9	14	µg/kg	14	U	UJ	RPD
0803L816-001	B051	S	08LE0145	Aroclor-1248	12672-29-6	14	µg/kg	14	U	UJ	RPD
0803L816-001	B051	S	08LE0145	Aroclor-1254	11097-69-1	14	µg/kg	14	U	UJ	RPD
0803L816-001	B051	S	08LE0145	Aroclor-1260	11096-82-5	14	µg/kg	14	U	UJ	RPD
0803L816-002	B052	S	08LE0145	Aroclor-1016	12674-11-2	14	µg/kg	14	U	UJ	RPD
0803L816-002	B052	S	08LE0145	Aroclor-1221	11104-28-2	14	µg/kg	14	U	UJ	RPD
0803L816-002	B052	S	08LE0145	Aroclor-1232	11141-16-5	14	µg/kg	14	U	UJ	RPD
0803L816-002	B052	S	08LE0145	Aroclor-1242	53469-21-9	14	µg/kg	14	U	UJ	RPD
0803L816-002	B052	S	08LE0145	Aroclor-1248	12672-29-6	14	µg/kg	14	U	UJ	RPD
0803L816-002	B052	S	08LE0145	Aroclor-1254	11097-69-1	14	µg/kg	14	U	UJ	RPD
0803L816-002	B052	S	08LE0145	Aroclor-1260	11096-82-5	14	µg/kg	14	U	UJ	RPD
0803L816-004	B054	S	08LE0145	Aroclor-1016	12674-11-2	14	µg/kg	14	U	UJ	RPD
0803L816-004	B054	S	08LE0145	Aroclor-1221	11104-28-2	14	µg/kg	14	U	UJ	RPD
0803L816-004	B054	S	08LE0145	Aroclor-1232	11141-16-5	14	µg/kg	14	U	UJ	RPD
0803L816-004	B054	S	08LE0145	Aroclor-1242	53469-21-9	14	µg/kg	14	U	UJ	RPD
0803L816-004	B054	S	08LE0145	Aroclor-1248	12672-29-6	14	µg/kg	14	U	UJ	RPD
0803L816-004	B054	S	08LE0145	Aroclor-1254	11097-69-1	14	µg/kg	14	U	UJ	RPD
0803L816-004	B054	S	08LE0145	Aroclor-1260	11096-82-5	14	µg/kg	14	U	UJ	RPD
0804L873-001	B064	S	08LE0166	Aroclor-1016	12674-11-2	14	µg/kg	14	U	UJ	RPD
0804L873-001	B064	S	08LE0166	Aroclor-1221	11104-28-2	14	µg/kg	14	U	UJ	RPD
0804L873-001	B064	S	08LE0166	Aroclor-1232	11141-16-5	14	µg/kg	14	U	UJ	RPD
0804L873-001	B064	S	08LE0166	Aroclor-1242	53469-21-9	14	µg/kg	14	U	UJ	RPD
0804L873-001	B064	S	08LE0166	Aroclor-1248	12672-29-6	14	µg/kg	14	U	UJ	RPD
0804L873-001	B064	S	08LE0166	Aroclor-1254	11097-69-1	14	µg/kg	14	U	UJ	RPD
0804L873-001	B064	S	08LE0166	Aroclor-1260	11096-82-5	14	µg/kg	14	U	UJ	RPD

Table 2-25. Summary of PCB Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0804L873-002	B065	S	08LE0166	Aroclor-1016	12674-11-2	14	µg/kg	14	U	UJ	RPD
0804L873-002	B065	S	08LE0166	Aroclor-1221	11104-28-2	14	µg/kg	14	U	UJ	RPD
0804L873-002	B065	S	08LE0166	Aroclor-1232	11141-16-5	14	µg/kg	14	U	UJ	RPD
0804L873-002	B065	S	08LE0166	Aroclor-1242	53469-21-9	14	µg/kg	14	U	UJ	RPD
0804L873-002	B065	S	08LE0166	Aroclor-1248	12672-29-6	14	µg/kg	14	U	UJ	RPD
0804L873-002	B065	S	08LE0166	Aroclor-1254	11097-69-1	14	µg/kg	14	U	UJ	RPD
0804L873-002	B065	S	08LE0166	Aroclor-1260	11096-82-5	14	µg/kg	14	U	UJ	RPD
0804L873-003	B066	S	08LE0166	Aroclor-1016	12674-11-2	14	µg/kg	14	U	UJ	RPD
0804L873-003	B066	S	08LE0166	Aroclor-1221	11104-28-2	14	µg/kg	14	U	UJ	RPD
0804L873-003	B066	S	08LE0166	Aroclor-1232	11141-16-5	14	µg/kg	14	U	UJ	RPD
0804L873-003	B066	S	08LE0166	Aroclor-1242	53469-21-9	14	µg/kg	14	U	UJ	RPD
0804L873-003	B066	S	08LE0166	Aroclor-1248	12672-29-6	14	µg/kg	14	U	UJ	RPD
0804L873-003	B066	S	08LE0166	Aroclor-1254	11097-69-1	14	µg/kg	14	U	UJ	RPD
0804L873-003	B066	S	08LE0166	Aroclor-1260	11096-82-5	14	µg/kg	14	U	UJ	RPD
0804L873-004	B068	S	08LE0166	Aroclor-1016	12674-11-2	14	µg/kg	14	U	UJ	RPD
0804L873-004	B068	S	08LE0166	Aroclor-1221	11104-28-2	14	µg/kg	14	U	UJ	RPD
0804L873-004	B068	S	08LE0166	Aroclor-1232	11141-16-5	14	µg/kg	14	U	UJ	RPD
0804L873-004	B068	S	08LE0166	Aroclor-1242	53469-21-9	14	µg/kg	14	U	UJ	RPD
0804L873-004	B068	S	08LE0166	Aroclor-1248	12672-29-6	14	µg/kg	14	U	UJ	RPD
0804L873-004	B068	S	08LE0166	Aroclor-1254	11097-69-1	14	µg/kg	14	U	UJ	RPD
0804L873-004	B068	S	08LE0166	Aroclor-1260	11096-82-5	14	µg/kg	14	U	UJ	RPD
0804L873-005	B069	S	08LE0166	Aroclor-1016	12674-11-2	14	µg/kg	14	U	UJ	RPD
0804L873-005	B069	S	08LE0166	Aroclor-1221	11104-28-2	14	µg/kg	14	U	UJ	RPD
0804L873-005	B069	S	08LE0166	Aroclor-1232	11141-16-5	14	µg/kg	14	U	UJ	RPD
0804L873-005	B069	S	08LE0166	Aroclor-1242	53469-21-9	14	µg/kg	14	U	UJ	RPD

Table 2-25. Summary of PCB Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0804L873-005	B069	S	08LE0166	Aroclor-1248	12672-29-6	14	µg/kg	14	U	UJ	RPD
0804L873-005	B069	S	08LE0166	Aroclor-1254	11097-69-1	14	µg/kg	14	U	UJ	RPD
0804L873-005	B069	S	08LE0166	Aroclor-1260	11096-82-5	14	µg/kg	14	U	UJ	RPD
0804L873-006	B070	S	08LE0166	Aroclor-1016	12674-11-2	14	µg/kg	14	U	UJ	RPD
0804L873-006	B070	S	08LE0166	Aroclor-1221	11104-28-2	14	µg/kg	14	U	UJ	RPD
0804L873-006	B070	S	08LE0166	Aroclor-1232	11141-16-5	14	µg/kg	14	U	UJ	RPD
0804L873-006	B070	S	08LE0166	Aroclor-1242	53469-21-9	14	µg/kg	14	U	UJ	RPD
0804L873-006	B070	S	08LE0166	Aroclor-1248	12672-29-6	14	µg/kg	14	U	UJ	RPD
0804L873-006	B070	S	08LE0166	Aroclor-1254	11097-69-1	14	µg/kg	14	U	UJ	RPD
0804L873-006	B070	S	08LE0166	Aroclor-1260	11096-82-5	14	µg/kg	14	U	UJ	RPD
0804L904-004	B075	S	08LE0174	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0804L904-004	B075	S	08LE0174	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0804L904-004	B075	S	08LE0174	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0804L904-004	B075	S	08LE0174	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0804L904-004	B075	S	08LE0174	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0804L904-004	B075	S	08LE0174	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0804L904-004	B075	S	08LE0174	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0804L904-005	B077	S	08LE0174	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0804L904-005	B077	S	08LE0174	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0804L904-005	B077	S	08LE0174	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0804L904-005	B077	S	08LE0174	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0804L904-005	B077	S	08LE0174	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0804L904-005	B077	S	08LE0174	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0804L904-005	B077	S	08LE0174	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0804L904-006	B078	S	08LE0174	Aroclor-1016	12674-11-2	14	µg/kg	14	U		

Table 2-25. Summary of PCB Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0804L904-006	B078	S	08LE0174	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0804L904-006	B078	S	08LE0174	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0804L904-006	B078	S	08LE0174	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0804L904-006	B078	S	08LE0174	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0804L904-006	B078	S	08LE0174	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0804L904-006	B078	S	08LE0174	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0804L904-001	B071	S	08LE0174	Aroclor-1016	12674-11-2	15	µg/kg	15	U		
0804L904-001	B071	S	08LE0174	Aroclor-1221	11104-28-2	15	µg/kg	15	U		
0804L904-001	B071	S	08LE0174	Aroclor-1232	11141-16-5	15	µg/kg	15	U		
0804L904-001	B071	S	08LE0174	Aroclor-1242	53469-21-9	15	µg/kg	15	U		
0804L904-001	B071	S	08LE0174	Aroclor-1248	12672-29-6	15	µg/kg	15	U		
0804L904-001	B071	S	08LE0174	Aroclor-1254	11097-69-1	15	µg/kg	15	U		
0804L904-001	B071	S	08LE0174	Aroclor-1260	11096-82-5	15	µg/kg	15	U		
0804L904-002	B072	S	08LE0174	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0804L904-002	B072	S	08LE0174	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0804L904-002	B072	S	08LE0174	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0804L904-002	B072	S	08LE0174	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0804L904-002	B072	S	08LE0174	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0804L904-002	B072	S	08LE0174	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0804L904-002	B072	S	08LE0174	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0804L904-003	B073	S	08LE0174	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0804L904-003	B073	S	08LE0174	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0804L904-003	B073	S	08LE0174	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0804L904-003	B073	S	08LE0174	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0804L904-003	B073	S	08LE0174	Aroclor-1248	12672-29-6	14	µg/kg	14	U		

Table 2-25. Summary of PCB Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0804L904-003	B073	S	08LE0174	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0804L904-003	B073	S	08LE0174	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0804L911-001	B082	S	08LE0184	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0804L911-001	B082	S	08LE0184	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0804L911-001	B082	S	08LE0184	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0804L911-001	B082	S	08LE0184	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0804L911-001	B082	S	08LE0184	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0804L911-001	B082	S	08LE0184	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0804L911-001	B082	S	08LE0184	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0804L911-002	B083	S	08LE0184	Aroclor-1016	12674-11-2	15	µg/kg	15	U		
0804L911-002	B083	S	08LE0184	Aroclor-1221	11104-28-2	15	µg/kg	15	U		
0804L911-002	B083	S	08LE0184	Aroclor-1232	11141-16-5	15	µg/kg	15	U		
0804L911-002	B083	S	08LE0184	Aroclor-1242	53469-21-9	15	µg/kg	15	U		
0804L911-002	B083	S	08LE0184	Aroclor-1248	12672-29-6	15	µg/kg	15	U		
0804L911-002	B083	S	08LE0184	Aroclor-1254	11097-69-1	15	µg/kg	15	U		
0804L911-002	B083	S	08LE0184	Aroclor-1260	11096-82-5	15	µg/kg	15	U		
0804L957-001	B084	S	08LE0199	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0804L957-001	B084	S	08LE0199	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0804L957-001	B084	S	08LE0199	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0804L957-001	B084	S	08LE0199	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0804L957-001	B084	S	08LE0199	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0804L957-001	B084	S	08LE0199	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0804L957-001	B084	S	08LE0199	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0804L957-002	B085	S	08LE0199	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0804L957-002	B085	S	08LE0199	Aroclor-1221	11104-28-2	14	µg/kg	14	U		

Table 2-25. Summary of PCB Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0804L957-002	B085	S	08LE0199	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0804L957-002	B085	S	08LE0199	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0804L957-002	B085	S	08LE0199	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0804L957-002	B085	S	08LE0199	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0804L957-002	B085	S	08LE0199	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0804L957-003	B087	S	08LE0199	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0804L957-003	B087	S	08LE0199	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0804L957-003	B087	S	08LE0199	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0804L957-003	B087	S	08LE0199	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0804L957-003	B087	S	08LE0199	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0804L957-003	B087	S	08LE0199	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0804L957-003	B087	S	08LE0199	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0804L957-004	B088	S	08LE0199	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0804L957-004	B088	S	08LE0199	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0804L957-004	B088	S	08LE0199	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0804L957-004	B088	S	08LE0199	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0804L957-004	B088	S	08LE0199	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0804L957-004	B088	S	08LE0199	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0804L957-004	B088	S	08LE0199	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0804L957-005	B089	S	08LE0199	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0804L957-005	B089	S	08LE0199	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0804L957-005	B089	S	08LE0199	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0804L957-005	B089	S	08LE0199	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0804L957-005	B089	S	08LE0199	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0804L957-005	B089	S	08LE0199	Aroclor-1254	11097-69-1	14	µg/kg	14	U		

Table 2-25. Summary of PCB Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0804L957-005	B089	S	08LE0199	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0804L967-001	B090	S	08LE0199	Aroclor-1016	12674-11-2	15	µg/kg	15	U		
0804L967-001	B090	S	08LE0199	Aroclor-1221	11104-28-2	15	µg/kg	15	U		
0804L967-001	B090	S	08LE0199	Aroclor-1232	11141-16-5	15	µg/kg	15	U		
0804L967-001	B090	S	08LE0199	Aroclor-1242	53469-21-9	15	µg/kg	15	U		
0804L967-001	B090	S	08LE0199	Aroclor-1248	12672-29-6	15	µg/kg	15	U		
0804L967-001	B090	S	08LE0199	Aroclor-1254	11097-69-1	15	µg/kg	15	U		
0804L967-001	B090	S	08LE0199	Aroclor-1260	11096-82-5	15	µg/kg	15	U		
0804L967-002	B091	S	08LE0199	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0804L967-002	B091	S	08LE0199	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0804L967-002	B091	S	08LE0199	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0804L967-002	B091	S	08LE0199	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0804L967-002	B091	S	08LE0199	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0804L967-002	B091	S	08LE0199	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0804L967-002	B091	S	08LE0199	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0804L967-003	B093	S	08LE0199	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0804L967-003	B093	S	08LE0199	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0804L967-003	B093	S	08LE0199	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0804L967-003	B093	S	08LE0199	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0804L967-003	B093	S	08LE0199	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0804L967-003	B093	S	08LE0199	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0804L967-003	B093	S	08LE0199	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0804L967-004	B094	S	08LE0199	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0804L967-004	B094	S	08LE0199	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0804L967-004	B094	S	08LE0199	Aroclor-1232	11141-16-5	14	µg/kg	14	U		

Table 2-25. Summary of PCB Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0804L967-004	B094	S	08LE0199	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0804L967-004	B094	S	08LE0199	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0804L967-004	B094	S	08LE0199	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0804L967-004	B094	S	08LE0199	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0804L967-005	B095	S	08LE0199	Aroclor-1016	12674-11-2	13	µg/kg	13	U		
0804L967-005	B095	S	08LE0199	Aroclor-1221	11104-28-2	13	µg/kg	13	U		
0804L967-005	B095	S	08LE0199	Aroclor-1232	11141-16-5	13	µg/kg	13	U		
0804L967-005	B095	S	08LE0199	Aroclor-1242	53469-21-9	13	µg/kg	13	U		
0804L967-005	B095	S	08LE0199	Aroclor-1248	12672-29-6	13	µg/kg	13	U		
0804L967-005	B095	S	08LE0199	Aroclor-1254	11097-69-1	13	µg/kg	13	U		
0804L967-005	B095	S	08LE0199	Aroclor-1260	11096-82-5	13	µg/kg	13	U		
0804L026-001	B102	S	08LE0224	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0804L026-001	B102	S	08LE0224	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0804L026-001	B102	S	08LE0224	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0804L026-001	B102	S	08LE0224	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0804L026-001	B102	S	08LE0224	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0804L026-001	B102	S	08LE0224	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0804L026-001	B102	S	08LE0224	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0804L026-002	B103	S	08LE0224	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0804L026-002	B103	S	08LE0224	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0804L026-002	B103	S	08LE0224	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0804L026-002	B103	S	08LE0224	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0804L026-002	B103	S	08LE0224	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0804L026-002	B103	S	08LE0224	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0804L026-002	B103	S	08LE0224	Aroclor-1260	11096-82-5	14	µg/kg	14	U		

Table 2-25. Summary of PCB Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0805L043-001	B104	S	08LE0225	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0805L043-001	B104	S	08LE0225	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0805L043-001	B104	S	08LE0225	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0805L043-001	B104	S	08LE0225	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0805L043-001	B104	S	08LE0225	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0805L043-001	B104	S	08LE0225	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0805L043-001	B104	S	08LE0225	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0805L043-002	B105	S	08LE0225	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0805L043-002	B105	S	08LE0225	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0805L043-002	B105	S	08LE0225	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0805L043-002	B105	S	08LE0225	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0805L043-002	B105	S	08LE0225	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0805L043-002	B105	S	08LE0225	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0805L043-002	B105	S	08LE0225	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0805L043-003	B107	S	08LE0225	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0805L043-003	B107	S	08LE0225	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0805L043-003	B107	S	08LE0225	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0805L043-003	B107	S	08LE0225	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0805L043-003	B107	S	08LE0225	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0805L043-003	B107	S	08LE0225	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0805L043-003	B107	S	08LE0225	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0805L043-004	B108	S	08LE0225	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0805L043-004	B108	S	08LE0225	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0805L043-004	B108	S	08LE0225	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0805L043-004	B108	S	08LE0225	Aroclor-1242	53469-21-9	14	µg/kg	14	U		

Table 2-25. Summary of PCB Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0805L043-004	B108	S	08LE0225	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0805L043-004	B108	S	08LE0225	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0805L043-004	B108	S	08LE0225	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0805L072-001	B109	S	08LE0227	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0805L072-001	B109	S	08LE0227	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0805L072-001	B109	S	08LE0227	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0805L072-001	B109	S	08LE0227	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0805L072-001	B109	S	08LE0227	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0805L072-001	B109	S	08LE0227	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0805L072-001	B109	S	08LE0227	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0805L068-001	G009	W	08LE0230	Aroclor-1016	12674-11-2	0.40	µg/L	0.4	U		
0805L068-001	G009	W	08LE0230	Aroclor-1221	11104-28-2	0.40	µg/L	0.4	U		
0805L068-001	G009	W	08LE0230	Aroclor-1232	11141-16-5	0.40	µg/L	0.4	U		
0805L068-001	G009	W	08LE0230	Aroclor-1242	53469-21-9	0.40	µg/L	0.4	U		
0805L068-001	G009	W	08LE0230	Aroclor-1248	12672-29-6	0.40	µg/L	0.4	U		
0805L068-001	G009	W	08LE0230	Aroclor-1254	11097-69-1	0.40	µg/L	0.4	U		
0805L068-001	G009	W	08LE0230	Aroclor-1260	11096-82-5	0.40	µg/L	0.4	U		
0805L068-002	G010	W	08LE0230	Aroclor-1016	12674-11-2	0.40	µg/L	0.4	U		
0805L068-002	G010	W	08LE0230	Aroclor-1221	11104-28-2	0.40	µg/L	0.4	U		
0805L068-002	G010	W	08LE0230	Aroclor-1232	11141-16-5	0.40	µg/L	0.4	U		
0805L068-002	G010	W	08LE0230	Aroclor-1242	53469-21-9	0.40	µg/L	0.4	U		
0805L068-002	G010	W	08LE0230	Aroclor-1248	12672-29-6	0.40	µg/L	0.4	U		
0805L068-002	G010	W	08LE0230	Aroclor-1254	11097-69-1	0.40	µg/L	0.4	U		
0805L068-002	G010	W	08LE0230	Aroclor-1260	11096-82-5	0.40	µg/L	0.4	U		
0805L068-003	G011	W	08LE0230	Aroclor-1016	12674-11-2	0.40	µg/L	0.4	U		

Table 2-25. Summary of PCB Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0805L068-003	G011	W	08LE0230	Aroclor-1221	11104-28-2	0.40	µg/L	0.4	U		
0805L068-003	G011	W	08LE0230	Aroclor-1232	11141-16-5	0.40	µg/L	0.4	U		
0805L068-003	G011	W	08LE0230	Aroclor-1242	53469-21-9	0.40	µg/L	0.4	U		
0805L068-003	G011	W	08LE0230	Aroclor-1248	12672-29-6	0.40	µg/L	0.4	U		
0805L068-003	G011	W	08LE0230	Aroclor-1254	11097-69-1	0.40	µg/L	0.4	U		
0805L068-003	G011	W	08LE0230	Aroclor-1260	11096-82-5	0.40	µg/L	0.4	U		
0805L068-004	G012	W	08LE0230	Aroclor-1016	12674-11-2	0.40	µg/L	0.4	U		
0805L068-004	G012	W	08LE0230	Aroclor-1221	11104-28-2	0.40	µg/L	0.4	U		
0805L068-004	G012	W	08LE0230	Aroclor-1232	11141-16-5	0.40	µg/L	0.4	U		
0805L068-004	G012	W	08LE0230	Aroclor-1242	53469-21-9	0.40	µg/L	0.4	U		
0805L068-004	G012	W	08LE0230	Aroclor-1248	12672-29-6	0.40	µg/L	0.4	U		
0805L068-004	G012	W	08LE0230	Aroclor-1254	11097-69-1	0.40	µg/L	0.4	U		
0805L068-004	G012	W	08LE0230	Aroclor-1260	11096-82-5	0.40	µg/L	0.4	U		
0805L068-005	G013	W	08LE0230	Aroclor-1016	12674-11-2	0.40	µg/L	0.4	U		
0805L068-005	G013	W	08LE0230	Aroclor-1221	11104-28-2	0.40	µg/L	0.4	U		
0805L068-005	G013	W	08LE0230	Aroclor-1232	11141-16-5	0.40	µg/L	0.4	U		
0805L068-005	G013	W	08LE0230	Aroclor-1242	53469-21-9	0.40	µg/L	0.4	U		
0805L068-005	G013	W	08LE0230	Aroclor-1248	12672-29-6	0.40	µg/L	0.4	U		
0805L068-005	G013	W	08LE0230	Aroclor-1254	11097-69-1	0.40	µg/L	0.4	U		
0805L068-005	G013	W	08LE0230	Aroclor-1260	11096-82-5	0.40	µg/L	0.4	U		
0805L102-001	B121	S	08LE0235	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0805L102-001	B121	S	08LE0235	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0805L102-001	B121	S	08LE0235	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0805L102-001	B121	S	08LE0235	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0805L102-001	B121	S	08LE0235	Aroclor-1248	12672-29-6	14	µg/kg	14	U		

Table 2-25. Summary of PCB Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0805L102-001	B121	S	08LE0235	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0805L102-001	B121	S	08LE0235	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0805L102-002	B122	S	08LE0235	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0805L102-002	B122	S	08LE0235	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0805L102-002	B122	S	08LE0235	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0805L102-002	B122	S	08LE0235	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0805L102-002	B122	S	08LE0235	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0805L102-002	B122	S	08LE0235	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0805L102-002	B122	S	08LE0235	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0805L107-001	B125	S	08LE0235	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0805L107-001	B125	S	08LE0235	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0805L107-001	B125	S	08LE0235	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0805L107-001	B125	S	08LE0235	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0805L107-001	B125	S	08LE0235	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0805L107-001	B125	S	08LE0235	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0805L107-001	B125	S	08LE0235	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0805L107-002	B126	S	08LE0235	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0805L107-002	B126	S	08LE0235	Aroclor-1221	11104-28-2	14	µg/kg	14	U		
0805L107-002	B126	S	08LE0235	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0805L107-002	B126	S	08LE0235	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0805L107-002	B126	S	08LE0235	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0805L107-002	B126	S	08LE0235	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0805L107-002	B126	S	08LE0235	Aroclor-1260	11096-82-5	14	µg/kg	14	U		
0805L107-003	B127	S	08LE0235	Aroclor-1016	12674-11-2	14	µg/kg	14	U		
0805L107-003	B127	S	08LE0235	Aroclor-1221	11104-28-2	14	µg/kg	14	U		

Table 2-25. Summary of PCB Validation. (20 Pages)

Lab ID	Client ID	Matrix	Batch ID	Analyte	CAS	Conc.	Units	EQL	Q	V	Reason
0805L107-003	B127	S	08LE0235	Aroclor-1232	11141-16-5	14	µg/kg	14	U		
0805L107-003	B127	S	08LE0235	Aroclor-1242	53469-21-9	14	µg/kg	14	U		
0805L107-003	B127	S	08LE0235	Aroclor-1248	12672-29-6	14	µg/kg	14	U		
0805L107-003	B127	S	08LE0235	Aroclor-1254	11097-69-1	14	µg/kg	14	U		
0805L107-003	B127	S	08LE0235	Aroclor-1260	11096-82-5	14	µg/kg	14	U		

CAS - Chemical Abstracts System
EQL - estimated quantitation limit
Q - laboratory qualifier
RPD - relative percent difference
S soil
V - validation qualifier
W - water

2.8.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each field sample and each QC sample?
- Was precision checked with an MSD?

Table 2-26 shows the number of each type of sample in each preparation batch.

Table 2-26. PCB Preparation Batch Summary. (4 Pages)

Matrix	Batch ID	Analyte	CAS	MB	LCS	MS	MSD	Sample	Surr
S	08LE0106	Aroclor-1016	12674-11-2	1	1	1	*	7	
S	08LE0106	Aroclor-1221	11104-28-2	1				7	
S	08LE0106	Aroclor-1232	11141-16-5	1				7	
S	08LE0106	Aroclor-1242	53469-21-9	1				7	
S	08LE0106	Aroclor-1248	12672-29-6	1				7	
S	08LE0106	Aroclor-1254	11097-69-1	1				7	
S	08LE0106	Aroclor-1260	11096-82-5	1	1	1	*	7	
S	08LE0106	Decachlorobiphenyl	2051-24-3						11
S	08LE0106	Tetrachloro-m-xylene	877-09-8						11
S	08LE0114	Aroclor-1016	12674-11-2	1	1	1	1	8	
S	08LE0114	Aroclor-1221	11104-28-2	1				8	
S	08LE0114	Aroclor-1232	11141-16-5	1				8	
S	08LE0114	Aroclor-1242	53469-21-9	1				8	
S	08LE0114	Aroclor-1248	12672-29-6	1				8	
S	08LE0114	Aroclor-1254	11097-69-1	1				8	
S	08LE0114	Aroclor-1260	11096-82-5	1	1	1	1	8	
S	08LE0114	Decachlorobiphenyl	2051-24-3						12
S	08LE0114	Tetrachloro-m-xylene	877-09-8						12
S	08LE0142	Aroclor-1016	12674-11-2	1	1	1	1	4	
S	08LE0142	Aroclor-1221	11104-28-2	1				4	
S	08LE0142	Aroclor-1232	11141-16-5	1				4	
S	08LE0142	Aroclor-1242	53469-21-9	1				4	
S	08LE0142	Aroclor-1248	12672-29-6	1				4	
S	08LE0142	Aroclor-1254	11097-69-1	1				4	
S	08LE0142	Aroclor-1260	11096-82-5	1	1	1	1	4	
S	08LE0142	Decachlorobiphenyl	2051-24-3						8
S	08LE0142	Tetrachloro-m-xylene	877-09-8						8
S	08LE0145	Aroclor-1016	12674-11-2	1	1	1	1	3	
S	08LE0145	Aroclor-1221	11104-28-2	1				3	

Table 2-26. PCB Preparation Batch Summary. (4 Pages)

Matrix	Batch ID	Analyte	CAS	MB	LCS	MS	MSD	Sample	Surr
S	08LE0145	Aroclor-1232	11141-16-5	1				3	
S	08LE0145	Aroclor-1242	53469-21-9	1				3	
S	08LE0145	Aroclor-1248	12672-29-6	1				3	
S	08LE0145	Aroclor-1254	11097-69-1	1				3	
S	08LE0145	Aroclor-1260	11096-82-5	1	1	1	1	3	
S	08LE0145	Decachlorobiphenyl	2051-24-3						7
S	08LE0145	Tetrachloro-m-xylene	877-09-8						7
S	08LE0166	Aroclor-1016	12674-11-2	1	1	1	1	6	
S	08LE0166	Aroclor-1221	11104-28-2	1				6	
S	08LE0166	Aroclor-1232	11141-16-5	1				6	
S	08LE0166	Aroclor-1242	53469-21-9	1				6	
S	08LE0166	Aroclor-1248	12672-29-6	1				6	
S	08LE0166	Aroclor-1254	11097-69-1	1				6	
S	08LE0166	Aroclor-1260	11096-82-5	1	1	1	1	6	
S	08LE0166	Decachlorobiphenyl	2051-24-3						10
S	08LE0166	Tetrachloro-m-xylene	877-09-8						10
S	08LE0174	Aroclor-1016	12674-11-2	1	1			6	
S	08LE0174	Aroclor-1221	11104-28-2	1				6	
S	08LE0174	Aroclor-1232	11141-16-5	1				6	
S	08LE0174	Aroclor-1242	53469-21-9	1				6	
S	08LE0174	Aroclor-1248	12672-29-6	1				6	
S	08LE0174	Aroclor-1254	11097-69-1	1				6	
S	08LE0174	Aroclor-1260	11096-82-5	1	1			6	
S	08LE0174	Decachlorobiphenyl	2051-24-3						8
S	08LE0174	Tetrachloro-m-xylene	877-09-8						8
S	08LE0184	Aroclor-1016	12674-11-2	1	1			2	
S	08LE0184	Aroclor-1221	11104-28-2	1				2	
S	08LE0184	Aroclor-1232	11141-16-5	1				2	
S	08LE0184	Aroclor-1242	53469-21-9	1				2	
S	08LE0184	Aroclor-1248	12672-29-6	1				2	
S	08LE0184	Aroclor-1254	11097-69-1	1				2	
S	08LE0184	Aroclor-1260	11096-82-5	1	1			2	
S	08LE0184	Decachlorobiphenyl	2051-24-3						4
S	08LE0184	Tetrachloro-m-xylene	877-09-8						4
S	08LE0199	Aroclor-1016	12674-11-2	1	1	1	1	10	
S	08LE0199	Aroclor-1221	11104-28-2	1				10	
S	08LE0199	Aroclor-1232	11141-16-5	1				10	
S	08LE0199	Aroclor-1242	53469-21-9	1				10	
S	08LE0199	Aroclor-1248	12672-29-6	1				10	

Table 2-26. PCB Preparation Batch Summary. (4 Pages)

Matrix	Batch ID	Analyte	CAS	MB	LCS	MS	MSD	Sample	Surr
S	08LE0199	Aroclor-1254	11097-69-1	1				10	
S	08LE0199	Aroclor-1260	11096-82-5	1	1	1	1	10	
S	08LE0199	Decachlorobiphenyl	2051-24-3						14
S	08LE0199	Tetrachloro-m-xylene	877-09-8						14
S	08LE0224	Aroclor-1016	12674-11-2	1	1			2	
S	08LE0224	Aroclor-1221	11104-28-2	1				2	
S	08LE0224	Aroclor-1232	11141-16-5	1				2	
S	08LE0224	Aroclor-1242	53469-21-9	1				2	
S	08LE0224	Aroclor-1248	12672-29-6	1				2	
S	08LE0224	Aroclor-1254	11097-69-1	1				2	
S	08LE0224	Aroclor-1260	11096-82-5	1	1			2	
S	08LE0224	Decachlorobiphenyl	2051-24-3						4
S	08LE0224	Tetrachloro-m-xylene	877-09-8						4
S	08LE0225	Aroclor-1016	12674-11-2	1	1	1	1	4	
S	08LE0225	Aroclor-1221	11104-28-2	1				4	
S	08LE0225	Aroclor-1232	11141-16-5	1				4	
S	08LE0225	Aroclor-1242	53469-21-9	1				4	
S	08LE0225	Aroclor-1248	12672-29-6	1				4	
S	08LE0225	Aroclor-1254	11097-69-1	1				4	
S	08LE0225	Aroclor-1260	11096-82-5	1	1	1	1	4	
S	08LE0225	Decachlorobiphenyl	2051-24-3						8
S	08LE0225	Tetrachloro-m-xylene	877-09-8						8
S	08LE0227	Aroclor-1016	12674-11-2	1	1			1	
S	08LE0227	Aroclor-1221	11104-28-2	1				1	
S	08LE0227	Aroclor-1232	11141-16-5	1				1	
S	08LE0227	Aroclor-1242	53469-21-9	1				1	
S	08LE0227	Aroclor-1248	12672-29-6	1				1	
S	08LE0227	Aroclor-1254	11097-69-1	1				1	
S	08LE0227	Aroclor-1260	11096-82-5	1	1			1	
S	08LE0227	Decachlorobiphenyl	2051-24-3						3
S	08LE0227	Tetrachloro-m-xylene	877-09-8						3
S	08LE0235	Aroclor-1016	12674-11-2	1	2			5	
S	08LE0235	Aroclor-1221	11104-28-2	1				5	
S	08LE0235	Aroclor-1232	11141-16-5	1				5	
S	08LE0235	Aroclor-1242	53469-21-9	1				5	
S	08LE0235	Aroclor-1248	12672-29-6	1				5	
S	08LE0235	Aroclor-1254	11097-69-1	1				5	
S	08LE0235	Aroclor-1260	11096-82-5	1	2			5	
S	08LE0235	Decachlorobiphenyl	2051-24-3						8

Table 2-26. PCB Preparation Batch Summary. (4 Pages)

Matrix	Batch ID	Analyte	CAS	MB	LCS	MS	MSD	Sample	Surr
S	08LE0235	Tetrachloro-m-xylene	877-09-8						8
W	08LE0109	Aroclor-1016	12674-11-2	1	2	1	1	5	
W	08LE0109	Aroclor-1221	11104-28-2	1				5	
W	08LE0109	Aroclor-1232	11141-16-5	1				5	
W	08LE0109	Aroclor-1242	53469-21-9	1				5	
W	08LE0109	Aroclor-1248	12672-29-6	1				5	
W	08LE0109	Aroclor-1254	11097-69-1	1				5	
W	08LE0109	Aroclor-1260	11096-82-5	1	2	1	1	5	
W	08LE0109	Decachlorobiphenyl	2051-24-3						10
W	08LE0109	Tetrachloro-m-xylene	877-09-8						10
W	08LE0230	Aroclor-1016	12674-11-2	1	1			5	
W	08LE0230	Aroclor-1221	11104-28-2	1				5	
W	08LE0230	Aroclor-1232	11141-16-5	1				5	
W	08LE0230	Aroclor-1242	53469-21-9	1				5	
W	08LE0230	Aroclor-1248	12672-29-6	1				5	
W	08LE0230	Aroclor-1254	11097-69-1	1				5	
W	08LE0230	Aroclor-1260	11096-82-5	1	1			5	
W	08LE0230	Decachlorobiphenyl	2051-24-3						7
W	08LE0230	Tetrachloro-m-xylene	877-09-8						7

* The MSD for batch 08LE0106 was reported as "not spiked," so it is not included here as a valid result.

CAS - Chemical Abstracts System
LCS - laboratory control sample
MB - method blank
MS - matrix spike
MSD - matrix spike duplicate
S - soil
Surr - Surrogate
W - water

PCB analysis was performed on 12 batches of soil samples and two batches of water samples. Each batch contained fewer than 20 field samples. An MB was analyzed in each sample batch, and at least one LCS containing Aroclor-1016 and Aroclor-1260 was analyzed in each sample batch.

The project goal for MS and MSD analysis is to analyze one of each for every 20 field samples of each matrix type, averaged over the project. Aroclor-1016 and Aroclor-1260 are to be spiked into each MS and MSD. For this group of samples, MS results were reported for seven out of the 12 soil batches, and MSD results were reported for six batches. MS and MSD were reported for one of the two water batches. There were 116 soil samples and 20 water samples analyzed, so the frequency of MS/MSD analyses exceeds the one-in-twenty average required for the project goal.

Surrogates were added to and analyzed in every sample, LCS, MB, MS, and MSD.

2.8.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for PCB analysis by method 8082 are specified in VET-1405-PLN-03, Rev. 0, as 14 days for soil and water samples. EPA (SW-846, Chapters 2 and 4) does not provide guidance for holding time for extraction of PCBs. Method 8082 indicates that samples should be analyzed within 40 days after extraction. Usually accepted holding times to extraction for PCBs are 7 days for water samples and 14 days for soil samples, with an additional 40 days for analysis. Since PCBs are quite stable, the usually accepted hold time limits were applied in this data validation. All sample results met these limits.

2.8.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The required quantitation limits (VET-1405-PLN-03, Rev. 0) are 1 µg/L in groundwater samples and 5000 µg/kg for soil samples.

PCBs were not detected in the MBs. Detection limits were below the required quantitation limits.

2.8.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

All results were nondetects. Detection limits met the requirements.

2.8.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, MSD, and surrogates meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS/MSD recoveries must be within the statistical limits set by the lab. These limits are shown in Table 2-27.

Table 2-27. LCS, MS/MSD, and Surrogate Limits for PCBs.

Matrix	Analyte	CAS	LCL (%)	UCL (%)
Water	Aroclor-1016	12674-11-2	49	119
Water	Aroclor-1260	11096-82-5	53	128
Water	Decachlorobiphenyl	2051-24-3	22	131
Water	Tetrachloro-m-xylene	877-09-8	45	117
Soil	Aroclor-1016	12674-11-2	50	138
Soil	Aroclor-1260	11096-82-5	50	148
Soil	Decachlorobiphenyl	2051-24-3	43	144
Soil	Tetrachloro-m-xylene	877-09-8	52	141

CAS - Chemical Abstracts System
LCL - lower control limit
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
PCB - polychlorinated biphenyl
UCL - upper control limit

In solid-sample batch 08LE0145, the result for Aroclor-1260 in the MS was 162%, exceeding the upper control limit (UCL). The result for the decachlorobiphenyl surrogate in the MS was also high (165%). However, since all associated sample results were nondetects, no qualification of results is required.

Both surrogate results for sample B069 exceeded the UCLs. Again, since all results were nondetects, no qualification of results is required.

All other LCS, MS, MSD, and surrogate recoveries were within the limits given in Table 2-27.

2.8.6. QC Check for Precision

- Did the MS/MSD relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the RPD between MS and MSD must be less than 20%. Table 2-28 shows the RPDs that exceeded 20%.

Table 2-28. MS/MSD RPDs for PCBs that exceeded the QC criterion

Batch ID	Matrix	Analyte	CAS	Recovery (%)		RPD (%)
				MS	MSD	
08LE0145	S	Aroclor-1016	12674-11-2	134	89	40.4
08LE0145	S	Aroclor-1260	11096-82-5	162	101	46.4
08LE0166	S	Aroclor-1016	12674-11-2	84	103	20.3
08LE0166	S	Aroclor-1260	11096-82-5	90	112	21.8

CAS - Chemical Abstracts System
MS - matrix spike
MSD - matrix spike duplicate
RPD - relative percent difference
S - soil

Because the precision criterion was exceeded for batches 08LE0145 and 08LE0166, all results in these batches were qualified as approximate and flagged "UJ." All other MS/MSD RPDs met the 20% criterion.

2.9. DATA VALIDATION REPORT FOR VOLATILE ORGANIC COMPOUNDS (METHOD 8260)

Eighty compounds were requested for each of the 95 samples in this group. Results were reported in the EDDs for the 78 compounds that the laboratory commonly reports. The remaining two, 1,4-difluorobenzene and tetrahydrofuran, are not expected to be detected regularly. The laboratory is performing a spectral search for those, and is reporting the results in the data package narrative.

The table listing the results is too large to include here. Please refer to the Microsoft Excel® file in the accompanying CD-ROM.

2.9.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each sample and each batch QC sample?
- Was precision checked with a MSD or DUP?

Volatile organic analysis was performed in 11 batches of solid samples, and 4 batches of water samples. Each batch contained fewer than 20 field samples. Results for 78 compounds were reported for each of the 95 samples (71 soils and 24 water samples, including trip blanks). An MB result was reported for each of the 78 compounds in each of the 16 batches. An LCS containing 48 of the compounds of interest was prepared and analyzed with all batches.

MS and MSD results were obtained for solids batches 08LVK075 and 08LVK086. In addition, an MS and MSD were obtained for sample B124 in batch 08LVK091. However, the MS and MSD were prepared and analyzed three days later in a different batch than the sample. The validation rules require that the MS and MSD be prepared with the associated samples, so the MS and MSD are not counted here. Two MSs and MSDs were obtained for the 71 soil samples. This does not support the project-average goal of obtaining one MS and one MSD result for every 20 samples of each matrix type. However, when the first group of results validated (EQM-DVAL-USE-001, Rev. 0) is considered together with this group, six MS/MSD pairs have been analyzed with 100 samples. This exceeds the 1-in-20 goal for MS/MSD analysis.

No MS or MSD results were obtained for the water sample batches examined in this validation group. Although MS and MSD were analyzed for water sample G014 in batch 08LVG082, the MS and MSD were prepared and analyzed two days later in a different batch than the sample. The validation rules require that the MS and MSD be prepared with the associated samples, so the MS and MSD were not counted here. Even when considered with the water samples in the first validation group, only one MS/MSD pair has been analyzed for 40 samples, including field duplicates, trip blanks, and equipment rinsates. Nevertheless, validation of project data is not yet complete, so data are not being qualified for lack of MS/MSD at this time.

Surrogates (1,2-dichloroethane-d4, bromofluorobenzene, and toluene-d8) were added to each sample, MB, LCS, MS, and MSD.

2.9.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for volatile organic analysis by method 8260B are specified in VET-1405-PLN-03, Rev. 0, as 14 days for water and soil samples. All results were generated within this limit.

2.9.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The RQLs (VET-1405-PLN-03, Rev. 0) for all VOCs are 5 µg/L for water samples and 20 µg/kg for soil samples. The compounds detected in the MBs are shown in Table 2-29.

Table 2-29. VOCs Found in Method Blanks.

Batch ID	Matrix	Sample ID	Analyte	CAS	Result	Units	Q
08LVK035	S	08LVK035-MB1MB	Methylene Chloride	75-09-2	3	µg/kg	J
08LVK038	S	08LVK038-MB1MB	1,2,4-Trichlorobenzene	120-82-1	3	µg/kg	J
08LVK038	S	08LVK038-MB1MB	2-hexanone	591-78-6	3	µg/kg	J
08LVK038	S	08LVK038-MB1MB	Methylene Chloride	75-09-2	9	µg/kg	
08LVK038	S	08LVK038-MB2MB	Methylene Chloride	75-09-2	10	µg/kg	B
08LVK038	S	08LVK038-MB1MB	Naphthalene	91-20-3	2	µg/kg	J
08LVK065	S	08LVK065-MB1MB	1,2,4-Trichlorobenzene	120-82-1	1	µg/kg	J
08LVK065	S	08LVK065-MB1MB	Methylene Chloride	75-09-2	6	µg/kg	
08LVK065	S	08LVK065-MB1MB	Naphthalene	91-20-3	1	µg/kg	J
08LVK072	S	08LVK072-MB1MB	1,2,4-Trichlorobenzene	120-82-1	1	µg/kg	J
08LVK072	S	08LVK072-MB1MB	Methylene Chloride	75-09-2	2	µg/kg	J
08LVK073	S	08LVK073-MB1MB	1,2,4-Trichlorobenzene	120-82-1	3	µg/kg	J
08LVK073	S	08LVK073-MB1MB	1,4-Dichlorobenzene	106-46-7	1	µg/kg	J
08LVK073	S	08LVK073-MB1MB	Methylene Chloride	75-09-2	9	µg/kg	
08LVK075	S	08LVK075-MB1MB	1,2,4-Trichlorobenzene	120-82-1	1	µg/kg	J
08LVK075	S	08LVK075-MB1MB	Methylene Chloride	75-09-2	4	µg/kg	J
08LVK077	S	08LVK077-MB1MB	Methylene Chloride	75-09-2	9	µg/kg	
08LVK082	S	08LVK082-MB1MB	Methylene Chloride	75-09-2	2	µg/kg	J
08LVK085	S	08LVK085-MB1MB	Methylene Chloride	75-09-2	3	µg/kg	J
08LVK086	S	08LVK086-MB1MB	1,2,4-Trichlorobenzene	120-82-1	1	µg/kg	J
08LVK086	S	08LVK086-MB1MB	Acetone	67-64-1	11	µg/kg	
08LVK086	S	08LVK086-MB1MB	Methylene Chloride	75-09-2	6	µg/kg	
08LVK091	S	08LVK091-MB1MB	1,2,4-Trichlorobenzene	120-82-1	1	µg/kg	J
08LVK091	S	08LVK091-MB1MB	Methylene Chloride	75-09-2	7	µg/kg	
08LVG033	W	08LVG033-MB1MB	Methylene Chloride	75-09-2	3	µg/L	J
08LVG053	W	08LVG053-MB1MB	Methylene Chloride	75-09-2	1	µg/L	J
08LVG082	W	08LVG082-MB1MB	Methylene Chloride	75-09-2	2	µg/L	J

CAS - Chemical Abstracts System
Q - laboratory qualifier
S - soil
VOC - volatile organic compound
W - water

Methylene chloride was detected in the MBs for all batches except 08LVG043. Methylene chloride is a common laboratory contaminant, so any detections in the affected batches less than ten times the blank concentration were qualified as estimated nondetects and were flagged "UJ." All methylene chloride detections for samples in these batches were at or below the RQL; the results below the RQL were raised to the RQL. Nondetect results for methylene chloride were not qualified.

Naphthalene was detected in the blanks for batches 08LVK038 and 08LVK065. Naphthalene was also detected in samples B028 and B046 in these batches. These two sample results were less than the RQL and less than five times the blank result. In accordance with the validation rules, the sample result was raised to the RQL, qualified as an estimated nondetect, and flagged "UJ." All other naphthalene results in these batches were nondetects. Nondetects do not require qualification for blank contamination.

Acetone was detected in the blank for batch 08LVK086. All sample results for acetone in this batch were detects less than the RQL and less than five times the blank result. These results were raised to the RQL, qualified as estimated nondetects, and flagged "UJ."

The compound 1,2,4-trichlorobenzene was detected in the method blanks for several batches. Also, 2-hexanone and 1,4-dichlorobenzene were each detected in the method blank for a single batch. However, all sample results for these compounds in the respective batches were nondetects. Nondetects do not require qualification for blank contamination.

2.9.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Of the 5538 volatile organic analysis (VOA) results reported for soil samples, four were nondetects exceeding the required detection limit of 20 µg/kg. These exceedances were all for 2-nitropropane. Of 1872 results reported for water samples, 425 were nondetects exceeding the required detection limit of 5 µg/L. Detection limit exceedances are not required to be qualified.

2.9.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, MSD, and surrogates meet the accuracy criteria?

The statistical QC limits determined by the laboratory for surrogate compounds are listed in Table 2-30. The surrogate recoveries were reviewed, and two were found to lie outside the acceptable range. One of these exceedances was 4-bromofluorobenzene in the trip blank for SDG 0803L798. The surrogate recovery was 116% vs. the UCL of 115%. The surrogate 4-bromofluorobenzene represents halogenated aromatic compounds. There were no detected halogenated aromatic compounds in the SDG 0803L798 trip blank, so qualification of results was not required.

The other surrogate exceedance was toluene-d8 in the LCS for batch 08LVG053. The surrogate recovery was 117% vs. the UCL of 114%. The surrogate toluene-d8 represents nonhalogenated aromatic compounds. There were no detected nonhalogenated aromatic compounds in batch 08LV053, so qualification of results was not required.

Recoveries for all other surrogates were within the limits given in Table 2-30.

Table 2-30. Statistical Limits for VOA Surrogate Compounds

Surrogate	Soil Samples		Water Samples	
	LCL (%)	UCL (%)	LCL (%)	UCL (%)
1,2-Dichloroethane-d4	63	151	74	125
Toluene-d8	68	140	85	114
4-Bromofluorobenzene	66	122	81	115

CAS - Chemical Abstracts System
LCL - lower control limit
UCL - upper control limit
VOA - volatile organic analysis

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS/MSD recoveries must be within the statistical limits set by the lab. These limits are shown in Table 2-31.

Table 2-31. Lionville Laboratory Limits for LCS, MS, and MSD Recovery (Water and Soil Samples). (2 Pages)

Analyte	CAS	LCL (%)	UCL (%)
1,1,1-Trichloroethane	71-55-6	65	130
1,1,2,2-Tetrachloroethane	79-34-5	65	130
1,1,2-Trichloroethane	79-00-5	75	125
1,1-Dichloroethane	75-34-3	70	135
1,1-Dichloroethene	75-35-4	70	130
1,2,4-Trichlorobenzene	120-82-1	65	135
1,2-Dibromo-3-chloropropane	96-12-8	50	130
1,2-Dibromoethane	106-93-4	80	120
1,2-Dichlorobenzene	95-50-1	70	120
1,2-Dichloroethane	107-06-2	70	130
1,2-Dichloroethene (total)	540-59-0	60	140
1,2-Dichloropropane	78-87-5	75	150
1,3-Dichlorobenzene	541-73-1	75	125
1,4-Dichlorobenzene	106-46-7	75	125

Table 2-31. Lionville Laboratory Limits for LCS, MS, and MSD Recovery (Water and Soil Samples). (2 Pages)

Analyte	CAS	LCL (%)	UCL (%)
2-Butanone	78-93-3	30	150
2-hexanone	591-78-6	55	130
4-Methyl-2-pentanone	108-10-1	60	135
Acetone	67-64-1	40	140
Benzene	71-43-2	80	120
Bromodichloromethane	75-27-4	75	120
Bromoform	75-25-2	70	130
Bromomethane	74-83-9	30	145
Carbon Disulfide	75-15-0	35	160
Carbon Tetrachloride	56-23-5	65	140
Chlorobenzene	108-90-7	80	120
Chloroethane	75-00-3	60	135
Chloroform	67-66-3	65	135
Chloromethane	74-87-3	40	125
Cis-1,2-dichloroethene	156-59-2	70	125
cis-1,3-Dichloropropene	10061-01-5	70	130
Dibromochloromethane	124-48-1	75	120
Dichlorodifluoromethane	75-71-8	30	155
Ethylbenzene	100-41-4	75	125
Freon 113	76-13-1	60	140
Isopropylbenzene	98-82-8	75	125
m- and p-Xylene	M+P_XYLENE	75	130
Methylene Chloride	75-09-2	55	140
Methyl-T-Butylether	1634-04-4	65	125
O-Xylene	95-47-6	80	120
Styrene	100-42-5	65	135
Tetrachloroethene	127-18-4	45	150
Toluene	108-88-3	75	120
Trans-1,2-dichloroethene	156-60-5	60	140
Trans-1,3-Dichloropropene	10061-02-6	55	140
Trichloroethene	79-01-6	70	125
Trichlorofluoromethane	75-69-4	60	145
Vinyl Chloride	75-01-4	50	145
Xylene (total)	1330-20-7	75	130

CAS - Chemical Abstracts System
LCL - lower control limit
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
UCL - upper control limit

Table 2-32 shows the LCS recoveries that were outside the control limits. All results for the analytes listed in the table and in the indicated batches were qualified as estimates and flagged with a "J" for detects and "UJ" for nondetects.

Table 2-32. LCS Recoveries That Did Not Satisfy QC Limits.

Batch ID	Matrix	Analyte	CAS	Recovery (%)	LCL (%)	UCL (%)
08LVK035	S	2-Butanone	78-93-3	193	30	150
08LVK035	S	2-hexanone	591-78-6	158	55	130
08LVK035	S	Acetone	67-64-1	239	40	140
08LVK035	S	Chloroethane	75-00-3	144	60	135
08LVK038	S	1,1,2,2-Tetrachloroethane	79-34-5	170	65	130
08LVK038	S	1,2-Dibromo-3-chloropropane	96-12-8	215	50	130
08LVK038	S	1,2-Dibromoethane	106-93-4	126	80	120
08LVK038	S	2-hexanone	591-78-6	173	55	130
08LVK038	S	4-Methyl-2-pentanone	108-10-1	160	60	135
08LVK038	S	Acetone	67-64-1	143	40	140
08LVK065	S	2-Butanone	78-93-3	159	30	150
08LVK065	S	2-hexanone	591-78-6	133	55	130
08LVK065	S	Acetone	67-64-1	221	40	140
08LVK072	S	Acetone	67-64-1	223	40	140
08LVK073	S	Acetone	67-64-1	211	40	140
08LVK075	S	2-Butanone	78-93-3	182	30	150
08LVK075	S	2-hexanone	591-78-6	155	55	130
08LVK075	S	Acetone	67-64-1	210	40	140
08LVK077	S	Chloromethane	74-87-3	131	40	125
08LVK082	S	Acetone	67-64-1	151	40	140
08LVK085	S	2-hexanone	591-78-6	138	55	130
08LVK085	S	Acetone	67-64-1	175	40	140
08LVK086	S	2-Butanone	78-93-3	159	30	150
08LVK086	S	2-hexanone	591-78-6	141	55	130
08LVK086	S	Acetone	67-64-1	169	40	140
08LVK091	S	Acetone	67-64-1	142	40	140

CAS - Chemical Abstracts System
LCL - lower control limit
LCS - laboratory control sample
QC - quality control
S - soil
UCL - upper control limit

Table 2-33 shows the VOA MS and MSD recoveries that were not within the QC limits. The surrogate results for these batches were all within limits, so no qualification of sample results was required.

Table 2-33. VOA MS and MSD Recoveries That Did Not Satisfy QC Limits. (2 Pages)

Batch ID	Matrix	QC Type	Analyte	CAS	Sample	Sample Result	Sample Q	Sample EQL	Units	Spike Conc.	Spiked Result	Q	Rec. (%)	LCL (%)	UCL (%)
08LVK075	S	MS	1,1,2,2-Tetrachloroethane	79-34-5	B079	5	U	5	µg/kg	56.9	80.8		142	65	130
08LVK075	S	MSD	1,1,2,2-Tetrachloroethane	79-34-5	B079	5	U	5	µg/kg	53.5	71.7		134	65	130
08LVK075	S	MS	1,2-Dibromo-3-chloropropane	96-12-8	B079	10	U	10	µg/kg	56.9	107.0		188	50	130
08LVK075	S	MSD	1,2-Dibromo-3-chloropropane	96-12-8	B079	10	U	10	µg/kg	53.5	93.6		175	50	130
08LVK075	S	MS	2-Butanone	78-93-3	B079	10	U	10	µg/kg	56.9	101.3		178	30	150
08LVK075	S	MSD	2-Butanone	78-93-3	B079	10	U	10	µg/kg	53.5	97.9		183	30	150
08LVK075	S	MS	2-hexanone	591-78-6	B079	10	U	10	µg/kg	56.9	97.9		172	55	130
08LVK075	S	MSD	2-hexanone	591-78-6	B079	10	U	10	µg/kg	53.5	89.9		168	55	130
08LVK075	S	MS	4-Methyl-2-pentanone	108-10-1	B079	10	U	10	µg/kg	56.9	89.9		158	60	135
08LVK075	S	MSD	4-Methyl-2-pentanone	108-10-1	B079	10	U	10	µg/kg	53.5	81.3		152	60	135
08LVK075	S	MS	Acetone	67-64-1	B079	10	U	10	µg/kg	56.9	85.3		150	40	140
08LVK086	S	MSD	1,1,2,2-Tetrachloroethane	79-34-5	S10	4	U	4	µg/kg	42.9	61.0		142	65	130
08LVK086	S	MS	1,2-Dibromo-3-chloropropane	96-12-8	S10	8	U	8	µg/kg	45.1	64.1		142	50	130
08LVK086	S	MSD	1,2-Dibromo-3-chloropropane	96-12-8	S10	8	U	8	µg/kg	42.9	75.1		175	50	130
08LVK086	S	MSD	1,2-Dibromoethane	106-93-4	S10	4	U	4	µg/kg	42.9	52.4		122	80	120
08LVK086	S	MS	1,2-Dichloroethane	107-06-2	S10	4	U	4	µg/kg	45.1	60.4		134	70	130
08LVK086	S	MSD	1,2-Dichloroethane	107-06-2	S10	4	U	4	µg/kg	42.9	58.8		137	70	130
08LVK086	S	MS	2-Butanone	78-93-3	S10	8	U	8	µg/kg	45.1	69.9		155	30	150
08LVK086	S	MSD	2-Butanone	78-93-3	S10	8	U	8	µg/kg	42.9	78.6		183	30	150
08LVK086	S	MS	2-hexanone	591-78-6	S10	8	U	8	µg/kg	45.1	69.0		153	55	130
08LVK086	S	MSD	2-hexanone	591-78-6	S10	8	U	8	µg/kg	42.9	79.0		184	55	130
08LVK086	S	MS	4-Methyl-2-pentanone	108-10-1	S10	8	U	8	µg/kg	45.1	67.7		150	60	135
08LVK086	S	MSD	4-Methyl-2-pentanone	108-10-1	S10	8	U	8	µg/kg	42.9	75.1		175	60	135

Table 2-33. VOA MS and MSD Recoveries That Did Not Satisfy QC Limits. (2 Pages)

Batch ID	Matrix	QC Type	Analyte	CAS	Sample	Sample			Units	Spike Conc.	Spiked Result	Q	Rec. (%)	LCL (%)	UCL (%)
						Result	Q	EQL							
08LVK086	S	MS	Chloromethane	74-87-3	S10	8	U	8	µg/kg	45.1	75.8		168	40	125
08LVK086	S	MSD	Chloromethane	74-87-3	S10	8	U	8	µg/kg	42.9	66.1		154	40	125
08LVK086	S	MSD	Methyl-T-Butylether	1634-04-4	S10	4	U	4	µg/kg	42.9	54.5		127	65	125

CAS - Chemical Abstracts System
EQL - estimated quantitation limit
LCL - lower control limit
MS - matrix spike
MSD - matrix spike duplicate
Q - laboratory qualifier
QC - quality control
UCL - upper control limit
VOA - volatile organic analysis

2.9.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

Table 2-34 shows the two MS/MSD RPDs that did not meet the 20% limit set by the laboratory. Associated sample results (all nondetects) were qualified as estimates and flagged "UJ."

Table 2-34. VOA RPDs That Did Not Satisfy Criteria.

Batch ID	Matrix	Analyte	CAS	Sample	MS Rec. (%)	MSD Rec. (%)	RPD
08LVK075	S	1,2,4-Trichlorobenzene	120-82-1	B079	70	90	25
08LVK086	S	1,2-Dibromo-3-chloropropane	96-12-8	S10	142	175	20.8

CAS - Chemical Abstracts System
MS - matrix spike
MSD - matrix spike duplicate
RPD - relative percent difference
VOA - volatile organic analysis

2.10. DATA VALIDATION REPORT FOR SEMIVOLATILE ORGANIC COMPOUNDS (METHOD 8270)

Eighty-five SVOCs were requested for each of the 63 samples in this group. Semi-volatile organic analysis (SVOA) results were reported in the EDDs for the 69 of these compounds that the laboratory commonly reports. Of the 16 SVOCs requested, but not reported by method 8270C, 1,2-dichlorobenzene, 1,3-dichlorobenzene and 1,4-dichlorobenzene, are reported as VOCs (method 8260B). For the remaining 13 (2,6-dimethylnaphthalene, 1,6,7-trimethylnaphthalene, 1-methyl-9H-fluorene, dibenzothiophene, 2-methylphenanthrene, 1-methylphenanthrene, 4,6-dimethyldibenzothiophene, 3,6-dimethylphenanthrene, 2-methylfluoranthene, retene, 5-methylchrysene, benzo(e)pyrene, and perylene) the laboratory is performing a spectral search, and is reporting the results for them in the data package narrative.

The table listing the analytical results and the results of the validation for SVOCs is too large to include here. Please refer to the Microsoft Excel® file in the accompanying CD-ROM.

2.10.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each sample and each batch QC sample?
- Was precision checked with a MSD or DUP?

Semivolatile organic analysis was performed in 13 batches. Each batch contained fewer than 20 field samples. An MB result was reported for each of the reported compounds in all but one of the batches. Table 2-35 shows the numbers of QC and field samples analyzed in each batch.

Table 2-35. SVOA Preparation Batch Summary.

QC Batch ID	Matrix	BLK	LCS	MS	MSD	Surr	Sample
08LE0107	S	1	2	2	2	17	10
08LE0108	W	1	2	1	1	5	10
08LE0143	S	1	1	1	1	4	8
08LE0147	S	1	1	0	0	5	3
08LE0169	S	1	1	1	1	10	6
08LE0177	S	1	1	0	0	10	8
08LE0189	S	1	1	1	1	9	5
08LE0200	S	1	1	0	0	7	5
08LE0218	S	1	1	0	0	2	3
08LE0219	S	1	2	0	0	7	4
08LE0226	W	1	1	0	0	7	5
08LE0229	S	1	1	0	0	3	1
08LE0237	S	1	1	0	0	7	5

BLK - blank
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
QC - quality control
S - soil
Surr - Surrogate
SVOA - semi-volatile organic analysis
W - water

In batch 08LE0218, blank results were reported for only 44 of the analytes reported in the samples. The compounds omitted from the blank results were 2,2'-oxybis(1-chloropropane), 2,4-dimethylphenol, 2-chlorophenol, 2-methylphenol, 2-nitrophenol, 3-and/or 4-methylphenol, benzoic acid, benzyl alcohol, bis(2-chloroethoxy)methane, bis(2-chloroethyl)ether, hexachloroethane, isophorone, nitrobenzene, n-nitroso-di-n-propylamine, and phenol. All sample results for these compounds in batch 08LE0218 were qualified as estimated because the blank values were missing. The detect results were flagged “J,” and the nondetect results were flagged “UJ.”

An LCS was prepared and analyzed with each batch. For batch 08LE0219, the LCS contained all reported compounds. The LCS for the other batches contained all compounds except 1,1-biphenyl. The LCS is not required to contain all compounds of interest. Therefore, no results were qualified for missing LCS.

MS and MSD results were obtained for one of the two batches of water samples and for four of the eleven batches of soil samples. The spikes contained all compounds of interest except 1,1-biphenyl. The project goal is to obtain one MS and MSD analysis for every 20 samples of each matrix type. Since there were 15 water samples and 58 soil samples analyzed, the number of MSs and MSDs supports this goal.

Surrogates (2,4,6-tribromophenol, 2-fluorobiphenyl, 2-fluorophenol, nitrobenzene-d5, phenol-d5, p-terphenyl-d14) were added to each sample, MB, LCS, MS, and MSD, except the MB for batch 08LE0218. Sample results were not qualified for this omission.

2.10.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for SVOA by method 8260B are specified in VET-1405-PLN-03, Rev. 0. The holding times to extraction are 7 days for water samples and 14 days for soil samples. Forty additional days after extraction are allowed to complete the analysis. All results were generated within the holding time limits.

2.10.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The RQLs in soil samples are 2 µg/kg for polycyclic aromatic hydrocarbons (PAHs) and 200 µg/kg for other analytes. The required detection limits in water samples are 0.22 µg/L for PAHs and 5 µg/L for other analytes. Most compounds in the MBs were undetected; the detection limits exceeded the RQL in all cases. However, the validation rules do not require qualification of results for high detection limits.

One or more phthalates (common laboratory contaminants) were found in most of the MBs, as shown in Table 2-36. Detect results less than ten times the blank result were qualified as estimated nondetects and flagged "UJ". Any of these results that were less than the RQL were raised to the level of the RQL. Detect results less than 20 times the blank result were qualified as estimates and flagged "J". Nondetect results were not qualified.

Table 2-36. SVOCs Found in Method Blanks.

Batch ID	Matrix	Analyte	CAS	Result	Q	RQL	Units
08LE0107	S	bis(2-Ethylhexyl)phthalate	117-81-7	25	J	200	µg/kg
08LE0177	S	bis(2-Ethylhexyl)phthalate	117-81-7	100	J	200	µg/kg
08LE0218	S	bis(2-Ethylhexyl)phthalate	117-81-7	27	J	200	µg/kg
08LE0219	S	bis(2-Ethylhexyl)phthalate	117-81-7	34	J	200	µg/kg
08LE0226	W	bis(2-Ethylhexyl)phthalate	117-81-7	2	J	5	µg/L
08LE0226	W	Di-n-butylphthalate	84-74-2	1	J	5	µg/L
08LE0229	S	bis(2-Ethylhexyl)phthalate	117-81-7	37	J	200	µg/kg
08LE0229	S	Di-n-butylphthalate	84-74-2	21	J	200	µg/kg
08LE0237	S	bis(2-Ethylhexyl)phthalate	117-81-7	53	J	200	µg/kg

CAS - Chemical Abstracts System
Q - laboratory qualifier
RQL - required quantitation limit
S - soil
SVOC - semi-volatile organic compound
W - water

2.10.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The required detection limits in soil samples are 2 µg/kg for PAHs and 200 µg/kg for other analytes. The required detection limits in water samples are 0.22 µg/L for PAHs and 5 µg/L for other analytes. None of the nondetect results met these requirements. However, the validation rules do not require qualification of the results.

2.10.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, MSD, and surrogates meet the accuracy criteria?

The statistical QC limits determined by the laboratory for surrogate compounds are listed in Table 2-37. Table 2-38 lists the cases where these limits were not achieved. In all these cases, the surrogate recoveries were below the lower control limit (LCL). Note that recoveries for 2,4,6-tribromophenol in batch 08LE0143 were low both in the samples and the MB.

Detect sample results associated with these cases were qualified as estimates and flagged "J." Nondetect sample results associated with surrogate recoveries less than the LCL, but greater than 10%, were qualified as estimates and flagged "UJ." Nondetect sample results associated with surrogate recoveries less than 10% were qualified as rejected and flagged "UR."

Table 2-37. Semi-Volatile Surrogate Recovery Limits

Compound	Water (%)	Soil (%)
Nitrobenzene-d5	35 to 114	23 to 120
2-fluorobiphenyl	43 to 116	30 to 115
Terphenyl-d14	33 to 141	18 to 137
Phenol-d6	10 to 94	24 to 113
2-fluorophenol	21 to 100	25 to 121
2,4,6-tribromophenol	10 to 123	19 to 122

Table 2-38. Instances in Which the Surrogate Recover Was Not in Limits. (2 Pages)

Batch ID	Matrix	Client ID	Lab ID	Analyte	CAS	Rec. (%)
08LE0143	S		08LE0143-MB1MB	2,4,6-Tribromophenol	118-79-6	11
08LE0143	S		0803L798-002MS	2,4,6-Tribromophenol	118-79-6	16
08LE0143	S	B048	0803L798-003	2,4,6-Tribromophenol	118-79-6	16
08LE0143	S	B049	0803L798-004	2,4,6-Tribromophenol	118-79-6	9
08LE0147	S	B051	0803L816-001	2,4,6-Tribromophenol	118-79-6	12
08LE0147	S	B052	0803L816-002	2,4,6-Tribromophenol	118-79-6	12
08LE0169	S	B064	0804L873-001	2,4,6-Tribromophenol	118-79-6	18
08LE0177	S	B083	0804L911-002	2,4,6-Tribromophenol	118-79-6	15
08LE0189	S	B085	0804L957-002	2,4,6-Tribromophenol	118-79-6	8

Table 2-38. Instances in Which the Surrogate Recover Was Not in Limits. (2 Pages)

Batch ID	Matrix	Client ID	Lab ID	Analyte	CAS	Rec. (%)
08LE0200	S		08LE0200-MB1MB	Nitrobenzene-d5	4165-60-0	19
08LE0200	S		08LE0200-MB1MB	2-Fluorobiphenyl	321-60-8	21
08LE0200	S		08LE0200-MB1MB	2,4,6-Tribromophenol	118-79-6	3
08LE0200	S		08LE0200-MB1MB	2-Fluorophenol	367-12-4	20
08LE0200	S		08LE0200-MB1MB	Phenol-d5	4165-62-2	20
08LE0219	S	B107	0805L043-003	2,4,6-Tribromophenol	118-79-6	18
08LE0229	S		08LE0229-MB1MB	2,4,6-Tribromophenol	118-79-6	18

CAS - Chemical Abstracts Service
S - soil

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS/MSD recoveries must be within the statistical limits set by the lab. These limits are shown in Table 2-39.

Table 2-39. Lionville Laboratory SVOA Limits for LCS, MS, and MSD. (3 Pages)

Analyte	CAS	Solid Samples		Water Samples	
		LCL (%)	UCL (%)	LCL (%)	UCL (%)
1,2,4-Trichlorobenzene	120-82-1	60	120	40	100
1,2-Diphenylhydrazine	122-66-7	50	110	50	110
1-Methylnaphthalene	90-12-0	50	110	40	110
2,2'-oxybis(1-Chloropropane)	108-60-1	50	120	40	110
2,4,5-Trichlorophenol	95-95-4	40	140	50	110
2,4,6-Trichlorophenol	88-06-2	10	140	50	110
2,4-Dichlorophenol	120-83-2	50	130	45	110
2,4-Dimethylphenol	105-67-9	50	120	30	110
2,4-Dinitrophenol	51-28-5	20	120	15	130
2,4-Dinitrotoluene	121-14-2	60	130	50	120
2,6-Dinitrotoluene	606-20-2	50	140	50	110
2-Chloronaphthalene	91-58-7	50	130	50	110
2-Chlorophenol	95-57-8	50	130	40	140
2-Methylnaphthalene	91-57-6	60	100	40	110
2-Methylphenol	95-48-7	60	120	40	110
2-Nitroaniline	88-74-4	60	130	50	110
2-Nitrophenol	88-75-5	50	130	40	110
3,3'-Dichlorobenzidine	91-94-1	20	140	0	120
3-and/or 4-Methylphenol	1319-77-3	60	130	40	110
3-Nitroaniline	99-09-2	40	130	10	120
4,6-Dinitro-2-Methylphenol	534-52-1	40	140	40	130

Table 2-39. Lionville Laboratory SVOA Limits for LCS, MS, and MSD. (3 Pages)

Analyte	CAS	Solid Samples		Water Samples	
		LCL (%)	UCL (%)	LCL (%)	UCL (%)
4-Bromophenyl phenyl ether	101-55-3	50	120	50	110
4-Chloro-3-Methylphenol	59-50-7	60	130	40	110
4-Chloroaniline	106-47-8	20	120	10	100
4-Chlorophenyl phenyl ether	7005-72-3	50	120	50	120
4-Nitroaniline	100-01-6	50	120	10	100
4-Nitrophenol	100-02-7	40	140	10	110
Acenaphthene	83-32-9	60	130	50	110
Acenaphthylene	208-96-8	60	130	50	110
Aniline	62-53-3	20	100	5	120
Anthracene	120-12-7	60	130	50	120
Benzidine	92-87-5	0	110	0	110
Benzo(a)anthracene	56-55-3	50	130	50	120
Benzo(a)pyrene	50-32-8	50	130	50	140
Benzo(b)fluoranthene	205-99-2	60	130	50	140
Benzo(g,h,i)perylene	191-24-2	50	140	50	140
Benzo(k)fluoranthene	207-08-9	50	130	50	140
Benzoic Acid	65-85-0	10	110	0	112
Benzyl Alcohol	100-51-6	50	100	40	110
Bis(2-Chloroethoxy)methane	111-91-1	40	140	45	105
Bis(2-Chloroethyl) ether	111-44-4	50	130	40	120
Bis(2-Ethylhexyl) phthalate	117-81-7	50	150	50	140
Butylbenzylphthalate	85-68-7	50	150	40	140
Carbazole	86-74-8	20	120	20	120
Chrysene	218-01-9	50	130	50	120
Dibenzo(a,h)anthracene	53-70-3	50	140	50	140
Dibenzofuran	132-64-9	60	130	60	110
Diethyl phthalate	84-66-2	50	130	40	130
Dimethyl phthalate	131-11-3	50	140	55	120
Di-n-Butyl phthalate	84-74-2	40	150	40	130
Di-n-octyl phthalate	117-84-0	50	150	40	140
Fluoranthene	206-44-0	50	130	50	120
Fluorene	86-73-7	60	130	60	110
Hexachloro-1,3-butadiene	87-68-3	40	130	40	100
Hexachlorobenzene	118-74-1	60	130	50	110
Hexachlorocyclopentadiene	77-47-4	20	100	20	100
Hexachloroethane	67-72-1	50	110	35	110
Indeno(1,2,3-cd)pyrene	193-39-5	60	140	50	140

Table 2-39. Lionville Laboratory SVOA Limits for LCS, MS, and MSD. (3 Pages)

Analyte	CAS	Solid Samples		Water Samples	
		LCL (%)	UCL (%)	LCL (%)	UCL (%)
Isophorone	78-59-1	60	120	40	110
Naphthalene	91-20-3	40	130	40	105
Nitrobenzene	98-95-3	50	110	40	100
N-Nitroso-Di-N-Propylamine	621-64-7	50	130	40	120
N-Nitrosodiphenylamine	86-30-6	50	130	50	110
Pentachlorophenol	87-86-5	30	130	15	130
Phenanthrene	85-01-8	60	130	50	120
Phenol	108-95-2	50	130	30	110
Pyrene	129-00-0	50	140	50	130
Pyridine	110-86-1	40	110	15	100

CAS - Chemical Abstracts System
LCL - lower control limit
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
SVOA - semi-volatile organic analysis
UCL - upper control limit

Table 2-40 shows the LCS recoveries that were outside the control limits. All results for the analytes in the batches indicated in the table were qualified as approximate. All results qualified were nondetects, so they were flagged "UJ."

Table 2-40. LCS* Recoveries That Did Not Satisfy QC Limits. (3 Pages)

Batch ID	Matrix	Analyte	CAS	Rec (%)	LCL (%)	UCL (%)
08LE0107	S	2,4-Dinitrophenol	51-28-5	16	20	120
08LE0107	S	4,6-Dinitro-2-methylphenol	534-52-1	25	40	140
08LE0107	S	Benzoic acid	65-85-0	8	10	110
08LE0108	W	1,2-Diphenylhydrazine	122-66-7	48	50	110
08LE0108	W	1,2-Diphenylhydrazine	122-66-7	46	50	110
08LE0108	W	2-Nitroaniline	88-74-4	45	50	110
08LE0108	W	3-Nitroaniline	99-09-2	1	10	120
08LE0108	W	3-Nitroaniline	99-09-2	1	10	120
08LE0108	W	4-Chloroaniline	106-47-8	4	10	100
08LE0108	W	4-Chloroaniline	106-47-8	1	10	100
08LE0108	W	4-Nitroaniline	100-01-6	3	10	100
08LE0108	W	4-Nitroaniline	100-01-6	7	10	100
08LE0108	W	Acenaphthylene	208-96-8	42	50	110
08LE0108	W	Acenaphthylene	208-96-8	47	50	110
08LE0108	W	Benzyl alcohol	100-51-6	36	40	110

Table 2-40. LCS* Recoveries That Did Not Satisfy QC Limits. (3 Pages)

Batch ID	Matrix	Analyte	CAS	Rec (%)	LCL (%)	UCL (%)
08LE0108	W	bis(2-Chloroethoxy)methane	111-91-1	20	45	105
08LE0108	W	bis(2-Chloroethoxy)methane	111-91-1	4	45	105
08LE0108	W	Dibenzofuran	132-64-9	56	60	110
08LE0108	W	Fluorene	86-73-7	54	60	110
08LE0108	W	N-Nitrosodiphenylamine	86-30-6	17	50	110
08LE0108	W	N-Nitrosodiphenylamine	86-30-6	21	50	110
08LE0143	S	4,6-Dinitro-2-methylphenol	534-52-1	36	40	140
08LE0147	S	4,6-Dinitro-2-methylphenol	534-52-1	35	40	140
08LE0147	S	Pentachlorophenol	87-86-5	29	30	130
08LE0169	S	1,2,4-Trichlorobenzene	120-82-1	58	60	120
08LE0169	S	1,2-Diphenylhydrazine	122-66-7	47	50	110
08LE0169	S	2,2'-oxybis(1-Chloropropane)	108-60-1	47	50	120
08LE0169	S	2-Methylphenol	95-48-7	54	60	120
08LE0169	S	2-Nitroaniline	88-74-4	52	60	130
08LE0169	S	3-and/or 4-Methylphenol	1319-77-3	54	60	130
08LE0169	S	4-Chloro-3-methylphenol	59-50-7	59	60	130
08LE0169	S	Acenaphthene	83-32-9	59	60	130
08LE0169	S	Benzoic acid	65-85-0	8	10	110
08LE0169	S	bis(2-Chloroethyl)ether	111-44-4	43	50	130
08LE0169	S	Fluorene	86-73-7	57	60	130
08LE0169	S	Isophorone	78-59-1	54	60	120
08LE0169	S	Nitrobenzene	98-95-3	49	50	110
08LE0169	S	N-Nitroso-di-n-propylamine	621-64-7	46	50	130
08LE0169	S	N-Nitrosodiphenylamine	86-30-6	49	50	130
08LE0169	S	Pyridine	110-86-1	29	40	110
08LE0177	S	Pyridine	110-86-1	36	40	110
08LE0189	S	Benzoic acid	65-85-0	3	10	110
08LE0200	S	1,2,4-Trichlorobenzene	120-82-1	56	60	120
08LE0200	S	2,4-Dinitrophenol	51-28-5	17	20	120
08LE0200	S	4,6-Dinitro-2-methylphenol	534-52-1	34	40	140
08LE0200	S	Benzoic acid	65-85-0	1	10	110
08LE0200	S	Indeno(1,2,3-cd)pyrene	193-39-5	57	60	140
08LE0200	S	N-Nitrosodiphenylamine	86-30-6	48	50	130
08LE0200	S	Pyridine	110-86-1	36	40	110
08LE0218	S	Benzoic acid	65-85-0	1	10	110
08LE0218	S	Benzyl alcohol	100-51-6	102	50	100
08LE0219	S	2,4-Dinitrophenol	51-28-5	15	20	120
08LE0219	S	3-and/or 4-Methylphenol	1319-77-3	59	60	130

Table 2-40. LCS* Recoveries That Did Not Satisfy QC Limits. (3 Pages)

Batch ID	Matrix	Analyte	CAS	Rec (%)	LCL (%)	UCL (%)
08LE0219	S	4,6-Dinitro-2-methylphenol	534-52-1	32	40	140
08LE0219	S	4,6-Dinitro-2-methylphenol	534-52-1	23	40	140
08LE0226	W	3-Nitroaniline	99-09-2	6	10	120
08LE0226	W	4-Chloroaniline	106-47-8	1	10	100
08LE0226	W	N-Nitrosodiphenylamine	86-30-6	37	50	110
08LE0229	S	Benzoic acid	65-85-0	8	10	110
08LE0237	S	4,6-Dinitro-2-methylphenol	534-52-1	33	40	140
08LE0237	S	Benzoic acid	65-85-0	8	10	110
08LE0237	S	Pentachlorophenol	87-86-5	23	30	130

*LCSs were analyzed in duplicate. If both the LCS and the LCS duplicate are outside the acceptable range for an analyte in a particular batch, that analyte will appear in the table twice for the batch.

CAS - Chemical Abstracts Service
LCL - lower control limit
LCS - laboratory control sample
QC - quality control
S - soil
UCL - upper control limit
W - water

Table 2-41 shows the MS and MSD recoveries that were outside the QC limits. All these recoveries were below the LCL. Sample results for the indicated analytes in the indicated batches were all nondetects. They were qualified as approximate and flagged "UJ."

Table 2-41. MS and MSD Recoveries That Did Not Satisfy QC Limits. (3 Pages)

Batch ID	Matrix	QC Type	Analyte	CAS	Sample	Sample Result	Q	Units	Spiked Result	Q	Spike Conc.	Rec. (%)	LCL (%)	UCL (%)
08LE0107	S	MS	1,2,4-Trichlorobenzene	120-82-1	0802L666-001	350	U	µg/kg	1169.95		2089.200	56	60	120
08LE0107	S	MS	1,2-Diphenylhydrazine	122-66-7	0802L666-001	350	U	µg/kg	835.68		2089.200	40	50	110
08LE0107	S	MS	4,6-Dinitro-2-methylphenol	534-52-1	0802L666-001	1700	U	µg/kg	731.22		2089.200	35	40	140
08LE0107	S	MS	Benzoic acid	65-85-0	0802L666-001	350	U	µg/kg	188.03		2089.200	9	10	110
08LE0108	W	MSD	3-Nitroaniline	99-09-2	0802L674-001	50	U	µg/L	4.41		60.000	7.4	10	120
08LE0108	W	MS	3-Nitroaniline	99-09-2	0802L674-001	50	U	µg/L	1.30		60.000	2.2	10	120
08LE0108	W	MS	4-Chloroaniline	106-47-8	0802L674-001	10	U	µg/L	0.849		60.000	1.4	10	100
08LE0108	W	MSD	4-Chloroaniline	106-47-8	0802L674-001	10	U	µg/L	3.40		60.000	5.7	10	100
08LE0108	W	MSD	N-Nitrosodiphenylamine	86-30-6	0802L674-001	10	U	µg/L	18.7		60.000	31.2	50	110
08LE0108	W	MS	N-Nitrosodiphenylamine	86-30-6	0802L674-001	10	U	µg/L	18.5		60.000	30.8	50	110
08LE0143	S	MS	1,2,4-Trichlorobenzene	120-82-1	0803L798-002	340	U	µg/kg	926.64		2059.200	45	60	120
08LE0143	S	MS	1-Methylnaphthalene	90-12-0	0803L798-002	340	U	µg/kg	967.82		2059.200	47	50	110
08LE0143	S	MS	2,2'-oxybis(1-Chloropropane)	108-60-1	0803L798-002	340	U	µg/kg	947.23		2059.200	46	50	120
08LE0143	S	MSD	2,4,5-Trichlorophenol	95-95-4	0803L798-002	340	U	µg/kg	741.31		2059.200	36	40	140
08LE0143	S	MS	2,4,5-Trichlorophenol	95-95-4	0803L798-002	340	U	µg/kg	473.62		2059.200	23	40	140
08LE0143	S	MS	2,4-Dichlorophenol	120-83-2	0803L798-002	340	U	µg/kg	967.82		2059.200	47	50	130
08LE0143	S	MS	2,4-Dinitrotoluene	121-14-2	0803L798-002	340	U	µg/kg	1214.93		2059.200	59	60	130
08LE0143	S	MS	2-Chlorophenol	95-57-8	0803L798-002	340	U	µg/kg	967.82		2059.200	47	50	130
08LE0143	S	MS	2-Methylnaphthalene	91-57-6	0803L798-002	340	U	µg/kg	1029.6		2059.200	50	60	100
08LE0143	S	MS	2-Methylphenol	95-48-7	0803L798-002	340	U	µg/kg	1009.01		2059.200	49	60	120
08LE0143	S	MS	2-Nitroaniline	88-74-4	0803L798-002	1700	U	µg/kg	1153.15		2059.200	56	60	130
08LE0143	S	MS	2-Nitrophenol	88-75-5	0803L798-002	340	U	µg/kg	988.42		2059.200	48	50	130
08LE0143	S	MS	3-and/or 4-Methylphenol	1319-77-3	0803L798-002	340	U	µg/kg	1070.78		2059.200	52	60	130
08LE0143	S	MS	4-Bromophenyl-phenylether	101-55-3	0803L798-002	340	U	µg/kg	885.46		2059.200	43	50	120

Table 2-41. MS and MSD Recoveries That Did Not Satisfy QC Limits. (3 Pages)

Batch ID	Matrix	QC Type	Analyte	CAS	Sample	Sample Result	Q	Units	Spiked Result	Q	Spike Conc.	Rec. (%)	LCL (%)	UCL (%)
08LE0143	S	MS	4-Chloro-3-methylphenol	59-50-7	0803L798-002	340	U	µg/kg	1132.56		2059.200	55	60	130
08LE0143	S	MS	4-Chlorophenyl-phenylether	7005-72-3	0803L798-002	340	U	µg/kg	1009.01		2059.200	49	50	120
08LE0143	S	MS	4-Nitrophenol	100-02-7	0803L798-002	1700	U	µg/kg	741.31		2059.200	36	40	140
08LE0143	S	MS	Acenaphthene	83-32-9	0803L798-002	340	U	µg/kg	1009.01		2059.200	49	60	130
08LE0143	S	MS	Acenaphthylene	208-96-8	0803L798-002	340	U	µg/kg	1050.19		2059.200	51	60	130
08LE0143	S	MS	Anthracene	120-12-7	0803L798-002	340	U	µg/kg	1132.56		2059.200	55	60	130
08LE0143	S	MS	Benzo(b)fluoranthene	205-99-2	0803L798-002	340	U	µg/kg	1111.97		2059.200	54	60	130
08LE0143	S	MSD	Benzoic acid	65-85-0	0803L798-002	340	U	µg/kg	0		2059.200	0	10	110
08LE0143	S	MS	Benzoic acid	65-85-0	0803L798-002	340	U	µg/kg	0		2059.200	0	10	110
08LE0143	S	MS	Benzyl alcohol	100-51-6	0803L798-002	340	U	µg/kg	864.86		2059.200	42	50	100
08LE0143	S	MS	bis(2-Chloroethyl)ether	111-44-4	0803L798-002	340	U	µg/kg	885.46		2059.200	43	50	130
08LE0143	S	MS	Dibenzofuran	132-64-9	0803L798-002	340	U	µg/kg	1111.97		2059.200	54	60	130
08LE0143	S	MS	Fluorene	86-73-7	0803L798-002	340	U	µg/kg	1029.6		2059.200	50	60	130
08LE0143	S	MS	Hexachlorobenzene	118-74-1	0803L798-002	340	U	µg/kg	1009.01		2059.200	49	60	130
08LE0143	S	MS	Hexachloroethane	67-72-1	0803L798-002	340	U	µg/kg	823.68		2059.200	40	50	110
08LE0143	S	MS	Indeno(1,2,3-cd)pyrene	193-39-5	0803L798-002	340	U	µg/kg	1070.78		2059.200	52	60	140
08LE0143	S	MS	Isophorone	78-59-1	0803L798-002	340	U	µg/kg	1070.78		2059.200	52	60	120
08LE0143	S	MS	Nitrobenzene	98-95-3	0803L798-002	340	U	µg/kg	906.05		2059.200	44	50	110
08LE0143	S	MS	N-Nitroso-di-n-propylamine	621-64-7	0803L798-002	340	U	µg/kg	926.64		2059.200	45	50	130
08LE0143	S	MS	N-Nitrosodiphenylamine	86-30-6	0803L798-002	340	U	µg/kg	926.64		2059.200	45	50	130
08LE0143	S	MS	Phenanthrene	85-01-8	0803L798-002	340	U	µg/kg	1091.38		2059.200	53	60	130
08LE0143	S	MS	Pyridine	110-86-1	0803L798-002	340	U	µg/kg	597.17		2059.200	29	40	110
08LE0169	S	MS	2-Methylphenol	95-48-7	0804L873-001	340	U	µg/kg	1219.88		2067.600	59	60	120
08LE0169	S	MSD	Benzoic acid	65-85-0	0804L873-001	340	U	µg/kg	41.35		2067.600	2	10	110
08LE0169	S	MS	Benzoic acid	65-85-0	0804L873-001	340	U	µg/kg	20.68		2067.600	1	10	110

Table 2-41. MS and MSD Recoveries That Did Not Satisfy QC Limits. (3 Pages)

Batch ID	Matrix	QC Type	Analyte	CAS	Sample	Sample Result	Q	Units	Spiked Result	Q	Spike Conc.	Rec. (%)	LCL (%)	UCL (%)
08LE0169	S	MSD	Pyridine	110-86-1	0804L873-001	340	U	µg/kg	682.31		2067.600	33	40	110
08LE0169	S	MS	Pyridine	110-86-1	0804L873-001	340	U	µg/kg	702.98		2067.600	34	40	110
08LE0189	S	MS	Benzoic acid	65-85-0	0804L957-005	340	U	µg/kg	20.34		2034.000	1	10	110
08LE0189	S	MSD	Benzoic acid	65-85-0	0804L957-005	340	U	µg/kg	61.02		2034.000	3	10	110

CAS - Chemical Abstracts System
LCL - lower control limit
MS - matrix spike
MSD - matrix spike duplicate
Q - laboratory qualifier
QC - quality control
S - soil
UCL - upper control limit
W - water

2.10.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the RPD between MS and MSD must be less than the criteria set by the laboratory. These criteria are listed in Table 2-42. The lab has not set criteria for all analytes; RPDs were evaluated only for those compounds for which an RPD limit is specified.

Table 2-43 lists the RPD failures in this batch of data. All associated sample results were nondetects. They were qualified as estimates and flagged "UJ."

Table 2-42. Relative Percent Difference Limits Set by Lionville Laboratory for SVOA MS/MSDs. (3 Pages)

Analyte	CAS	RPD (%)	
		For Solid Matrix	For Water Matrix
1,2,4-Trichlorobenzene	120-82-1	40	20
1,2-Diphenylhydrazine	122-66-7	40	20
1-Methylnaphthalene	90-12-0	40	20
2,2'-oxybis(1-Chloropropane)	108-60-1	40	20
2,4,5-Trichlorophenol	95-95-4	40	20
2,4,6-Trichlorophenol	88-06-2	40	20
2,4-Dichlorophenol	120-83-2	40	20
2,4-Dimethylphenol	105-67-9	40	20
2,4-Dinitrophenol	51-28-5	40	20
2,4-Dinitrotoluene	121-14-2	40	20
2,6-Dinitrotoluene	606-20-2	40	20
2-Chloronaphthalene	91-58-7	40	20
2-Chlorophenol	95-57-8	40	20
2-Methylnaphthalene	91-57-6	40	20
2-Methylphenol	95-48-7	40	20
2-Nitroaniline	88-74-4	40	20
2-Nitrophenol	88-75-5	40	20
3,3'-Dichlorobenzidine	91-94-1	40	100
3-and/or 4-Methylphenol	1319-77-3	40	20
3-Nitroaniline	99-09-2	40	20
4,6-Dinitro-2-Methylphenol	534-52-1	40	20
4-Bromophenyl phenyl ether	101-55-3	40	20
4-Chloro-3-Methylphenol	59-50-7	40	20
4-Chloroaniline	106-47-8	40	20

Table 2-42. Relative Percent Difference Limits Set by Lionville Laboratory for SVOA MS/MSDs. (3 Pages)

Analyte	CAS	RPD (%)	
		For Solid Matrix	For Water Matrix
4-Chlorophenyl phenyl ether	7005-72-3	40	20
4-Nitroaniline	100-01-6	40	20
4-Nitrophenol	100-02-7	40	20
Acenaphthene	83-32-9	40	20
Acenaphthylene	208-96-8	40	20
Aniline	62-53-3	40	20
Anthracene	120-12-7	40	20
Benzidine	92-87-5	100	100
Benzo(a)anthracene	56-55-3	40	20
Benzo(a)pyrene	50-32-8	40	20
Benzo(b)fluoranthene	205-99-2	40	20
Benzo(g,h,i)perylene	191-24-2	40	20
Benzo(k)fluoranthene	207-08-9	40	20
Benzoic Acid	65-85-0	40	60
Benzyl Alcohol	100-51-6	40	20
Bis(2-Chloroethoxy)methane	111-91-1	80	20
Bis(2-Chloroethyl) ether	111-44-4	40	20
Bis(2-Ethylhexyl) phthalate	117-81-7	40	20
Butylbenzylphthalate	85-68-7	100	20
Carbazole	86-74-8	40	20
Chrysene	218-01-9	40	20
Dibenzo(a,h)anthracene	53-70-3	40	20
Dibenzofuran	132-64-9	40	20
Diethyl phthalate	84-66-2	40	20
Dimethyl phthalate	131-11-3	40	20
Di-n-Butyl phthalate	84-74-2	40	20
Di-n-octyl phthalate	117-84-0	40	20
Fluoranthene	206-44-0	40	20
Fluorene	86-73-7	40	20
Hexachloro-1,3-butadiene	87-68-3	40	20
Hexachlorobenzene	118-74-1	40	20
Hexachlorocyclopentadiene	77-47-4	40	20
Hexachloroethane	67-72-1	40	20
Indeno(1,2,3-cd)pyrene	193-39-5	40	20
Isophorone	78-59-1	40	20
Naphthalene	91-20-3	40	20

Table 2-42. Relative Percent Difference Limits Set by Lionville Laboratory for SVOA MS/MSDs. (3 Pages)

Analyte	CAS	RPD (%)	
		For Solid Matrix	For Water Matrix
Nitrobenzene	98-95-3	40	20
N-Nitroso-Di-N-Propylamine	621-64-7	40	60
N-Nitrosodiphenylamine	86-30-6	80	60
Pentachlorophenol	87-86-5	60	40
Phenanthrene	85-01-8	40	20
Phenol	108-95-2	40	20
Pyrene	129-00-0	40	20
Pyridine	110-86-1	60	40

CAS - Chemical Abstracts System
MS - matrix spike
MSD - matrix spike duplicate
RPD - relative percent difference
SVOA - semi-volatile organic analysis

Table 2-43. RPDs Outside QC Criteria.

Batch ID	Matrix	Analyte	CAS	Original Sample	MS Rec (%)	MSD Rec (%)	RPD
08LE0107	S	1,2-Diphenylhydrazine	122-66-7	0802L666-001	40	79	65.5
08LE0107	S	Benzidine	92-87-5	0802L666-001	0	3	200
08LE0108	W	2,4-Dinitrophenol	51-28-5	0802L674-001	71.7	99.2	32.2
08LE0108	W	3,3-Dichlorobenzidine	91-94-1	0802L674-001	0	8.5	200
08LE0108	W	3-Nitroaniline	99-09-2	0802L674-001	2.2	7.4	108.3
08LE0108	W	4-Chloroaniline	106-47-8	0802L674-001	1.4	5.7	121.1
08LE0108	W	4-Nitrophenol	100-02-7	0802L674-001	64	83.8	26.8
08LE0108	W	Aniline	62-53-3	0802L674-001	10.9	24.5	76.8
08LE0108	W	Benzidine	92-87-5	0802L674-001	0	5.4	200
08LE0143	S	2,4,5-Trichlorophenol	95-95-4	0803L798-002	23	36	44.1
08LE0143	S	3,3-Dichlorobenzidine	91-94-1	0803L798-002	37	56	40.9
08LE0143	S	Aniline	62-53-3	0803L798-002	28	43	42.3
08LE0143	S	Benzidine	92-87-5	0803L798-002	0	1	200
08LE0169	S	Benzoic acid	65-85-0	0804L873-001	1	2	66.7
08LE0189	S	2,4,6-Trichlorophenol	88-06-2	0804L957-005	19	32	51
08LE0189	S	Benzoic acid	65-85-0	0804L957-005	1	3	100

CAS - Chemical Abstracts System
MS - matrix spike
MSD - matrix spike duplicate
QC - quality control
RPD - relative percent difference
S - soil
W - water

Environmental Quality Management, Inc.

EQM-DVAL-USE-003 Rev. 0

Data Verification and Data Validation of US Ecology Site Data, Chains of Custody 19, 23, 25, 26, 31, 37, 42, 47, 48, 49, 50, 51, 55, 57, 59, 61, 62, and 63.

Submitted to:

Vista Engineering

Date:
September 8, 2008

VISTA
ENGINEERING TECHNOLOGIES

EXECUTIVE SUMMARY

Samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, volatile organic compounds, semi-volatile organic compounds, and polychlorinated biphenyls.

All analyses were conducted by Lionville Laboratory, Inc., Lionville, Pennsylvania, (LVL) following the *Specification for Analytical Laboratory Services: Soil and Water Analysis* (VET-1405-SPEC-03, Rev. 1). In addition to printed data packages for each sample delivery group, the laboratory provided electronic data deliverables (EDDs), consisting of a number of Microsoft® Excel files containing tables of results and associated quality control (QC).

This data validation report presents the results of validating the analyses reported in the third group of EDDs prepared by the laboratory. This group of EDDs provided the results and QC data for the samples delivered to the laboratory under the chain-of custody documents listed in Table ES-1.

Table ES-1. Chains Of Custody Applicable To The Data Validated In This Report.

VET-1405-COC-019	VET-1405-COC-042	VET-1405-COC-055
VET-1405-COC-023	VET-1405-COC-047	VET-1405-COC-057
VET-1405-COC-025	VET-1405-COC-048	VET-1405-COC-059
VET-1405-COC-026	VET-1405-COC-049	VET-1405-COC-061
VET-1405-COC-031	VET-1405-COC-050	VET-1405-COC-062
VET-1405-COC-037	VET-1405-COC-051	VET-1405-COC-063

COC - chain of custody

Please note that the quarterly ground water data was split between two validation reports. The data validation for Vista COCs VET-1405-COC-043 and VET-1405-COC-045 were included in EQM-DVAL-USE-002.

The data validation was performed using an electronic data checker to evaluate whether batch QC met criteria. The electronic data checker identifies any QC results that exceed applicable criteria. The data validation process is completed by the data validation chemist, who evaluates the impacts of the exceedances and adds data validation qualifiers.

Asterisks (*) used as qualifiers in the semi-volatile organic compounds section were removed. As stated in an email from Orlette Johnson of LVL (7/30/2008), these qualifiers were hold-overs from other LVL projects that request a flag for each time a spike sample recovery is outside limits.

As a result of this validation process, results for silicon in forty-five samples in batches 08L0125, 08L0146, 08L0163, 08L0178, 08L0200, 08L0210 and 08L0220 were rejected due to extremely low laboratory control sample recoveries, less than 50%. All rejected results were detects.

Table ES-2 summarizes the validation results by analysis.

Table ES-2. Summary Validation Results by Analysis. (2 Pages)

Analysis	Number of Results	Number of Qualified Results	Summary
Metals	1798	238	The majority of the qualifiers apply to silicon in soils due to low LCS. Forty-five silicon results were rejected due to extremely low LCS recoveries. All of the antimony data for soil samples were qualified as estimated due to low matrix spike recoveries. Other qualification was due to out-of-specification MS/MSD recoveries for barium, calcium, chromium, iron, and silver and contamination of blanks with sodium. Some data were also qualified due to high RPDs.
Mercury	62	0	Mercury was not detected in most samples. No results were qualified.
Chromium (VI)	62	4	All water sample results were qualified as estimated due to low MS recoveries. One soil sample result was qualified as estimated for a high LCS recovery. No data were rejected.
Cyanide	57	0	Cyanide was not detected in the samples. No data were qualified.
Sulfide	62	3	Three results were qualified as estimated due to holding time. Sulfide was detected in only four samples. No data were rejected.
Anions	434	3	Three sulfate results were qualified as estimated due to a low MS recovery. No data were rejected.
Total phenols	62	0	Phenols were detected in ten soil samples. No data were qualified.
PCBs	434	65	The qualifications were due to exceeding holding time requirements and RPDs exceeding the 20% precision limit. No data were rejected.

Table ES-2. Summary Validation Results by Analysis. (2 Pages)

Analysis	Number of Results	Number of Qualified Results	Summary
VOCs	5697	175	Results were qualified due to high LCS recoveries and low levels of contamination in blanks with common laboratory contaminants, low matrix spike recoveries and high RPDs. No requested data were rejected.
SVOCs	4325	1584	Most qualification was due to MS and LCS recoveries and RPDs. Many results were qualified for multiple reasons. No data were rejected.

LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
PCB - polychlorinated biphenyl
RPD - relative percent difference
SVOC - semi-volatile organic compound
VOC - volatile organic compound

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ACRONYMS

BLK	Blank (column heading)
CAS	Chemical Abstracts Service (column heading)
COC	chain of custody
DUP	Duplicate sample (laboratory duplicate)
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
EQL	estimated quantitation limit (column heading)
ICP	inductively coupled plasma
LCL	lower control limit
LCS	laboratory control sample
MB	method blank
MICE	Management Information Capability for Enforcement
MS	matrix spike
MSD	matrix spike duplicate
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
Q	Laboratory qualifier (column heading)
QC	quality control
RDL	required detection limit
RPD	relative percent difference
RQL	required quantitation limit
S	soil
SDG	sample delivery group
Surr	surrogate (column heading)
SVOA	semi-volatile organic analysis
SVOC	semi-volatile organic compound
UCL	upper control limit
V	Validation qualifier (column heading)
VOA	volatile organic analysis
VOC	volatile organic compound
W	water

Lionville Qualifiers

B (Metals Only)	Indicates that the parameter was between the Instrument Detection Limit (IDL) and the Contract Required Detection Limit (CRDL)
B (All Others)	Analyte is found in the associated blank as well as in the sample. It indicates possible/probably blank contamination. This flag is also used for a TIC as well as for a positively identified TCL compound.
J	Analyte detected below quantitation limit
U	Analyte is not detected, the associated quantitation limit is given

Data Validation Applied Qualifiers

UJ	Indicates the compound was analyzed for but not detected in the sample. Due to a QC deficiency identified during data validation, the associated quantitation limit is an estimate
J	Indicates the compound was analyzed for and detected in the sample. The associated concentration is an estimate, but the data are usable for decision making purposes

1. INTRODUCTION – APPROACH TO VALIDATION

Soil and groundwater samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and polychlorinated biphenyls (PCBs).

All analyses were conducted by Lionville Laboratory, Inc., Lionville, Pennsylvania, following the *Specification for Analytical Laboratory Services: Soil and Water Analysis* (VET-1405-SPEC-03, Rev. 1). The results of these analyses were presented in a printed data package for each sample delivery group. In addition, the laboratory provided an electronic data deliverable (EDD) for each sample delivery group. The EDDs are Microsoft® Excel files containing tables of results and associated quality control (QC).

This data validation report presents the results of validating the analyses reported in the third group of EDDs received from the laboratory. This group of EDDs and the corresponding chain-of-custody documents are identified in Table 1-1 below. The data contained in these EDDs includes the analysis of metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, VOCs, SVOCs, and PCBs.

Table 1-1. Chains of Custody and Electronic Data Deliverables Applicable to the Data Validated.

Chain of Custody	EDD	
	File Name	Date Received
VET-1405-COC-019	L0803762.xls	6/25/2008
VET-1405-COC-023	L0803842.xls	7/2/2008
VET-1405-COC-025	L0803842.xls	7/2/2008
VET-1405-COC-026	L0804852.xls	6/19/2008
VET-1405-COC-031	L0804905.xls	6/19/2008
VET-1405-COC-037	L0804010.xls	6/19/2008
VET-1405-COC-042	L0805044.xls	6/19/2008
VET-1405-COC-047	L0805085.xls	6/19/2008
VET-1405-COC-048	L0805085.xls	6/19/2008
VET-1405-COC-049	L0805085.xls	6/19/2008
VET-1405-COC-050	L0805087.xls	6/23/2008
VET-1405-COC-051	L0805095.xls	6/23/2008
VET-1405-COC-055	L0805111.xls	6/23/2008
VET-1405-COC-057	L0805119.xls	6/19/2008
VET-1405-COC-059	L0805126.xls	6/19/2008
VET-1405-COC-061	L0805143.xls	6/19/2008
VET-1405-COC-062	L0805168.xls	6/23/2008
VET-1405-COC-063	L0805194.xls	6/30/2008

EDD - electronic data deliverable

This validation was performed in a two-tiered approach.

1. Completeness: an assessment of the completeness is made on the pdf file of the "hard copy" data.
2. Electronic holding time and QC evaluation.

The approach is summarized in Table 1-2. The electronic review is performed on all incoming EDDs. The EDDs are evaluated to assure consistency with the hard copy data. By using electronic review of all QC, appropriate qualification of all the data can be made.

Table 1-2. Data Validation and Verification Approach.

Review item	Manually Done	Electronic	All Samples
Verification of deliverables	X		X
Requested vs reported analyses		X	X
Holding times		X	X
Blank contamination		X	X
Detection Limits		X	X
MS/MSD and LCS		X	X
Surrogates		X	X
Laboratory duplicates		X	X

LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate

The remainder of this report consists of several chapters, with each chapter providing the details for data validation of a particular method of analysis. Most chapters begin with a summary table of the analytical results validated and the validation qualifiers that have been applied. These tables are also provided in an accompanying Microsoft Excel file along with any summary tables that were too large to include in this DVR. After the summary table, if it is included here, each chapter explains the details of the validation process and provides reasons for any data qualifiers that may have been applied. The automated data validation process determines whether the following facets of laboratory quality control have been achieved:

- Were there 20 or fewer samples in each preparation batch?
- Were a method blank (MB), a laboratory control sample (LCS), and a matrix spike sample (MS) prepared with each batch of samples?
- Were surrogates added to each sample and batch QC samples for each method where surrogates are required?
- Was precision checked with a matrix spike duplicate (MSD) or sample duplicate (DUP)?
- Were holding time requirements for preparation and analysis satisfied?
- Were the MB results less than the required quantitation limits?
- Did the quantitation limit for nondetect results meet the required detection limit?
- Did the recoveries for the LCS, MS, MSD, and surrogates meet the accuracy criteria?
- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

After this automated checking, the "no" answers to these questions were investigated manually, the effect on each sample result was determined, and the results were qualified according to the validation rules in *Data Validation Procedure for Chemical Analyses* (HNF-20433). These evaluations are presented on the following pages.

2. DATA VALIDATION REPORTS

2.1. DATA VALIDATION REPORT FOR ICP METALS (METHOD 6010A)

Results for 29 metals (aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, molybdenum, nickel, potassium, selenium, silicon, silver, sodium, strontium, thallium, tin, titanium, uranium, vanadium and zinc) were requested for each of the 62 samples in this group. The table listing the results is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM for the analytical results for inductively coupled plasma (ICP) metals, as well as the flags applied during validation and the reasons for the flags.

2.1.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-1 shows the number of each type of sample in each preparation batch.

Table 2-1. ICP Metals Preparation Batch Summary. (8 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
08L0104	S	Aluminum, Total	7429-90-5	1	1	1	1		9
08L0104	S	Antimony, Total	7440-36-0	1	1	1	1		9
08L0104	S	Arsenic, Total	7440-38-2	1	1	1	1		9
08L0104	S	Barium, Total	7440-39-3	1	1	1	1		9
08L0104	S	Beryllium, Total	7440-41-7	1	1	1	1		9
08L0104	S	Boron, Total	7440-42-8	1	1	1	1		9
08L0104	S	Cadmium, Total	7440-43-9	1	1	1	1		9
08L0104	S	Calcium, Total	7440-70-2	1	1	1	1		9
08L0104	S	Chromium, Total	7440-47-3	1	1	1	1		9
08L0104	S	Cobalt, Total	7440-48-4	1	1	1	1		9
08L0104	S	Copper, Total	7440-50-8	1	1	1	1		9
08L0104	S	Iron, Total	7439-89-6	1	1	1	1		9
08L0104	S	Lead, Total	7439-92-1	1	1	1	1		9
08L0104	S	Magnesium, Total	7439-95-4	1	1	1	1		9
08L0104	S	Manganese, Total	7439-96-5	1	1	1	1		9
08L0104	S	Molybdenum, Total	7439-98-7	1	1	1	1		9
08L0104	S	Nickel, Total	7440-02-0	1	1	1	1		9
08L0104	S	Potassium, Total	7440-09-7	1	1	1	1		9
08L0104	S	Selenium, Total	7782-49-2	1	1	1	1		9
08L0104	S	Silicon, Total	7440-21-3	1	1	1	1		9
08L0104	S	Silver, Total	7440-22-4	1	1	1	1		9

Table 2-1. ICP Metals Preparation Batch Summary. (8 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
08L0104	S	Sodium, Total	7440-23-5	1	1	1	1		9
08L0104	S	Strontium, Total	7440-24-6	1	1	1	1		9
08L0104	S	Thallium, Total	7440-28-0	1	1	1	1		9
08L0104	S	Tin, Total	7440-31-5	1	1	1	1		9
08L0104	S	Titanium, Total	7440-32-6	1	1	1	1		9
08L0104	S	Uranium, Total	7440-61-1	1	1	1	1		9
08L0104	S	Vanadium, Total	7440-62-2	1	1	1	1		9
08L0104	S	Zinc, Total	7440-66-6	1	1	1	1		9
08L0125	S	Aluminum, Total	7429-90-5	1	1	1	1	1	12
08L0125	S	Antimony, Total	7440-36-0	1	1	1	1	1	12
08L0125	S	Arsenic, Total	7440-38-2	1	1	1	1	1	12
08L0125	S	Barium, Total	7440-39-3	1	1	1	1	1	12
08L0125	S	Beryllium, Total	7440-41-7	1	1	1	1	1	12
08L0125	S	Boron, Total	7440-42-8	1	1	1	1	1	12
08L0125	S	Cadmium, Total	7440-43-9	1	1	1	1	1	12
08L0125	S	Calcium, Total	7440-70-2	1	1	1	1	1	12
08L0125	S	Chromium, Total	7440-47-3	1	1	1	1	1	12
08L0125	S	Cobalt, Total	7440-48-4	1	1	1	1	1	12
08L0125	S	Copper, Total	7440-50-8	1	1	1	1	1	12
08L0125	S	Iron, Total	7439-89-6	1	1	1	1	1	12
08L0125	S	Lead, Total	7439-92-1	1	1	1	1	1	12
08L0125	S	Magnesium, Total	7439-95-4	1	1	1	1	1	12
08L0125	S	Manganese, Total	7439-96-5	1	1	1	1	1	12
08L0125	S	Molybdenum, Total	7439-98-7	1	1	1	1	1	12
08L0125	S	Nickel, Total	7440-02-0	1	1	1	1	1	12
08L0125	S	Potassium, Total	7440-09-7	1	1	1	1	1	12
08L0125	S	Selenium, Total	7782-49-2	1	1	1	1	1	12
08L0125	S	Silicon, Total	7440-21-3	1	1	1	1	1	12
08L0125	S	Silver, Total	7440-22-4	1	1	1	1	1	12
08L0125	S	Sodium, Total	7440-23-5	1	1	1	1	1	12
08L0125	S	Strontium, Total	7440-24-6	1	1	1	1	1	12
08L0125	S	Thallium, Total	7440-28-0	1	1	1	1	1	12
08L0125	S	Tin, Total	7440-31-5	1	1	1	1	1	12
08L0125	S	Titanium, Total	7440-32-6	1	1	1	1	1	12
08L0125	S	Uranium, Total	7440-61-1	1	1	1	1	1	12
08L0125	S	Vanadium, Total	7440-62-2	1	1	1	1	1	12
08L0125	S	Zinc, Total	7440-66-6	1	1	1	1	1	12
08L0146	S	Aluminum, Total	7429-90-5	1	1	1	1		6
08L0146	S	Antimony, Total	7440-36-0	1	1	1	1		6
08L0146	S	Arsenic, Total	7440-38-2	1	1	1	1		6
08L0146	S	Barium, Total	7440-39-3	1	1	1	1		6

Table 2-1. ICP Metals Preparation Batch Summary. (8 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
08L0146	S	Beryllium, Total	7440-41-7	1	1	1	1		6
08L0146	S	Boron, Total	7440-42-8	1	1	1	1		6
08L0146	S	Cadmium, Total	7440-43-9	1	1	1	1		6
08L0146	S	Calcium, Total	7440-70-2	1	1	1	1		6
08L0146	S	Chromium, Total	7440-47-3	1	1	1	1		6
08L0146	S	Cobalt, Total	7440-48-4	1	1	1	1		6
08L0146	S	Copper, Total	7440-50-8	1	1	1	1		6
08L0146	S	Iron, Total	7439-89-6	1	1	1	1		6
08L0146	S	Lead, Total	7439-92-1	1	1	1	1		6
08L0146	S	Magnesium, Total	7439-95-4	1	1	1	1		6
08L0146	S	Manganese, Total	7439-96-5	1	1	1	1		6
08L0146	S	Molybdenum, Total	7439-98-7	1	1	1	1		6
08L0146	S	Nickel, Total	7440-02-0	1	1	1	1		6
08L0146	S	Potassium, Total	7440-09-7	1	1	1	1		6
08L0146	S	Selenium, Total	7782-49-2	1	1	1	1		6
08L0146	S	Silicon, Total	7440-21-3	1	1	1	1		6
08L0146	S	Silver, Total	7440-22-4	1	1	1	1		6
08L0146	S	Sodium, Total	7440-23-5	1	1	1	1		6
08L0146	S	Strontium, Total	7440-24-6	1	1	1	1		6
08L0146	S	Thallium, Total	7440-28-0	1	1	1	1		6
08L0146	S	Tin, Total	7440-31-5	1	1	1	1		6
08L0146	S	Titanium, Total	7440-32-6	1	1	1	1		6
08L0146	S	Uranium, Total	7440-61-1	1	1	1	1		6
08L0146	S	Vanadium, Total	7440-62-2	1	1	1	1		6
08L0146	S	Zinc, Total	7440-66-6	1	1	1	1		6
08L0163	S	Aluminum, Total	7429-90-5	1	1	1	1	1	10
08L0163	S	Antimony, Total	7440-36-0	1	1	1	1	1	10
08L0163	S	Arsenic, Total	7440-38-2	1	1	1	1	1	10
08L0163	S	Barium, Total	7440-39-3	1	1	1	1	1	10
08L0163	S	Beryllium, Total	7440-41-7	1	1	1	1	1	10
08L0163	S	Boron, Total	7440-42-8	1	1	1	1	1	10
08L0163	S	Cadmium, Total	7440-43-9	1	1	1	1	1	10
08L0163	S	Calcium, Total	7440-70-2	1	1	1	1	1	10
08L0163	S	Chromium, Total	7440-47-3	1	1	1	1	1	10
08L0163	S	Cobalt, Total	7440-48-4	1	1	1	1	1	10
08L0163	S	Copper, Total	7440-50-8	1	1	1	1	1	10
08L0163	S	Iron, Total	7439-89-6	1	1	1	1	1	10
08L0163	S	Lead, Total	7439-92-1	1	1	1	1	1	10
08L0163	S	Magnesium, Total	7439-95-4	1	1	1	1	1	10
08L0163	S	Manganese, Total	7439-96-5	1	1	1	1	1	10
08L0163	S	Molybdenum, Total	7439-98-7	1	1	1	1	1	10

Table 2-1. ICP Metals Preparation Batch Summary. (8 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
08L0163	S	Nickel, Total	7440-02-0	1	1	1	1	1	10
08L0163	S	Potassium, Total	7440-09-7	1	1	1	1	1	10
08L0163	S	Selenium, Total	7782-49-2	1	1	1	1	1	10
08L0163	S	Silicon, Total	7440-21-3	1	1	1	1	1	10
08L0163	S	Sodium, Total	7440-23-5	1	1	1	1	1	10
08L0163	S	Strontium, Total	7440-24-6	1	1	1	1	1	10
08L0163	S	Thallium, Total	7440-28-0	1	1	1	1	1	10
08L0163	S	Tin, Total	7440-31-5	1	1	1	1	1	10
08L0163	S	Titanium, Total	7440-32-6	1	1	1	1	1	10
08L0163	S	Uranium, Total	7440-61-1	1	1	1	1	1	10
08L0163	S	Vanadium, Total	7440-62-2	1	1	1	1	1	10
08L0163	S	Zinc, Total	7440-66-6	1	1	1	1	1	10
08L0177	S	Silver, Total	7440-22-4	1	1	1	1	1	10
08L0178	S	Aluminum, Total	7429-90-5	1	1	1	1		14
08L0178	S	Antimony, Total	7440-36-0	1	1	1	1		14
08L0178	S	Arsenic, Total	7440-38-2	1	1	1	1		14
08L0178	S	Barium, Total	7440-39-3	1	1	1	1		14
08L0178	S	Beryllium, Total	7440-41-7	1	1	1	1		14
08L0178	S	Boron, Total	7440-42-8	1	1	1	1		14
08L0178	S	Cadmium, Total	7440-43-9	1	1	1	1		14
08L0178	S	Calcium, Total	7440-70-2	1	1	1	1		14
08L0178	S	Chromium, Total	7440-47-3	1	1	1	1		14
08L0178	S	Cobalt, Total	7440-48-4	1	1	1	1		14
08L0178	S	Copper, Total	7440-50-8	1	1	1	1		14
08L0178	S	Iron, Total	7439-89-6	1	1	1	1		14
08L0178	S	Lead, Total	7439-92-1	1	1	1	1		14
08L0178	S	Magnesium, Total	7439-95-4	1	1	1	1		14
08L0178	S	Manganese, Total	7439-96-5	1	1	1	1		14
08L0178	S	Molybdenum, Total	7439-98-7	1	1	1	1		14
08L0178	S	Nickel, Total	7440-02-0	1	1	1	1		14
08L0178	S	Potassium, Total	7440-09-7	1	1	1	1		14
08L0178	S	Selenium, Total	7782-49-2	1	1	1	1		14
08L0178	S	Silicon, Total	7440-21-3	1	1	1	1		14
08L0178	S	Silver, Total	7440-22-4	1	1	1	1		14
08L0178	S	Sodium, Total	7440-23-5	1	1	1	1		14
08L0178	S	Strontium, Total	7440-24-6	1	1	1	1		14
08L0178	S	Thallium, Total	7440-28-0	1	1	1	1		14
08L0178	S	Tin, Total	7440-31-5	1	1	1	1		14
08L0178	S	Titanium, Total	7440-32-6	1	1	1	1		14
08L0178	S	Uranium, Total	7440-61-1	1	1	1	1		14
08L0178	S	Vanadium, Total	7440-62-2	1	1	1	1		14

Table 2-1. ICP Metals Preparation Batch Summary. (8 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
08L0178	S	Zinc, Total	7440-66-6	1	1	1	1		14
08L0193	S	Aluminum, Total	7429-90-5	1	1	1	1	1	17
08L0193	S	Antimony, Total	7440-36-0	1	1	1	1	1	17
08L0193	S	Arsenic, Total	7440-38-2	1	1	1	1	1	17
08L0193	S	Barium, Total	7440-39-3	1	1	1	1	1	17
08L0193	S	Beryllium, Total	7440-41-7	1	1	1	1	1	17
08L0193	S	Boron, Total	7440-42-8	1	1	1	1	1	17
08L0193	S	Cadmium, Total	7440-43-9	1	1	1	1	1	17
08L0193	S	Calcium, Total	7440-70-2	1	1	1	1	1	17
08L0193	S	Chromium, Total	7440-47-3	1	1	1	1	1	17
08L0193	S	Cobalt, Total	7440-48-4	1	1	1	1	1	17
08L0193	S	Copper, Total	7440-50-8	1	1	1	1	1	17
08L0193	S	Iron, Total	7439-89-6	1	1	1	1	1	17
08L0193	S	Lead, Total	7439-92-1	1	1	1	1	1	17
08L0193	S	Magnesium, Total	7439-95-4	1	1	1	1	1	17
08L0193	S	Manganese, Total	7439-96-5	1	1	1	1	1	17
08L0193	S	Molybdenum, Total	7439-98-7	1	1	1	1	1	17
08L0193	S	Nickel, Total	7440-02-0	1	1	1	1	1	17
08L0193	S	Potassium, Total	7440-09-7	1	1	1	1	1	17
08L0193	S	Selenium, Total	7782-49-2	1	1	1	1	1	17
08L0193	S	Silicon, Total	7440-21-3	1	1	1	1	1	17
08L0193	S	Silver, Total	7440-22-4	1	1	1	1	1	17
08L0193	S	Sodium, Total	7440-23-5	1	1	1	1	1	17
08L0193	S	Strontium, Total	7440-24-6	1	1	1	1	1	17
08L0193	S	Thallium, Total	7440-28-0	1	1	1	1	1	17
08L0193	S	Tin, Total	7440-31-5	1	1	1	1	1	17
08L0193	S	Titanium, Total	7440-32-6	1	1	1	1	1	17
08L0193	S	Uranium, Total	7440-61-1	1	1	1	1	1	17
08L0193	S	Vanadium, Total	7440-62-2	1	1	1	1	1	17
08L0193	S	Zinc, Total	7440-66-6	1	1	1	1	1	17
08L0200	S	Aluminum, Total	7429-90-5	1	1	1	1	1	14
08L0200	S	Antimony, Total	7440-36-0	1	1	1	1	1	14
08L0200	S	Arsenic, Total	7440-38-2	1	1	1	1	1	14
08L0200	S	Barium, Total	7440-39-3	1	1	1	1	1	14
08L0200	S	Beryllium, Total	7440-41-7	1	1	1	1	1	14
08L0200	S	Boron, Total	7440-42-8	1	1	1	1	1	14
08L0200	S	Cadmium, Total	7440-43-9	1	1	1	1	1	14
08L0200	S	Calcium, Total	7440-70-2	1	1	1	1	1	14
08L0200	S	Chromium, Total	7440-47-3	1	1	1	1	1	14
08L0200	S	Cobalt, Total	7440-48-4	1	1	1	1	1	14
08L0200	S	Copper, Total	7440-50-8	1	1	1	1	1	14

Table 2-1. ICP Metals Preparation Batch Summary. (8 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
08L0200	S	Iron, Total	7439-89-6	1	1	1	1	1	14
08L0200	S	Lead, Total	7439-92-1	1	1	1	1	1	14
08L0200	S	Magnesium, Total	7439-95-4	1	1	1	1	1	14
08L0200	S	Manganese, Total	7439-96-5	1	1	1	1	1	14
08L0200	S	Molybdenum, Total	7439-98-7	1	1	1	1	1	14
08L0200	S	Nickel, Total	7440-02-0	1	1	1	1	1	14
08L0200	S	Potassium, Total	7440-09-7	1	1	1	1	1	14
08L0200	S	Selenium, Total	7782-49-2	1	1	1	1	1	14
08L0200	S	Silicon, Total	7440-21-3	1	1	1	1	1	14
08L0200	S	Silver, Total	7440-22-4	1	1	1	1	1	14
08L0200	S	Sodium, Total	7440-23-5	1	1	1	1	1	14
08L0200	S	Strontium, Total	7440-24-6	1	1	1	1	1	14
08L0200	S	Thallium, Total	7440-28-0	1	1	1	1	1	14
08L0200	S	Tin, Total	7440-31-5	1	1	1	1	1	14
08L0200	S	Titanium, Total	7440-32-6	1	1	1	1	1	14
08L0200	S	Uranium, Total	7440-61-1	1	1	1	1	1	14
08L0200	S	Vanadium, Total	7440-62-2	1	1	1	1	1	14
08L0200	S	Zinc, Total	7440-66-6	1	1	1	1	1	14
08L0202	W	Aluminum, Total	7429-90-5	1	1	1	1	1	8
08L0202	W	Antimony, Total	7440-36-0	1	1	1	1	1	8
08L0202	W	Arsenic, Total	7440-38-2	1	1	1	1	1	8
08L0202	W	Barium, Total	7440-39-3	1	1	1	1	1	8
08L0202	W	Beryllium, Total	7440-41-7	1	1	1	1	1	8
08L0202	W	Boron, Total	7440-42-8	1	1	1	1	1	8
08L0202	W	Cadmium, Total	7440-43-9	1	1	1	1	1	8
08L0202	W	Calcium, Total	7440-70-2	1	1	1	1	1	8
08L0202	W	Chromium, Total	7440-47-3	1	1	1	1	1	8
08L0202	W	Cobalt, Total	7440-48-4	1	1	1	1	1	8
08L0202	W	Copper, Total	7440-50-8	1	1	1	1	1	8
08L0202	W	Iron, Total	7439-89-6	1	1	1	1	1	8
08L0202	W	Lead, Total	7439-92-1	1	1	1	1	1	8
08L0202	W	Magnesium, Total	7439-95-4	1	1	1	1	1	8
08L0202	W	Manganese, Total	7439-96-5	1	1	1	1	1	8
08L0202	W	Molybdenum, Total	7439-98-7	1	1	1	1	1	8
08L0202	W	Nickel, Total	7440-02-0	1	1	1	1	1	8
08L0202	W	Potassium, Total	7440-09-7	1	1	1	1	1	8
08L0202	W	Selenium, Total	7782-49-2	1	1	1	1	1	8
08L0202	W	Silicon, Total	7440-21-3	1	1	1	1	1	8
08L0202	W	Silver, Total	7440-22-4	1	1	1	1	1	8
08L0202	W	Sodium, Total	7440-23-5	1	1	1	1	1	8
08L0202	W	Strontium, Total	7440-24-6	1	1	1	1	1	8

Table 2-1. ICP Metals Preparation Batch Summary. (8 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
08L0202	W	Thallium, Total	7440-28-0	1	1	1	1	1	8
08L0202	W	Tin, Total	7440-31-5	1	1	1	1	1	8
08L0202	W	Titanium, Total	7440-32-6	1	1	1	1	1	8
08L0202	W	Uranium, Total	7440-61-1	1	1	1	1	1	8
08L0202	W	Vanadium, Total	7440-62-2	1	1	1	1	1	8
08L0202	W	Zinc, Total	7440-66-6	1	1	1	1	1	8
08L0210	S	Aluminum, Total	7429-90-5	1	1	1	1	1	16
08L0210	S	Antimony, Total	7440-36-0	1	1	1	1	1	16
08L0210	S	Arsenic, Total	7440-38-2	1	1	1	1	1	16
08L0210	S	Barium, Total	7440-39-3	1	1	1	1	1	16
08L0210	S	Beryllium, Total	7440-41-7	1	1	1	1	1	16
08L0210	S	Boron, Total	7440-42-8	1	1	1	1	1	16
08L0210	S	Cadmium, Total	7440-43-9	1	1	1	1	1	16
08L0210	S	Calcium, Total	7440-70-2	1	1	1	1	1	16
08L0210	S	Chromium, Total	7440-47-3	1	1	1	1	1	16
08L0210	S	Cobalt, Total	7440-48-4	1	1	1	1	1	16
08L0210	S	Copper, Total	7440-50-8	1	1	1	1	1	16
08L0210	S	Iron, Total	7439-89-6	1	1	1	1	1	16
08L0210	S	Lead, Total	7439-92-1	1	1	1	1	1	16
08L0210	S	Magnesium, Total	7439-95-4	1	1	1	1	1	16
08L0210	S	Manganese, Total	7439-96-5	1	1	1	1	1	16
08L0210	S	Molybdenum, Total	7439-98-7	1	1	1	1	1	16
08L0210	S	Nickel, Total	7440-02-0	1	1	1	1	1	16
08L0210	S	Potassium, Total	7440-09-7	1	1	1	1	1	16
08L0210	S	Selenium, Total	7782-49-2	1	1	1	1	1	16
08L0210	S	Silicon, Total	7440-21-3	1	1	1	1	1	16
08L0210	S	Silver, Total	7440-22-4	1	1	1	1	1	16
08L0210	S	Sodium, Total	7440-23-5	1	1	1	1	1	16
08L0210	S	Strontium, Total	7440-24-6	1	1	1	1	1	16
08L0210	S	Thallium, Total	7440-28-0	1	1	1	1	1	16
08L0210	S	Tin, Total	7440-31-5	1	1	1	1	1	16
08L0210	S	Titanium, Total	7440-32-6	1	1	1	1	1	16
08L0210	S	Uranium, Total	7440-61-1	1	1	1	1	1	16
08L0210	S	Vanadium, Total	7440-62-2	1	1	1	1	1	16
08L0210	S	Zinc, Total	7440-66-6	1	1	1	1	1	16
08L0220	S	Aluminum, Total	7429-90-5	1	1	1	1		6
08L0220	S	Antimony, Total	7440-36-0	1	1	1	1		6
08L0220	S	Arsenic, Total	7440-38-2	1	1	1	1		6
08L0220	S	Barium, Total	7440-39-3	1	1	1	1		6
08L0220	S	Beryllium, Total	7440-41-7	1	1	1	1		6
08L0220	S	Boron, Total	7440-42-8	1	1	1	1		6

Table 2-1. ICP Metals Preparation Batch Summary. (8 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
08L0220	S	Cadmium, Total	7440-43-9	1	1	1	1		6
08L0220	S	Calcium, Total	7440-70-2	1	1	1	1		6
08L0220	S	Chromium, Total	7440-47-3	1	1	1	1		6
08L0220	S	Cobalt, Total	7440-48-4	1	1	1	1		6
08L0220	S	Copper, Total	7440-50-8	1	1	1	1		6
08L0220	S	Iron, Total	7439-89-6	1	1	1	1		6
08L0220	S	Lead, Total	7439-92-1	1	1	1	1		6
08L0220	S	Magnesium, Total	7439-95-4	1	1	1	1		6
08L0220	S	Manganese, Total	7439-96-5	1	1	1	1		6
08L0220	S	Molybdenum, Total	7439-98-7	1	1	1	1		6
08L0220	S	Nickel, Total	7440-02-0	1	1	1	1		6
08L0220	S	Potassium, Total	7440-09-7	1	1	1	1		6
08L0220	S	Selenium, Total	7782-49-2	1	1	1	1		6
08L0220	S	Silicon, Total	7440-21-3	1	1	1	1		6
08L0220	S	Silver, Total	7440-22-4	1	1	1	1		6
08L0220	S	Sodium, Total	7440-23-5	1	1	1	1		6
08L0220	S	Strontium, Total	7440-24-6	1	1	1	1		6
08L0220	S	Thallium, Total	7440-28-0	1	1	1	1		6
08L0220	S	Tin, Total	7440-31-5	1	1	1	1		6
08L0220	S	Titanium, Total	7440-32-6	1	1	1	1		6
08L0220	S	Uranium, Total	7440-61-1	1	1	1	1		6
08L0220	S	Vanadium, Total	7440-62-2	1	1	1	1		6
08L0220	S	Zinc, Total	7440-66-6	1	1	1	1		6

CAS - Chemical Abstracts Service
DUP - duplicate
ICP - inductively coupled plasma
LCS - laboratory control sample
MB - method blank
MS - matrix spike
MSD - matrix spike duplicate
S - soil
W - water

ICP metals analysis was performed in eleven batches. Nine batches had all analytes included. Batch 08L0163 included all analytes with the exception of silver. Batch 08L0177 included only silver. Each batch contained fewer than 20 field samples. At least one LCS and MB were analyzed in each sample batch.

A MS and a MSD or DUP are to be analyzed with every 20 samples from the field, per *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). For the 8 samples in the one water batch, there was one DUP, one MS and one MSD, so the intent of the sampling plan was met. For the 104 samples in the soil batches, there were 9 DUPs, 9 MS and 5 MSDs, so the intent of the sampling plan was met. Please note that the four extra MS were LVL internal matrix spike samples.

No data were qualified for missing QC samples.

2.1.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for ICP metals analysis by method 6010A are specified in VET-1405-PLN-03, Rev. 0, as 180 days from sampling to analysis. All results were generated within these limits.

2.1.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The required quantitation limits (RQLs) (VET-1405-PLN-03, Rev. 0) are shown in Table 2-2.

Table 2-2. Required Quantitation Limit for ICP Metals.

Analyte	Water (µg/L)	Soil (mg/kg)
Aluminum	50	2.5
Antimony	40	2.0
Arsenic	50	2.5
Barium	5	0.25
Beryllium	5	0.25
Boron	50	2.5
Cadmium	5	0.25
Calcium	50	2.5
Chromium	5	0.25
Cobalt	5	0.25
Copper	5	0.25
Iron	50	2.5
Lead	50	2.5
Magnesium	50	2.5
Manganese	10	0.50
Molybdenum	5	0.25
Nickel	10	0.50
Potassium	500	2.5
Selenium	50	2.5
Silicon	50	2.5
Silver	10	0.50
Sodium	50	2.5
Strontium	5	0.25
Thallium	50	2.5
Tin	50	2.5
Titanium	10	0.50
Uranium	5	0.25
Vanadium	5	0.25
Zinc	10	0.50

ICP - inductively coupled plasma

All method blank failures are included in Table 2-3

Table 2-3. ICP Metals Method Blank Failures. (2 Pages)

Batch ID	Matrix	Analyte	CAS	Result	Q	3 Times the Detection Limit[1]	RQL
08L0104	S	Barium	7440-39-3	0.12	B	0.3	0.25
08L0104	S	Calcium	7440-70-2	7.8	B	12	2.5
08L0104	S	Copper	7440-50-8	-0.2	B	0.6	0.25
08L0104	S	Iron	7439-89-6	4.8	B	13.5	2.5
08L0104	S	Manganese	7439-96-5	0.06	B	0.12	0.5
08L0104	S	Sodium	7440-23-5	9.3	B	6	2.5
08L0104	S	Strontium	7440-24-6	0.06	B	0.09	0.25
08L0104	S	Thallium	7440-28-0	-0.9	B	1.8	2.5
08L0104	S	Tin	7440-31-5	1.3	B	1.8	2.5
08L0104	S	Titanium	7440-32-6	0.83		0.3	0.5
08L0125	S	Calcium	7440-70-2	4.9	B	12	2.5
08L0125	S	Sodium	7440-23-5	12.3		6	2.5
08L0125	S	Tin	7440-31-5	0.67	B	1.8	2.5
08L0146	S	Barium	7440-39-3	0.25	B	0.3	0.25
08L0146	S	Calcium	7440-70-2	11	B	12	2.5
08L0146	S	Iron	7439-89-6	22.3		13.5	2.5
08L0146	S	Magnesium	7439-95-4	10.7		7.5	2.5
08L0146	S	Manganese	7439-96-5	0.18	B	0.12	0.5
08L0146	S	Silicon	7440-21-3	5	B	12	2.5
08L0146	S	Sodium	7440-23-5	18.7		6	2.5
08L0146	S	Strontium	7440-24-6	0.18		0.09	0.25
08L0146	S	Titanium	7440-32-6	1.1		0.3	0.5
08L0163	S	Aluminum	7429-90-5	23.4		12	2.5
08L0163	S	Barium	7440-39-3	0.18	B	0.3	0.25
08L0163	S	Calcium	7440-70-2	4.3	B	12	2.5
08L0163	S	Manganese	7439-96-5	0.06	B	0.12	0.5
08L0163	S	Selenium	7782-49-2	0.65	B	1.8	2.5
08L0163	S	Sodium	7440-23-5	7.3	B	6	2.5
08L0163	S	Strontium	7440-24-6	0.04	B	0.09	0.25
08L0163	S	Titanium	7440-32-6	0.16	B	0.3	0.5
08L0178	S	Barium	7440-39-3	0.21	B	0.3	0.25
08L0178	S	Calcium	7440-70-2	11.1	B	12	2.5
08L0178	S	Copper	7440-50-8	0.21	B	0.6	0.25
08L0178	S	Iron	7439-89-6	7.6	B	13.5	2.5
08L0178	S	Lead	7439-92-1	0.3	B	0.9	2.5
08L0178	S	Magnesium	7439-95-4	3.3	B	7.5	2.5
08L0178	S	Manganese	7439-96-5	0.16	B	0.12	0.5
08L0178	S	Sodium	7440-23-5	16.8		6	2.5
08L0178	S	Strontium	7440-24-6	0.07	B	0.09	0.25
08L0178	S	Titanium	7440-32-6	0.32	B	0.3	0.5
08L0193	S	Barium	7440-39-3	0.1	B	0.3	0.25

Table 2-3. ICP Metals Method Blank Failures. (2 Pages)

Batch ID	Matrix	Analyte	CAS	Result	Q	3 Times the Detection Limit[1]	RQL
08L0193	S	Calcium	7440-70-2	5.6	B	12	2.5
08L0193	S	Manganese	7439-96-5	0.05	B	0.12	0.5
08L0193	S	Nickel	7440-02-0	0.84	B	0.6	0.5
08L0193	S	Sodium	7440-23-5	7.4	B	6	2.5
08L0193	S	Strontium	7440-24-6	0.04	B	0.09	0.25
08L0200	S	Calcium	7440-70-2	5.1	B	12	2.5
08L0200	S	Sodium	7440-23-5	7.7	B	6	2.5
08L0202	W	Barium	7440-39-3	0.34	B	0.75	5
08L0202	W	Sodium	7440-23-5	10.8	B	15	50
08L0210	S	Cadmium	7440-43-9	0.05	B	0.15	0.25
08L0210	S	Calcium	7440-70-2	5.7	B	12	2.5
08L0210	S	Chromium	7440-47-3	0.21	B	0.6	0.25
08L0210	S	Manganese	7439-96-5	0.05	B	0.12	0.5
08L0210	S	Potassium	7440-09-7	65.9		147.9	2.5
08L0210	S	Sodium	7440-23-5	10.3		6	2.5
08L0210	S	Tin	7440-31-5	0.82	B	1.8	2.5
08L0210	S	Zinc	7440-66-6	1.2	B	1.8	0.5
08L0220	S	Barium	7440-39-3	0.37	B	0.3	0.25
08L0220	S	Calcium	7440-70-2	10.2	B	12	2.5
08L0220	S	Chromium	7440-47-3	0.2	B	0.6	0.25
08L0220	S	Iron	7439-89-6	19.5	B	13.5	2.5
08L0220	S	Magnesium	7439-95-4	3.5	B	7.5	2.5
08L0220	S	Manganese	7439-96-5	0.12	B	0.12	0.5
08L0220	S	Sodium	7440-23-5	10.8		6	2.5
08L0220	S	Strontium	7440-24-6	0.13		0.09	0.25
08L0220	S	Tin	7440-31-5	1.2	B	1.8	2.5
08L0220	S	Titanium	7440-32-6	0.54		0.3	0.5

1. Units are µg/L for water and mg/kg for soil.

CAS - Chemicat Abstract Service
ICP - inductively coupled plasma
Q - laboratory qualifier
RQL - required quantitation limit
S - soil
W - water

In batch 08L0104, barium, copper, manganese, strontium, thallium and tin were all detected in the method blank at levels that were less than three times the detection limit. No copper, manganese, strontium, thallium or tin results in batch 08L0104 were qualified due to blank contamination.

In batch 08L0104, calcium, iron, sodium, and titanium were detected in the method blank at levels that exceeded the required detection limit (RDL) for those analytes. However, all sample results for calcium, iron, sodium, and titanium in this batch were greater than ten times the blank concentration, so none of these results required qualification.

In batch 08L0125, tin was detected in the method blank at a level that was less than three times the detection limit. Therefore, no tin results in this batch were qualified due to blank contamination.

In batch 08L0125, calcium and sodium were detected in the method blank at levels that exceeded their RDLs. All sample results for calcium and sodium in this batch were detected at levels that were greater than ten times the blank concentrations. Therefore, no calcium or sodium results in this batch were qualified due to blank contamination.

In batch 08L0146, barium was detected in the method blank at a level that was less than three times the detection limit. Therefore, no barium results in this batch were qualified due to blank contamination.

In batch 08L0146, calcium, iron, magnesium, silicon, and titanium were detected in the method blank at levels that exceeded the RDL for those analytes. However, all sample results for calcium, iron, magnesium, silicon, and titanium were greater than ten times the blank concentration, so none of these results were qualified due to blank contamination.

In batch 08L0146, sodium was detected in the method blank at a level that exceeded the RDL. Two samples in this batch had sodium detected at a level that was less than ten times the blank concentration. These two sodium results were qualified as estimated and flagged with "J". The other sodium result in this batch was greater than ten times the blank concentration and did not require qualification.

Manganese and strontium were detected in the method blank for batch 08L0146 at a level that was greater than three times the detection limit. However, the sample results for these two analytes were greater than ten times the blank concentrations. None of the sample results for manganese or strontium in this batch were qualified due to blank contamination.

In batch 08L0163, barium, manganese, selenium, strontium, and titanium were detected in the method blank at levels that were less than three times the detection limits. No barium, manganese, selenium, strontium or titanium results in this batch were qualified as estimated due to blank contamination.

Aluminum, calcium and sodium were detected in the method blank for batch 08L0163 at levels that exceeded their respective RDLs. All sample results in this batch for these analytes were greater than ten times the blank concentrations. No sample results for aluminum, calcium or sodium were qualified due to blank contamination in this batch.

In batch 08L0178, barium, copper, lead, manganese, and strontium were detected in the method blank at levels that were less than three times the detection limit. No sample results for these analytes were qualified due to blank contamination in this batch.

Calcium, iron and magnesium were detected in the method blank for batch 08L0178 at levels that exceeded the RDLs for those analytes. However, all sample results for calcium, iron and magnesium were greater than ten times the blank concentrations. Therefore, no calcium, iron or magnesium results were qualified due to blank contamination in this batch.

Sodium was detected in the method blank for batch 08L0178 at a level that exceeded the RDL. Two results for sodium in this batch that were less than ten times the blank concentration were qualified as estimated and flagged with "J". The other two sodium results in this batch were greater than ten times the blank concentration and did not require qualification.

Titanium was detected in the method blank for batch 08L0178 at a level that exceeded three times the detection limit. However, all sample results for titanium in this batch were greater than times the blank concentration and did not require qualification.

In batch 08L0193 barium, manganese and strontium were detected in the method blank at levels that were less than three times the detection limits for those analytes. No barium, manganese or strontium data in this batch were qualified as estimated due blank contamination.

Calcium was detected in the method blank for batch 08L0193 at a level that exceeded the RDL. All calcium results in this batch were greater than ten times the blank concentration so did not require qualification due to blank contamination.

Nickel and sodium were detected in the method blank for batch 08L0193 at levels that exceeded three times their respective detection limits. All results for nickel and sodium in this batch were greater than ten times the blank concentrations and did not require qualification.

In batch 08L0200 calcium and sodium were detected in the method blank at levels that exceeded their respective RDLs. All results for calcium and sodium in this batch were greater than ten times the blank concentration and did not require qualification.

In batch 08L0202 barium and sodium were detected in the method blank at levels that were less than three times their respective detection limits. No barium or sodium results in this batch were qualified due to blank contamination.

In batch 08L0210 cadmium, chromium, manganese and tin were detected in the method blank at levels that were less than three times their respective detection limits. No results for these analytes in batch 08L0210 were qualified due to blank contamination.

Calcium, potassium and sodium were detected in the method blank for batch 08L0210 at levels that exceeded their RDLs. All calcium, potassium and sodium results in this batch were greater than ten times the blank concentrations and did not require qualification.

Chromium, manganese and tin were detected in the method blank for batch 08L0220 at levels that were less than three times their respective detection limits. Chromium, manganese and tin data for this batch did not require qualification due to blank contamination.

In batch 08L0220, barium, calcium, iron, magnesium, sodium and titanium were detected in the method blank at levels that exceeded their RDLs. All results for these analytes in batch 08L0220 were greater than ten times the blank concentrations and did not require qualification.

Strontium was detected in the method blank for batch 08L0220 at a level that was greater than three times the detection limit. All strontium results in this batch were greater than ten times the blank concentration and did not require qualification.

2.1.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The quantitation limit for nondetect results did not meet the required detection limit in the cases listed in Table 2-4. Per *Data Validation Procedure for Chemical Analyses* (HNF-20433, Rev. 0), no qualifiers were applied.

Table 2-4. Nondetect Results That Did Not Meet The Required Detection Limits. (2 Pages)

Batch	Matrix	Lab Sample ID	Analytes	Reporting Limit (mg/kg)	Requested Detection Limit (mg/kg)
08L0104	S	0803L762-001	Uranium	1.8	0.25
08L0104	S	0803L762-002	Uranium	1.9	0.25
08L0104	S	0803L762-003	Uranium	1.8	0.25
08L0125	S	0803L842-001	Uranium	1.9	0.25
08L0125	S	0803L842-002	Uranium	1.9	0.25
08L0125	S	0803L842-003	Uranium	1.8	0.25
08L0125	S	0803L842-004	Uranium	1.7	0.25
08L0125	S	0803L842-005	Uranium	2	0.25
08L0146	S	0804L852-001	Uranium	1.7	0.25
08L0146	S	0804L852-002	Uranium	1.7	0.25
08L0146	S	0804L852-003	Uranium	1.8	0.25
08L0163	S	0804L905-001	Uranium	1.8	0.25
08L0163	S	0804L905-002	Uranium	1.6	0.25
08L0163	S	0804L905-003	Uranium	1.7	0.25
08L0178	S	0804L010-001	Uranium	1.8	0.25
08L0178	S	0804L010-002	Uranium	1.8	0.25
08L0178	S	0804L010-003	Uranium	1.8	0.25
08L0178	S	0804L010-004	Uranium	1.9	0.25
08L0193	S	0805L044-001	Uranium	1.9	0.25
08L0193	S	0805L044-002	Uranium	1.8	0.25
08L0193	S	0805L044-003	Uranium	1.8	0.25
08L0193	S	0805L044-004	Uranium	1.7	0.25
08L0193	S	0805L044-005	Uranium	1.8	0.25
08L0193	S	0805L044-006	Uranium	1.8	0.25
08L0193	S	0805L044-007	Uranium	1.8	0.25
08L0193	S	0805L044-008	Uranium	1.8	0.25
08L0193	S	0805L044-009	Uranium	1.8	0.25
08L0193	S	0805L044-010	Uranium	1.5	0.25
08L0193	S	0805L044-011	Uranium	1.7	0.25
08L0200	S	0805L087-001	Uranium	2.1	0.25
08L0200	S	0805L087-002	Uranium	1.8	0.25
08L0200	S	0805L087-003	Uranium	1.8	0.25
08L0200	S	0805L095-001	Uranium	1.7	0.25
08L0200	S	0805L095-002	Uranium	1.8	0.25
08L0200	S	0805L095-003	Uranium	1.8	0.25

Table 2-4. Nondetect Results That Did Not Meet The Required Detection Limits. (2 Pages)

Batch	Matrix	Lab Sample ID	Analytes	Reporting Limit (mg/kg)	Requested Detection Limit (mg/kg)
08L0200	S	0805L095-005	Uranium	1.9	0.25
08L0200	S	0805L095-006	Uranium	2	0.25
08L0210	S	0805L111-001	Uranium	1.7	0.25
08L0210	S	0805L111-002	Uranium	1.9	0.25
08L0210	S	0805L119-001	Uranium	1.8	0.25
08L0210	S	0805L119-002	Uranium	1.9	0.25
08L0210	S	0805L119-003	Uranium	1.7	0.25
08L0210	S	0805L119-004	Uranium	1.8	0.25
08L0210	S	0805L126-001	Uranium	1.8	0.25
08L0210	S	0805L126-003	Uranium	1.8	0.25
08L0210	S	0805L126-004	Uranium	1.7	0.25
08L0210	S	0805L126-005	Uranium	1.8	0.25
08L0210	S	0805L143-001	Uranium	1.8	0.25
08L0210	S	0805L143-002	Uranium	1.8	0.25
08L0210	S	0805L143-003	Uranium	1.6	0.25
08L0210	S	0805L143-004	Uranium	1.6	0.25
08L0210	S	0805L143-005	Uranium	1.7	0.25
08L0210	S	0805L143-006	Uranium	1.6	0.25
08L0220	S	0805L168-001	Uranium	1.9	0.25
08L0220	S	0805L168-002	Uranium	1.9	0.25
08L0220	S	0805L168-003	Uranium	1.7	0.25
08L0220	S	0805L168-004	Uranium	1.8	0.25
08L0220	S	0805L168-005	Uranium	1.9	0.25
08L0220	S	0805L194-001	Uranium	1.9	0.25

S - soil

2.1.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, and MSD meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS, MS, and MSD recoveries must be between 75% and 125%.

Table 2-5 outlines the batches that had LCS failures. Silicon results in batches 08L0125, 08L0146, 08L0163, 08L0178, 08L0200, 08L0210 and 08L0220 were rejected and flagged with an “R” due to extremely low LCS recoveries below 50%. Silicon results in batches 08L0104 and 08L0193 were flagged with a “J” due to low LCS recovery. Uranium results in batch 08L0146 were not qualified as all results were less than the instrument detection limit and the LCS recovery was high.

Table 2-5. ICP-Metals LCS Failures.

Batch ID	Matrix	Analyte	CAS	Percent Recovery	LCL (%)	UCL (%)
08L0104	S	Silicon	7440-21-3	57.2	75	125
08L0125	S	Silicon	7440-21-3	10.7	75	125
08L0146	S	Silicon	7440-21-3	5.5	75	125
08L0146	S	Uranium	7440-61-1	193	75	125
08L0163	S	Silicon	7440-21-3	30.8	75	125
08L0178	S	Silicon	7440-21-3	26.1	75	125
08L0193	S	Silicon	7440-21-3	52.9	75	125
08L0200	S	Silicon	7440-21-3	26.6	75	125
08L0210	S	Silicon	7440-21-3	40.6	75	125
08L0220	S	Silicon	7440-21-3	38.4	75	125

CAS - Chemical Abstracts Service
ICP - inductively coupled plasma
LCL - lower control limit
LCS - laboratory control sample
S - soil
UCL - upper control limit

Table 2-6 outlines the batches that had MS and/or MSD failures.

In batch 08L0104 aluminum, iron, silicon, and titanium were detected in the original sample at levels greater than four times the spike levels. Results for these analytes in batch 08L0104 were not qualified.

Antimony recovery was low in the MS for batch 08L0104. All antimony results in this batch were qualified as estimated and flagged with “J” for detects and “UJ” for nondetects.

In batch 08L0125 aluminum, iron, manganese, silicon and titanium were detected in the original sample at levels greater than four times the spike levels. Results for these analytes in batch 08L0125 were not qualified.

Antimony and chromium recoveries were low in the MS and the MSD for batch 08L0125. All antimony and chromium results in this batch were qualified as estimated and flagged with “J” for detects and “UJ” for nondetects.

Calcium recoveries were high in the MS and MSD for batch 08L0125. All calcium results in this batch were detects that were qualified as estimated and flagged with “J”.

In batch 08L0146 aluminum, iron, manganese, silicon, and titanium were detected in the original sample at levels greater than four times the spike levels. Results for these analytes in batch 08L0146 were not qualified.

Antimony and chromium recoveries in the MS for batch 08L0146 were low. All antimony and chromium results in this batch were qualified as estimated and flagged with “J” for detects and “UJ” for nondetects.

Uranium recovery was high in the MS for batch 08L0146. All uranium results in this batch were nondetects so did not require qualification.

In batch 08L0163 aluminum, iron, manganese, silicon and titanium were detected in the original sample at levels greater than four times the spike levels. Results for these anlytes in batch 08L0163 were not qualified.

Antimony recovery was low in the MS and MSD for batch 08L0163. All antimony results for this batch were qualified as estimated and flagged with "J" for detects and "UJ" for nondetects.

In batch 08L0178 aluminum, iron and titanium were detected in the original sample at levels greater than four times the spike levels. Results for these analytes in batch 08L0178 were not qualified.

Antimony recovery was low in the MS for batch 08L0178. All antimony results for this batch were nondetects that were qualified as estimated and flagged with "UJ".

In batch 08L0193 aluminum, iron, manganese, silicon and titanium were detected in the original sample at levels greater than four times the spike levels. Results for these analytes in batch 08L0193 were not qualified.

Antimony and chromium recoveries were low in the MS and MSD for batch 08L0193. All antimony and chromium results for this batch were qualified as estimated and flagged with "J" for detects and "UJ" for nondetects.

In batch 08L0200 aluminum, iron, manganese, silicon and titanium were detected in the original sample at levels greater than four times the spike levels. Results for these analytes in batch 08L0200 were not qualified.

Antimony and barium recoveries were low in the MS and MSD for batch 08L0200. Chromium recovery was low in the MSD for this batch, as well. All antimony, barium and chromium results in this batch were qualified as estimated and flagged with "J" for detects and "UJ" for nondetects.

In batch 08L0202 calcium, silicon and sodium were detected in the original sample at levels that were greater than four times the spike levels. Results for these analytes in batch 08L0202 were not qualified.

The iron recovery in the MSD and the silver recovery in the MS and MSD were low for batch 08L0202. All iron and silver results were qualified as estimated and flagged with "J" for detects and "UJ" for nondetects.

In batch 08L0210 aluminum, iron, manganese, silicon and titanium were detected in the original sample at levels greater than four times the spike levels. Results for these analytes in batch 08L0210 were not qualified.

Antimony recovery was low in the MS and MSD for batch 08L0210. Antimony results in this batch were qualified as estimated and flagged with "J" for detects and "UJ" for nondetects.

In batch 08L0220 aluminum, iron, manganese and silicon were detected in the original sample at levels greater than fouir times the spike levels. Results for these analytes in batch 08L0220 were not qualified.

Antimony recovery was low in the MS for batch 08L0220. All antimony results in this batch were qualified as estimated and flagged with "J" for detects and "UJ" for nondetects

Table 2-6. ICP-Metals MS and MSD Failures. (3 Pages)

Batch ID	Matrix	QCCode	Analyte	CAS	Percent Recovery	LCL (%)	UCL (%)
08L0104	S	MS	Aluminum	7429-90-5	220.9	75	125
08L0104	S	MS	Antimony	7440-36-0	52.7	75	125
08L0104	S	MS	Iron	7439-89-6	317.8	75	125
08L0104	S	MS	Silicon	7440-21-3	311.6	75	125
08L0104	S	MS	Titanium	7440-32-6	156.3	75	125
08L0125	S	MS	Aluminum	7429-90-5	422.1	75	125
08L0125	S	MSD	Aluminum	7429-90-5	354.8	75	125
08L0125	S	MS	Antimony	7440-36-0	39.4	75	125
08L0125	S	MSD	Antimony	7440-36-0	43.4	75	125
08L0125	S	MS	Calcium	7440-70-2	137.4	75	125
08L0125	S	MSD	Calcium	7440-70-2	197.9	75	125
08L0125	S	MS	Chromium	7440-47-3	64.4	75	125
08L0125	S	MSD	Chromium	7440-47-3	64.1	75	125
08L0125	S	MS	Iron	7439-89-6	372.7	75	125
08L0125	S	MSD	Iron	7439-89-6	0	75	125
08L0125	S	MS	Manganese	7439-96-5	144.2	75	125
08L0125	S	MS	Silicon	7440-21-3	0	75	125
08L0125	S	MSD	Silicon	7440-21-3	4.1	75	125
08L0125	S	MS	Titanium	7440-32-6	31.8	75	125
08L0125	S	MSD	Titanium	7440-32-6	61.1	75	125
08L0146	S	MS	Aluminum	7429-90-5	324	75	125
08L0146	S	MS	Antimony	7440-36-0	32	75	125
08L0146	S	MS	Chromium	7440-47-3	68.9	75	125
08L0146	S	MS	Iron	7439-89-6	-39.2	75	125
08L0146	S	MS	Manganese	7439-96-5	54.9	75	125
08L0146	S	MS	Silicon	7440-21-3	0.4	75	125
08L0146	S	MS	Titanium	7440-32-6	24.6	75	125
08L0146	S	MS	Uranium	7440-61-1	187.2	75	125
08L0163	S	MS	Aluminum	7429-90-5	390.6	75	125
08L0163	S	MSD	Aluminum	7429-90-5	335.3	75	125
08L0163	S	MS	Antimony	7440-36-0	44.4	75	125

Table 2-6. ICP-Metals MS and MSD Failures. (3 Pages)

Batch ID	Matrix	QCCode	Analyte	CAS	Percent Recovery	LCL (%)	UCL (%)
08L0163	S	MSD	Antimony	7440-36-0	39.7	75	125
08L0163	S	MS	Iron	7439-89-6	1.7	75	125
08L0163	S	MSD	Iron	7439-89-6	1.8	75	125
08L0163	S	MS	Manganese	7439-96-5	43	75	125
08L0163	S	MSD	Manganese	7439-96-5	60	75	125
08L0163	S	MS	Silicon	7440-21-3	163	75	125
08L0163	S	MS	Titanium	7440-32-6	3.8	75	125
08L0163	S	MSD	Titanium	7440-32-6	132.6	75	125
08L0178	S	MS	Aluminum	7429-90-5	327	75	125
08L0178	S	MS	Antimony	7440-36-0	44.7	75	125
08L0178	S	MS	Iron	7439-89-6	-6.8	75	125
08L0178	S	MS	Titanium	7440-32-6	10.8	75	125
08L0193	S	MS	Aluminum	7429-90-5	678.1	75	125
08L0193	S	MSD	Aluminum	7429-90-5	952.9	75	125
08L0193	S	MS	Antimony	7440-36-0	61.1	75	125
08L0193	S	MSD	Antimony	7440-36-0	54.9	75	125
08L0193	S	MS	Chromium	7440-47-3	37.7	75	125
08L0193	S	MSD	Chromium	7440-47-3	43.1	75	125
08L0193	S	MS	Iron	7439-89-6	1547.4	75	125
08L0193	S	MSD	Iron	7439-89-6	1871.7	75	125
08L0193	S	MS	Manganese	7439-96-5	146.9	75	125
08L0193	S	MSD	Manganese	7439-96-5	147.4	75	125
08L0193	S	MS	Silicon	7440-21-3	468.1	75	125
08L0193	S	MSD	Silicon	7440-21-3	319	75	125
08L0193	S	MS	Titanium	7440-32-6	258.6	75	125
08L0193	S	MSD	Titanium	7440-32-6	263.3	75	125
08L0200	S	MS	Aluminum	7429-90-5	497.8	75	125
08L0200	S	MSD	Aluminum	7429-90-5	359.7	75	125
08L0200	S	MS	Antimony	7440-36-0	49.2	75	125
08L0200	S	MSD	Antimony	7440-36-0	49.5	75	125
08L0200	S	MS	Barium	7440-39-3	56.4	75	125
08L0200	S	MSD	Barium	7440-39-3	55.5	75	125
08L0200	S	MSD	Chromium	7440-47-3	71.5	75	125
08L0200	S	MS	Iron	7439-89-6	1277	75	125
08L0200	S	MSD	Iron	7439-89-6	-36	75	125
08L0200	S	MSD	Manganese	7439-96-5	173.1	75	125
08L0200	S	MS	Silicon	7440-21-3	353.8	75	125
08L0200	S	MSD	Silicon	7440-21-3	352	75	125

Table 2-6. ICP-Metals MS and MSD Failures. (3 Pages)

Batch ID	Matrix	QCCode	Analyte	CAS	Percent Recovery	LCL (%)	UCL (%)
08L0200	S	MS	Titanium	7440-32-6	165.5	75	125
08L0202	W	MS	Calcium	7440-70-2	43.4	75	125
08L0202	W	MSD	Calcium	7440-70-2	67.3	75	125
08L0202	W	MSD	Iron	7439-89-6	72.4	75	125
08L0202	W	MS	Silicon	7440-21-3	-15.2	75	125
08L0202	W	MSD	Silicon	7440-21-3	-15.2	75	125
08L0202	W	MS	Silver	7440-22-4	48.4	75	125
08L0202	W	MSD	Silver	7440-22-4	48.4	75	125
08L0202	W	MS	Sodium	7440-23-5	63.5	75	125
08L0202	W	MSD	Sodium	7440-23-5	-23.4	75	125
08L0210	S	MS	Aluminum	7429-90-5	647.5	75	125
08L0210	S	MSD	Aluminum	7429-90-5	331.5	75	125
08L0210	S	MS	Antimony	7440-36-0	56.2	75	125
08L0210	S	MSD	Antimony	7440-36-0	61.5	75	125
08L0210	S	MS	Iron	7439-89-6	34.5	75	125
08L0210	S	MSD	Iron	7439-89-6	37	75	125
08L0210	S	MSD	Manganese	7439-96-5	21.3	75	125
08L0210	S	MS	Silicon	7440-21-3	307.7	75	125
08L0210	S	MSD	Silicon	7440-21-3	441.6	75	125
08L0210	S	MS	Titanium	7440-32-6	28.6	75	125
08L0210	S	MSD	Titanium	7440-32-6	20.3	75	125
08L0220	S	MS	Aluminum	7429-90-5	357.1	75	125
08L0220	S	MS	Antimony	7440-36-0	44.2	75	125
08L0220	S	MS	Iron	7439-89-6	386.8	75	125
08L0220	S	MS	Manganese	7439-96-5	0.3	75	125
08L0220	S	MS	Silicon	7440-21-3	201	75	125

CAS - Chemical Abstracts Service
ICP - inductively coupled plasma
LCL - lower control limit
MS - matrix spike
MSD - matrix spike duplicate
S - soil
UCL - upper control limit
W - water

2.1.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the relative percent difference (RPD) between MS and MSD, as well as sample and duplicate, must be less than 20% for all samples. Table 2-7 shows the MS and MSD failures for RPD.

The following analytes did not require qualification because the original sample result was greater than four times the spike level:

- Iron, manganese, silicon and titanium in batch 08L0125,
- Manganese, silicon and titanium in batch 08L0163,
- Aluminum and silicon in batch 08L0163,
- Iron, manganese and titanium in batch 08L0200,
- Calcium and sodium in batch 08L0202, and
- Manganese, silicon and titanium in btach 08L0210.

In batch 08L0125 calcium results were qualified as estimated and flagged with "J". In batch 08L0200 aluminum, calcium and chromium results were qualified as estimated and flagged with "J". In batch 08L0202 iron results were qualified as estimated and flagged with "J". In batch 08L0210 aluminum and strontium results were qualified as estimated and flagged with "J". All batch sample results that were qualified due to high MS/MSD RPD were detects.

Table 2-7. ICP-Metals MS/MSD RPD Failures.

Batch ID	Matrix	Analyte	CAS	RPD	RPD Limit
08L0125	S	Calcium	7440-70-2	36.1	20
08L0125	S	Iron	7439-89-6	200	20
08L0125	S	Manganese	7439-96-5	45	20
08L0125	S	Silicon	7440-21-3	200	20
08L0125	S	Titanium	7440-32-6	63.1	20
08L0163	S	Manganese	7439-96-5	33	20
08L0163	S	Silicon	7440-21-3	72.5	20
08L0163	S	Titanium	7440-32-6	188.9	20
08L0193	S	Aluminum	7429-90-5	33.7	20
08L0193	S	Silicon	7440-21-3	37.9	20
08L0200	S	Aluminum	7429-90-5	32.2	20
08L0200	S	Calcium	7440-70-2	21.8	20
08L0200	S	Chromium	7440-47-3	34.6	20
08L0200	S	Iron	7439-89-6	211.6	20
08L0200	S	Manganese	7439-96-5	50.1	20
08L0200	S	Titanium	7440-32-6	57.7	20
08L0202	W	Calcium	7440-70-2	43.2	20
08L0202	W	Iron	7439-89-6	20.8	20
08L0202	W	Sodium	7440-23-5	433.4	20
08L0210	S	Aluminum	7429-90-5	64.6	20
08L0210	S	Manganese	7439-96-5	133.7	20
08L0210	S	Silicon	7440-21-3	35.7	20
08L0210	S	Strontium	7440-24-6	20.1	20
08L0210	S	Titanium	7440-32-6	33.9	20

CAS - Chemical Abstracts Service
ICP - inductively coupled plasma
MS - matrix spike
MSD - matrix spike duplicate
RPD - relative percent difference
S - soil
W - water

Table 2-8 shows the sample duplicate failures for RPD. Nickel and sodium results in batch 08L0146, copper results in batch 08L0163, chromium and nickel results in batch 08L0200 and manganese results in batch 08L0220 were qualified as estimated and flagged with "J" for detects and "UJ" for nondetects.

Table 2-8. ICP-Metals Sample/Duplicate RPD Failures.

Batch ID	Matrix	Analyte	CAS	Original Sample	Duplicate Sample	RPD	RPD Limit
08L0146	S	Nickel	7440-02-0	0804L852-001	0804L852-001DUP	24	20
08L0146	S	Sodium	7440-23-5	0804L852-001	0804L852-001DUP	48.3	20
08L0163	S	Copper	7440-50-8	0804L905-001	0804L905-001DUP	21.7	20
08L0200	S	Chromium	7440-47-3	0805L087-002	0805L087-002DUP	20.4	20
08L0200	S	Nickel	7440-02-0	0805L087-002	0805L087-002DUP	28.1	20
08L0220	S	Manganese	7439-96-5	0805L168-001	0805L168-001DUP	20.9	20

CAS - Chemical Abstracts Service
ICP - inductively coupled plasma
RPD - relative percent difference
S - soil

2.2. DATA VALIDATION REPORT FOR MERCURY (METHODS 7470A and 7471A)

Table 2-9 is a summary of the validated results for mercury.

Table 2-9. Summary of Mercury Validation. (3 Pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0803L762-001	B043	S	08C0053	0.01	mg/kg	0.01	U		
0803L762-002	B044	S	08C0053	0.01	mg/kg	0.01	U		
0803L762-003	B045	S	08C0053	0.01	mg/kg	0.01	U		
0803L842-001	B055	S	08C0062	0.01	mg/kg	0.01	U		
0803L842-002	B056	S	08C0062	0.01	mg/kg	0.01	U		
0803L842-003	B058	S	08C0062	0.01	mg/kg	0.01	U		
0803L842-004	B059	S	08C0062	0.01	mg/kg	0.01	B		
0803L842-005	B060	S	08C0062	0.01	mg/kg	0.01	U		
0804L010-001	B096	S	08C0078	0.01	mg/kg	0.01	U		
0804L010-002	B098	S	08C0078	0.01	mg/kg	0.01	U		
0804L010-003	B099	S	08C0078	0.01	mg/kg	0.01	U		
0804L010-004	B101	S	08C0078	0.01	mg/kg	0.01	U		
0804L852-001	B061	S	08C0062	0.01	mg/kg	0.01	U		
0804L852-002	B062	S	08C0062	0.01	mg/kg	0.01	U		
0804L852-003	B063	S	08C0062	0.01	mg/kg	0.01	U		
0804L905-001	B079	S	08C0072	0.01	mg/kg	0.01	U		

Table 2-9. Summary of Mercury Validation. (3 Pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0804L905-002	B080	S	08C0072	0.01	mg/kg	0.01	U		
0804L905-003	B081	S	08C0072	0.01	mg/kg	0.01	U		
0805L044-001	S01	S	08C0084	0.009	mg/kg	0.01	U		
0805L044-002	S02	S	08C0084	0.008	mg/kg	0.01	U		
0805L044-003	S03	S	08C0084	0.01	mg/kg	0.01	B		
0805L044-004	S04	S	08C0084	0.01	mg/kg	0.01	U		
0805L044-005	S05	S	08C0084	0.02	mg/kg	0.01	B		
0805L044-006	S06	S	08C0084	0.01	mg/kg	0.01	U		
0805L044-007	S07	S	08C0084	0.01	mg/kg	0.01	U		
0805L044-008	S08	S	08C0084	0.01	mg/kg	0.01	U		
0805L044-009	S09	S	08C0084	0.01	mg/kg	0.01	U		
0805L044-010	S10	S	08C0084	0.01	mg/kg	0.01	U		
0805L044-011	S11	S	08C0084	0.01	mg/kg	0.01	U		
0805L085-001	G014	W	08C0086	0.06	µg/L	0.06	U		
0805L085-002	G015	W	08C0086	0.06	µg/L	0.06	U		
0805L085-004	G016	W	08C0086	0.06	µg/L	0.06	U		
0805L087-001	B110	S	08C0085	0.01	mg/kg	0.01			
0805L087-002	B111	S	08C0085	0.01	mg/kg	0.01	U		
0805L087-003	B112	S	08C0085	0.01	mg/kg	0.01	U		
0805L095-001	B114	S	08C0085	0.01	mg/kg	0.01	U		
0805L095-002	B115	S	08C0085	0.01	mg/kg	0.01	U		
0805L095-003	B116	S	08C0085	0.01	mg/kg	0.01	U		
0805L095-005	B118	S	08C0085	0.06	mg/kg	0.008			
0805L095-006	B119	S	08C0085	0.01	mg/kg	0.01	U		
0805L111-001	B123	S	08C0087	0.01	mg/kg	0.01	U		
0805L111-002	B124	S	08C0087	0.01	mg/kg	0.01	U		
0805L119-001	B128	S	08C0087	0.01	mg/kg	0.01	U		
0805L119-002	B129	S	08C0087	0.01	mg/kg	0.01	U		
0805L119-003	B131	S	08C0087	0.01	mg/kg	0.01	U		
0805L119-004	B132	S	08C0087	0.01	mg/kg	0.01	U		
0805L126-001	B133	S	08C0087	0.01	mg/kg	0.01	U		
0805L126-003	B135	S	08C0087	0.01	mg/kg	0.01	U		
0805L126-004	B137	S	08C0087	0.01	mg/kg	0.01	U		
0805L126-005	B138	S	08C0087	0.01	mg/kg	0.01	U		
0805L143-001	B139	S	08C0091	0.009	mg/kg	0.01	U		
0805L143-002	B140	S	08C0091	0.01	mg/kg	0.01	U		

Table 2-9. Summary of Mercury Validation. (3 Pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0805L143-003	B141	S	08C0091	0.008	mg/kg	0.01	U		
0805L143-004	B142	S	08C0091	0.008	mg/kg	0.01	U		
0805L143-005	B143	S	08C0091	0.01	mg/kg	0.01	U		
0805L143-006	B144	S	08C0091	0.01	mg/kg	0.01	U		
0805L168-001	B145	S	08C0092	0.01	mg/kg	0.01	U		
0805L168-002	B146	S	08C0092	1.6	mg/kg	1.6	U		
0805L168-003	B147	S	08C0092	0.16	mg/kg	0.01			
0805L168-004	B149	S	08C0092	0.03	mg/kg	0.008			
0805L168-005	B150	S	08C0092	0.01	mg/kg	0.01	U		
0805L194-001	B148	S	08C0096	0.01	mg/kg	0.01	U		

Conc. - concentration
EQL - estimated quantitation limit
Q - laboratory qualifier
S - soil
V - validation flag
W - water

2.2.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-10 shows the number of each type of sample in each preparation batch.

Table 2-10. Mercury Preparation Batch Summary.

Batch ID	Matrix	BLK	DUP	LCS	MS	MSD	Sample
08C0053	S	1	1	1	1		5
08C0062	S	1	1	1	1	1	8
08C0072	S	1	1	1	1	1	11
08C0078	S	1	1	1	1		6
08C0084	S	1	1	1	1	1	16
08C0085	S	1	1	1	1	1	10
08C0086	W	1	1	1	1	1	8
08C0087	S	1	1	1	1	1	13
08C0091	S	1		1			6
08C0092	S	1		1			5
08C0096	S	1		1			1

BLK - blank
DUP - duplicate
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
S - soil
W - water

Mercury analysis was performed in eleven batches. Each batch contained fewer than 20 field samples. At least one method blank and LCS were analyzed in each sample batch. The water batch also has a DUP, MS and MSD.

The soil batches do not have a DUP, MS and MSD included in each batch. However, the intent of the sampling plan is that one DUP, MS and MSD be included for every 20 field samples. For the 81 soil samples in these batches, there were seven DUPs, seven MS and five MSDs. Therefore the intent of the sampling plan was met. Please note that the two extra MS were LVL internal matrix spike samples. No data were qualified for missing quality control samples.

2.2.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for mercury analysis by methods 7470A and 7471A are specified in VET-1405-PLN-03, Rev. 0, as 28 days. All results were generated within these limits.

2.2.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The RQL (VET-1405-PLN-03, Rev. 0) is shown in Table 2-11.

Table 2-11. Required Quantitation Limit for Mercury.

Analyte	Water (µg/L)	Soil (mg/kg)
Mercury	0.05	5

All method blank results were below the instrument detection limits.

2.2.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

None of the quantitation limits for the nondetect results met the required detection limit. Per *Data Validation Procedure for Chemical Analyses* (HNF-20433, Rev.0), no data were qualified.

2.2.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, and MSD meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS, MS, and MSD recoveries must be between 75% and 125%. All LCS and MS/MSD recoveries were within the accuracy limits.

2.2.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the RPD between MS and MSD, as well as sample and duplicate, must be less than 20% for all samples. All RPDs met this criterion.

2.3. DATA VALIDATION REPORT FOR HEXAVALENT CHROMIUM (METHOD 7196A)

Table 2-12 is a summary of the validated results for hexavalent chromium.

Table 2-12. Summary of Hexavalent Chromium Validation. (2 Pages)

Client ID	Sample ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
B043	0803L762-001	S	08LVIA26	0.20	mg/kg	0.2	U		
B044	0803L762-002	S	08LVIA26	1.8	mg/kg	0.2			
B045	0803L762-003	S	08LVIA26	0.25	mg/kg	0.2			
B055	0803L842-001	S	08LVI033	0.21	mg/kg	0.21	U		
B056	0803L842-002	S	08LVI033	0.2	mg/kg	0.2	U		
B058	0803L842-003	S	08LVI033	0.21	mg/kg	0.21	U		
B059	0803L842-004	S	08LVI033	0.2	mg/kg	0.2	U		
B060	0803L842-005	S	08LVI033	0.21	mg/kg	0.21	U		
B061	0804L852-001	S	08LVI033	0.21	mg/kg	0.21	U		
B062	0804L852-002	S	08LVI033	0.21	mg/kg	0.21	U		
B063	0804L852-003	S	08LVI033	0.21	mg/kg	0.21	U		
B079	0804L905-001	S	08LVI035	0.21	mg/kg	0.21	U		
B080	0804L905-002	S	08LVI035	0.2	mg/kg	0.2	U		
B081	0804L905-003	S	08LVI035	0.21	mg/kg	0.21	U		
B096	0804L010-001	S	08LVI040	0.2	mg/kg	0.2	U		
B098	0804L010-002	S	08LVI040	0.21	mg/kg	0.21	U		
B099	0804L010-003	S	08LVI040	0.2	mg/kg	0.2	U		
B101	0804L010-004	S	08LVI040	0.21	mg/kg	0.21	U		
B110	0805L087-001	S	08LVI045	0.25	mg/kg	0.24			
B111	0805L087-002	S	08LVI045	0.21	mg/kg	0.21			
B112	0805L087-003	S	08LVI045	0.36	mg/kg	0.21			
B114	0805L095-001	S	08LVI045	0.21	mg/kg	0.21	U		
B115	0805L095-002	S	08LVI045	0.21	mg/kg	0.21	U		
B116	0805L095-003	S	08LVI045	0.21	mg/kg	0.21	U		
B118	0805L095-005	S	08LVI045	0.58	mg/kg	0.21			
B119	0805L095-006	S	08LVI045	0.86	mg/kg	0.21			
B123	0805L111-001	S	08LVI046	0.21	mg/kg	0.21	U		
B124	0805L111-002	S	08LVI046	3.6	mg/kg	0.21			
B128	0805L119-001	S	08LVI047	0.22	mg/kg	0.22	U		

Table 2-12. Summary of Hexavalent Chromium Validation. (2 Pages)

Client ID	Sample ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
B129	0805L119-002	S	08LVI047	0.28	mg/kg	0.22		J	High LCS
B131	0805L119-003	S	08LVI047	0.21	mg/kg	0.21	U		
B132	0805L119-004	S	08LVI047	0.21	mg/kg	0.21	U		
B133	0805L126-001	S	08LVI048	0.40	mg/kg	0.21			
B135	0805L126-003	S	08LVI048	0.34	mg/kg	0.21			
B137	0805L126-004	S	08LVI048	0.21	mg/kg	0.21	U		
B138	0805L126-005	S	08LVI048	0.22	mg/kg	0.21			
B139	0805L143-001	S	08LVI048	0.21	mg/kg	0.21	U		
B140	0805L143-002	S	08LVI048	0.59	mg/kg	0.21			
B141	0805L143-003	S	08LVI048	0.26	mg/kg	0.21			
B142	0805L143-004	S	08LVI048	0.21	mg/kg	0.21	U		
B143	0805L143-005	S	08LVI048	0.22	mg/kg	0.21			
B144	0805L143-006	S	08LVI048	1.0	mg/kg	0.22			
B145	0805L168-001	S	08LVI049	0.3	mg/kg	0.21			
B146	0805L168-002	S	08LVI049	1.3	mg/kg	0.22			
B147	0805L168-003	S	08LVI049	1.1	mg/kg	0.22			
B148	0805L194-001	S	08LVI049	0.82	mg/kg	0.22			
B149	0805L168-004	S	08LVI049	2.1	mg/kg	0.21			
B150	0805L168-005	S	08LVI049	2.2	mg/kg	0.21			
G014	0805L085-001	W	08LVI044	0.051	mg/L	0.01		J	MS low
G015	0805L085-002	W	08LVI044	0.047	mg/L	0.01		J	MS low
G016	0805L085-004	W	08LVI044	0.097	mg/L	0.01		J	MS low
S01	0805L044-001	S	08LVI043	0.21	mg/kg	0.21	U		
S02	0805L044-002	S	08LVI043	0.21	mg/kg	0.21	U		
S03	0805L044-003	S	08LVI043	0.21	mg/kg	0.21	U		
S04	0805L044-004	S	08LVI043	0.21	mg/kg	0.21	U		
S05	0805L044-005	S	08LVI043	0.21	mg/kg	0.21	U		
S06	0805L044-006	S	08LVI043	0.22	mg/kg	0.22	U		
S07	0805L044-007	S	08LVI043	0.22	mg/kg	0.22	U		
S08	0805L044-008	S	08LVI043	0.21	mg/kg	0.21	U		
S09	0805L044-009	S	08LVI043	0.21	mg/kg	0.21	U		
S10	0805L044-010	S	08LVI043	0.21	mg/kg	0.21	U		
S11	0805L044-011	S	08LVI043	0.21	mg/kg	0.21	U		

EQL - estimated quantitation limit
LCS - laboratory control sample
MS - matrix spike
Q - laboratory qualifier
S - soil
V - validator flag
W - water

2.3.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, and a MS sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-13 shows the number of each type of sample in each preparation batch.

Table 2-13. Hexavalent Chromium Preparation Batch Summary.

Batch ID	Matrix	BLK	LCS	DUP	MS	MSD	Sample
08LVI033	S	1	2	1	1	1	8
08LVI035	S	1	2	1	1	1	9
08LVI040	S	1	2				4
08LVI043	S	1	2	1	1	1	15
08LVI045	S	1	2	1	1	1	11
08LVI046	S	1	2	1	1	1	5
08LVI047	S	1	2				4
08LVI048	S	1	2				10
08LVI049	S	1	2				6
08LVIA26	S	1	2	1	1	1	3
08LVI044	W	1	2	1	1		3

BLK - blank
DUP - duplicate
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
S soil
W - water

Hexavalent chromium analysis was performed in 10 batches of soil samples and one batch of water samples. Each batch contained fewer than 20 field samples. At least one LCS and MB were analyzed in each sample batch.

A MS/MSD or a MS and a DUP are to be analyzed for every 20 sample results of each matrix type, averaged over the project. A MS and a DUP result were obtained for the batch of water samples.

A MS and MSD analysis was performed in six of the solid-sample batches. Since 75 solid samples were analyzed, this satisfies the one-in-twenty average.

2.3.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for chromium (VI) analysis by method 7196A are specified in VET-1405-PLN-03, Rev. 0, as 28 days for soil samples and one day for water samples. All results were generated within these limits.

2.3.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Project documentation does not specify a required quantitation limit for chromium (VI). Chromium (VI) was not detected in the method blanks. Detection limits in the blanks were 0.2 mg/kg for soils and 0.01 mg/L for water samples.

2.3.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for chromium (VI). Detection limits for soils were 0.22 mg/kg or less. Chromium (VI) was detected in all water samples.

2.3.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, and MSD meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS, MS, and MSD recoveries must be between 75% and 125%. However, the recovery for a LCS in batch "08LVI047" was 129%. Therefore, the one detect result in that batch (sample B129) was qualified as approximate and flagged with a "J."

Also, the MS recovery for the water-sample batch (batch "08LVI044") was low (49%). Therefore, all water sample results were qualified as approximate and were flagged "J".

All other LCS and MS/MSD recoveries were within the accuracy limits.

2.3.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the MS/MSD and DUP RPDs must be less than 20%. The RPD, as defined in the validation instructions, cannot be evaluated if the RDL is not specified. Therefore, no results were qualified for precision.

2.4. DATA VALIDATION REPORT FOR CYANIDE (METHOD 9014)

Table 2-14 is a summary of the validated results for cyanide.

Table 2-14. Summary of Cyanide Validation. (3 Pages)

Client ID	Sample ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
B043	0803L762-001	S	08LC017	0.49	mg/kg	0.49	U		
B044	0803L762-002	S	08LC017	0.48	mg/kg	0.48	U		
B045	0803L762-003	S	08LC017	0.49	mg/kg	0.49	U		

Table 2-14. Summary of Cyanide Validation. (3 Pages)

Client ID	Sample ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
B061	0804L852-001	S	08LC021	0.5	mg/kg	0.5	U		
B062	0804L852-002	S	08LC021	0.45	mg/kg	0.45	U		
B063	0804L852-003	S	08LC021	0.5	mg/kg	0.5	U		
B079	0804L905-001	S	08LC023	0.52	mg/kg	0.52	U		
B080	0804L905-002	S	08LC023	0.48	mg/kg	0.48	U		
B081	0804L905-003	S	08LC023	0.49	mg/kg	0.49	U		
B096	0804L010-001	S	08LC027	0.48	mg/kg	0.48	U		
B098	0804L010-002	S	08LC027	0.49	mg/kg	0.49	U		
B099	0804L010-003	S	08LC027	0.5	mg/kg	0.5	U		
B101	0804L010-004	S	08LC027	0.51	mg/kg	0.51	U		
B102	0804L026-001	S	08LC027	0.49	mg/kg	0.49	U		
B111	0805L087-002	S	08LC029	0.51	mg/kg	0.51	U		
B112	0805L087-003	S	08LC029	0.51	mg/kg	0.51	U		
B114	0805L095-001	S	08LC031	0.44	mg/kg	0.44	U		
B115	0805L095-002	S	08LC031	0.47	mg/kg	0.47	U		
B116	0805L095-003	S	08LC031	0.47	mg/kg	0.47	U		
B118	0805L095-005	S	08LC031	0.52	mg/kg	0.52	U		
B119	0805L095-006	S	08LC031	0.5	mg/kg	0.5	U		
B123	0805L111-001	S	08LC032	0.5	mg/kg	0.5	U		
B124	0805L111-002	S	08LC032	0.5	mg/kg	0.5	U		
B128	0805L119-001	S	08LC032	0.46	mg/kg	0.46	U		
B129	0805L119-002	S	08LC032	0.52	mg/kg	0.52	U		
B131	0805L119-003	S	08LC032	0.52	mg/kg	0.52	U		
B132	0805L119-004	S	08LC032	0.51	mg/kg	0.51	U		
B133	0805L126-001	S	08LC032	0.50	mg/kg	0.5	U		
B135	0805L126-003	S	08LC032	0.52	mg/kg	0.52	U		
B137	0805L126-004	S	08LC032	0.50	mg/kg	0.5	U		
B138	0805L126-005	S	08LC032	0.50	mg/kg	0.5	U		
B139	0805L143-001	S	08LC033	0.51	mg/kg	0.51	U		
B140	0805L143-002	S	08LC033	0.50	mg/kg	0.5	U		
B141	0805L143-003	S	08LC033	0.50	mg/kg	0.5	U		
B142	0805L143-004	S	08LC033	0.52	mg/kg	0.52	U		
B143	0805L143-005	S	08LC033	0.50	mg/kg	0.5	U		
B144	0805L143-006	S	08LC033	0.53	mg/kg	0.53	U		
B145	0805L168-001	S	08LC033	0.49	mg/kg	0.49	U		
B146	0805L168-002	S	08LC033	0.49	mg/kg	0.49	U		
B147	0805L168-003	S	08LC033	0.42	mg/kg	0.42	U		
B148	0805L194-001	S	08LC034	0.54	mg/kg	0.54	U		
B149	0805L168-004	S	08LC033	0.47	mg/kg	0.47	U		
B150	0805L168-005	S	08LC033	0.42	mg/kg	0.42	U		
G014	0805L085-001	W	08LC030	5	µg/L	5	U		

Table 2-14. Summary of Cyanide Validation. (3 Pages)

Client ID	Sample ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
G015	0805L085-002	W	08LC030	5	µg/L	5	U		
G016	0805L085-004	W	08LC030	5	µg/L	5	U		
S01	0805L044-001	S	08LC028	0.51	mg/kg	0.51	U		
S02	0805L044-002	S	08LC028	0.51	mg/kg	0.51	U		
S03	0805L044-003	S	08LC028	0.51	mg/kg	0.51	U		
S04	0805L044-004	S	08LC028	0.51	mg/kg	0.51	U		
S05	0805L044-005	S	08LC028	0.52	mg/kg	0.52	U		
S06	0805L044-006	S	08LC028	0.53	mg/kg	0.53	U		
S07	0805L044-007	S	08LC028	0.52	mg/kg	0.52	U		
S08	0805L044-008	S	08LC028	0.52	mg/kg	0.52	U		
S09	0805L044-009	S	08LC028	0.52	mg/kg	0.52	U		
S10	0805L044-010	S	08LC028	0.52	mg/kg	0.52	U		
S11	0805L044-011	S	08LC028	0.46	mg/kg	0.46	U		

Conc. - concentration
EQL - estimated quantitation limit
Q - laboratory qualifier
S - soil
V - validation qualifier
W - water

2.4.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-15 shows the number of each type of sample in each preparation batch.

Table 2-15. Cyanide Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	DUP	MS	Sample
08LC017	S	1	2	1	1	5
08LC021	S	1	2	1	1	8
08LC023	S	1	2	1	1	9
08LC027	S	1	2	1	1	6
08LC028	S	1	2	1	1	15
08LC029	S	1	2	1	1	4
08LC031	S	1	2	1	1	10
08LC032	S	1	2	1	1	10
08LC033	S	1	2	1	1	11
08LC034	S	1	2	1	1	1
08LC030	W	1	2	1	1	8

DUP - duplicate
LCS - laboratory control sample
MB - method blank
MS - matrix spike
S - soil
W - water

Cyanide analysis was performed in 10 batches of solid samples and one water batch. Each batch contained fewer than 20 field samples. At least one MB, LCS, MS, and DUP were analyzed in each sample batch. These numbers satisfy all project requirements for frequency of QC sample analysis.

2.4.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for cyanide analysis by method 9014 is specified in VET-1405-PLN-03, Rev. 0, as 14 days. All results were generated within these limits.

2.4.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Project documentation does not specify a required quantitation limit for cyanide. Cyanide was not detected in the method blanks. Detection limits in the blanks were 0.5 mg/kg or less for soil blanks and 5 µg/L for the water blank.

2.4.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for cyanide. Cyanide was not detected in any of the samples. Detection limits were 5 µg/L for water samples and 0.59 mg/kg or less for soil samples.

2.4.5. QC Checks for Accuracy

- Did the LCS and MS recoveries meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS recoveries must be between 75% and 125%. All LCS and MS recoveries were within these limits.

2.4.6. QC Check for Precision

- Did the DUP relative percent differences meet the precision criteria?

As specified in VET-1332-PRO-004, Rev. 0, the MS/MSD and DUP RPDs must be less than 20%. The RPD, as defined in the validation instructions, cannot be evaluated if the RDL is not specified. Therefore, no results were qualified for precision.

2.5. DATA VALIDATION REPORT FOR SULFIDE (METHODS 9030B and 9034)

Table 2-16 is a summary of the validated results for sulfide.

Table 2-16. Summary of Sulfide Validation. (2 Pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
B043	0803L762-001	S	08LSD016	20.2	mg/kg	20.2	U		
B044	0803L762-002	S	08LSD016	21.8	mg/kg	21.8	U		
B045	0803L762-003	S	08LSD016	21.9	mg/kg	21.9	U		
B055	0803L842-001	S	08LSD020	22.7	mg/kg	22.7	U		
B056	0803L842-002	S	08LSD020	22.7	mg/kg	22.7	U		
B058	0803L842-003	S	08LSD020	23.2	mg/kg	23.2	U		
B059	0803L842-004	S	08LSD020	22.4	mg/kg	22.4	U		
B060	0803L842-005	S	08LSD020	23.1	mg/kg	23.1	U		
B061	0804L852-001	S	08LSD022	21.6	mg/kg	21.6	U		
B062	0804L852-002	S	08LSD022	34	mg/kg	34	U		
B063	0804L852-003	S	08LSD022	24.4	mg/kg	24.4	U		
B079	0804L905-001	S	08LSD025	21.1	mg/kg	21.1	U		
B080	0804L905-002	S	08LSD025	20.1	mg/kg	20.1	U		
B081	0804L905-003	S	08LSD026	20.2	mg/kg	20.2	U		
B096	0804L010-001	S	08LSD031	21.3	mg/kg	21.3	U		
B098	0804L010-002	S	08LSD031	21.1	mg/kg	21.1	U		
B099	0804L010-003	S	08LSD031	21	mg/kg	21	U		
B101	0804L010-004	S	08LSD031	21	mg/kg	21	U		
B110	0805L087-001	S	08LSD036	24.2	mg/kg	24.2	U		
B111	0805L087-002	S	08LSD036	21.6	mg/kg	21.6	U		
B112	0805L087-003	S	08LSD038	20.9	mg/kg	20.9	U		
B114	0805L095-001	S	08LSD038	20.7	mg/kg	20.7	U		
B115	0805L095-002	S	08LSD039	22	mg/kg	22	U		
B116	0805L095-003	S	08LSD039	20.3	mg/kg	20.3	U		
B118	0805L095-005	S	08LSD039	18.3	mg/kg	18.3	U		
B119	0805L095-006	S	08LSD039	21.1	mg/kg	21.1	U		
B123	0805L111-001	S	08LSDA40	18.5	mg/kg	18.5	U		
B124	0805L111-002	S	08LSDA40	21.1	mg/kg	21.1	U		
B128	0805L119-001	S	08LSDA40	22.2	mg/kg	22.2	U		
B129	0805L119-002	S	08LSDA40	22.3	mg/kg	22.3	U		
B131	0805L119-003	S	08LSDA40	21.7	mg/kg	21.7	U		
B132	0805L119-004	S	08LSDA40	21.5	mg/kg	21.5	U		
B133	0805L126-001	S	08LSDA40	22.7	mg/kg	22.7	U		
B135	0805L126-003	S	08LSDA40	22.5	mg/kg	22.5	U		
B137	0805L126-004	S	08LSDA40	21.7	mg/kg	21.7	U		
B138	0805L126-005	S	08LSDA40	21.6	mg/kg	21.6	U		
B139	0805L143-001	S	08LSD041	20.5	mg/kg	20.5	U		
B140	0805L143-002	S	08LSD041	20.9	mg/kg	20.9	U		
B141	0805L143-003	S	08LSD041	20.5	mg/kg	20.5	U		
B142	0805L143-004	S	08LSD042	21.1	mg/kg	21.1		J	Hold time
B143	0805L143-005	S	08LSD042	21.0	mg/kg	21	U	UJ	Hold time

Table 2-16. Summary of Sulfide Validation. (2 Pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
B144	0805L143-006	S	08LSD042	21.7	mg/kg	21.7	U	UJ	Hold time
B145	0805L168-001	S	08LSD042	21.5	mg/kg	21.4			
B146	0805L168-002	S	08LSD042	22.1	mg/kg	22.1			
B147	0805L168-003	S	08LSD042	22.5	mg/kg	22.5	U		
B148	0805L194-001	S	08LSD043	21.7	mg/kg	21.7	U		
B149	0805L168-004	S	08LSD042	26.1	mg/kg	21.7			
B150	0805L168-005	S	08LSD042	21.6	mg/kg	21.6	U		
G014	0805L085-001	W	08LSD037	1	mg/L	1	U		
G015	0805L085-002	W	08LSD037	1	mg/L	1	U		
G016	0805L085-004	W	08LSD037	1	mg/L	1	U		
S01	0805L044-001	S	08LSD034	21.4	mg/kg	21.4	U		
S02	0805L044-002	S	08LSD034	23.5	mg/kg	23.5	U		
S03	0805L044-003	S	08LSD035	22	mg/kg	22	U		
S04	0805L044-004	S	08LSD035	21.9	mg/kg	21.9	U		
S05	0805L044-005	S	08LSD035	21.6	mg/kg	21.6	U		
S06	0805L044-006	S	08LSD035	22.5	mg/kg	22.5	U		
S07	0805L044-007	S	08LSD035	23.8	mg/kg	23.8	U		
S08	0805L044-008	S	08LSD035	23	mg/kg	23	U		
S09	0805L044-009	S	08LSD035	21.4	mg/kg	21.4	U		
S10	0805L044-010	S	08LSD035	21.9	mg/kg	21.9	U		
S11	0805L044-011	S	08LSD035	21.7	mg/kg	21.7	U		

Conc. - concentration
EQL - estimated quantitation limit
Q - laboratory qualifier
S - soil
V - validation qualifier
W - water

2.5.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-17 shows the number of each type of sample in each preparation batch.

Table 2-17. Sulfide Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	MB	LCS	DUP	MS	Sample
08LSD016	S	1	2	1	1	5
08LSD020	S	1	2	1	1	5
08LSD022	S	1	2	1	1	3
08LSD025	S	1	2	1	1	8
08LSD026	S	1	2	1	1	3

Table 2-17. Sulfide Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	MB	LCS	DUP	MS	Sample
08LSD031	S	1	2	1	1	4
08LSD034	S	1	2	1	1	6
08LSD035	S	1	2	1	1	9
08LSD036	S	1	2	2	1	3
08LSD038	S	1	2	1	1	2
08LSD039	S	1	2	1	1	6
08LSD041	S	1	2	1	1	3
08LSD042	S	1	2	1	1	8
08LSD043	S	1	2	1	1	1
08LSDA40	S	1	2	1	1	13
08LSD037	W	1	2	1	1	3

DUP - duplicate
LCS - laboratory control sample
MB - method blank
MS - matrix spike
S - soil
W - water

Sulfide analysis was performed in 15 batches of soil samples and one water batch. Each batch contained fewer than 20 field samples. At least one MB, LCS, MS, and DUP were analyzed in each sample batch. These numbers satisfy all requirements for frequency of QC sample analysis.

2.5.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for sulfide analysis by method 9030B and 9034 are specified in VET-1405-PLN-03, Rev. 0, as 7 days. All results were generated within these limits except for samples B142, B143, and B144. The analysis for these samples was completed one day after the hold time had expired. For this reason, the results for samples B142, B143, and B144 were qualified as approximate and flagged “J” for detects (sample B142) and “UJ” for nondetects (samples B143, and B144).

2.5.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Project documentation does not specify a required quantitation limit for sulfide. Sulfide was not detected in the method blanks. Detection limits in the blanks were 1 mg/L for water and less than 25 mg/kg for soils.

2.5.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for sulfide. Detection limits were 1 mg/L for water samples and less than 35 mg/kg for soil samples.

2.5.5. QC Checks for Accuracy

- Did the recoveries for the LCS and MS results meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS recoveries must be between 75% and 125%. All LCS and MS recoveries were within these limits.

2.5.6. QC Check for Precision

- Did the DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, sample duplicate RPDs must be less than 20%. All RPDs satisfied this criterion.

2.6. DATA VALIDATION REPORT FOR ANIONS (METHOD 9056)

Results for seven anions (chloride, fluoride, nitrate, nitrite, phosphate, and sulfate) were requested for each of the 65 samples in this group. The table listing the results is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM for the analytical results for anions, as well as the flags applied during validation and the reasons for the flags. Note that results for bromide were reported by the laboratory, but were not required by the sampling and analysis plan. Bromide results are listed in the Microsoft® Excel file, but were not validated.

2.6.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-18 shows the number of each type of sample in each preparation batch.

Table 2-18. Anion Preparation Batch Summary. (3 Pages)

Batch ID	Matrix	Analyte	CAS	MB	LCS	DUP	MS	Sample
08LICS22	S	Bromide by IC	24959-67-9	1	1	1	1	9
08LICS28	S	Bromide by IC	24959-67-9	1	1	1	1	5
08LICS34	S	Bromide by IC	24959-67-9	1	1	1	1	16
08LICS35	S	Bromide by IC	24959-67-9	1	1	1	1	15

Table 2-18. Anion Preparation Batch Summary. (3 Pages)

Batch ID	Matrix	Analyte	CAS	MB	LCS	DUP	MS	Sample
08LICS39	S	Bromide by IC	24959-67-9	1	1	1	1	12
08LICT25	S	Bromide by IC	24959-67-9	1	1	1	1	8
08LICT36	S	Bromide by IC	24959-67-9	1	1	2	2	16
08LICT38	S	Bromide by IC	24959-67-9	1	1			8
08LICS22	S	Chloride by IC	16887-00-6	1	1	1	1	9
08LICS28	S	Chloride by IC	16887-00-6	1	1	1	1	5
08LICS34	S	Chloride by IC	16887-00-6	1	1	1	1	16
08LICS35	S	Chloride by IC	16887-00-6	1	1	1	1	15
08LICS39	S	Chloride by IC	16887-00-6	1	1	1	1	12
08LICT25	S	Chloride by IC	16887-00-6	1	1	1	1	8
08LICT36	S	Chloride by IC	16887-00-6	1	1	2	2	16
08LICT38	S	Chloride by IC	16887-00-6	1	1			8
08LICS22	S	Fluoride by IC	16984-48-8	1	1	1	1	9
08LICS28	S	Fluoride by IC	16984-48-8	1	1	1	1	5
08LICS34	S	Fluoride by IC	16984-48-8	1	1	1	1	16
08LICS35	S	Fluoride by IC	16984-48-8	1	1	1	1	15
08LICS38	S	Fluoride by IC	16984-48-8	1	1			8
08LICS39	S	Fluoride by IC	16984-48-8	1	1	1	1	12
08LICT25	S	Fluoride by IC	16984-48-8	1	1	1	1	8
08LICT36	S	Fluoride by IC	16984-48-8	1	1	2	2	16
08LICS22	S	Nitrate by IC	14797-55-8	1	1	1	1	9
08LICS28	S	Nitrate by IC	14797-55-8	1	1	1	1	5
08LICS34	S	Nitrate by IC	14797-55-8	1	1	1	1	15
08LICS38	S	Nitrate by IC	14797-55-8	1	1			8
08LICS39	S	Nitrate by IC	14797-55-8	1	1	1	1	12
08LICT25	S	Nitrate by IC	14797-55-8	1	1	1	1	8
08LICT35	S	Nitrate by IC	14797-55-8	1	1	1	1	16
08LICT36	S	Nitrate by IC	14797-55-8	1	1	2	2	16
08LICS22	S	Nitrite by IC	14797-65-0	1	1	1	1	9
08LICS28	S	Nitrite by IC	14797-65-0	1	1	1	1	5
08LICS34	S	Nitrite by IC	14797-65-0	1	1	1	1	16
08LICS35	S	Nitrite by IC	14797-65-0	1	1	1	1	15
08LICS38	S	Nitrite by IC	14797-65-0	1	1			8
08LICS39	S	Nitrite by IC	14797-65-0	1	1	1	1	12
08LICT25	S	Nitrite by IC	14797-65-0	1	1	1	1	8
08LICT36	S	Nitrite by IC	14797-65-0	1	1	2	2	16
08LICS22	S	Phosphate by IC	14265-44-2	1	1	1	1	9
08LICS28	S	Phosphate by IC	14265-44-2	1	1	1	1	5
08LICS34	S	Phosphate by IC	14265-44-2	1	1	1	1	16

Table 2-18. Anion Preparation Batch Summary. (3 Pages)

Batch ID	Matrix	Analyte	CAS	MB	LCS	DUP	MS	Sample
08LICS35	S	Phosphate by IC	14265-44-2	1	1	1	1	15
08LICS39	S	Phosphate by IC	14265-44-2	1	1	1	1	12
08LICT25	S	Phosphate by IC	14265-44-2	1	1	1	1	8
08LICT36	S	Phosphate by IC	14265-44-2	1	1	2	2	16
08LICT38	S	Phosphate by IC	14265-44-2	1	1			8
08LICS22	S	Sulfate by IC	14808-79-8	1	1	1	1	9
08LICS28	S	Sulfate by IC	14808-79-8	1	1	1	1	5
08LICS34	S	Sulfate by IC	14808-79-8	1	1	1	1	16
08LICS35	S	Sulfate by IC	14808-79-8	1	1	1	1	15
08LICS38	S	Sulfate by IC	14808-79-8	1	1			8
08LICS39	S	Sulfate by IC	14808-79-8	1	1	1	1	12
08LICT25	S	Sulfate by IC	14808-79-8	1	1	1	1	8
08LICT36	S	Sulfate by IC	14808-79-8	1	1	2	2	16
08LICC35	W	Bromide by IC	24959-67-9	1	1	1	1	3
08LICA35	W	Chloride by IC	16887-00-6	1	1	1	1	3
08LIC035	W	Fluoride by IC	16984-48-8	1	1	1	1	3
08LICD35	W	Nitrate by IC	14797-55-8	1	1	1	1	3
08LICB35	W	Nitrite by IC	14797-65-0	1	1	1	1	3
08LICE35	W	Phosphate by IC	14265-44-2	1	1	1	1	3
08LICF35	W	Sulfate by IC	14808-79-8	1	1	1	1	3

CAS - Chemical Abstracts System
DUP - duplicate
LCS - laboratory control sample
MB - method blank
MS - matrix spike
S - soil
W - water

From the information in Table 2-19, it may be shown that anion analysis was performed on 89 solid samples in 8 batches and on three water samples in one batch for each anion. (Not all anions were analyzed in each batch, and the numbers of samples include samples in chains of custody (COCs) other than those of concern in this report.) Each batch contained fewer than 20 field samples. At least one MB, LCS, MS, and DUP were analyzed in each sample batch, except batches “08LICS38” (for fluoride, nitrate, nitrite, and sulfate) and “08LICT38” (for chloride, phosphate, and sulfate) omitted both MS and DUP.

The numbers of QC samples analyzed were sufficient to support the project-average goal of analyzing one LCS, MB, MS, and DUP (or MSD) for every 20 samples of each matrix type.

2.6.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for analysis by method 9056 is specified in VET-1405-PLN-03, Rev. 0, as 48 hours. However, since holding times for these samples range up to 22 days, this limit would result in rejection of most of the nondetect data. Normally, the 48-hour limit is applied only to nitrate, nitrite, and phosphate (SW-846; Method 9056A, Rev. 1, and Chapter 3, Rev. 4, Table 3-2). The limit for other ion chromatography analytes is 28 days. In addition, the U.S. Environmental Protection Agency (EPA) Methods Information Communication Exchange Service (MICE) has made the reasonable recommendation that the 48-hour limit for nitrate, nitrite, and phosphate be applied only to water samples and solid samples containing enough free liquid to analyze (e-mail to M. Miller, 7/13/07). Under this recommendation, analysis of nitrate, nitrite, and phosphate in normal soil samples would be allowed 28 days to extraction, and another 48 hours for analysis. Holding times for all samples met the criteria as interpreted by MICE.

2.6.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Project documentation does not specify required quantitation limits for anions by ion chromatography in soil samples. Required quantitation limits for water sample method blanks were achieved except for fluoride, chloride, and nitrite, for which the detection limit was 0.25 mg/L vs. the RQL of 0.1 mg/L. Analytes were not detected in any of the method blanks. No qualification of sample results was required.

2.6.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify required quantitation limits for anions by ion chromatography in soil samples. The required quantitation limit was exceeded for nitrite in all water samples. The validation criteria do not require that these results be qualified. Other nondetect anion results met the required quantitation limit.

2.6.5. QC Checks for Accuracy

- Did the recoveries for the LCS and MS meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS recoveries must be between 75% and 125%. The MS recovery for sulfate in batch “08LICS22” was 68.4%, which is below the lower control limit (LCL). All sulfate results in batch “08LICS22” were detects. Therefore, they were qualified as approximate and flagged “J.” All other LCS and MS recoveries were within the required limits.

2.6.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PRO-03, Rev. 0, the DUP RPDs must be less than 20%. This limit was met for all RPDs for water samples.

No RDL was specified for solid samples. The RPD, as defined in the validation instructions, cannot be evaluated if the RDL is not specified. Therefore, no results for solid samples were qualified for precision.

2.7. DATA VALIDATION REPORT FOR TOTAL PHENOLS (METHOD 9066)

Table 2-19 is a summary of the validated results for analysis of total phenols.

Table 2-19. Summary of Total Phenols Validation. (2 Pages)

Client ID	Sample ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
B043	0803L762-001	S	08LPN008	0.26	mg/kg	0.26	U		
B044	0803L762-002	S	08LPN008	0.26	mg/kg	0.26	U		
B045	0803L762-003	S	08LPN008	0.26	mg/kg	0.26	U		
B055	0803L842-001	S	08LPL008	0.26	mg/kg	0.26	U		
B056	0803L842-002	S	08LPL008	0.26	mg/kg	0.26	U		
B058	0803L842-003	S	08LPL008	0.26	mg/kg	0.26	U		
B059	0803L842-004	S	08LPL008	0.25	mg/kg	0.25	U		
B060	0803L842-005	S	08LPL008	0.26	mg/kg	0.26	U		
B061	0804L852-001	S	08LPL009	0.26	mg/kg	0.26	U		
B062	0804L852-002	S	08LPL009	0.26	mg/kg	0.26	U		
B063	0804L852-003	S	08LPL009	0.26	mg/kg	0.26	U		
B079	0804L905-001	S	08LPL010	0.26	mg/kg	0.26	U		
B080	0804L905-002	S	08LPL010	0.25	mg/kg	0.25	U		
B081	0804L905-003	S	08LPL010	0.26	mg/kg	0.26	U		
B096	0804L010-001	S	08LPL011	0.25	mg/kg	0.25	U		
B098	0804L010-002	S	08LPL011	0.26	mg/kg	0.26	U		
B099	0804L010-003	S	08LPL011	0.26	mg/kg	0.26	U		
B101	0804L010-004	S	08LPL011	0.25	mg/kg	0.25	U		
B110	0805L087-001	S	08LPLA13	0.29	mg/kg	0.29	U		
B111	0805L087-002	S	08LPLA13	0.26	mg/kg	0.26	U		
B112	0805L087-003	S	08LPLA13	0.26	mg/kg	0.26	U		
B114	0805L095-001	S	08LPL014	0.72	mg/kg	0.26			
B115	0805L095-002	S	08LPL014	0.33	mg/kg	0.27			
B116	0805L095-003	S	08LPL014	0.26	mg/kg	0.26	U		
B118	0805L095-005	S	08LPL014	0.26	mg/kg	0.26	U		
B119	0805L095-006	S	08LPL014	0.26	mg/kg	0.26	U		
B123	0805L111-001	S	08LPL014	0.26	mg/kg	0.26	U		

Table 2-19. Summary of Total Phenols Validation. (2 Pages)

Client ID	Sample ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
B124	0805L111-002	S	08LPL014	0.26	mg/kg	0.26	U		
B128	0805L119-001	S	08LPL014	0.27	mg/kg	0.27	U		
B129	0805L119-002	S	08LPL014	0.27	mg/kg	0.27	U		
B131	0805L119-003	S	08LPL014	0.26	mg/kg	0.26	U		
B132	0805L119-004	S	08LPL014	0.26	mg/kg	0.26	U		
B133	0805L126-001	S	08LPL015	0.26	mg/kg	0.26	U		
B135	0805L126-003	S	08LPL015	0.26	mg/kg	0.26	U		
B137	0805L126-004	S	08LPL015	0.26	mg/kg	0.26	U		
B138	0805L126-005	S	08LPL015	0.26	mg/kg	0.26	U		
B139	0805L143-001	S	08LPL015	0.26	mg/kg	0.26	U		
B140	0805L143-002	S	08LPL015	0.26	mg/kg	0.26	U		
B141	0805L143-003	S	08LPL015	0.26	mg/kg	0.26	U		
B142	0805L143-004	S	08LPL015	0.26	mg/kg	0.26	U		
B143	0805L143-005	S	08LPL015	0.26	mg/kg	0.26	U		
B144	0805L143-006	S	08LPL015	0.27	mg/kg	0.27	U		
B145	0805L168-001	S	08LPL015	0.26	mg/kg	0.26	U		
B146	0805L168-002	S	08LPL015	0.26	mg/kg	0.26	U		
B147	0805L168-003	S	08LPL015	0.27	mg/kg	0.27	U		
B148	0805L194-001	S	08LPL015	0.27	mg/kg	0.27	U		
B149	0805L168-004	S	08LPL015	0.26	mg/kg	0.26	U		
B150	0805L168-005	S	08LPL015	0.26	mg/kg	0.26	U		
G014	0805L085-001	W	08LPL013	5	µg/L	5	U		
G015	0805L085-002	W	08LPL013	5	µg/L	5	U		
G016	0805L085-004	W	08LPLA14	5	µg/L	5	U		
S01	0805L044-001	S	08LPL012	0.33	mg/kg	0.26			
S02	0805L044-002	S	08LPL012	0.27	mg/kg	0.26			
S03	0805L044-003	S	08LPL012	0.27	mg/kg	0.26			
S04	0805L044-004	S	08LPL012	0.32	mg/kg	0.27			
S05	0805L044-005	S	08LPL012	0.26	mg/kg	0.26			
S06	0805L044-006	S	08LPL012	0.27	mg/kg	0.27	U		
S07	0805L044-007	S	08LPL012	0.32	mg/kg	0.27			
S08	0805L044-008	S	08LPL012	0.32	mg/kg	0.26			
S09	0805L044-009	S	08LPL012	0.26	mg/kg	0.26	U		
S10	0805L044-010	S	08LPL012	0.26	mg/kg	0.26	U		
S11	0805L044-011	S	08LPL012	0.29	mg/kg	0.26			

Conc. - concentration
EQL - estimated quantitation limit
Q - laboratory qualifier
S - soil
V - validation qualifier
W - water

2.7.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-20 shows the number of each type of sample in each preparation batch.

Table 2-20. Total Phenols Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	DUP	MS	Sample
08LPL008	S	1	2	1	1	12
08LPL009	S	1	2	1	1	9
08LPL010	S	1	2	1	1	16
08LPL011	S	1	2	1	1	11
08LPL012	S	1	2	1	1	15
08LPL014	S	1	2	1	1	16
08LPL015	S	1	2	1	1	16
08LPLA13	S	1	2	1	1	4
08LPN008	S	1	1	1	1	3
08LPL013	W	1	2	1	1	7
08LPLA14	W	1	2	1	1	1

DUP - duplicate
LCS - laboratory control sample
MB - method blank
MS - matrix spike
S - soil
W - water

Total phenol analysis was performed in nine batches of solid samples and two batches of water samples. Each batch contained fewer than 20 field samples. At least one MB, LCS, MS, and DUP were analyzed for each batch. All requirements for frequency of QC sample analysis were achieved.

2.7.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for total phenol analysis is specified in VET-1405-PLN-03, Rev. 0, as 28 days. All results were generated within these limits.

2.7.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Project documentation does not specify a required quantitation limit for total phenol. Phenols were not detected in the method blanks. Detection limits in the blanks were 5 µg/L for water and 0.5 mg/kg or less for soils.

2.7.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for total phenol. Detection limits for phenols were 5 µg/L for water samples and 0.29 mg/kg or less for soil samples.

2.7.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, and MSD, meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS, MS, and MSD recoveries must be between 75% and 125%. All LCS and MS/MSD recoveries were within these limits.

2.7.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the RPD must be less than 20%. All LCS/LCS duplicate RPDs met this criterion.

2.8. DATA VALIDATION REPORT FOR POLYCHLORINATED BIPHENYL COMPOUNDS (METHOD 8082)

Results for seven Aroclors (Aroclor-1016, Aroclor-1221, Aroclor-1232, Aroclor-1242, Aroclor-1248, Aroclor-1254, Aroclor-1260) were requested for each of the 62 samples in this group. The table listing the results is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM for the analytical results for anions, as well as the flags applied during validation and the reasons for the flags.

2.8.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each field sample and each QC sample?
- Was precision checked with an MSD?

Table 2-21 shows the number of each type of sample in each preparation batch.

Table 2-21. PCB Preparation Batch Summary. (4 Pages)

Batch ID	Matrix	Analyte	CAS	MB	LCS	MS	MSD	Surr	Sample
08LE0134	S	Aroclor-1016	12674-11-2	1	1	1	1		5
08LE0134	S	Aroclor-1221	11104-28-2	1					5
08LE0134	S	Aroclor-1232	11141-16-5	1					5
08LE0134	S	Aroclor-1242	53469-21-9	1					5
08LE0134	S	Aroclor-1248	12672-29-6	1					5
08LE0134	S	Aroclor-1254	11097-69-1	1					5
08LE0134	S	Aroclor-1260	11096-82-5	1	1	1	1		5
08LE0134	S	Aroclor-1262	37324-23-5	1					
08LE0134	S	Aroclor-1268	11100-14-4	1					
08LE0134	S	Decachlorobiphenyl	2051-24-3					9	
08LE0134	S	Tetrachloro-m-xylene	877-09-8					9	
08LE0157	S	Aroclor-1016	12674-11-2	1	2				3
08LE0157	S	Aroclor-1221	11104-28-2	1	1				3
08LE0157	S	Aroclor-1232	11141-16-5	1	1				3
08LE0157	S	Aroclor-1242	53469-21-9	1	1				3
08LE0157	S	Aroclor-1248	12672-29-6	1	1				3
08LE0157	S	Aroclor-1254	11097-69-1	1	1				3
08LE0157	S	Aroclor-1260	11096-82-5	1	2				3
08LE0157	S	Decachlorobiphenyl	2051-24-3					6	
08LE0157	S	Tetrachloro-m-xylene	877-09-8					6	
08LE0174	S	Aroclor-1016	12674-11-2	1	1	1	1		9
08LE0174	S	Aroclor-1221	11104-28-2	1					9
08LE0174	S	Aroclor-1232	11141-16-5	1					9
08LE0174	S	Aroclor-1242	53469-21-9	1					9
08LE0174	S	Aroclor-1248	12672-29-6	1					9
08LE0174	S	Aroclor-1254	11097-69-1	1					9
08LE0174	S	Aroclor-1260	11096-82-5	1	1	1	1		9
08LE0174	S	Decachlorobiphenyl	2051-24-3					13	
08LE0174	S	Tetrachloro-m-xylene	877-09-8					13	
08LE0184	S	Aroclor-1016	12674-11-2	1	1	1	1		7
08LE0184	S	Aroclor-1221	11104-28-2	1					7
08LE0184	S	Aroclor-1232	11141-16-5	1					7
08LE0184	S	Aroclor-1242	53469-21-9	1					7

Table 2-21. PCB Preparation Batch Summary. (4 Pages)

Batch ID	Matrix	Analyte	CAS	MB	LCS	MS	MSD	Surr	Sample
08LE0184	S	Aroclor-1248	12672-29-6	1					7
08LE0184	S	Aroclor-1254	11097-69-1	1					7
08LE0184	S	Aroclor-1260	11096-82-5	1	1	1	1		7
08LE0184	S	Decachlorobiphenyl	2051-24-3					11	
08LE0184	S	Tetrachloro-m-xylene	877-09-8					11	
08LE0224	S	Aroclor-1016	12674-11-2	1	1	1	1		17
08LE0224	S	Aroclor-1221	11104-28-2	1					17
08LE0224	S	Aroclor-1232	11141-16-5	1					17
08LE0224	S	Aroclor-1242	53469-21-9	1					17
08LE0224	S	Aroclor-1248	12672-29-6	1					17
08LE0224	S	Aroclor-1254	11097-69-1	1					17
08LE0224	S	Aroclor-1260	11096-82-5	1	1	1	1		17
08LE0224	S	Decachlorobiphenyl	2051-24-3					21	
08LE0224	S	Tetrachloro-m-xylene	877-09-8					21	
08LE0227	S	Aroclor-1016	12674-11-2	1	1	1	1		4
08LE0227	S	Aroclor-1221	11104-28-2	1					4
08LE0227	S	Aroclor-1232	11141-16-5	1					4
08LE0227	S	Aroclor-1242	53469-21-9	1					4
08LE0227	S	Aroclor-1248	12672-29-6	1					4
08LE0227	S	Aroclor-1254	11097-69-1	1					4
08LE0227	S	Aroclor-1260	11096-82-5	1	1	1	1		4
08LE0227	S	Decachlorobiphenyl	2051-24-3					8	
08LE0227	S	Tetrachloro-m-xylene	877-09-8					8	
08LE0228	S	Aroclor-1016	12674-11-2	1	1	1	1		5
08LE0228	S	Aroclor-1221	11104-28-2	1					5
08LE0228	S	Aroclor-1232	11141-16-5	1					5
08LE0228	S	Aroclor-1242	53469-21-9	1					5
08LE0228	S	Aroclor-1248	12672-29-6	1					5
08LE0228	S	Aroclor-1254	11097-69-1	1					5
08LE0228	S	Aroclor-1260	11096-82-5	1	1	1	1		5
08LE0228	S	Decachlorobiphenyl	2051-24-3					9	
08LE0228	S	Tetrachloro-m-xylene	877-09-8					9	
08LE0230	W	Aroclor-1016	12674-11-2	1	1	1	1		8
08LE0230	W	Aroclor-1221	11104-28-2	1					8
08LE0230	W	Aroclor-1232	11141-16-5	1					8

Table 2-21. PCB Preparation Batch Summary. (4 Pages)

Batch ID	Matrix	Analyte	CAS	MB	LCS	MS	MSD	Surr	Sample
08LE0230	W	Aroclor-1242	53469-21-9	1					8
08LE0230	W	Aroclor-1248	12672-29-6	1					8
08LE0230	W	Aroclor-1254	11097-69-1	1					8
08LE0230	W	Aroclor-1260	11096-82-5	1	1	1	1		8
08LE0230	W	Decachlorobiphenyl	2051-24-3					12	
08LE0230	W	Tetrachloro-m-xylene	877-09-8					12	
08LE0235	S	Aroclor-1016	12674-11-2	1	2	1	1		11
08LE0235	S	Aroclor-1221	11104-28-2	1					11
08LE0235	S	Aroclor-1232	11141-16-5	1					11
08LE0235	S	Aroclor-1242	53469-21-9	1					11
08LE0235	S	Aroclor-1248	12672-29-6	1					11
08LE0235	S	Aroclor-1254	11097-69-1	1					11
08LE0235	S	Aroclor-1260	11096-82-5	1	2	1	1		11
08LE0235	S	Decachlorobiphenyl	2051-24-3					16	
08LE0235	S	Tetrachloro-m-xylene	877-09-8					16	
08LE0238	S	Aroclor-1016	12674-11-2	1	1				4
08LE0238	S	Aroclor-1221	11104-28-2	1					4
08LE0238	S	Aroclor-1232	11141-16-5	1					4
08LE0238	S	Aroclor-1242	53469-21-9	1					4
08LE0238	S	Aroclor-1248	12672-29-6	1					4
08LE0238	S	Aroclor-1254	11097-69-1	1					4
08LE0238	S	Aroclor-1260	11096-82-5	1	1				4
08LE0238	S	Decachlorobiphenyl	2051-24-3					6	
08LE0238	S	Tetrachloro-m-xylene	877-09-8					6	
08LE0256	S	Aroclor-1016	12674-11-2	1	1				6
08LE0256	S	Aroclor-1221	11104-28-2	1					6
08LE0256	S	Aroclor-1232	11141-16-5	1					6
08LE0256	S	Aroclor-1242	53469-21-9	1					6
08LE0256	S	Aroclor-1248	12672-29-6	1					6
08LE0256	S	Aroclor-1254	11097-69-1	1					6
08LE0256	S	Aroclor-1260	11096-82-5	1	1				6
08LE0256	S	Decachlorobiphenyl	2051-24-3					8	
08LE0256	S	Tetrachloro-m-xylene	877-09-8					8	
08LE0271	S	Aroclor-1016	12674-11-2	1	1				6
08LE0271	S	Aroclor-1221	11104-28-2	1					6
08LE0271	S	Aroclor-1232	11141-16-5	1					6
08LE0271	S	Aroclor-1242	53469-21-9	1					6

Table 2-21. PCB Preparation Batch Summary. (4 Pages)

Batch ID	Matrix	Analyte	CAS	MB	LCS	MS	MSD	Surr	Sample
08LE0271	S	Aroclor-1248	12672-29-6	1					6
08LE0271	S	Aroclor-1254	11097-69-1	1					6
08LE0271	S	Aroclor-1260	11096-82-5	1	1				6
08LE0271	S	Decachlorobiphenyl	2051-24-3					8	
08LE0271	S	Tetrachloro-m-xylene	877-09-8					8	

CAS - Chemical Abstracts System
LCS - laboratory control sample
MB - method blank
MS - matrix spike
MSD - matrix spike duplicate
PCB - polycholorinated biphenyl
S - soil
Surr - Surrogate
W - water

PCB analysis was performed on 11 batches of soil samples and one batch of water samples. Each batch contained fewer than 20 field samples. An MB was analyzed in each sample batch, and at least one LCS containing at least Aroclor-1016 and Aroclor-1260 was analyzed in each sample batch.

The project goal for MS and MSD analysis is to analyze one of each for every 20 field samples of each matrix type, averaged over the project. Aroclor-1016 and Aroclor-1260 are to be spiked into each MS and MSD. For this group of samples, MS and MSD results were reported for seven out of the 11 soil batches. MS and MSD were also reported for the water batch. There were 77 soil samples and 8 water samples analyzed in the batches listed in Table 2-21 (including those not in the COCs of concern in this report), so the frequency of MS/MSD analyses exceeds the one-in-twenty average required for the project goal.

Surrogates were added to and analyzed in every sample, LCS, MB, MS, and MSD.

2.8.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for PCB analysis by method 8082 are specified in VET-1405-PLN-03, Rev. 0, as 14 days for soil and water samples. EPA (SW-846, Chapters 2 and 4) does not provide guidance for holding time for extraction of PCBs. Method 8082 indicates that samples should be analyzed within 40 days after extraction. Usually accepted holding times to extraction for PCBs are 7 days for water samples and 14 days for soil samples, with an additional 40 days for analysis. Since PCBs are quite stable, the usually accepted hold time limits were applied in this data validation.

The samples in batch “08LE0184” were extracted 22 days to 23 days after the samples were collected. This exceeds the holding time, so all sample results in that batch (all nondetects) were qualified as estimates and flagged “UJ.” All other sample results met the holding time limits.

2.8.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The required quantitation limits (VET-1405-PLN-03, Rev. 0) are 1 µg/L in groundwater samples and 5000 µg/kg for soil samples.

PCBs were not detected in the MBs. Detection limits were below the required quantitation limits.

2.8.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

All results were nondetects. Detection limits met the requirements.

2.8.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, MSD, and surrogates meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS/MSD recoveries must be within the statistical limits set by the lab. These limits are shown in Table 2-22.

Table 2-22. LCS, MS/MSD, and Surrogate Limits for PCBs.

Matrix	Analyte	CAS	LCL (%)	UCL (%)
Water	Aroclor-1016	12674-11-2	49	119
Water	Aroclor-1260	11096-82-5	53	128
Water	Decachlorobiphenyl	2051-24-3	22	131
Water	Tetrachloro-m-xylene	877-09-8	45	117
Soil	Aroclor-1016	12674-11-2	50	138
Soil	Aroclor-1260	11096-82-5	50	148
Soil	Decachlorobiphenyl	2051-24-3	43	144
Soil	Tetrachloro-m-xylene	877-09-8	52	141

CAS - Chemical Abstracts System
LCL - lower control limit
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
PCB - polychlorinated biphenyl
UCL - upper control limit

The recovery for the tetrachloro-m-xylene surrogate in sample B123 was 162%, which exceeds the upper control limit (UCL) of 141%. Since all results for this sample were nondetects, no results were qualified.

All other LCS, MS, MSD, and surrogate recoveries were within the limits given in Table 2-22.

2.8.6. QC Check for Precision

- Did the MS/MSD relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the RPD between MS and MSD must be less than 20%. The RPD for Aroclor-1260 in batch "08LE0235" was 20.8%. Therefore, results in that batch for associated analytes were qualified as approximate and flagged "UJ." (All Aroclors were deemed to be "associated" except Aroclor-1016 and Aroclor-1221, which do not have major constituents in common with Aroclor-1260.)

All other MS/MSD RPDs met the 20% criterion.

2.9. DATA VALIDATION REPORT FOR VOLATILE ORGANIC COMPOUNDS (METHOD 8260)

Eighty compounds were requested for each of the 73 samples in this group. Results were reported in the EDDs for the 78 compounds that the laboratory commonly reports. The remaining two, 1,4-difluorobenzene and tetrahydrofuran, are not expected to be detected regularly. The laboratory is performing a spectral search for those, and is reporting the results in the data package narrative.

The table listing the results is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM.

2.9.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each sample and each batch QC sample?
- Was precision checked with a MSD or DUP?

Volatile organic analysis was performed in 11 batches of solid samples, and 3 batches of water samples. Each batch contained fewer than 20 field samples. Results for 78 compounds were reported for each of the 73 samples (62 soils and 11 water samples, including trip blanks). An MB result was reported for each of the 78 compounds in each of the 14 batches. An LCS containing 48 of the compounds of interest was prepared and analyzed with all batches.

MS and MSD results were obtained for solids batches 08LVK069, 08LVK075, and 08LVG093. In addition, two pair of MS and MSDs were obtained for batch 08LVK086. However, the MS and MSD were prepared and analyzed three days later in a different batch than the sample. The validation rules require that the MS and MSD be prepared with the associated samples, so the MS and MSD are not counted here. Three MSs and MSDs were obtained for the 62 soil samples. This substantially supports the project-average goal of obtaining one MS and one MSD result for every 20 samples of each matrix type.

One pair of MS/MSD results were obtained for the water sample batches examined in this validation group. The samples consisted of 3 real water samples. The other 8 water samples were trip blanks. Therefore the one per 20 sample project requirement was met for the real groundwater samples.

Surrogates (1,2-dichloroethane-d4, bromofluorobenzene, and toluene-d8) were added to each sample, MB, LCS, MS, and MSD.

2.9.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for volatile organic analysis by method 8260B are specified in VET-1405-PLN-03, Rev. 0, as 14 days for water and soil samples. All results were generated within this limit.

2.9.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The RQLs (VET-1405-PLN-03, Rev. 0) for all VOCs are 5 µg/L for water samples and 20 µg/kg for soil samples. The compounds detected in the MBs are shown in Table 2-23.

Table 2-23. VOCs Found in Method Blanks. (2 Pages)

Batch ID	Matrix	Sample ID	Analyte	CAS	Result	Units	Q
08LVG082	W	08LVG082-MB1MB	Methylene Chloride	75-09-2	2	µg/L	J
08LVG084	W	08LVG084-MB1MB	Methylene Chloride	75-09-2	4	µg/L	J
08LVG088	W	08LVG088-MB1MB	Methylene Chloride	75-09-2	4	µg/L	J
08LVK059	S	08LVK059-MB1MB	1,2,4-Trichlorobenzene	120-82-1	1	µg/kg	J
08LVK059	S	08LVK059-MB1MB	Methylene Chloride	75-09-2	3	µg/kg	J
08LVK071	S	08LVK071-MB1MB	Methylene Chloride	75-09-2	1	µg/kg	J
08LVK075	S	08LVK075-MB1MB	1,2,4-Trichlorobenzene	120-82-1	1	µg/kg	J
08LVK075	S	08LVK075-MB1MB	Methylene Chloride	75-09-2	4	µg/kg	J
08LVK085	S	08LVK085-MB1MB	Methylene Chloride	75-09-2	3	µg/kg	J
08LVK086	S	08LVK086-MB1MB	1,2,4-Trichlorobenzene	120-82-1	1	µg/kg	J
08LVK091	S	08LVK091-MB1MB	1,2,4-Trichlorobenzene	120-82-1	1	µg/kg	J
08LVK093	S	08LVK093-MB1MB	Methylene Chloride	75-09-2	5	µg/kg	J
08LVK097	S	08LVK097-MB1MB	Acetone	67-64-1	9	µg/kg	J
08LVK100	S	08LVK100-MB1MB	UNKNOWN		6	µg/kg	J
08LVK069	S	08LVK069-MB1MB	Methylene Chloride	75-09-2	6	µg/kg	
08LVK079	S	08LVK079-MB1MB	Methylene Chloride	75-09-2	6	µg/kg	
08LVK086	S	08LVK086-MB1MB	Acetone	67-64-1	11	µg/kg	
08LVK086	S	08LVK086-MB1MB	Methylene Chloride	75-09-2	6	µg/kg	
08LVK091	S	08LVK091-MB1MB	Methylene Chloride	75-09-2	7	µg/kg	

Table 2-23. VOCs Found in Method Blanks. (2 Pages)

Batch ID	Matrix	Sample ID	Analyte	CAS	Result	Units	Q
08LVK097	S	08LVK097-MB1MB	Methylene Chloride	75-09-2	9	µg/kg	
08LVK100	S	08LVK100-MB1MB	Methylene Chloride	75-09-2	10	µg/kg	
08LVK100	S	08LVK100-MB1MB	SILOXANE		7	µg/kg	J
08LVK100	S	08LVK100-MB1MB	SILOXANE		20	µg/kg	J

CAS - Chemical Abstracts System
Q - laboratory qualifier
S - soil
VOC - volatile organic compound
W - water

Methylene chloride was detected in the MBs for all batches for both soil and water matrices. Methylene chloride is a common laboratory contaminant, so any detections in the affected batches less than ten times the blank concentration were qualified as estimated nondetects and were flagged "UJ." All methylene chloride detections below the RQL were raised to the RQL. Nondetect results for methylene chloride were not qualified.

Acetone was detected in the blank for batches 08LVK086 and 08LVK097. All sample results for acetone in this batch were detects less than the RQL and less than five times the blank result. These results were raised to the RQL, qualified as estimated nondetects, and flagged "UJ."

The compound 1,2,4-trichlorobenzene was detected in the method blanks for several batches. However, all sample results for these compounds in the respective batches were nondetects. Nondetects do not require qualification for blank contamination.

Siloxane was reported as a tentatively identified compound in one blank associated with batch 08LVK100, sample number 0805L194-001. Siloxane is associated with column bleed from the instrument and is not a real detect; therefore it was rejected.

2.9.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Of the 4605 volatile organic analysis (VOA) results reported for soil samples, four were nondetects exceeding the required detection limit of 20 µg/kg. These exceedances were all for 2-nitropropane. Of 1092 results reported for water samples, 250 were nondetects exceeding the required detection limit of 5 µg/L. Detection limit exceedances are not required to be qualified. Most of the exceedances were reported at 10 µg/L which is an industry norm for water VOAs.

2.9.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, MSD, and surrogates meet the accuracy criteria?

The statistical QC limits determined by the laboratory for surrogate compounds are listed in Table 2-24. The surrogate recoveries were reviewed, and two were found to lie outside the

acceptable range. Both of these exceedances were 4-bromofluorobenzene in the LCSs for sample delivery groups (SDGs) 0805L119 and 0805L126. The surrogate recovery was 116% vs. the UCL of 115%. The surrogate 4-bromofluorobenzene represents halogenated aromatic compounds. There were no detected halogenated aromatic compounds in the respective SDGs, so qualification of results was not required.

Recoveries for all other surrogates were within the limits given in Table 2-24.

Table 2-24. Statistical Limits for VOA Surrogate Compounds

Surrogate	Soil Samples		Water Samples	
	LCL (%)	UCL (%)	LCL (%)	UCL (%)
1,2-Dichloroethane-d4	63	151	74	125
Toluene-d8	68	140	85	114
4-Bromofluorobenzene	66	122	81	115

LCL - lower control limit
UCL - upper control limit
VOA - volatile organic analysis

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS/MSD recoveries must be within the statistical limits set by the lab. These limits are shown in Table 2-25.

Table 2-25. Lionville Laboratory Limits for LCS, MS, and MSD Recovery (Water and Soil Samples). (2 Pages)

Analyte	CAS	LCL (%)	UCL (%)
1,1,1-Trichloroethane	71-55-6	65	130
1,1,2,2-Tetrachloroethane	79-34-5	65	130
1,1,2-Trichloroethane	79-00-5	75	125
1,1-Dichloroethane	75-34-3	70	135
1,1-Dichloroethene	75-35-4	70	130
1,2,4-Trichlorobenzene	120-82-1	65	135
1,2-Dibromo-3-chloropropane	96-12-8	50	130
1,2-Dibromoethane	106-93-4	80	120
1,2-Dichlorobenzene	95-50-1	70	120
1,2-Dichloroethane	107-06-2	70	130
1,2-Dichloroethene (total)	540-59-0	60	140
1,2-Dichloropropane	78-87-5	75	150
1,3-Dichlorobenzene	541-73-1	75	125
1,4-Dichlorobenzene	106-46-7	75	125

Table 2-25. Lionville Laboratory Limits for LCS, MS, and MSD Recovery (Water and Soil Samples). (2 Pages)

Analyte	CAS	LCL (%)	UCL (%)
2-Butanone	78-93-3	30	150
2-hexanone	591-78-6	55	130
4-Methyl-2-pentanone	108-10-1	60	135
Acetone	67-64-1	40	140
Benzene	71-43-2	80	120
Bromodichloromethane	75-27-4	75	120
Bromoform	75-25-2	70	130
Bromomethane	74-83-9	30	145
Carbon Disulfide	75-15-0	35	160
Carbon Tetrachloride	56-23-5	65	140
Chlorobenzene	108-90-7	80	120
Chloroethane	75-00-3	60	135
Chloroform	67-66-3	65	135
Chloromethane	74-87-3	40	125
Cis-1,2-dichloroethene	156-59-2	70	125
cis-1,3-Dichloropropene	10061-01-5	70	130
Dibromochloromethane	124-48-1	75	120
Dichlorodifluoromethane	75-71-8	30	155
Ethylbenzene	100-41-4	75	125
Freon 113	76-13-1	60	140
Isopropylbenzene	98-82-8	75	125
m- and p-Xylene	M+P_XYLENE	75	130
Methylene Chloride	75-09-2	55	140
Methyl-T-Butylether	1634-04-4	65	125
O-Xylene	95-47-6	80	120
Styrene	100-42-5	65	135
Tetrachloroethene	127-18-4	45	150
Toluene	108-88-3	75	120
Trans-1,2-dichloroethene	156-60-5	60	140
Trans-1,3-Dichloropropene	10061-02-6	55	140
Trichloroethene	79-01-6	70	125
Trichlorofluoromethane	75-69-4	60	145
Vinyl Chloride	75-01-4	50	145
Xylene (total)	1330-20-7	75	130

CAS - Chemical Abstracts System
LCL - lower control limit
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
UCL - upper control limit

Table 2-26 shows the LCS recoveries that were outside the control limits. All results for the analytes listed in the table and in the indicated batches were qualified as estimates and flagged with a "J" for detects and "UJ" for nondetects.

Table 2-26. LCS Recoveries That Did Not Satisfy QC Limits.

Batch ID	Matrix	Analyte	CAS	Recovery (%)	LCL (%)	UCL (%)
08LVG084	Water	Acetone	67-64-1	143	40	140
08LVK059	Soil	Acetone	67-64-1	181	40	140
08LVK059	Soil	2-Butanone	78-93-3	153	30	150
08LVK071	Soil	Acetone	67-64-1	199	40	140
08LVK071	Soil	Methyl-T-Butylether	1634-04-4	50	65	125
08LVK075	Soil	2-hexanone	591-78-6	155	55	130
08LVK075	Soil	Acetone	67-64-1	210	40	140
08LVK075	Soil	2-Butanone	78-93-3	182	30	150
08LVK079	Soil	2-hexanone	591-78-6	136	55	130
08LVK079	Soil	Acetone	67-64-1	173	40	140
08LVK079	Soil	2-Butanone	78-93-3	162	30	150
08LVK085	Soil	Acetone	67-64-1	175	40	140
08LVK085	Soil	2-hexanone	591-78-6	138	55	130
08LVK086	Soil	Acetone	67-64-1	169	40	140
08LVK086	Soil	2-Butanone	78-93-3	159	30	150
08LVK086	Soil	2-hexanone	591-78-6	141	55	130
08LVK091	Soil	Acetone	67-64-1	142	40	140
08LVK093	Soil	Chloromethane	74-87-3	158	40	125
08LVK100	Soil	1,2,4-Trichlorobenzene	120-82-1	8	65	135

CAS - Chemical Abstracts System
LCL - lower control limit
LCS - laboratory control sample
QC - quality control
UCL - upper control limit

Table 2-27 shows the VOA MS and MSD recoveries that were not within the QC limits. The surrogate results for these batches were all within limits, so no qualification of sample results was required.

Table 2-27. VOA MS and MSD Recoveries That Did Not Satisfy QC Limits. (2 Pages)

Batch ID	Matrix	QC Type	Analyte	CAS	Sample	Sample			Units	Spike Conc.	Spiked Result	Rec. (%)	LCL (%)	UCL (%)
						Result	Q	EQL						
08LVK069	S	MSD	1,2-Dibromo-3-chloropropane	96-12-8	B060	7	U	7	µg/kg	42.947	61.84	144	50	130
08LVK069	S	MSD	Acetone	67-64-1	B060	7	U	7	µg/kg	42.947	66.14	154	40	140
08LVK069	S	MSD	Chloroform	67-66-3	B060	24		4	µg/kg	42.947	42.9	44	65	135
08LVK075	S	MS	1,1,2,2-Tetrachloroethane	79-34-5	B079	5	U	5	µg/kg	56.895	80.79	142	65	130
08LVK075	S	MSD	1,1,2,2-Tetrachloroethane	79-34-5	B079	5	U	5	µg/kg	53.482	71.67	134	65	130
08LVK075	S	MS	1,2-Dibromo-3-chloropropane	96-12-8	B079	10	U	10	µg/kg	56.895	106.96	188	50	130
08LVK075	S	MSD	1,2-Dibromo-3-chloropropane	96-12-8	B079	10	U	10	µg/kg	53.482	93.59	175	50	130
08LVK075	S	MS	2-Butanone	78-93-3	B079	10	U	10	µg/kg	56.895	101.27	178	30	150
08LVK075	S	MSD	2-Butanone	78-93-3	B079	10	U	10	µg/kg	53.482	97.87	183	30	150
08LVK075	S	MS	2-hexanone	591-78-6	B079	10	U	10	µg/kg	56.895	97.86	172	55	130
08LVK075	S	MSD	2-hexanone	591-78-6	B079	10	U	10	µg/kg	53.482	89.85	168	55	130
08LVK075	S	MS	4-Methyl-2-pentanone	108-10-1	B079	10	U	10	µg/kg	56.895	89.89	158	60	135
08LVK075	S	MSD	4-Methyl-2-pentanone	108-10-1	B079	10	U	10	µg/kg	53.482	81.29	152	60	135
08LVK075	S	MS	Acetone	67-64-1	B079	10	U	10	µg/kg	56.895	85.34	150	40	140
08LVK086	S	MS	1,1,2,2-Tetrachloroethane	79-34-5	B111	4	U	4	µg/kg	48.656	72.5	149	65	130
08LVK086	S	MSD	1,1,2,2-Tetrachloroethane	79-34-5	B111	4	U	4	µg/kg	47.771	65.92	138	65	130
08LVK086	S	MS	1,2-Dibromo-3-chloropropane	96-12-8	B111	9	U	9	µg/kg	48.656	86.61	178	50	130
08LVK086	S	MSD	1,2-Dibromo-3-chloropropane	96-12-8	B111	9	U	9	µg/kg	47.771	81.69	171	50	130
08LVK086	S	MS	1,2-Dibromoethane	106-93-4	B111	4	U	4	µg/kg	48.656	59.36	122	80	120
08LVK086	S	MSD	1,2-Dibromoethane	106-93-4	B111	4	U	4	µg/kg	47.771	57.8	121	80	120
08LVK086	S	MS	1,2-Dichloroethane	107-06-2	B111	4	U	4	µg/kg	48.656	71.52	147	70	130
08LVK086	S	MSD	1,2-Dichloroethane	107-06-2	B111	4	U	4	µg/kg	47.771	65.45	137	70	130
08LVK086	S	MS	2-Butanone	78-93-3	B111	9	U	9	µg/kg	48.656	93.91	193	30	150
08LVK086	S	MSD	2-Butanone	78-93-3	B111	9	U	9	µg/kg	47.771	86.94	182	30	150
08LVK086	S	MS	2-hexanone	591-78-6	B111	9	U	9	µg/kg	48.656	91.47	188	55	130

Table 2-27. VOA MS and MSD Recoveries That Did Not Satisfy QC Limits. (2 Pages)

Batch ID	Matrix	QC Type	Analyte	CAS	Sample	Sample			Units	Spike Conc.	Spiked Result	Rec. (%)	LCL (%)	UCL (%)
						Result	Q	EQL						
08LVK086	S	MSD	2-hexanone	591-78-6	B111	9	U	9	µg/kg	47.771	86.47	181	55	130
08LVK086	S	MS	4-Methyl-2-pentanone	108-10-1	B111	9	U	9	µg/kg	48.656	85.63	176	60	135
08LVK086	S	MSD	4-Methyl-2-pentanone	108-10-1	B111	9	U	9	µg/kg	47.771	81.69	171	60	135
08LVK086	S	MS	Chloromethane	74-87-3	B111	9	U	9	µg/kg	48.656	83.2	171	40	125
08LVK086	S	MSD	Chloromethane	74-87-3	B111	9	U	9	µg/kg	47.771	72.61	152	40	125
08LVK086	S	MS	Methyl-T-Butylether	1634-04-4	B111	4	U	4	µg/kg	48.656	63.74	131	65	125
08LVK086	S	MSD	1,1,2,2-Tetrachloroethane	79-34-5	S10	4	U	4	µg/kg	42.924	60.95	142	65	130
08LVK086	S	MS	1,2-Dibromo-3-chloropropane	96-12-8	S10	8	U	8	µg/kg	45.106	64.05	142	50	130
08LVK086	S	MSD	1,2-Dibromo-3-chloropropane	96-12-8	S10	8	U	8	µg/kg	42.924	75.12	175	50	130
08LVK086	S	MSD	1,2-Dibromoethane	106-93-4	S10	4	U	4	µg/kg	42.924	52.37	122	80	120
08LVK086	S	MS	1,2-Dichloroethane	107-06-2	S10	4	U	4	µg/kg	45.106	60.44	134	70	130
08LVK086	S	MSD	1,2-Dichloroethane	107-06-2	S10	4	U	4	µg/kg	42.924	58.81	137	70	130
08LVK086	S	MS	2-Butanone	78-93-3	S10	8	U	8	µg/kg	45.106	69.91	155	30	150
08LVK086	S	MSD	2-Butanone	78-93-3	S10	8	U	8	µg/kg	42.924	78.55	183	30	150
08LVK086	S	MS	2-hexanone	591-78-6	S10	8	U	8	µg/kg	45.106	69.01	153	55	130
08LVK086	S	MSD	2-hexanone	591-78-6	S10	8	U	8	µg/kg	42.924	78.98	184	55	130
08LVK086	S	MS	4-Methyl-2-pentanone	108-10-1	S10	8	U	8	µg/kg	45.106	67.66	150	60	135
08LVK086	S	MSD	4-Methyl-2-pentanone	108-10-1	S10	8	U	8	µg/kg	42.924	75.12	175	60	135
08LVK086	S	MS	Chloromethane	74-87-3	S10	8	U	8	µg/kg	45.106	75.78	168	40	125
08LVK086	S	MSD	Chloromethane	74-87-3	S10	8	U	8	µg/kg	42.924	66.1	154	40	125
08LVK086	S	MSD	Methyl-T-Butylether	1634-04-4	S10	4	U	4	µg/kg	42.924	54.51	127	65	125

CAS - Chemical Abstracts System
Conc. - concentration
EQL - estimated quantitation limit
LCL - lower control limit
MS - matrix spike
MSD - matrix spike duplicate
Q - laboratory qualifier
QC - quality control
Rec. - recovery (%)
S - soil
UCL - upper control limit
VOA - volatile organic analysis

2.9.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

Table 2-28 shows the three MS/MSD RPDs that did not meet the 20% limit set by the laboratory. Associated sample results for 1,2,4-Trichlorobenzene and 1,2-Dibromo-3-chloropropane in batches 08LVK075 and 08LVK086 (all nondetects) were qualified as estimates and flagged "UJ." Chloroform was detected in samples in batch 08LVK069 and the detects are qualified with a "J."

Table 2-28. VOA RPDs That Did Not Satisfy Criteria.

Batch ID	Matrix	Analyte	CAS	Sample	MS Rec. (%)	MSD Rec. (%)	RPD
08LVK069	S	Chloroform	67-66-3	B060	93	44	71.5
08LVK075	S	1,2,4-Trichlorobenzene	120-82-1	B079	70	90	25
08LVK086	S	1,2-Dibromo-3-chloropropane	96-12-8	S10	142	175	20.8

CAS - Chemical Abstracts System
MS - matrix spike
MSD - matrix spike duplicate
Rec. - recovery (%)
RPD - relative percent difference
S - soil
VOA - volatile organic analysis

2.10. DATA VALIDATION REPORT FOR SEMIVOLATILE ORGANIC COMPOUNDS (METHOD 8270)

Eighty-five SVOCs were requested for 62 of the 63 samples in this group (polycyclic aromatic hydrocarbons [PAHs] were not requested for sample B063, reducing the number of analytes requested for this sample to 50). Semi-volatile organic analysis (SVOA) results were reported in the EDDs for the 69 of these compounds that the laboratory commonly reports. Of the 16 SVOCs requested, but not reported by method 8270C, 1,2-dichlorobenzene, 1,3-dichlorobenzene and 1,4-dichlorobenzene, are reported as VOCs (method 8260B). For the remaining 13 (2,6-dimethylnaphthalene, 1,6,7-trimethylnaphthalene, 1-methyl-9H-fluorene, dibenzothiophene, 2-methylphenanthrene, 1-methylphenanthrene, 4,6-dimethyldibenzothiophene, 3,6-dimethylphenanthrene, 2-methylfluoranthene, retene, 5-methylchrysene, benzo(e)pyrene, and perylene) the laboratory is performing a spectral search, and is reporting the results for them in the data package narrative. In addition, for batch "08LE0177" (samples B079, B080, and B081), 4-methylphenol (CAS #106-44-5) was reported instead of the mixture 3- and/or 4-methylphenol.

The table listing the analytical results and the results of the validation for SVOCs is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM.

2.10.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each sample and each batch QC sample?
- Was precision checked with a MSD or DUP?

Table 2-29 the numbers of QC and field samples analyzed in each batch.

Table 2-29. SVOA Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	MS	MSD	Surr	Sample
08LE0135	S	1	1	1	1	9	5
08LE0164	S	1	1	1	1	12	8
08LE0177	S	1	1	1	1	15	11
08LE0218	S	1	1	1	1	21	17
08LE0226	W	1	1	1	1	12	8
08LE0229	S	1	1	1	1	13	9
08LE0237	S	1	1	1	1	19	15
08LE0255	S	1	1			8	6
08LE0264	S	1	2			9	6

LCS - laboratory control sample
MB - method blank
MS - matrix spike
MSD - matrix spike duplicate
S - soil
Surr - Surrogate
SVOA - semi-volatile organic analysis
W - water

Semivolatile organic analysis was performed in eight batches of soil samples and one water sample batch. Each batch contained fewer than 20 field samples. A MB result was reported for each of the reported compounds in every batch.

A LCS was reported in every batch for every requested analyte except 1,1-biphenyl. The LCS is not required to contain all compounds of interest. Therefore, no results were qualified for missing LCS.

MS and MSD results were obtained for the batch of water samples and for six of the eight batches of soil samples. The spikes contained all compounds of interest except 1,1-biphenyl. The project goal is to obtain one MS and MSD analysis for every 20 samples of each matrix type. Since there were eight water samples and 77 soil samples analyzed in these batches, the number of MS and MSD results supports this goal.

Surrogates (2,4,6-tribromophenol, 2-fluorobiphenyl, 2-fluorophenol, nitrobenzene-d5, phenol-d5, p-terphenyl-d14) were added to each sample, MB, LCS, MS, and MSD.

2.10.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for SVOA by method 8260B are specified in VET-1405-PLN-03, Rev. 0. The holding times to extraction are 7 days for water samples and 14 days for soil samples. Forty additional days after extraction are allowed to complete the analysis. All results were generated within the holding time limits.

2.10.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The required detection limits in soil samples are 2 µg/kg for PAHs and 200 µg/kg for other analytes (except 20 µg/kg for hexachloroethane). The required detection limits in water samples are 0.2 µg/L for PAHs and 5 µg/L for other analytes. Most compounds in the MBs were undetected; the detection limits exceeded the RQL in all cases. However, the validation rules do not require qualification of results for high detection limits.

One or more phthalates (common laboratory contaminants) were found in the MBs for most batches, as shown in Table 2-30. Detect results associated with the respective analytes and batches that were less than ten times the blank result were qualified as estimated nondetects and flagged "UJ". Any of these results that were less than the RQL were raised to the level of the RQL. Detect results less than 20 times the blank result were qualified as estimates and flagged "J". Nondetect results were not qualified.

Table 2-30. SVOCs Found in Method Blanks.

Batch ID	Matrix	Analyte	CAS	Result	Q	RQL	Units
08LE0164	S	bis(2-Ethylhexyl)phthalate	117-81-7	370		200	µg/kg
08LE0177	S	bis(2-Ethylhexyl)phthalate	117-81-7	100	J	200	µg/kg
08LE0218	S	bis(2-Ethylhexyl)phthalate	117-81-7	27	J	200	µg/kg
08LE0226	W	bis(2-Ethylhexyl)phthalate	117-81-7	2	J	5	µg/L
08LE0226	W	Di-n-butylphthalate	84-74-2	1	J	5	µg/L
08LE0229	S	bis(2-Ethylhexyl)phthalate	117-81-7	37	J	200	µg/kg
08LE0229	S	Di-n-butylphthalate	84-74-2	21	J	200	µg/kg
08LE0237	S	bis(2-Ethylhexyl)phthalate	117-81-7	53	J	200	µg/kg
08LE0255	S	bis(2-Ethylhexyl)phthalate	117-81-7	59	J	200	µg/kg

CAS - Chemical Abstracts System
Q - laboratory qualifier
RQL - required quantitation limit
S - soil
SVOC - semi-volatile organic compound
W - water

2.10.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The required detection limits in soil samples are 2 µg/kg for PAHs and 200 µg/kg for other analytes. The required detection limits in water samples are 0.2 µg/L for PAHs and 5 µg/L for other analytes. None of the nondetect results met these requirements. However, the validation rules do not require qualification of the results.

2.10.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, MSD, and surrogates meet the accuracy criteria?

The statistical QC limits determined by the laboratory for surrogate compounds are listed in Table 2-31. Table 2-32 lists the cases where these limits were not achieved. In all these cases, the surrogate recoveries were below the LCL. Note that recoveries for 2,4,6-tribromophenol in batch 08LE0135 were low both in the sample and the MB.

All sample results associated with these cases were nondetects. They were qualified as estimates and flagged "UJ." Results were not qualified for inadequate surrogate recovery in the MB samples.

Table 2-31. Semi-Volatile Surrogate Recovery Limits

Compound	Water (%)	Soil (%)
Nitrobenzene-d5	35 to 114	23 to 120
2-fluorobiphenyl	43 to 116	30 to 115
Terphenyl-d14	33 to 141	18 to 137
Phenol-d6	10 to 94	24 to 113
2-fluorophenol	21 to 100	25 to 121
2,4,6-tribromophenol	10 to 123	19 to 122

Table 2-32. Instances in Which the Surrogate Recover Was Not in Limits. (2 Pages)

Batch ID	Matrix	Client ID	Lab ID	Analyte	CAS	Rec. (%)
08LE0135	S	B045	0803L762-003	2,4,6-Tribromophenol	118-79-6	14
08LE0135	S		08LE0135-MB1MB	2,4,6-Tribromophenol	118-79-6	11
08LE0218	S	S08	0805L044-008	2,4,6-Tribromophenol	118-79-6	11
08LE0218	S	S05	0805L044-005	2,4,6-Tribromophenol	118-79-6	15
08LE0218	S	S06	0805L044-006	2,4,6-Tribromophenol	118-79-6	16
08LE0218	S	S09	0805L044-009	2,4,6-Tribromophenol	118-79-6	18
08LE0229	S		08LE0229-MB1MB	2,4,6-Tribromophenol	118-79-6	18

CAS - Chemical Abstracts Service
S - soil

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS/MSD recoveries must be within the statistical limits set by the lab. These limits are shown in Table 2-33.

Table 2-33. Lionville Laboratory SVOA Limits for LCS, MS, and MSD. (2 Pages)

Analyte	CAS	Solid Samples		Water Samples	
		LCL (%)	UCL (%)	LCL (%)	UCL (%)
1,2,4-Trichlorobenzene	120-82-1	60	120	40	100
1,2-Diphenylhydrazine	122-66-7	50	110	50	110
1-Methylnaphthalene	90-12-0	50	110	40	110
2,2'-oxybis(1-Chloropropane)	108-60-1	50	120	40	110
2,4,5-Trichlorophenol	95-95-4	40	140	50	110
2,4,6-Trichlorophenol	88-06-2	10	140	50	110
2,4-Dichlorophenol	120-83-2	50	130	45	110
2,4-Dimethylphenol	105-67-9	50	120	30	110
2,4-Dinitrophenol	51-28-5	20	120	15	130
2,4-Dinitrotoluene	121-14-2	60	130	50	120
2,6-Dinitrotoluene	606-20-2	50	140	50	110
2-Chloronaphthalene	91-58-7	50	130	50	110
2-Chlorophenol	95-57-8	50	130	40	140
2-Methylnaphthalene	91-57-6	60	100	40	110
2-Methylphenol	95-48-7	60	120	40	110
2-Nitroaniline	88-74-4	60	130	50	110
2-Nitrophenol	88-75-5	50	130	40	110
3,3'-Dichlorobenzidine	91-94-1	20	140	0	120
3-and/or 4-Methylphenol	1319-77-3	60	130	40	110
3-Nitroaniline	99-09-2	40	130	10	120
4,6-Dinitro-2-Methylphenol	534-52-1	40	140	40	130
4-Bromophenyl phenyl ether	101-55-3	50	120	50	110
4-Chloro-3-Methylphenol	59-50-7	60	130	40	110
4-Chloroaniline	106-47-8	20	120	10	100
4-Chlorophenyl phenyl ether	7005-72-3	50	120	50	120
4-Nitroaniline	100-01-6	50	120	10	100
4-Nitrophenol	100-02-7	40	140	10	110
Acenaphthene	83-32-9	60	130	50	110
Acenaphthylene	208-96-8	60	130	50	110
Aniline	62-53-3	20	100	5	120
Anthracene	120-12-7	60	130	50	120
Benzidine	92-87-5	0	110	0	110
Benzo(a)anthracene	56-55-3	50	130	50	120
Benzo(a)pyrene	50-32-8	50	130	50	140

Table 2-33. Lionville Laboratory SVOA Limits for LCS, MS, and MSD. (2 Pages)

Analyte	CAS	Solid Samples		Water Samples	
		LCL (%)	UCL (%)	LCL (%)	UCL (%)
Benzo(b)fluoranthene	205-99-2	60	130	50	140
Benzo(g,h,i)perylene	191-24-2	50	140	50	140
Benzo(k)fluoranthene	207-08-9	50	130	50	140
Benzoic Acid	65-85-0	10	110	0	112
Benzyl Alcohol	100-51-6	50	100	40	110
Bis(2-Chloroethoxy)methane	111-91-1	40	140	45	105
Bis(2-Chloroethyl) ether	111-44-4	50	130	40	120
Bis(2-Ethylhexyl) phthalate	117-81-7	50	150	50	140
Butylbenzylphthalate	85-68-7	50	150	40	140
Carbazole	86-74-8	20	120	20	120
Chrysene	218-01-9	50	130	50	120
Dibenzo(a,h)anthracene	53-70-3	50	140	50	140
Dibenzofuran	132-64-9	60	130	60	110
Diethyl phthalate	84-66-2	50	130	40	130
Dimethyl phthalate	131-11-3	50	140	55	120
Di-n-Butyl phthalate	84-74-2	40	150	40	130
Di-n-octyl phthalate	117-84-0	50	150	40	140
Fluoranthene	206-44-0	50	130	50	120
Fluorene	86-73-7	60	130	60	110
Hexachloro-1,3-butadiene	87-68-3	40	130	40	100
Hexachlorobenzene	118-74-1	60	130	50	110
Hexachlorocyclopentadiene	77-47-4	20	100	20	100
Hexachloroethane	67-72-1	50	110	35	110
Indeno(1,2,3-cd)pyrene	193-39-5	60	140	50	140
Isophorone	78-59-1	60	120	40	110
Naphthalene	91-20-3	40	130	40	105
Nitrobenzene	98-95-3	50	110	40	100
N-Nitroso-Di-N-Propylamine	621-64-7	50	130	40	120
N-Nitrosodiphenylamine	86-30-6	50	130	50	110
Pentachlorophenol	87-86-5	30	130	15	130
Phenanthrene	85-01-8	60	130	50	120
Phenol	108-95-2	50	130	30	110
Pyrene	129-00-0	50	140	50	130
Pyridine	110-86-1	40	110	15	100

CAS - Chemical Abstracts System
LCL - lower control limit
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
SVOA - semi-volatile organic analysis
UCL - upper control limit

Table 2-34 shows the LCS recoveries that were outside the control limits. All results for the analytes in the batches indicated in the table were qualified as approximate. All results qualified were nondetects, so they were flagged "UJ."

Table 2-34. LCS* Recoveries That Did Not Satisfy QC Limits. (3 Pages)

Batch ID	Matrix	Analyte	CAS	Rec (%)
08LE0177	S	Pyridine	110-86-1	36
08LE0218	S	BENZOIC ACID	65-85-0	1
08LE0218	S	Benzyl alcohol	100-51-6	102
08LE0226	W	3-Nitroaniline	99-09-2	6
08LE0226	W	4-Chloroaniline	106-47-8	1
08LE0226	W	N-Nitrosodiphenylamine	86-30-6	37
08LE0229	S	BENZOIC ACID	65-85-0	8
08LE0237	S	4,6-Dinitro-2-methylphenol	534-52-1	33
08LE0237	S	BENZOIC ACID	65-85-0	8
08LE0237	S	Pentachlorophenol	87-86-5	23
08LE0255	S	1,2,4-Trichlorobenzene	120-82-1	36
08LE0255	S	1,2-Diphenylhydrazine	122-66-7	41
08LE0255	S	1-Methylnaphthalene	90-12-0	38
08LE0255	S	2,2'-oxybis(1-Chloropropane)	108-60-1	30
08LE0255	S	2,4-Dichlorophenol	120-83-2	42
08LE0255	S	2,4-Dimethylphenol	105-67-9	33
08LE0255	S	2,4-Dinitrotoluene	121-14-2	50
08LE0255	S	2,6-Dinitrotoluene	606-20-2	49
08LE0255	S	2-Chloronaphthalene	91-58-7	44
08LE0255	S	2-Chlorophenol	95-57-8	40
08LE0255	S	2-Methylnaphthalene	91-57-6	40
08LE0255	S	2-Methylphenol	95-48-7	37
08LE0255	S	2-Nitroaniline	88-74-4	44
08LE0255	S	2-Nitrophenol	88-75-5	39
08LE0255	S	3-and/or 4-Methylphenol	1319-77-3	39
08LE0255	S	4,6-Dinitro-2-methylphenol	534-52-1	30
08LE0255	S	4-Bromophenyl-phenylether	101-55-3	38
08LE0255	S	4-Chloro-3-methylphenol	59-50-7	42
08LE0255	S	4-Chlorophenyl-phenylether	7005-72-3	43
08LE0255	S	4-Nitroaniline	100-01-6	48
08LE0255	S	Acenaphthene	83-32-9	48
08LE0255	S	Acenaphthylene	208-96-8	49

Table 2-34. LCS* Recoveries That Did Not Satisfy QC Limits. (3 Pages)

Batch ID	Matrix	Analyte	CAS	Rec (%)
08LE0255	S	Anthracene	120-12-7	49
08LE0255	S	Benzo(a)anthracene	56-55-3	47
08LE0255	S	Benzo(a)pyrene	50-32-8	44
08LE0255	S	Benzo(b)fluoranthene	205-99-2	44
08LE0255	S	Benzo(g,h,i)perylene	191-24-2	42
08LE0255	S	Benzo(k)fluoranthene	207-08-9	46
08LE0255	S	BENZOIC ACID	65-85-0	5
08LE0255	S	Benzyl alcohol	100-51-6	45
08LE0255	S	bis(2-Chloroethoxy)methane	111-91-1	34
08LE0255	S	bis(2-Chloroethyl)ether	111-44-4	31
08LE0255	S	Chrysene	218-01-9	47
08LE0255	S	Dibenzo(a,h)anthracene	53-70-3	46
08LE0255	S	Dibenzofuran	132-64-9	45
08LE0255	S	Dimethylphthalate	131-11-3	48
08LE0255	S	Fluoranthene	206-44-0	49
08LE0255	S	Fluorene	86-73-7	45
08LE0255	S	Hexachlorobenzene	118-74-1	46
08LE0255	S	Hexachlorobutadiene	87-68-3	39
08LE0255	S	Hexachloroethane	67-72-1	34
08LE0255	S	Indeno(1,2,3-cd)pyrene	193-39-5	43
08LE0255	S	Isophorone	78-59-1	40
08LE0255	S	Naphthalene	91-20-3	35
08LE0255	S	Nitrobenzene	98-95-3	33
08LE0255	S	N-Nitroso-di-n-propylamine	621-64-7	37
08LE0255	S	N-Nitrosodiphenylamine	86-30-6	37
08LE0255	S	Phenanthrene	85-01-8	47
08LE0255	S	Phenol	108-95-2	38
08LE0255	S	Pyridine	110-86-1	22
08LE0264	S	1,2,4-Trichlorobenzene	120-82-1	48
08LE0264	S	1,2,4-Trichlorobenzene	120-82-1	59
08LE0264	S	1-Methylnaphthalene	90-12-0	48
08LE0264	S	2,2'-oxybis(1-Chloropropane)	108-60-1	44
08LE0264	S	2,4-Dimethylphenol	105-67-9	41
08LE0264	S	2-Methylnaphthalene	91-57-6	51
08LE0264	S	2-Methylphenol	95-48-7	52
08LE0264	S	2-Nitrophenol	88-75-5	49
08LE0264	S	3-and/or 4-Methylphenol	1319-77-3	52

Table 2-34. LCS* Recoveries That Did Not Satisfy QC Limits. (3 Pages)

Batch ID	Matrix	Analyte	CAS	Rec (%)
08LE0264	S	4,6-Dinitro-2-methylphenol	534-52-1	38
08LE0264	S	4-Chloro-3-methylphenol	59-50-7	50
08LE0264	S	4-Chloro-3-methylphenol	59-50-7	59
08LE0264	S	BENZOIC ACID	65-85-0	0
08LE0264	S	Benzyl alcohol	100-51-6	48
08LE0264	S	bis(2-Chloroethyl)ether	111-44-4	47
08LE0264	S	Hexachloroethane	67-72-1	49
08LE0264	S	Indeno(1,2,3-cd)pyrene	193-39-5	59
08LE0264	S	Isophorone	78-59-1	51
08LE0264	S	Nitrobenzene	98-95-3	44
08LE0264	S	N-Nitrosodiphenylamine	86-30-6	49
08LE0264	S	Pyridine	110-86-1	39
08LE0264	S	Pyridine	110-86-1	32

*LCSs were analyzed in duplicate. If both the LCS and the LCS duplicate are outside the acceptable range for an analyte in a particular batch, that analyte will appear in the table twice for the batch.

CAS - Chemical Abstracts Service
LCS - laboratory control sample
QC - quality control
Rec. - recovery (%)
S - soil
UCL - upper control limit
W - water

Table 2-35 shows the MS and MSD recoveries that were outside the QC limits. All these recoveries were below the LCL. Associated sample results were qualified as estimated. Detect results were flagged "J" and nondetects were flagged "UJ."

Table 2-35. MS and MSD Recoveries That Did Not Satisfy QC Limits. (6 Pages)

Batch ID	Matrix	QC Type	Analyte	CAS	Sample	Sample Result	Q	Units	Spiked Result	Q	Spike Conc.	Rec. (%)	LCL (%)	UCL (%)
08LE0177	S	MS	BENZOIC ACID	65-85-0	0804L905-001	360	U	µg/kg	43		2140	2	10	110
08LE0218	S	MS	1,2,4-Trichlorobenzene	120-82-1	0805L044-010	350	U	µg/kg	809		2129	38	60	120
08LE0218	S	MS	1-Methylnaphthalene	90-12-0	0805L044-010	350	U	µg/kg	1043		2129	49	50	110
08LE0218	S	MS	2,2'-oxybis(1-Chloropropane)	108-60-1	0805L044-010	350	U	µg/kg	915		2129	43	50	120
08LE0218	S	MS	2,4,5-Trichlorophenol	95-95-4	0805L044-010	350	U	µg/kg	766		2129	36	40	140
08LE0218	S	MS	2,4-Dimethylphenol	105-67-9	0805L044-010	350	U	µg/kg	1022		2129	48	50	120
08LE0218	S	MS	2-Methylnaphthalene	91-57-6	0805L044-010	350	U	µg/kg	1086		2129	51	60	100
08LE0218	S	MS	2-Methylphenol	95-48-7	0805L044-010	350	U	µg/kg	1256		2129	59	60	120
08LE0218	S	MS	2-Nitrophenol	88-75-5	0805L044-010	350	U	µg/kg	1022		2129	48	50	130
08LE0218	S	MS	4-Chloro-3-methylphenol	59-50-7	0805L044-010	350	U	µg/kg	1001		2129	47	60	130
08LE0218	S	MSD	4-Chloro-3-methylphenol	59-50-7	0805L044-010	350	U	µg/kg	1064		2129	50	60	130
08LE0218	S	MS	Benzyl alcohol	100-51-6	0805L044-010	350	U	µg/kg	766		2129	36	50	100
08LE0218	S	MS	bis(2-Chloroethyl)ether	111-44-4	0805L044-010	350	U	µg/kg	873		2129	41	50	130
08LE0218	S	MS	Hexachlorobutadiene	87-68-3	0805L044-010	350	U	µg/kg	745		2129	35	40	130
08LE0218	S	MS	Hexachloroethane	67-72-1	0805L044-010	350	U	µg/kg	596		2129	28	50	110
08LE0218	S	MS	Isophorone	78-59-1	0805L044-010	350	U	µg/kg	1256		2129	59	60	120
08LE0218	S	MS	Nitrobenzene	98-95-3	0805L044-010	350	U	µg/kg	915		2129	43	50	110
08LE0218	S	MS	Pyridine	110-86-1	0805L044-010	350	U	µg/kg	319		2129	15	40	110
08LE0226	W	MS	3-Nitroaniline	99-09-2	0805L085-001	50	U	µg/L	1		60	2	10	120
08LE0226	W	MS	4-Chloroaniline	106-47-8	0805L085-001	10	U	µg/L	1		60	1	10	100
08LE0226	W	MS	4-Nitroaniline	100-01-6	0805L085-001	50	U	µg /L	5		60	9	10	100
08LE0226	W	MS	bis(2-Chloroethoxy)methane	111-91-1	0805L085-001	10	U	µg /L	13		60	22	45	105
08LE0226	W	MS	N-Nitrosodiphenylamine	86-30-6	0805L085-001	10	U	µg/L	16		60	26	50	110
08LE0229	S	MS	1,2,4-Trichlorobenzene	120-82-1	0805L087-002	350	U	µg/kg	610		2102	29	60	120

Table 2-35. MS and MSD Recoveries That Did Not Satisfy QC Limits. (6 Pages)

Batch ID	Matrix	QC Type	Analyte	CAS	Sample	Sample Result	Q	Units	Spiked Result	Q	Spike Conc.	Rec. (%)	LCL (%)	UCL (%)
08LE0229	S	MSD	1,2,4-Trichlorobenzene	120-82-1	0805L087-002	350	U	µg/kg	883		2102	42	60	120
08LE0229	S	MS	1,2-Diphenylhydrazine	122-66-7	0805L087-002	350	U	µg/kg	589		2102	28	50	110
08LE0229	S	MSD	1,2-Diphenylhydrazine	122-66-7	0805L087-002	350	U	µg/kg	988		2102	47	50	110
08LE0229	S	MS	1-Methylnaphthalene	90-12-0	0805L087-002	350	U	µg/kg	589		2102	28	50	110
08LE0229	S	MSD	1-Methylnaphthalene	90-12-0	0805L087-002	350	U	µg/kg	904		2102	43	50	110
08LE0229	S	MS	2,2'-oxybis(1-Chloropropane)	108-60-1	0805L087-002	350	U	µg/kg	631		2102	30	50	120
08LE0229	S	MSD	2,2'-oxybis(1-Chloropropane)	108-60-1	0805L087-002	350	U	µg/kg	904		2102	43	50	120
08LE0229	S	MS	2,4,5-Trichlorophenol	95-95-4	0805L087-002	350	U	µg/kg	631		2102	30	40	140
08LE0229	S	MS	2,4-Dichlorophenol	120-83-2	0805L087-002	350	U	µg/kg	610		2102	29	50	130
08LE0229	S	MS	2,4-Dimethylphenol	105-67-9	0805L087-002	350	U	µg/kg	547		2102	26	50	120
08LE0229	S	MSD	2,4-Dimethylphenol	105-67-9	0805L087-002	350	U	µg/kg	946		2102	45	50	120
08LE0229	S	MS	2,4-Dinitrophenol	51-28-5	0805L087-002	1800	U	µg/kg	42		2102	2	20	120
08LE0229	S	MS	2,4-Dinitrotoluene	121-14-2	0805L087-002	350	U	µg/kg	694		2102	33	60	130
08LE0229	S	MS	2,6-Dinitrotoluene	606-20-2	0805L087-002	350	U	µg/kg	652		2102	31	50	140
08LE0229	S	MS	2-Chloronaphthalene	91-58-7	0805L087-002	350	U	µg/kg	652		2102	31	50	130
08LE0229	S	MSD	2-Chloronaphthalene	91-58-7	0805L087-002	350	U	µg/kg	1030		2102	49	50	130
08LE0229	S	MS	2-Chlorophenol	95-57-8	0805L087-002	350	U	µg/kg	631		2102	30	50	130
08LE0229	S	MS	2-Methylnaphthalene	91-57-6	0805L087-002	350	U	µg/kg	631		2102	30	60	100
08LE0229	S	MSD	2-Methylnaphthalene	91-57-6	0805L087-002	350	U	µg/kg	946		2102	45	60	100
08LE0229	S	MS	2-Methylphenol	95-48-7	0805L087-002	350	U	µg/kg	610		2102	29	60	120
08LE0229	S	MSD	2-Methylphenol	95-48-7	0805L087-002	350	U	µg/kg	1030		2102	49	60	120
08LE0229	S	MS	2-Nitroaniline	88-74-4	0805L087-002	1800	U	µg/kg	505		2102	24	60	130
08LE0229	S	MSD	2-Nitroaniline	88-74-4	0805L087-002	1800	U	µg/kg	1114		2102	53	60	130
08LE0229	S	MS	2-Nitrophenol	88-75-5	0805L087-002	350	U	µg/kg	610		2102	29	50	130
08LE0229	S	MS	3,3-Dichlorobenzidine	91-94-1	0805L087-002	700	U	µg/kg	21		2102	1	20	140

Table 2-35. MS and MSD Recoveries That Did Not Satisfy QC Limits. (6 Pages)

Batch ID	Matrix	QC Type	Analyte	CAS	Sample	Sample Result	Q	Units	Spiked Result	Q	Spike Conc.	Rec. (%)	LCL (%)	UCL (%)
08LE0229	S	MS	3-and/or 4-Methylphenol	1319-77-3	0805L087-002	350	U	µg/kg	631		2102	30	60	130
08LE0229	S	MSD	3-and/or 4-Methylphenol	1319-77-3	0805L087-002	350	U	µg/kg	1030		2102	49	60	130
08LE0229	S	MS	3-Nitroaniline	99-09-2	0805L087-002	1800	U	µg/kg	252		2102	12	40	130
08LE0229	S	MS	4,6-Dinitro-2-methylphenol	534-52-1	0805L087-002	1800	U	µg/kg	105		2102	5	40	140
08LE0229	S	MS	4-Bromophenyl-phenylether	101-55-3	0805L087-002	350	U	µg/kg	568		2102	27	50	120
08LE0229	S	MSD	4-Bromophenyl-phenylether	101-55-3	0805L087-002	350	U	µg/kg	904		2102	43	50	120
08LE0229	S	MS	4-Chloro-3-methylphenol	59-50-7	0805L087-002	350	U	µg/kg	631		2102	30	60	130
08LE0229	S	MSD	4-Chloro-3-methylphenol	59-50-7	0805L087-002	350	U	µg/kg	1114		2102	53	60	130
08LE0229	S	MS	4-Chloroaniline	106-47-8	0805L087-002	350	U	µg/kg	189		2102	9	20	120
08LE0229	S	MS	4-Chlorophenyl-phenylether	7005-72-3	0805L087-002	350	U	µg/kg	673		2102	32	50	120
08LE0229	S	MS	4-Nitroaniline	100-01-6	0805L087-002	1800	U	µg/kg	210		2102	10	50	120
08LE0229	S	MS	4-Nitrophenol	100-02-7	0805L087-002	1800	U	µg/kg	589		2102	28	40	140
08LE0229	S	MS	Acenaphthene	83-32-9	0805L087-002	350	U	µg/kg	631		2102	30	60	130
08LE0229	S	MSD	Acenaphthene	83-32-9	0805L087-002	350	U	µg/kg	1009		2102	48	60	130
08LE0229	S	MS	Acenaphthylene	208-96-8	0805L087-002	350	U	µg/kg	589		2102	28	60	130
08LE0229	S	MSD	Acenaphthylene	208-96-8	0805L087-002	350	U	µg/kg	1030		2102	49	60	130
08LE0229	S	MS	Aniline	62-53-3	0805L087-002	350	U	µg/kg	168		2102	8	20	100
08LE0229	S	MS	Anthracene	120-12-7	0805L087-002	350	U	µg/kg	673		2102	32	60	130
08LE0229	S	MSD	Anthracene	120-12-7	0805L087-002	350	U	µg/kg	1135		2102	54	60	130
08LE0229	S	MS	Benzo(a)anthracene	56-55-3	0805L087-002	350	U	µg/kg	736		2102	35	50	130
08LE0229	S	MS	Benzo(a)pyrene	50-32-8	0805L087-002	350	U	µg/kg	673		2102	32	50	130
08LE0229	S	MS	Benzo(b)fluoranthene	205-99-2	0805L087-002	350	U	µg/kg	799		2102	38	60	130
08LE0229	S	MS	Benzo(g,h,i)perylene	191-24-2	0805L087-002	350	U	µg/kg	820		2102	39	50	140
08LE0229	S	MS	Benzo(k)fluoranthene	207-08-9	0805L087-002	350	U	µg/kg	778		2102	37	50	130
08LE0229	S	MSD	BENZOIC ACID	65-85-0	0805L087-002	350	U	µg/kg	84		2102	4	10	110

Table 2-35. MS and MSD Recoveries That Did Not Satisfy QC Limits. (6 Pages)

Batch ID	Matrix	QC Type	Analyte	CAS	Sample	Sample Result	Q	Units	Spiked Result	Q	Spike Conc.	Rec. (%)	LCL (%)	UCL (%)
08LE0229	S	MS	Benzyl alcohol	100-51-6	0805L087-002	350	U	µg/kg	463		2102	22	50	100
08LE0229	S	MSD	Benzyl alcohol	100-51-6	0805L087-002	350	U	µg/kg	967		2102	46	50	100
08LE0229	S	MS	bis(2-Chloroethoxy)methane	111-91-1	0805L087-002	350	U	µg/kg	631		2102	30	40	140
08LE0229	S	MS	bis(2-Chloroethyl)ether	111-44-4	0805L087-002	350	U	µg/kg	610		2102	29	50	130
08LE0229	S	MSD	bis(2-Chloroethyl)ether	111-44-4	0805L087-002	350	U	µg/kg	883		2102	42	50	130
08LE0229	S	MS	bis(2-Ethylhexyl)phthalate	117-81-7	0805L087-002	28	JB	µg/kg	701		2102	32	50	150
08LE0229	S	MS	Butylbenzylphthalate	85-68-7	0805L087-002	350	U	µg/kg	589		2102	28	50	150
08LE0229	S	MS	Carbazole	86-74-8	0805L087-002	350	U	µg/kg	357		2102	17	20	120
08LE0229	S	MS	Chrysene	218-01-9	0805L087-002	350	U	µg/kg	757		2102	36	50	130
08LE0229	S	MS	Dibenzo(a,h)anthracene	53-70-3	0805L087-002	350	U	µg/kg	799		2102	38	50	140
08LE0229	S	MS	Dibenzofuran	132-64-9	0805L087-002	350	U	µg/kg	694		2102	33	60	130
08LE0229	S	MSD	Dibenzofuran	132-64-9	0805L087-002	350	U	µg/kg	1135		2102	54	60	130
08LE0229	S	MS	Diethylphthalate	84-66-2	0805L087-002	350	U	µg/kg	652		2102	31	50	130
08LE0229	S	MS	Dimethylphthalate	131-11-3	0805L087-002	350	U	µg/kg	652		2102	31	50	140
08LE0229	S	MS	Di-n-butylphthalate	84-74-2	0805L087-002	22	JB	µg/kg	737		2102	34	40	150
08LE0229	S	MS	Di-n-octyl phthalate	117-84-0	0805L087-002	350	U	µg/kg	610		2102	29	50	150
08LE0229	S	MS	Fluoranthene	206-44-0	0805L087-002	350	U	µg/kg	820		2102	39	50	130
08LE0229	S	MS	Fluorene	86-73-7	0805L087-002	350	U	µg/kg	673		2102	32	60	130
08LE0229	S	MSD	Fluorene	86-73-7	0805L087-002	350	U	µg/kg	1093		2102	52	60	130
08LE0229	S	MS	Hexachlorobenzene	118-74-1	0805L087-002	350	U	µg/kg	694		2102	33	60	130
08LE0229	S	MSD	Hexachlorobenzene	118-74-1	0805L087-002	350	U	µg/kg	1114		2102	53	60	130
08LE0229	S	MS	Hexachlorobutadiene	87-68-3	0805L087-002	350	U	µg/kg	652		2102	31	40	130
08LE0229	S	MS	Hexachlorocyclopentadiene	77-47-4	0805L087-002	350	U	µg/kg	231		2102	11	20	100
08LE0229	S	MS	Hexachloroethane	67-72-1	0805L087-002	350	U	µg/kg	589		2102	28	50	110
08LE0229	S	MSD	Hexachloroethane	67-72-1	0805L087-002	350	U	µg/kg	778		2102	37	50	110

Table 2-35. MS and MSD Recoveries That Did Not Satisfy QC Limits. (6 Pages)

Batch ID	Matrix	QC Type	Analyte	CAS	Sample	Sample Result	Q	Units	Spiked Result	Q	Spike Conc.	Rec. (%)	LCL (%)	UCL (%)
08LE0229	S	MS	Indeno(1,2,3-cd)pyrene	193-39-5	0805L087-002	350	U	µg/kg	799		2102	38	60	140
08LE0229	S	MSD	Indeno(1,2,3-cd)pyrene	193-39-5	0805L087-002	350	U	µg/kg	1219		2102	58	60	140
08LE0229	S	MS	Isophorone	78-59-1	0805L087-002	350	U	µg/kg	673		2102	32	60	120
08LE0229	S	MSD	Isophorone	78-59-1	0805L087-002	350	U	µg/kg	1030		2102	49	60	120
08LE0229	S	MS	Naphthalene	91-20-3	0805L087-002	350	U	µg/kg	610		2102	29	40	130
08LE0229	S	MS	Nitrobenzene	98-95-3	0805L087-002	350	U	µg/kg	631		2102	30	50	110
08LE0229	S	MSD	Nitrobenzene	98-95-3	0805L087-002	350	U	µg/kg	883		2102	42	50	110
08LE0229	S	MS	N-Nitroso-di-n-propylamine	621-64-7	0805L087-002	350	U	µg/kg	610		2102	29	50	130
08LE0229	S	MSD	N-Nitroso-di-n-propylamine	621-64-7	0805L087-002	350	U	µg/kg	904		2102	43	50	130
08LE0229	S	MS	N-Nitrosodiphenylamine	86-30-6	0805L087-002	350	U	µg/kg	357		2102	17	50	130
08LE0229	S	MSD	N-Nitrosodiphenylamine	86-30-6	0805L087-002	350	U	µg/kg	883		2102	42	50	130
08LE0229	S	MS	Pentachlorophenol	87-86-5	0805L087-002	1800	U	µg/kg	442		2102	21	30	130
08LE0229	S	MS	Phenanthrene	85-01-8	0805L087-002	350	U	µg/kg	694		2102	33	60	130
08LE0229	S	MSD	Phenanthrene	85-01-8	0805L087-002	350	U	µg/kg	1114		2102	53	60	130
08LE0229	S	MS	Phenol	108-95-2	0805L087-002	350	U	µg/kg	736		2102	35	50	130
08LE0229	S	MSD	Phenol	108-95-2	0805L087-002	350	U	µg/kg	1009		2102	48	50	130
08LE0229	S	MS	Pyrene	129-00-0	0805L087-002	350	U	µg/kg	736		2102	35	50	140
08LE0229	S	MS	Pyridine	110-86-1	0805L087-002	350	U	µg/kg	378		2102	18	40	110
08LE0229	S	MSD	Pyridine	110-86-1	0805L087-002	350	U	µg/kg	484		2102	23	40	110
08LE0237	S	MS	1,2,4-Trichlorobenzene	120-82-1	0805L111-002	340	U	µg/kg	992		2066	48	60	120
08LE0237	S	MSD	1,2,4-Trichlorobenzene	120-82-1	0805L111-002	340	U	µg/kg	909		2066	44	60	120
08LE0237	S	MSD	1-Methylnaphthalene	90-12-0	0805L111-002	340	U	µg/kg	1013		2066	49	50	110
08LE0237	S	MS	2-Methylnaphthalene	91-57-6	0805L111-002	340	U	µg/kg	1095		2066	53	60	100
08LE0237	S	MSD	2-Methylnaphthalene	91-57-6	0805L111-002	340	U	µg/kg	1054		2066	51	60	100
08LE0237	S	MSD	2-Nitrophenol	88-75-5	0805L111-002	340	U	µg/kg	992		2066	48	50	130

Table 2-35. MS and MSD Recoveries That Did Not Satisfy QC Limits. (6 Pages)

Batch ID	Matrix	QC Type	Analyte	CAS	Sample	Sample Result	Q	Units	Spiked Result	Q	Spike Conc.	Rec. (%)	LCL (%)	UCL (%)
08LE0237	S	MS	4-Chloro-3-methylphenol	59-50-7	0805L111-002	340	U	µg/kg	1219		2066	59	60	130
08LE0237	S	MS	Benzyl alcohol	100-51-6	0805L111-002	340	U	µg/kg	289		2066	14	50	100
08LE0237	S	MSD	Benzyl alcohol	100-51-6	0805L111-002	340	U	µg/kg	930		2066	45	50	100
08LE0237	S	MSD	bis(2-Chloroethyl)ether	111-44-4	0805L111-002	340	U	µg/kg	992		2066	48	50	130
08LE0237	S	MSD	Hexachloroethane	67-72-1	0805L111-002	340	U	µg/kg	868		2066	42	50	110
08LE0237	S	MS	Isophorone	78-59-1	0805L111-002	340	U	µg/kg	1199		2066	58	60	120
08LE0237	S	MSD	Isophorone	78-59-1	0805L111-002	340	U	µg/kg	1137		2066	55	60	120
08LE0237	S	MS	Nitrobenzene	98-95-3	0805L111-002	340	U	µg/kg	1013		2066	49	50	110
08LE0237	S	MSD	Nitrobenzene	98-95-3	0805L111-002	340	U	µg/kg	930		2066	45	50	110
08LE0237	S	MS	Pyridine	110-86-1	0805L111-002	340	U	µg/kg	806		2066	39	40	110
08LE0237	S	MSD	Pyridine	110-86-1	0805L111-002	340	U	µg/kg	579		2066	28	40	110

CAS - Chemical Abstracts System
Conc. - concentration
LCL - lower control limit
MS - matrix spike
MSD - matrix spike duplicate
Q - laboratory qualifier
QC - quality control
Rec. - recovery (%)
S - soil
UCL - upper control limit
W - water

2.10.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the RPD between MS and MSD must be less than the criteria set by the laboratory. These criteria are listed in Table 2-36. The lab has not set criteria for all analytes; RPDs were evaluated only for those compounds for which an RPD limit is specified.

Table 2-37 lists the RPD failures in this batch of data. All associated sample results were qualified as estimates. Detect results were flagged "J," and nondetect results were flagged "UJ."

Table 2-36. Relative Percent Difference Limits Set by Lionville Laboratory for SVOA MS/MSDs. (3 Pages)

Analyte	CAS	RPD (%)	
		For Solid Matrix	For Water Matrix
1,2,4-Trichlorobenzene	120-82-1	40	20
1,2-Diphenylhydrazine	122-66-7	40	20
1-Methylnaphthalene	90-12-0	40	20
2,2'-oxybis(1-Chloropropane)	108-60-1	40	20
2,4,5-Trichlorophenol	95-95-4	40	20
2,4,6-Trichlorophenol	88-06-2	40	20
2,4-Dichlorophenol	120-83-2	40	20
2,4-Dimethylphenol	105-67-9	40	20
2,4-Dinitrophenol	51-28-5	40	20
2,4-Dinitrotoluene	121-14-2	40	20
2,6-Dinitrotoluene	606-20-2	40	20
2-Chloronaphthalene	91-58-7	40	20
2-Chlorophenol	95-57-8	40	20
2-Methylnaphthalene	91-57-6	40	20
2-Methylphenol	95-48-7	40	20
2-Nitroaniline	88-74-4	40	20
2-Nitrophenol	88-75-5	40	20
3,3'-Dichlorobenzidine	91-94-1	40	100
3-and/or 4-Methylphenol	1319-77-3	40	20
3-Nitroaniline	99-09-2	40	20
4,6-Dinitro-2-Methylphenol	534-52-1	40	20
4-Bromophenyl phenyl ether	101-55-3	40	20
4-Chloro-3-Methylphenol	59-50-7	40	20
4-Chloroaniline	106-47-8	40	20

Table 2-36. Relative Percent Difference Limits Set by Lionville Laboratory for SVOA MS/MSDs. (3 Pages)

Analyte	CAS	RPD (%)	
		For Solid Matrix	For Water Matrix
4-Chlorophenyl phenyl ether	7005-72-3	40	20
4-Nitroaniline	100-01-6	40	20
4-Nitrophenol	100-02-7	40	20
Acenaphthene	83-32-9	40	20
Acenaphthylene	208-96-8	40	20
Aniline	62-53-3	40	20
Anthracene	120-12-7	40	20
Benzidine	92-87-5	100	100
Benzo(a)anthracene	56-55-3	40	20
Benzo(a)pyrene	50-32-8	40	20
Benzo(b)fluoranthene	205-99-2	40	20
Benzo(g,h,i)perylene	191-24-2	40	20
Benzo(k)fluoranthene	207-08-9	40	20
Benzoic Acid	65-85-0	40	60
Benzyl Alcohol	100-51-6	40	20
Bis(2-Chloroethoxy)methane	111-91-1	80	20
Bis(2-Chloroethyl) ether	111-44-4	40	20
Bis(2-Ethylhexyl) phthalate	117-81-7	40	20
Butylbenzylphthalate	85-68-7	100	20
Carbazole	86-74-8	40	20
Chrysene	218-01-9	40	20
Dibenzo(a,h)anthracene	53-70-3	40	20
Dibenzofuran	132-64-9	40	20
Diethyl phthalate	84-66-2	40	20
Dimethyl phthalate	131-11-3	40	20
Di-n-Butyl phthalate	84-74-2	40	20
Di-n-octyl phthalate	117-84-0	40	20
Fluoranthene	206-44-0	40	20
Fluorene	86-73-7	40	20
Hexachloro-1,3-butadiene	87-68-3	40	20
Hexachlorobenzene	118-74-1	40	20
Hexachlorocyclopentadiene	77-47-4	40	20
Hexachloroethane	67-72-1	40	20
Indeno(1,2,3-cd)pyrene	193-39-5	40	20
Isophorone	78-59-1	40	20
Naphthalene	91-20-3	40	20

Table 2-36. Relative Percent Difference Limits Set by Lionville Laboratory for SVOA MS/MSDs. (3 Pages)

Analyte	CAS	RPD (%)	
		For Solid Matrix	For Water Matrix
Nitrobenzene	98-95-3	40	20
N-Nitroso-Di-N-Propylamine	621-64-7	40	60
N-Nitrosodiphenylamine	86-30-6	80	60
Pentachlorophenol	87-86-5	60	40
Phenanthrene	85-01-8	40	20
Phenol	108-95-2	40	20
Pyrene	129-00-0	40	20
Pyridine	110-86-1	60	40

CAS - Chemical Abstracts System
MS - matrix spike
MSD - matrix spike duplicate
RPD - relative percent difference
SVOA - semi-volatile organic analysis

Table 2-37. RPDs Outside QC Criteria. (4 Pages)

Batch ID	Matrix	Analyte	CAS	Original Sample	MS Rec (%)	MSD Rec (%)	RPD
08LE0135	S	2,4,5-Trichlorophenol	95-95-4	0803L755-001	45	85	61.5
08LE0135	S	2,4,6-Trichlorophenol	88-06-2	0803L755-001	17	78	128.4
08LE0135	S	Benzidine	92-87-5	0803L755-001	1	0	200
08LE0135	S	BENZOIC ACID	65-85-0	0803L755-001	11	37	108.3
08LE0164	S	BENZOIC ACID	65-85-0	0803L842-005	21	37	55.2
08LE0177	S	2,4,6-Trichlorophenol	88-06-2	0804L905-001	37	77	70.2
08LE0177	S	3,3-Dichlorobenzidine	91-94-1	0804L905-001	60	92	42.1
08LE0177	S	4-Methylphenol	106-44-5	0804L905-001	79	87	9.6
08LE0177	S	BENZOIC ACID	65-85-0	0804L905-001	2	37	179.5
08LE0218	S	1,2,4-Trichlorobenzene	120-82-1	0805L044-010	38	60	44.9
08LE0218	S	2,2'-oxybis(1-Chloropropane)	108-60-1	0805L044-010	43	79	59
08LE0218	S	BENZOIC ACID	65-85-0	0805L044-010	13	23	55.6
08LE0218	S	bis(2-Chloroethyl)ether	111-44-4	0805L044-010	41	75	58.6
08LE0218	S	Hexachlorobutadiene	87-68-3	0805L044-010	35	61	54.2
08LE0218	S	Hexachloroethane	67-72-1	0805L044-010	28	64	78.3
08LE0218	S	Pyridine	110-86-1	0805L044-010	15	47	103.2
08LE0226	W	1,2-Diphenylhydrazine	122-66-7	0805L085-001	62	82	27.8
08LE0226	W	2,4,5-Trichlorophenol	95-95-4	0805L085-001	81	63	25
08LE0226	W	2,4,6-Trichlorophenol	88-06-2	0805L085-001	79	58	30.7

Table 2-37. RPDs Outside QC Criteria. (4 Pages)

Batch ID	Matrix	Analyte	CAS	Original Sample	MS Rec (%)	MSD Rec (%)	RPD
08LE0226	W	2,4-Dinitrophenol	51-28-5	0805L085-001	91	15	143.4
08LE0226	W	2-Nitrophenol	88-75-5	0805L085-001	72	57	23.3
08LE0226	W	3,3-Dichlorobenzidine	91-94-1	0805L085-001	0	85	200
08LE0226	W	3-and/or 4-Methylphenol	1319-77-3	0805L085-001	71	91	24.7
08LE0226	W	3-Nitroaniline	99-09-2	0805L085-001	2	88	191.1
08LE0226	W	4,6-Dinitro-2-methylphenol	534-52-1	0805L085-001	88	49	56.9
08LE0226	W	4-Bromophenyl-phenylether	101-55-3	0805L085-001	64	79	21
08LE0226	W	4-Chloro-3-methylphenol	59-50-7	0805L085-001	75	93	21.4
08LE0226	W	4-Chloroaniline	106-47-8	0805L085-001	1	91	195.7
08LE0226	W	4-Nitroaniline	100-01-6	0805L085-001	9	86	162.1
08LE0226	W	4-Nitrophenol	100-02-7	0805L085-001	81	55	38.2
08LE0226	W	Aniline	62-53-3	0805L085-001	10	74	152.4
08LE0226	W	Benzidine	92-87-5	0805L085-001	2	19	161.9
08LE0226	W	Benzo(k)fluoranthene	207-08-9	0805L085-001	76	94	21.2
08LE0226	W	BENZOIC ACID	65-85-0	0805L085-001	72	6	169.2
08LE0226	W	Benzyl alcohol	100-51-6	0805L085-001	69	91	27.5
08LE0226	W	bis(2-Chloroethoxy)methane	111-91-1	0805L085-001	22	84	117
08LE0226	W	Di-n-butylphthalate	84-74-2	0805L085-001	71.4	88.4	21.3
08LE0226	W	Di-n-octyl phthalate	117-84-0	0805L085-001	76	97	24.3
08LE0226	W	Isophorone	78-59-1	0805L085-001	78	96	20.7
08LE0226	W	N-Nitrosodiphenylamine (1)	86-30-6	0805L085-001	26	69	90.5
08LE0226	W	Pentachlorophenol	87-86-5	0805L085-001	100	55	58.1
08LE0226	W	Phenol	108-95-2	0805L085-001	69	87	23.1
08LE0226	W	Pyridine	110-86-1	0805L085-001	38	71	60.6
08LE0229	S	1,2-Diphenylhydrazine	122-66-7	0805L087-002	28	47	50.7
08LE0229	S	1-Methylnaphthalene	90-12-0	0805L087-002	28	43	42.3
08LE0229	S	2,4,5-Trichlorophenol	95-95-4	0805L087-002	30	46	42.1
08LE0229	S	2,4-Dichlorophenol	120-83-2	0805L087-002	29	50	53.2
08LE0229	S	2,4-Dimethylphenol	105-67-9	0805L087-002	26	45	53.5
08LE0229	S	2,4-Dinitrophenol	51-28-5	0805L087-002	2	46	183.3
08LE0229	S	2,4-Dinitrotoluene	121-14-2	0805L087-002	33	60	58.1
08LE0229	S	2,6-Dinitrotoluene	606-20-2	0805L087-002	31	56	57.5
08LE0229	S	2-Chloronaphthalene	91-58-7	0805L087-002	31	49	45
08LE0229	S	2-Chlorophenol	95-57-8	0805L087-002	30	50	50
08LE0229	S	2-Methylphenol	95-48-7	0805L087-002	29	49	51.3
08LE0229	S	2-Nitroaniline	88-74-4	0805L087-002	24	53	75.3

Table 2-37. RPDs Outside QC Criteria. (4 Pages)

Batch ID	Matrix	Analyte	CAS	Original Sample	MS Rec (%)	MSD Rec (%)	RPD
08LE0229	S	2-Nitrophenol	88-75-5	0805L087-002	29	50	53.2
08LE0229	S	3,3-Dichlorobenzidine	91-94-1	0805L087-002	1	51	192.3
08LE0229	S	3-and/or 4-Methylphenol	1319-77-3	0805L087-002	30	49	48.1
08LE0229	S	3-Nitroaniline	99-09-2	0805L087-002	12	52	125
08LE0229	S	4,6-Dinitro-2-methylphenol	534-52-1	0805L087-002	5	51	164.3
08LE0229	S	4-Bromophenyl-phenylether	101-55-3	0805L087-002	27	43	45.7
08LE0229	S	4-Chloro-3-methylphenol	59-50-7	0805L087-002	30	53	55.4
08LE0229	S	4-Chloroaniline	106-47-8	0805L087-002	9	40	126.5
08LE0229	S	4-Chlorophenyl-phenylether	7005-72-3	0805L087-002	32	52	47.6
08LE0229	S	4-Nitroaniline	100-01-6	0805L087-002	10	57	140.3
08LE0229	S	4-Nitrophenol	100-02-7	0805L087-002	28	51	58.2
08LE0229	S	Acenaphthene	83-32-9	0805L087-002	30	48	46.2
08LE0229	S	Acenaphthylene	208-96-8	0805L087-002	28	49	54.5
08LE0229	S	Aniline	62-53-3	0805L087-002	8	34	123.8
08LE0229	S	Anthracene	120-12-7	0805L087-002	32	54	51.2
08LE0229	S	Benzidine	92-87-5	0805L087-002	0	6	200
08LE0229	S	Benzo(a)anthracene	56-55-3	0805L087-002	35	57	47.8
08LE0229	S	Benzo(a)pyrene	50-32-8	0805L087-002	32	60	60.9
08LE0229	S	Benzo(b)fluoranthene	205-99-2	0805L087-002	38	64	51
08LE0229	S	Benzo(k)fluoranthene	207-08-9	0805L087-002	37	61	49
08LE0229	S	BENZOIC ACID	65-85-0	0805L087-002	11	4	93.3
08LE0229	S	Benzyl alcohol	100-51-6	0805L087-002	22	46	70.6
08LE0229	S	bis(2-Ethylhexyl)phthalate	117-81-7	0805L087-002	32	61	62.4
08LE0229	S	Carbazole	86-74-8	0805L087-002	17	57	108.1
08LE0229	S	Chrysene	218-01-9	0805L087-002	36	58	46.8
08LE0229	S	Dibenzo(a,h)anthracene	53-70-3	0805L087-002	38	58	41.7
08LE0229	S	Dibenzofuran	132-64-9	0805L087-002	33	54	48.3
08LE0229	S	Diethylphthalate	84-66-2	0805L087-002	31	54	54.1
08LE0229	S	Dimethylphthalate	131-11-3	0805L087-002	31	54	54.1
08LE0229	S	Di-n-butylphthalate	84-74-2	0805L087-002	34	56	48.9
08LE0229	S	Di-n-octyl phthalate	117-84-0	0805L087-002	29	57	65.1
08LE0229	S	Fluoranthene	206-44-0	0805L087-002	39	59	40.8
08LE0229	S	Fluorene	86-73-7	0805L087-002	32	52	47.6
08LE0229	S	Hexachlorobenzene	118-74-1	0805L087-002	33	53	46.5
08LE0229	S	Hexachlorocyclopentadiene	77-47-4	0805L087-002	11	34	102.2
08LE0229	S	Indeno(1,2,3-cd)pyrene	193-39-5	0805L087-002	38	58	41.7

Table 2-37. RPDs Outside QC Criteria. (4 Pages)

Batch ID	Matrix	Analyte	CAS	Original Sample	MS Rec (%)	MSD Rec (%)	RPD
08LE0229	S	Isophorone	78-59-1	0805L087-002	32	49	42
08LE0229	S	N-Nitrosodiphenylamine (1)	86-30-6	0805L087-002	17	42	84.7
08LE0229	S	Pentachlorophenol	87-86-5	0805L087-002	21	43	68.8
08LE0229	S	Phenanthrene	85-01-8	0805L087-002	33	53	46.5
08LE0229	S	Pyrene	129-00-0	0805L087-002	35	59	51.1
08LE0237	S	3,3-Dichlorobenzidine	91-94-1	0805L111-002	31	60	63.7
08LE0237	S	3-Nitroaniline	99-09-2	0805L111-002	41	67	48.1
08LE0237	S	4-Chloroaniline	106-47-8	0805L111-002	22	42	62.5
08LE0237	S	Aniline	62-53-3	0805L111-002	20	39	64.4
08LE0237	S	Benzidine	92-87-5	0805L111-002	0	1	200
08LE0237	S	BENZOIC ACID	65-85-0	0805L111-002	74	30	84.6
08LE0237	S	Benzyl alcohol	100-51-6	0805L111-002	14	45	105.1

CAS - Chemical Abstracts System
MS - matrix spike
MSD - matrix spike duplicate
QC - quality control
Rec. - recovery (%)
RPD - relative percent difference
S - soil
W - water

Environmental Quality Management, Inc.

EQM-DVAL-USE-004, Rev. 0

Data Verification and Data Validation of US Ecology Site Data, Chains of Custody 64, 65, 66, 67, 68, 69, 70, and 71

Submitted to:

Vista Engineering

Date:
September 17, 2008

VISTA
ENGINEERING TECHNOLOGIES

EXECUTIVE SUMMARY

Samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for volatile organic compounds by method TO-15.

All analyses were conducted by Southwest Research Institute (SwRI), San Antonio, Texas, following the *Specification for Analytical Laboratory Services: Select Soil Gas Volatiles by Method TO-15* (VET-1405-SPEC-01, Rev. 2). In addition to printed data packages for each sample delivery group, the laboratory provided electronic data deliverables (EDDs), consisting of two Microsoft Excel® files containing tables of results and associated quality control (QC).

This data validation report presents the results of validating the analyses reported in the first group of EDDs prepared by the laboratory. This group of EDDs provided the results and QC data for the samples delivered to the laboratory under the chain-of custody documents listed in Table ES-1.

Table ES-1. Chains Of Custody Applicable To The Data Validated In This Report.

VET-1405-COC-064	VET-1405-COC-065	VET-1405-COC-066
VET-1405-COC-067	VET-1405-COC-068	VET-1405-COC-069
VET-1405-COC-070	VET-1405-COC-071	

COC - chain of custody

The data validation was performed using an electronic data checker to evaluate whether batch QC met criteria. The electronic data checker identified any QC results that exceed applicable criteria. The data validation process was completed by the data validation chemist, who evaluated the impacts of the exceedances and added data validation qualifiers.

No data were rejected as a result of this validation process.

Table ES-2 summarizes the validation result.

Table ES-2. Summary Validation Results by Analysis.

Analysis	Number of Results	Number of Qualified Results	Summary
TO-15	4890	0	No data were qualified.

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ACRONYMS

CAS	Chemical Abstracts Service (column heading)
COC	chain of custody
Conc.	concentration (column heading)
DUP	duplicate sample (laboratory duplicate)
EDD	electronic data deliverable
LCL	lower control limit
LCS	laboratory control sample
MB	method blank
MDL	minimum detection limit (column heading)
MS	matrix spike
MSD	matrix spike duplicate
Q	laboratory qualifier (column heading)
QC	quality control
RPD	relative percent difference
SwRI	Southwest Research Institute
UCL	upper control limit
VOA	volatile organic analysis
VOC	volatile organic compound

SwRI Qualifiers

D	This flag indicates the result was from a dilution
E	This flag indicates compounds whose concentrations exceeded the calibration range

1. INTRODUCTION – APPROACH TO VALIDATION

Soil and groundwater samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for volatile organic compounds (VOCs) by method TO-15.

All analyses were conducted by Southwest Research Institute (SwRI), San Antonio, Texas, following the *Specification for Analytical Laboratory Services: Select Soil Gas Volatiles by Method TO-15* (VET-1405-SPEC-01, Rev. 2). The results of these analyses were presented in a printed data package for each sample delivery group. In addition, the laboratory provided an electronic data deliverable (EDD) for each sample delivery group. The EDDs were Microsoft Excel® files containing tables of results and associated quality control (QC).

This data validation report presents the results of validating the analyses reported in the first group of EDDs received from the laboratory. This group of EDDs and the corresponding chain-of-custody documents are identified in Table 1-1 below. The data contained in these EDDs included the analysis of VOCs by TO-15, only.

Table 1-1. Chains of Custody and Electronic Data Deliverables Applicable to the Data Validated.

Chain of Custody	EDD	
	File Name	Date Received
VET-1405-COC-064	330709.xls	7/22/2008
VET-1405-COC-065	330709.xls	7/22/2008
VET-1405-COC-066	330709.xls	7/22/2008
VET-1405-COC-067	331347.xls	7/29/2008
VET-1405-COC-068	331347.xls	7/29/2008
VET-1405-COC-069	331347.xls	7/29/2008
VET-1405-COC-070	331347.xls	7/29/2008
VET-1405-COC-071	331347.xls	7/29/2008

EDD - electronic data deliverable

This validation was performed in a two-tiered approach.

1. Completeness: an assessment of the completeness was made on the pdf file of the "hard copy" data.
2. Electronic holding time and QC evaluation.

The approach is summarized in Table 1-2. The electronic review was performed on all incoming EDDs. The EDDs were evaluated to assure consistency with the hard copy data. By using electronic review of all QC, appropriate qualification of all the data can be made.

Table 1-2. Data Validation and Verification Approach.

Review item	Manually Done	Electronic	All Samples
Verification of deliverables	X		X
Requested vs reported analyses		X	X
Holding times		X	X
Blank contamination		X	X
Detection Limits		X	X
MS/MSD and LCS		X	X
Surrogates		X	X
Laboratory duplicates		X	X

LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate

The remainder of this report consists of the details for data validation of Method TO-15 data. It explains the details of the overall validation process and provides reasons for any data qualifiers that were applied. The automated data validation process determined whether the following facets of laboratory quality control had been achieved.

- Was a method blank (MB) analyzed each day?
- Were surrogates added to each sample and batch QC samples for each method where surrogates are required?
- Was precision checked with a field duplicate (DUP)?
- Were holding time requirements for preparation and analysis satisfied?
- Were the MB results less than the required quantitation limits?
- Did the quantitation limit for nondetect results meet the required detection limit?
- Did the recoveries for the laboratory control sample (LCS) and surrogates, where required, meet the accuracy criteria?
- Did the DUP relative percent differences meet the precision criteria?

After this automated checking, the “no” answers to these questions were investigated manually, the effect on each sample result was determined, and the results were qualified according to the validation rules in *Data Validation Procedure for Chemical Analyses* (HNF-20433). The evaluations of the automated checking results that were determined to have a potential impact on data quality were appropriately qualified and are presented in the remainder of this report.

2. DATA VALIDATION REPORT

2.1. DATA VALIDATION REPORT FOR VOLATILE ORGANIC COMPOUNDS (METHOD TO-15)

Fifty-seven compounds were requested for each of the 43 samples in this group. All 57 compounds were reported in the EDDs for each sample.

The table listing the results is too large to include here; refer to the Microsoft® Excel file on the accompanying CD-ROM.

2.1.1. Batch Size and Completeness of QC Analysis

QC Requirements --

- Was a MB analyzed each day?
- Were surrogates added to each sample and batch QC samples for each method where surrogates are required?
- Was precision checked with a field duplicate?

Analysis was performed in two batches of vapor samples. Batch 330709 contained 40 samples (where a dilution is counted as another sample) and 4 blanks. Batch 331347 contained 44 samples (where a dilution is counted as another sample) and 4 blanks. Because a blank was analyzed on each day that samples were analyzed, QC requirements were met for batches 330709 and 331347.

There were two field duplicates analyzed for the 43 samples that were submitted by Vista. This satisfies method field duplicate requirements.

Though it is not required by the method, a LCS was analyzed on each day. This LCS contained 16 of the analytes of interest.

Surrogates are required for MB and LCS. Though not required by the method, surrogates (1,2-dichloroethane-d4, bromofluorobenzene, and toluene-d8) were added to each sample, as well as the MB and LCS.

2.1.2. Holding Times

QC Requirement --

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for volatile organic analysis by method TO-15 are specified in VET-1405-PLN-03, Rev. 0, as 30 days for summa canisters. All sample analytical results were generated within this limit.

2.1.3. Method Blanks

QC Requirement --

- Were the MB results less than the required quantitation limits?

The required quantitation limits (VET-1405-PLN-03, Rev. 0) for all VOCs by Method TO-15 are 0.5 ppbv. There were no VOCs detected in the method blanks. However, none of the target analyte detection limits met the required quantitation limits. The validation criteria do not require that data be qualified due to laboratory detection limits failing to meet required quantitation limits.

2.1.4. Detection Limits

QC Requirement --

- Did the quantitation limit for nondetect results meet the required detection limit?

All target analyte nondetects exceeded the required detection limit of 0.5 ppbv based on the sampling and analysis plan (VET-1405-PLN-03, Rev. 0). Exeedence of the required detection limit does not require qualification of data.

2.1.5. QC Checks for Accuracy

QC Requirement --

- Did the recoveries for the LCS and surrogates, where required, meet the accuracy criteria?

There is no requirement for the addition of surrogates to VOC samples in Summa canisters. However surrogates are required in the LCS and MB samples. As no limits for surrogate recoveries were listed in project documents for the QC samples, the laboratory derived limits were used to evaluate surrogate recoveries. The statistical QC limits determined by the laboratory for surrogate compounds are listed in Table 2-1. Surrogate recoveries in the required QC samples were within these limits.

Table 2-1. Statistical Limits for VOA Surrogate Compounds

Surrogate	Vapor Samples	
	LCL (%)	UCL (%)
1,2-Dichloroethane-d4	69	137
Toluene-d8	84	117
Bromofluorobenzene	52	139

LCL - lower control limit
UCL - upper control limit
VOA - volatile organic analysis

There is no requirement for the analysis of LCS in method TO-15. However, LCS were analyzed in these batches. As specified in the analytical package narratives, target analyte recoveries in LCS must be within 70% to 130%. LCS recoveries for the sixteen compounds monitored by the laboratory were within this range.

2.1.6. QC Check for Precision

- Did the DUP relative percent differences meet the precision criteria?

The limit for precision is 25% between field replicate samples per Method TO-15, Section 11.3.2. There are two field replicates included in this sample set. The failures are included in Table 2-2. All relative percent differences (RPDs) for detected target analytes in duplicate sample 330830 (Vista ID V017) are above the 25% limit. The RPD for acetone in duplicate sample 331348 is high as well. As there is no field duplicate criteria specified in project documents, the VOC criteria from *Data Validation Procedure for Chemical Analyses* (HNF-20433) are used. HNF-20433 does not require that data be qualified due to poor field replicate RPDs.

Table 2-2. Field Replicate RPDs That Failed to Meet Method Acceptance Criteria.[a,b] (2 Pages)

Analyte	CAS	Batch ID	Original Sample			Duplicate Sample			Units	RPD
			Conc.	Q	MDL	Conc.	Q	MDL		
1,1,1-trichloroethane	71-55-6	330709[c]	150		6.4	370		6.4	ppb (V/V)	84.62%
1,1,1-trichloroethane	71-55-6	330709	140	D	13	290	D	32	ppb (V/V)	69.77%
1,1,2-trichlorotrifluoroethane	76-13-1	330709	1200	E	6.5	3100	E	6.5	ppb (V/V)	88.37%
1,1,2-trichlorotrifluoroethane	76-13-1	330709	1100	D	13	2600	D	32	ppb (V/V)	81.08%
1,1-dichloroethane	75-34-3	330709	63		6.5	120		6.5	ppb (V/V)	62.30%
1,1-dichloroethane	75-34-3	330709	63	D	13	110	D	32	ppb (V/V)	54.34%
1,1-dichloroethene	75-35-4	330709	20		6.5	43		6.5	ppb (V/V)	73.02%
1,1-dichloroethene	75-35-4	330709	20	D	13	40	D	32	ppb (V/V)	66.67%
1,2-dichloropropane	78-87-5	330709	9.7		6.5	16		6.5	ppb (V/V)	49.03%
acetone	67-64-1	330709	15		6.5	21		6.5	ppb (V/V)	33.33%
carbon tetrachloride	56-23-5	330709	8.4		6.4	18		6.4	ppb (V/V)	72.73%
chloroform	67-66-3	330709	480		5.9	970	E	5.9	ppb (V/V)	67.59%
chloroform	67-66-3	330709	440	D	12	750	D	30	ppb (V/V)	52.10%
dichlorodifluoromethane	75-71-8	330709	190		5.9	620	E	5.9	ppb (V/V)	106.17%
dichlorodifluoromethane	75-71-8	330709	170	D	12	520	D	30	ppb (V/V)	101.45%
methylene chloride	75-09-2	330709	22	D	13	34	D	32	ppb (V/V)	42.86%
tetrachloroethene	127-18-4	330709	580		6.4	1300	E	6.4	ppb (V/V)	76.60%
tetrachloroethene	127-18-4	330709	490	D	13	750	D	32	ppb (V/V)	41.94%
trichloroethene	79-01-6	330709	1600	E	6.4	3000	E	6.4	ppb (V/V)	60.87%
trichloroethene	79-01-6	330709	1600	DE	13	3300	DE	32	ppb (V/V)	69.39%
trichlorofluoromethane (R11)	75-69-4	330709	120		6.3	340		6.3	ppb (V/V)	95.65%
trichlorofluoromethane (R11)	75-69-4	330709	110	D	13	340	D	32	ppb (V/V)	102.22%
acetone	67-64-1	331347[d]	4		1.2	5.2		1.2	ppb (V/V)	26.09%

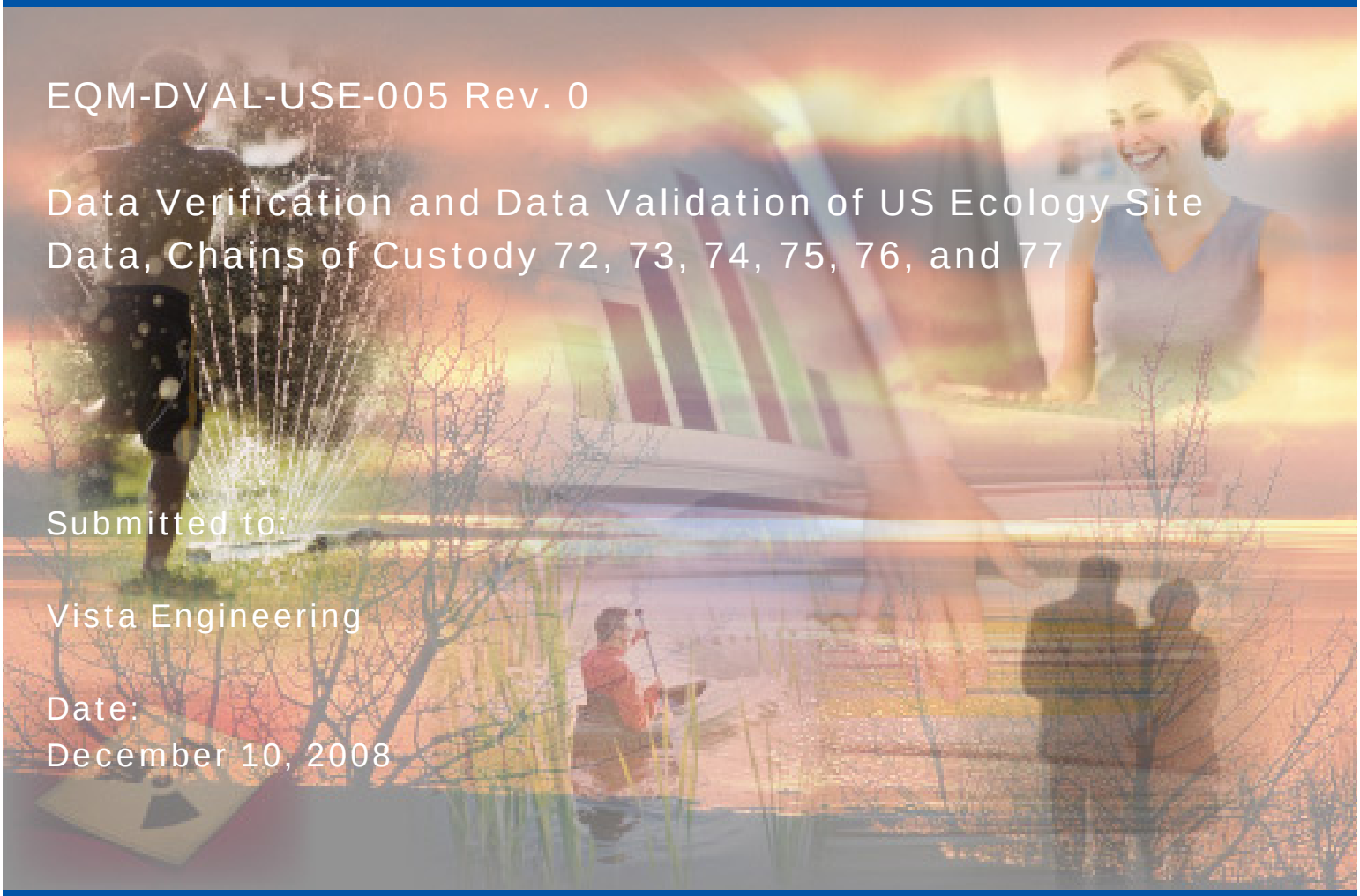
Table 2-2. Field Replicate RPDs That Failed to Meet Method Acceptance Criteria.[a,b] (2 Pages)

Analyte	CAS	Batch ID	Original Sample			Duplicate Sample			Units	RPD
			Conc.	Q	MDL	Conc.	Q	MDL		

a. Results are reported only for compounds that were present above the detection limit in at least one of the replicate samples.
b. Compounds that were not detected in both replicates (U-flagged) are not listed. RPDs for U-flagged compounds are 0% by definition but the value has no significance in data validation activities.
c. The original sample for batch 330709 is 330829 (Vista ID V016) and the duplicate sample is 330830 (Vista ID V017).
d. The original sample for batch 331347 is 331347 (Vista ID V022) and the duplicate sample is 331348 (Vista ID V023).

CAS - Chemical Abstracts Service
Conc. - concentration (column heading)
MDL - minimum detection limit (column heading)
Q - laboratory qualifier (column heading)
RPD - relative percent difference

Environmental Quality Management, Inc.



EQM-DVAL-USE-005 Rev. 0

Data Verification and Data Validation of US Ecology Site Data, Chains of Custody 72, 73, 74, 75, 76, and 77

Submitted to:

Vista Engineering

Date:
December 10, 2008

VISTA
ENGINEERING TECHNOLOGIES

EXECUTIVE SUMMARY

Samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, volatile organic compounds, semi-volatile organic compounds, and polychlorinated biphenyls.

All analyses were conducted by Lionville Laboratory, Inc., Lionville, Pennsylvania, (LVL) following the *Specification for Analytical Laboratory Services: Soil and Water Analysis* (VET-1405-SPEC-03, Rev. 1). In addition to printed data packages for each sample delivery group, the laboratory provided electronic data deliverables (EDDs), consisting of a number of Microsoft® Excel files containing tables of results and associated quality control (QC).

This data validation report presents the results of validating the analyses reported in the EDDs prepared by the laboratory for the third quarter groundwater samples. This group of EDDs provided the results and QC data for the samples delivered to the laboratory under the chain-of custody documents listed in Table ES-1.

Table ES-1. Chains Of Custody Applicable To The Data Validated In This Report.

VET-1405-COC-072	VET-1405-COC-073	VET-1405-COC-074
VET-1405-COC-075	VET-1405-COC-076	VET-1405-COC-077

COC - chain of custody

The data validation was performed using an electronic data checker to evaluate whether batch QC met criteria. The electronic data checker identifies any QC results that exceed applicable criteria. The data validation process is completed by the data validation chemist, who evaluates the impacts of the exceedances and adds data validation qualifiers.

No data were rejected as a result of this validation process.

Table ES-2 summarizes the validation results by analysis.

Table ES-2. Summary Validation Results by Analysis. (2 Pages)

Analysis	Number of Results	Number of Qualified Results	Summary
Metals	232	8	All qualifications applied to silver results were due to a high MS/MSD RPD. No data were rejected.
Mercury	8	0	Mercury was not detected in any samples. No results were qualified.
Chromium (VI)	8	0	No results were qualified.

Table ES-2. Summary Validation Results by Analysis. (2 Pages)

Analysis	Number of Results	Number of Qualified Results	Summary
Cyanide	8	0	Cyanide was not detected in the samples. No data were qualified.
Sulfide	8	0	Sulfide was not detected in any samples. No results were qualified.
Anions	56	1	One nitrate result was qualified as estimated due to a missed hold time. No data were rejected.
Total phenols	8	0	Phenols were not detected in any samples. No data were qualified.
PCBs	56	0	PCBs were not detected in any samples. No data were qualified.
VOCs	859	12	Results were qualified due to low levels of contamination in blanks with common laboratory contaminants. One tentatively identified compound, butylated hydroxytoluene, was present in blanks and one sample. This detection was qualified "UJ". No data were rejected.
SVOCs	562	142	The majority (126 results) of qualification was due to MS and LCS recoveries and RPDs. The rest of qualification was due to blank contamination and surrogate recoveries. Approximately 20 results were qualified for multiple reasons. No data were rejected.

LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
PCB - polychlorinated biphenyl
RPD - relative percent difference
SVOC - semi-volatile organic compound
VOC - volatile organic compound

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ACRONYMS

BLK	Blank (column heading)
CAS	Chemical Abstracts Service (column heading)
COC	chain of custody
DUP	Duplicate sample (laboratory duplicate)
EDD	electronic data deliverable
IC	ion chromatography
ICP	inductively coupled plasma
LCL	lower control limit
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LVL	Lionville Laboratory, Lionville, Pennsylvania
MB	method blank
MS	matrix spike
MSD	matrix spike duplicate
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
Q	Laboratory qualifier (column heading)
QC	quality control
RPD	relative percent difference
RQL	required quantitation limit
Surr	surrogate (column heading)
SVOA	semi-volatile organic analysis
SVOC	semi-volatile organic compound
UCL	upper control limit
V	Validation qualifier (column heading)
VOA	volatile organic analysis
VOC	volatile organic compound
W	water

Lionville Qualifiers

J	Analyte detected below quantitation limit
N	Indicates presumptive evidence of a compound. This flag is only used for tentatively identified compounds (TICs), where the identification is based on a mass spectral library search. It is applied to all TIC results. For generic characterization of a TIC, such as chlorinated hydrocarbon, the N code is not used.
U	Analyte is not detected, the associated quantitation limit is given

Data Validation Applied Qualifiers

UJ	Indicates the compound was analyzed for but not detected in the sample. Due to a QC deficiency identified during data validation, the associated quantitation limit is an estimate
J	Indicates the compound was analyzed for and detected in the sample. The associated concentration is an estimate, but the data are usable for decision making purposes
U	Indicates the compound was analyzed for but not detected in the sample

1. INTRODUCTION – APPROACH TO VALIDATION

Groundwater samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and polychlorinated biphenyls (PCBs).

All analyses were conducted by Lionville Laboratory, Inc., Lionville, Pennsylvania (LVL), following the *Specification for Analytical Laboratory Services: Soil and Water Analysis* (VET-1405-SPEC-03, Rev. 1). The results of these analyses were presented in a printed data package for each sample delivery group. In addition, the laboratory provided an electronic data deliverable (EDD) for each sample delivery group. The EDDs are Microsoft® Excel files containing tables of results and associated quality control (QC).

This data validation report presents the results of validating the analyses reported in the EDDs received from the laboratory that include the third quarter groundwater samples. This group of EDDs and the corresponding chain-of-custody documents are identified in Table 1-1 below. The data contained in these EDDs includes the analysis of metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, VOCs, SVOCs, and PCBs.

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VET-1405-COC-073	L0807484.xls	11/3/2008
VET-1405-COC-074	L0807484.xls	11/3/2008
VET-1405-COC-075	L0807491.xls	10/22/2008
VET-1405-COC-076	L0807491.xls	10/22/2008
VET-1405-COC-077	L0807517.xls	11/10/2008

EDD - electronic data deliverable

This validation was performed in a two-tiered approach.

1. Completeness: an assessment of the completeness is made on the pdf file of the "hard copy" data.
2. Electronic holding time and QC evaluation.

The approach is summarized in Table 1-2. The electronic review is performed on all incoming EDDs. The EDDs are evaluated to assure consistency with the hard copy data. By using electronic review of all QC, appropriate qualification of all the data can be made.

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Detection Limits		X	X
MS/MSD and LCS		X	X
Surrogates		X	X
Laboratory duplicates		X	X

LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate

The remainder of this report consists of several chapters, with each chapter providing the details for data validation of a particular method of analysis. Most chapters begin with a summary table of the analytical results validated and the validation qualifiers that have been applied. These tables are also provided in an accompanying Microsoft Excel file along with any summary tables that were too large to include in this data validation report. After the summary table, if it is included here, each chapter explains the details of the validation process and provides reasons for any data qualifiers that may have been applied. The automated data validation process determines whether the following facets of laboratory quality control have been achieved:

- Were there 20 or fewer samples in each preparation batch?
- Were a method blank (MB), a laboratory control sample (LCS), and a matrix spike sample (MS) prepared with each batch of samples?
- Were surrogates added to each sample and batch QC samples for each method where surrogates are required?
- Was precision checked with a matrix spike duplicate (MSD) or sample duplicate (DUP)?
- Were holding time requirements for preparation and analysis satisfied?
- Were the MB results less than the required quantitation limits?
- Did the quantitation limit for nondetect results meet the required detection limit?
- Did the recoveries for the LCS, MS, MSD, and surrogates, for analyses where they are required, meet the accuracy criteria?
- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

After this automated checking, the “no” answers to these questions were investigated manually, the effect on each sample result was determined, and the results were qualified according to the validation rules in *Data Validation Procedure for Chemical Analyses* (HNF-20433). These evaluations are presented on the following pages.

2. DATA VALIDATION REPORTS

2.1. DATA VALIDATION REPORT FOR ICP METALS (METHOD 6010B)

Results for 29 metals (aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, molybdenum, nickel, potassium, selenium, silicon, silver, sodium, strontium, thallium, tin, titanium, uranium, vanadium and zinc) were requested for each of the 8 samples in this group. The table listing the results is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM for the analytical results for inductively coupled plasma (ICP) metals, as well as the flags applied during validation and the reasons for the flags.

2.1.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-1 shows the number of each type of sample in each preparation batch.

Table 2-1. ICP Metals Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
08L0290	W	Aluminum	7429-90-5	1	1	1	1	1	8
08L0290	W	Antimony	7440-36-0	1	1	1	1	1	8
08L0290	W	Arsenic	7440-38-2	1	1	1	1	1	8
08L0290	W	Barium	7440-39-3	1	1	1	1	1	8
08L0290	W	Beryllium	7440-41-7	1	1	1	1	1	8
08L0290	W	Boron	7440-42-8	1	1	1	1	1	8
08L0290	W	Cadmium	7440-43-9	1	1	1	1	1	8
08L0290	W	Calcium	7440-70-2	1	1	1	1	1	8
08L0290	W	Chromium	7440-47-3	1	1	1	1	1	8
08L0290	W	Cobalt	7440-48-4	1	1	1	1	1	8
08L0290	W	Copper	7440-50-8	1	1	1	1	1	8
08L0290	W	Iron	7439-89-6	1	1	1	1	1	8
08L0290	W	Lead	7439-92-1	1	1	1	1	1	8
08L0290	W	Magnesium	7439-95-4	1	1	1	1	1	8
08L0290	W	Manganese	7439-96-5	1	1	1	1	1	8
08L0290	W	Molybdenum	7439-98-7	1	1	1	1	1	8
08L0290	W	Nickel	7440-02-0	1	1	1	1	1	8
08L0290	W	Potassium	7440-09-7	1	1	1	1	1	8
08L0290	W	Selenium	7782-49-2	1	1	1	1	1	8
08L0290	W	Silicon	7440-21-3	1	1	1	1	1	8
08L0290	W	Silver	7440-22-4	1	1	1	1	1	8
08L0290	W	Sodium	7440-23-5	1	1	1	1	1	8
08L0290	W	Strontium	7440-24-6	1	1	1	1	1	8

Table 2-1. ICP Metals Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
08L0290	W	Thallium	7440-28-0	1	1	1	1	1	8
08L0290	W	Tin	7440-31-5	1	1	1	1	1	8
08L0290	W	Titanium	7440-32-6	1	1	1	1	1	8
08L0290	W	Uranium	7440-61-1	1	1	1	1	1	8
08L0290	W	Vanadium	7440-62-2	1	1	1	1	1	8
08L0290	W	Zinc	7440-66-6	1	1	1	1	1	8

CAS - Chemical Abstracts Service
DUP - duplicate
ICP - inductively coupled plasma
LCS - laboratory control sample
MB - method blank
MS - matrix spike
MSD - matrix spike duplicate
W - water

ICP metals analysis was performed in one batch. The batch had fewer than 20 field samples. All analytes were included in the batch. The batch had one MB, DUP, LCS, MS and MSD. All accuracy and precision frequency requirements were met for the metals batch.

No data were qualified for missing QC samples.

2.1.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for ICP metals analysis by method 6010A are specified in VET-1405-PLN-03, Rev. 0, as 180 days from sampling to analysis. All results were generated within these limits.

2.1.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The required quantitation limits (RQLs) (VET-1405-PLN-03, Rev. 0) are shown in Table 2-2.

Table 2-2. Required Quantitation Limit for ICP Metals. (2 Pages)

Analyte	Water (µg/L)
Aluminum	50
Antimony	40
Arsenic	50
Barium	5
Beryllium	5
Boron	50
Cadmium	5
Calcium	50
Chromium	5

Table 2-2. Required Quantitation Limit for ICP Metals. (2 Pages)

Analyte	Water (µg/L)
Cobalt	5
Copper	5
Iron	50
Lead	50
Magnesium	50
Manganese	10
Molybdenum	5
Nickel	10
Potassium	500
Selenium	50
Silicon	50
Silver	10
Sodium	50
Strontium	5
Thallium	50
Tin	50
Titanium	10
Uranium	5
Vanadium	5
Zinc	10

ICP - inductively coupled plasma

All method blank exceedances are included in Table 2-3.

Table 2-3. ICP Metals Method Blank Exceedances.

Batch ID	Matrix	Analyte	CAS	Result	Q	3 Times the Detection Limit[1]	RQL
08L0290	W	Boron	7440-42-8	1.3		3.6	50
08L0290	W	Calcium	7440-70-2	24		30	50
08L0290	W	Magnesium	7439-95-4	13.9		18.6	50
08L0290	W	Sodium	7440-23-5	41.2		15	50
08L0290	W	Strontium	7440-24-6	0.1		0.24	5

1. Units are µg/L for water.

CAS - Chemical Abstracts Service
ICP - inductively coupled plasma
Q - laboratory qualifier
RQL - required quantitation limit
W - water

Boron, calcium, magnesium, and strontium were detected in the method blank at levels that were less than three times the detection limit. No boron, calcium, magnesium or strontium results were qualified due to blank contamination.

Sodium was detected in the method blank at a level that exceeded three times the detection limit. However, all sample results for sodium were greater than ten times the blank result and no data were qualified.

2.1.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The quantitaion limits for nondetect results always met the required detection limits.

2.1.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, and MSD meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS, MS, and MSD recoveries must be between 75% and 125%.

There were no LCS failures in this batch.

Table 2-4 outlines the analytes that had MS and/or MSD recoveries that were outside of limits. Silicon failed in both the MS and the MSD. However, the original sample result (20100 µg/L) was greater than four times the spike level (250 µg/L), so no results were qualified.

Table 2-4. ICP-Metals MS and MSD Recoveries Outside of Limits.

Batch ID	Matrix	QCCode	Analyte	CAS	Percent Recovery	LCL (%)	UCL (%)
08L0290	W	MS	Silicon	7440-21-3	150.6	75	125
08L0290	W	MSD	Silicon	7440-21-3	12.7	75	125

CAS - Chemical Abstracts Service
ICP - inductively coupled plasma
LCL - lower control limit
MS - matrix spike
MSD - matrix spike duplicate
UCL - upper control limit
W - water

2.1.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the relative percent difference (RPD) between MS and MSD, as well as sample and duplicate, must be less than 20% for all samples. Table 2-5 shows the MS and MSD exceedances for RPD.

Silicon did not require qualification because the original sample result was greater than four times the spike level.

The MS/MSD RPD for silver was high at 20.9%. All silver results for this batch were qualified as estimated and flagged with “UJ”.

Table 2-5. ICP-Metals MS/MSD RPD Exceedances.

Batch ID	Matrix	Analyte	CAS	RPD	RPD Limit
08L0290	W	Silicon	7440-21-3	168.9	20
08L0290	W	Silver	7440-22-4	20.9	20

CAS - Chemical Abstracts Service
ICP - inductively coupled plasma
MS - matrix spike
MSD - matrix spike duplicate
RPD - relative percent difference
W - water

There were no sample duplicate exceedances for RPD.

2.2. DATA VALIDATION REPORT FOR MERCURY (METHOD 7470A)

Table 2-6 is a summary of the validated results for mercury.

Table 2-6. Summary of Mercury Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	RQL	Q	V	Reason
0807L484-001	G017	W	08C0136	0.06	µg/L	0.06	U		
0807L484-002	G018	W	08C0136	0.06	µg/L	0.06	U		
0807L484-003	G019	W	08C0136	0.06	µg/L	0.06	U		
0807L484-004	G020	W	08C0136	0.06	µg/L	0.06	U		
0807L491-001	G021	W	08C0136	0.06	µg/L	0.06	U		
0807L491-002	G022	W	08C0136	0.06	µg/L	0.06	U		
0807L491-003	G023	W	08C0136	0.06	µg/L	0.06	U		
0807L517-001	G024	W	08C0137	0.06	µg/L	0.06	U		

Conc. - concentration
RQL - required quantitation limit
Q - laboratory qualifier
V - validation flag
W - water

2.2.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-7 shows the number of each type of sample in each preparation batch.

Table 2-7. Mercury Preparation Batch Summary.

Batch ID	Matrix	BLK	DUP	LCS	MS	MSD	Sample
08C0136	W	1	1	1	1		7
08C0137	W	1		1			1

BLK - blank
DUP - duplicate
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
W - water

Mercury analysis was performed in two batches. Each batch contained fewer than 20 field samples. Each batch included a method blank and a LCS.

Batch 08C0136 included a DUP, MS and MSD. Batch 08C0137 did not include a duplicate, MS, or MSD. The sampling plan calls for a MS and a MSD or DUP for every 20 field samples. There was a DUP, MS and MSD for the eight water samples included in these two batches. Therefore, the intent of the sampling plan was met and precision and accuracy frequency requirements were met for these batches.

2.2.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for mercury analysis by method 7470A is specified in VET-1405-PLN-03, Rev. 0, as 28 days. All results were generated within this limit.

2.2.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The RQL (VET-1405-PLN-03, Rev. 0) is shown in Table 2-8.

Table 2-8. Required Quantitation Limit for Mercury.

Analyte	Water (µg/L)
Mercury	0.05

All method blank results were below the instrument detection limits. However, the reporting limit of 0.06 µg/L exceeded the required quantitation limit of 0.05 µg/L. The data validation rules do not require that data be qualified for nondetect results that exceed the required quantitation limit.

2.2.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

None of the quantitation limits for the nondetect results met the required detection limit. Per *Data Validation Procedure for Chemical Analyses* (HNF-20433, Rev.0), no data were qualified.

2.2.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, and MSD meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS, MS, and MSD recoveries must be between 75% and 125%. All LCS and MS/MSD recoveries were within the accuracy limits.

2.2.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the RPD between MS and MSD, as well as sample and duplicate, must be less than 20% for all samples. All RPDs met this criterion.

2.3. DATA VALIDATION REPORT FOR HEXAVALENT CHROMIUM (METHOD 7196A)

Table 2-9 is a summary of the validated results for hexavalent chromium.

Table 2-9. Summary of Hexavalent Chromium Validation.

Client ID	Sample ID	Matrix	Batch ID	Conc.	Units	RQL	Q	V	Reason
0807L484-001	G017	W	08LVI054	0.056	mg/L	0.02			
0807L484-002	G018	W	08LVI054	0.054	mg/L	0.02			
0807L484-003	G019	W	08LVI054	0.056	mg/L	0.02			
0807L484-004	G020	W	08LVI054	0.07	mg/L	0.02			
0807L491-001	G021	W	08LVI055	0.065	mg/L	0.02			
0807L491-002	G022	W	08LVI055	0.043	mg/L	0.02			
0807L491-003	G023	W	08LVI055	0.034	mg/L	0.02			
0807L517-001	G024	W	08LVI056	0.10	mg/L	0.02			

RQL - required quantitation limit
MS - matrix spike
Q - laboratory qualifier
V - validator flag
W - water

2.3.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, and a MS sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-10 shows the number of each type of sample in each preparation batch.

Table 2-10. Hexavalent Chromium Preparation Batch Summary.

Batch ID	Matrix	BLK	LCS	DUP	MS	MSD	Sample
08LVI054	W	1	1	1	1		4
08LVI055	W	1	2	1	1		3
08LVI056	W	1	2	1	1		1

BLK - blank
DUP - duplicate
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
W - water

Hexavalent chromium analysis was performed in 3 batches. Each batch contained fewer than 20 field samples. At least one LCS and MB were analyzed in each sample batch.

A MS/MSD or a MS and a DUP are to be analyzed for every 20 sample results of each matrix type, averaged over the project. A MS and a DUP result were obtained for each batch.

2.3.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for chromium (VI) analysis by method 7196A is specified in VET-1405-PLN-03, Rev. 0, as one day for water samples. Samples 0807L491-001 (G21), 0807L491-002 (G22), 0807L491-003 (G23) and 0807L517-001 (G24) were analyzed two days after sampling.

All other results were generated within these limits.

2.3.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Project documentation does not specify a required quantitation limit for chromium (VI). Chromium (VI) was not detected in the method blanks. Detection limits in the blanks were 0.02 mg/L for water samples.

2.3.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for chromium (VI). Chromium (VI) was detected in all samples.

2.3.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, and MSD meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS, MS, and MSD recoveries must be between 75% and 125%. All LCS, MS and MSD recoveries were within these limits.

2.3.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the MS/MSD and DUP RPDs must be less than 20%. The RPD, as defined in the validation instructions, cannot be evaluated if the RQL is not specified. Therefore, no results were qualified for precision.

However, the LCS/laboratory control sample duplicate (LCSD) RPD was evaluated and for the two batches that had both an LCS and an LCSD, the RPD was <20%.

2.4. DATA VALIDATION REPORT FOR CYANIDE (METHOD 9014)

Table 2-11 is a summary of the validated results for cyanide.

Table 2-11. Summary of Cyanide Validation.

Client ID	Sample ID	Matrix	Batch ID	Conc.	Units	RQL	Q	V	Reason
0807L484-001	G017	W	08LC042	5.00	µg /L	5	U		
0807L484-002	G018	W	08LC042	5.00	µg /L	5	U		
0807L484-003	G019	W	08LC042	5.00	µg /L	5	U		
0807L484-004	G020	W	08LC042	5.00	µg /L	5	U		
0807L491-001	G021	W	08LC042	5.00	µg /L	5	U		
0807L491-002	G022	W	08LC042	5.00	µg /L	5	U		
0807L491-003	G023	W	08LC042	5.00	µg /L	5	U		
0807L517-001	G024	W	08LC044	5.00	µg /L	5	U		

Conc. - concentration
RQL - required quantitation limit
Q - laboratory qualifier
V - validation qualifier
W - water

2.4.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-12 shows the number of each type of sample in each preparation batch.

Table 2-12. Cyanide Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	DUP	MS	Sample
08LC042	W	2	2	1	1	7
08LC044	W	1	2	1		1

DUP - duplicate
LCS - laboratory control sample
MB - method blank
MS - matrix spike
W - water

Cyanide analysis was performed in two batches of samples. Each batch contained fewer than 20 field samples. At least one MB, LCS, and DUP were analyzed in each sample batch. One batch had an MS included. The sampling plan requires that there be one MS per every 20 field samples, so accuracy frequency requirements were met. All other QC requirements were met.

2.4.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for cyanide analysis by method 9014 is specified in VET-1405-PLN-03, Rev. 0, as 14 days. All results were generated within these limits.

2.4.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Project documentation does not specify a required quantitation limit for cyanide. Cyanide was not detected in the method blanks. Detection limits in the blanks were 5 µg/L.

2.4.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for cyanide. Cyanide was not detected in any of the samples. Detection limits were 5 µg/L for water samples.

2.4.5. QC Checks for Accuracy

- Did the LCS and MS recoveries meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS recoveries must be between 75% and 125%. All LCS and MS recoveries were within these limits.

2.4.6. QC Check for Precision

- Did the DUP relative percent differences meet the precision criteria?

As specified in VET-1332-PRO-004, Rev. 0, the MS/MSD and DUP RPDs must be less than 20%. The RPD, as defined in the validation instructions, cannot be evaluated if the RQL is not specified. Therefore, no results were qualified for precision.

2.5. DATA VALIDATION REPORT FOR SULFIDE (METHOD 9034)

Table 2-13 is a summary of the validated results for sulfide.

Table 2-13. Summary of Sulfide Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	RQL	Q	V	Reason
0807L484-001	G017	W	08LSD049	1.0	mg/L	1	U		
0807L484-002	G018	W	08LSD049	1.0	mg/L	1	U		
0807L484-003	G019	W	08LSD049	1.0	mg/L	1	U		
0807L484-004	G020	W	08LSD049	1.0	mg/L	1	U		
0807L491-001	G021	W	08LSD049	1.0	mg/L	1	U		
0807L491-002	G022	W	08LSD049	1.0	mg/L	1	U		
0807L491-003	G023	W	08LSD049	1.0	mg/L	1	U		
0807L517-001	G024	W	08LSD050	1.0	mg/L	1	U		

Conc. - concentration
RQL - required quantitation limit
Q - laboratory qualifier
V - validation qualifier
W - water

2.5.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-14 shows the number of each type of sample in each preparation batch.

Table 2-14. Sulfide Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	DUP	MS	Sample
08LSD049	W	1	2	1	1	7
08LSD050	W	1	2			1

DUP - duplicate
LCS - laboratory control sample
MB - method blank
MS - matrix spike
W - water

Sulfide analysis was performed in two batches. Each batch contained fewer than 20 field samples. At least one MB and LCS were analyzed in each sample batch. A MS, and a DUP were analyzed in one sample batch. The sampling plan requires one MS and one DUP for every 20 field samples. These numbers satisfy all requirements for frequency of QC sample analysis.

2.5.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for sulfide analysis by method 9034 are specified in VET-1405-PLN-03, Rev. 0, as 7 days. All results were generated within these limits.

2.5.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Project documentation does not specify a required quantitation limit for sulfide. Sulfide was not detected in the method blanks. The detection limit in the blanks was 1 mg/L for water.

2.5.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for sulfide. The detection limit was 1 mg/L for water.

2.5.5. QC Checks for Accuracy

- Did the recoveries for the LCS and MS results meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS recoveries must be between 75% and 125%. All LCS and MS recoveries were within these limits.

2.5.6. QC Check for Precision

- Did the DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, sample duplicate RPDs must be less than 20%. All RPDs satisfied this criterion. The LCS/LCSD RPDs were also less than 20%.

2.6. DATA VALIDATION REPORT FOR ANIONS (METHOD 9056)

Results for six anions (chloride, fluoride, nitrate, nitrite, phosphate, and sulfate) were requested for each of the 8 samples in this group. The table listing the results is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM for the analytical results for anions, as well as the flags applied during validation and the reasons for the flags. Note that results for bromide were reported by the laboratory, but were not required by the sampling and analysis plan. Bromide results are listed in the Microsoft® Excel file, but were not validated.

2.6.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-15 shows the number of each type of sample in each preparation batch.

Table 2-15. Anion Preparation Batch Summary.

Batch ID	Matrix	Analyte	CAS	MB	LCS	DUP	MS	Sample
08LICB51	W	Bromide by IC	24959-67-9	1	1	1	1	7
08LICA51	W	Chloride by IC	16887-00-6	1	1	1	1	7
08LIC051	W	Fluoride by IC	16984-48-8	1	1	1	1	7
08LICB51	W	Nitrate by IC	14797-55-8	1	1	1	1	7
08LICB51	W	Nitrite by IC	14797-65-0	1	1	1	1	7
08LICB51	W	Phosphate by IC	14265-44-2	1	1	1	1	7
08LICA51	W	Sulfate by IC	14808-79-8	1	1	1	1	7
08LICC52	W	Bromide by IC	24959-67-9	1	1			1
08LICA52	W	Chloride by IC	16887-00-6	1	1			1
08LIC052	W	Fluoride by IC	16984-48-8	1	1			1
08LICA57	W	Nitrate by IC	14797-55-8	1	1			1
08LICB52	W	Nitrite by IC	14797-65-0	1	1			1
08LICE52	W	Phosphate by IC	14265-44-2	1	1			1
08LICA57	W	Sulfate by IC	14808-79-8	1	1			1

CAS - Chemical Abstracts System
DUP - duplicate
IC - ion chromatography
LCS - laboratory control sample
MB - method blank
MS - matrix spike
W - water

From the information in Table 2-15, it may be shown that anion analysis was performed on 8 samples in two batches for each anion. (Note each anion batch does not include all anions requested.) Each batch contained fewer than 20 field samples. At least one MB and one LCS were analyzed in each sample batch.

The sampling plan requires one MS and one DUP be analyzed for every 20 field samples. There were eight samples between the two anion batches and one MS and one DUP for those eight samples. Thus the intent of the sampling plan was met and accuracy and precision frequency requirements were met for these batches.

2.6.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for analysis by method 9056 is specified in VET-1405-PLN-03, Rev. 0, as 48 hours. The nitrate result for sample 0807L517-001 (G024) was obtained 16 days after collection. This result was a detect and, per the validation criteria, was qualified as estimated and flagged with “J”.

All other sample results met hold times.

2.6.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Required quantitation limits for water sample method blanks were achieved except for fluoride, chloride, and nitrite, for which the detection limit was 0.25 mg/L vs. the RQL of 0.1 mg/L. Analytes were not detected in any of the method blanks. No qualification of sample results was required.

2.6.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The required quantitation limit was exceeded for nitrite in all water samples. The validation criteria do not require that these results be qualified. Other nondetect anion results met the required quantitation limit.

2.6.5. QC Checks for Accuracy

- Did the recoveries for the LCS and MS meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS recoveries must be between 75% and 125%. All LCS and MS recoveries were within the required limits.

2.6.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PRO-03, Rev. 0, the DUP RPDs must be less than 20%. This limit was met for all RPDs for water samples.

2.7. DATA VALIDATION REPORT FOR TOTAL PHENOLS (METHOD 9066)

Table 2-16 is a summary of the validated results for analysis of total phenols.

Table 2-16. Summary of Total Phenols Validation.

Client ID	Sample ID	Matrix	Batch ID	Conc.	Units	RQL	Q	V	Reason
0807L484-001	G017	W	08LPL016	5.0	µg /L	5	U		
0807L484-002	G018	W	08LPL016	5.0	µg /L	5	U		
0807L484-003	G019	W	08LPL016	5.0	µg /L	5	U		
0807L484-004	G020	W	08LPL016	5.0	µg /L	5	U		
0807L491-001	G021	W	08LPL016	5.0	µg /L	5	U		
0807L491-002	G022	W	08LPL016	5.0	µg /L	5	U		
0807L491-003	G023	W	08LPL016	5.0	µg /L	5	U		
0807L517-001	G024	W	08LPL016	5.0	µg /L	5	U		

Conc. - concentration
RQL - required quantitation limit
Q - laboratory qualifier
V - validation qualifier
W - water

2.7.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-17 shows the number of each type of sample in each preparation batch.

Table 2-17. Total Phenols Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	DUP	MS	Sample
08LPL016	W	2	2	1	1	8

DUP - duplicate
LCS - laboratory control sample
MB - method blank
MS - matrix spike
W - water

Total phenol analysis was performed in one batch. The batch contained fewer than 20 field samples. At least one MB, LCS, MS, and DUP were analyzed in the batch. All requirements for frequency of QC sample analysis were achieved.

2.7.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for total phenol analysis is specified in VET-1405-PLN-03, Rev. 0, as 28 days. All results were generated within these limits.

2.7.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Project documentation does not specify a required quantitation limit for total phenol. Phenols were not detected in the method blanks. The detection limit in the blanks was 5 µg/L for water.

2.7.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for total phenol. Detection limits for phenols were 5 µg/L for water samples.

2.7.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, and MSD, meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LC and, MS recoveries must be between 75% and 125%. All LCS and MS recoveries were within these limits.

2.7.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the RPD must be less than 20%. All LCS/LCS duplicate RPDs met this criterion.

2.8. DATA VALIDATION REPORT FOR POLYCHLORINATED BIPHENYL COMPOUNDS (METHOD 8082)

Results for seven Aroclors (Aroclor-1016, Aroclor-1221, Aroclor-1232, Aroclor-1242, Aroclor-1248, Aroclor-1254, Aroclor-1260) were requested for each of the 8 samples in this group. The table listing the results is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM for the analytical results for anions, as well as the flags applied during validation and the reasons for the flags.

2.8.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each field sample and each QC sample?
- Was precision checked with an MSD?

Table 2-18 shows the number of each type of sample in each preparation batch.

Table 2-18. PCB Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	Analyte	CAS	MB	LCS	MS	MSD	Surr	Sample
08LE0352	W	Aroclor-1016	12674-11-2	1	1	1	1		7
08LE0352	W	Aroclor-1221	11104-28-2	1					7
08LE0352	W	Aroclor-1232	11141-16-5	1					7
08LE0352	W	Aroclor-1242	53469-21-9	1					7
08LE0352	W	Aroclor-1248	12672-29-6	1					7
08LE0352	W	Aroclor-1254	11097-69-1	1					7
08LE0352	W	Aroclor-1260	11096-82-5	1	1	1	1		7
08LE0352	W	Decachlorobiphenyl	2051-24-3					11	
08LE0352	W	Tetrachloro-m-xylene	877-09-8					11	
08LE0359	W	Arochlor-1016	12674-11-2	1	2				1

Table 2-18. PCB Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	Analyte	CAS	MB	LCS	MS	MSD	Surr	Sample
08LE0359	W	Arochlor-1221	11104-28-2	1					1
08LE0359	W	Arochlor-1232	11141-16-5	1					1
08LE0359	W	Arochlor-1242	53469-21-9	1					1
08LE0359	W	Arochlor-1248	12672-29-6	1					1
08LE0359	W	Arochlor-1254	11097-69-1	1					1
08LE0359	W	Arochlor-1260	11096-82-5	1	2				1
08LE0359	W	Arochlor-1262	37324-23-5	1					
08LE0359	W	Arochlor-1268	11100-14-4	1					
08LE0359	W	Decachlorobiphenyl	2051-24-3					4	
08LE0359	W	Tetrachloro-m-xylene	877-09-8					4	

CAS - Chemical Abstracts System
LCS - laboratory control sample
MB - method blank
MS - matrix spike
MSD - matrix spike duplicate
PCB - polycholorinated biphenyl
Surr - Surrogate
W - water

PCB analysis was performed on 2 batches of water samples. Each batch contained fewer than 20 field samples. An MB was analyzed in each sample batch, and at least one LCS containing at least Aroclor-1016 and Aroclor-1260 was analyzed in each sample batch.

The project goal for MS and MSD analysis is to analyze one of each for every 20 field samples of each matrix type, averaged over the project. Aroclor-1016 and Aroclor-1260 are to be spiked into each MS and MSD. For this group of samples, MS and MSD results were reported for one of the two batches. There were 8 samples, so the frequency of MS/MSD analyses exceeds the one-in-twenty average required for the project goal.

Surrogates were added to and analyzed in every sample, LCS, MB, MS, and MSD.

2.8.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for PCB analysis by method 8082 are specified in VET-1405-PLN-03, Rev. 0, as 14 days for water samples. U.S. Environmental Protection Agency (SW-846, Chapter 2) lists the holding time limit to extraction of PCBs as 7 days for water samples. Method 8082 indicates that samples should be analyzed within 40 days after extraction. The SW-846 limits of 7 days to extraction and 40 days after extraction to analysis were used.

All sample results met the holding time limits.

2.8.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The required quantitation limits (VET-1405-PLN-03, Rev. 0) are 1 µg/L in groundwater samples.

PCBs were not detected in the MBs. Detection limits were below the required quantitation limits.

2.8.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

All results were nondetects. Detection limits met the requirements.

2.8.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, MSD, and surrogates meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS/MSD recoveries must be within the statistical limits set by the lab. These limits are shown in Table 2-19.

Table 2-19. LCS, MS/MSD, and Surrogate Limits for PCBs.

Matrix	Analyte	CAS	LCL (%)	UCL (%)
Water	Aroclor-1016	12674-11-2	49	119
Water	Aroclor-1260	11096-82-5	53	128
Water	Decachlorobiphenyl	2051-24-3	22	131
Water	Tetrachloro-m-xylene	877-09-8	45	117

CAS - Chemical Abstracts System
LCL - lower control limit
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
PCB - polychlorinated biphenyl
UCL - upper control limit

All LCS, MS, MSD, and surrogate recoveries were within the limits given in Table 2-19.

2.8.6. QC Check for Precision

- Did the MS/MSD relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the RPD between MS and MSD must be less than 20%. All MS/MSD RPDs met the 20% criterion.

2.9. DATA VALIDATION REPORT FOR VOLATILE ORGANIC COMPOUNDS (METHOD 8260)

Eighty compounds were requested for each of the 8 samples in this group. Results were reported in the EDDs for the 78 compounds that the laboratory commonly reports. The

remaining two, 1,4-difluorobenzene and tetrahydrofuran, are not expected to be detected regularly. The laboratory is performing a spectral search for those, and is reporting the results in the data package narrative.

The table listing the results is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM.

2.9.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each sample and each batch QC sample?
- Was precision checked with a MSD or DUP?

The sample batches for volatile organic analysis are outlined in Table 2-20.

Table 2-20. VOA Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	MS	MSD	Surr	Sample
08LVG126	W	1	1	1	1	12	8
08LVG127	W	1	1			3	1
08LVG128	W	1	1			4	2

LCS - laboratory control sample
MB - method blank
MS - matrix spike
MSD - matrix spike duplicate
Surr - Surrogate
VOA - volatile organic analysis
W - water

Volatile organic analysis was performed in 3 batches of water samples. Each batch contained fewer than 20 field samples. Results for 78 compounds were reported for each of the 11 samples (including trip blanks). An MB result was reported for each of the 78 compounds in each of the 3 batches. An LCS containing 48 of the compounds of interest was prepared and analyzed with all batches.

MS and MSD results were obtained for batch 08LVG126. Neither of the other batches contained an MS or MSD. However, the project goal is to average one MS/MSD pair for every groundwater sample quarter. As there were seven field samples in this group (quarter), the project goal was met for MS/MSD frequency.

Surrogates (1,2-dichloroethane-d4, bromofluorobenzene, and toluene-d8) were added to each sample, MB, LCS, MS, and MSD.

2.9.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for volatile organic analysis by method 8260B are specified in VET-1405-PLN-03, Rev. 0, as 14 days for water samples. All results were generated within this limit.

2.9.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The RQLs (VET-1405-PLN-03, Rev. 0) for all VOCs are 5 µg/L for water samples. The compounds detected in the MBs are shown in Table 2-21.

Table 2-21. VOCs Found in Method Blanks.

Batch ID	Matrix	Sample ID	Analyte	CAS	Result	Units	Q
08LVG126	W	08LVG126-MB1MB	Butylated Hydroxytoluene		20	µg/L	NJ
08LVG126	W	08LVG126-MB1MB	Methylene Chloride	75-09-2	4	µg/L	J
08LVG127	W	08LVG127-MB1MB	Butylated Hydroxytoluene		10	µg/L	NJ
08LVG127	W	08LVG127-MB1MB	Methylene Chloride	75-09-2	3	µg/L	J
08LVG128	W	08LVG128-MB1MB	Butylated Hydroxytoluene		30	µg/L	NJ
08LVG128	W	08LVG128-MB1MB	Methylene Chloride	75-09-2	3	µg/L	J

CAS - Chemical Abstracts System
Q - laboratory qualifier
VOC - volatile organic compound
W - water

Methylene chloride was detected in the MBs for all batches. Methylene chloride is a common laboratory contaminant, so any detections in the affected batches less than ten times the blank concentration were qualified as undetected and were flagged "U." All methylene chloride detections below the RQL were raised to the RQL. Nondetect results for methylene chloride were not qualified.

Butylated hydroxytoluene was reported as a tentatively identified compound in the MBs for all batches. One sample in batch 08LVG127 had butylated hydroxytoluene detected. This sample results was less than five times the blank result, so the sample result was qualified as undetected and flagged "U".

2.9.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Of 859 results reported, 194 were nondetects exceeding the required detection limit of 5 µg/L. Detection limit exceedances are not required to be qualified. Most of the exceedances were reported at 10 µg/L which is an industry norm for water volatile organic analyses (VOAs).

2.9.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, MSD, and surrogates meet the accuracy criteria?

The statistical QC limits determined by the laboratory for surrogate compounds are listed in Table 2-22. The surrogate recoveries were reviewed, and none were found to lie outside the acceptable range.

Table 2-22. Statistical Limits for VOA Surrogate Compounds

Surrogate	Water Samples	
	LCL (%)	UCL (%)
1,2-Dichloroethane-d4	74	125
Toluene-d8	85	114
4-Bromofluorobenzene	81	115

LCL - lower control limit
UCL - upper control limit
VOA - volatile organic analysis

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS/MSD recoveries must be within the statistical limits set by the lab. These limits are shown in Table 2-23.

Table 2-23. Lionville Laboratory Limits for VOA LCS, MS, and MSD Recovery (Water Samples). (2 Pages)

Analyte	CAS	LCL (%)	UCL (%)
1,1,1-Trichloroethane	71-55-6	65	130
1,1,2,2-Tetrachloroethane	79-34-5	65	130
1,1,2-Trichloroethane	79-00-5	75	125
1,1-Dichloroethane	75-34-3	70	135
1,1-Dichloroethene	75-35-4	70	130
1,2,4-Trichlorobenzene	120-82-1	65	135
1,2-Dibromo-3-chloropropane	96-12-8	50	130
1,2-Dibromoethane	106-93-4	80	120
1,2-Dichlorobenzene	95-50-1	70	120
1,2-Dichloroethane	107-06-2	70	130
1,2-Dichloroethene (total)	540-59-0	60	140
1,2-Dichloropropane	78-87-5	75	150
1,3-Dichlorobenzene	541-73-1	75	125
1,4-Dichlorobenzene	106-46-7	75	125
2-Butanone	78-93-3	30	150
2-hexanone	591-78-6	55	130
4-Methyl-2-pentanone	108-10-1	60	135
Acetone	67-64-1	40	140

Table 2-23. Lionville Laboratory Limits for VOA LCS, MS, and MSD Recovery (Water Samples). (2 Pages)

Analyte	CAS	LCL (%)	UCL (%)
Benzene	71-43-2	80	120
Bromodichloromethane	75-27-4	75	120
Bromoform	75-25-2	70	130
Bromomethane	74-83-9	30	145
Carbon Disulfide	75-15-0	35	160
Carbon Tetrachloride	56-23-5	65	140
Chlorobenzene	108-90-7	80	120
Chloroethane	75-00-3	60	135
Chloroform	67-66-3	65	135
Chloromethane	74-87-3	40	125
Cis-1,2-dichloroethene	156-59-2	70	125
cis-1,3-Dichloropropene	10061-01-5	70	130
Dibromochloromethane	124-48-1	75	120
Dichlorodifluoromethane	75-71-8	30	155
Ethylbenzene	100-41-4	75	125
Freon 113	76-13-1	60	140
Isopropylbenzene	98-82-8	75	125
m- and p-Xylene	M+P_XYLENE	75	130
Methylene Chloride	75-09-2	55	140
Methyl-T-Butylether	1634-04-4	65	125
O-Xylene	95-47-6	80	120
Styrene	100-42-5	65	135
Tetrachloroethene	127-18-4	45	150
Toluene	108-88-3	75	120
Trans-1,2-dichloroethene	156-60-5	60	140
Trans-1,3-Dichloropropene	10061-02-6	55	140
Trichloroethene	79-01-6	70	125
Trichlorofluoromethane	75-69-4	60	145
Vinyl Chloride	75-01-4	50	145
Xylene (total)	1330-20-7	75	130

CAS - Chemical Abstracts System
LCL - lower control limit
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
UCL - upper control limit
VOA - volatile organic analysis

All LCS, MS and MSD recoveries were within these control limits.

2.9.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

The limit for MS/MSD RPDs is 20%. All MS/MSD RPDs were less than this limit.

2.10. DATA VALIDATION REPORT FOR SEMIVOLATILE ORGANIC COMPOUNDS (METHOD 8270)

Eighty-five SVOCs were requested for the 8 samples in this group. Semi-volatile organic analysis (SVOA) results were reported in the EDDs for the 69 of these compounds that the laboratory commonly reports. Of the 16 SVOCs requested, but not reported by method 8270C, 1,2-dichlorobenzene, 1,3-dichlorobenzene and 1,4-dichlorobenzene, are reported as VOCs (method 8260B). For the remaining 13 (2,6-dimethylnaphthalene, 1,6,7-trimethylnaphthalene, 1-methyl-9H-fluorene, dibenzothiophene, 2-methylphenanthrene, 1-methylphenanthrene, 4,6-dimethyldibenzothiophene, 3,6-dimethylphenanthrene, 2-methylfluoranthene, retene, 5-methylchrysene, benzo(e)pyrene, and perylene) the laboratory is performing a spectral search, and is reporting the results for them in the data package narrative.

Asterisks (*) used as qualifiers in the semi-volatile organic compounds section were removed by Environmental Quality Management, Inc. (EQM). As already discussed in a previous data validation report for this project, Orlette Johnson of LVL stated in an email (7/30/2008) that these qualifiers were hold-overs from other LVL projects that request a flag for each time a spike sample recovery is outside limits.

The table listing the analytical results and the results of the validation for SVOCs is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM.

2.10.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each sample and each batch QC sample?
- Was precision checked with a MSD or DUP?

Table 2-24 the numbers of QC and field samples analyzed in each batch.

Table 2-24. SVOA Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	MS	MSD	Surr	Sample
08LE0348	W	1	1	1	1	11	7
08LE0358	W	1	2			4	1

LCS - laboratory control sample
MB - method blank
MS - matrix spike
MSD - matrix spike duplicate
Surr - Surrogate
SVOA - semi-volatile organic analysis
W - water

Semivolatile organic analysis was performed in two batches. Each batch contained fewer than 20 field samples. A MB result was reported for each of the reported compounds in every batch.

A LCS was reported in every batch for every requested analyte except 1,1-biphenyl. The LCS is not required to contain all compounds of interest. Therefore, no results were qualified for missing LCS.

MS and MSD results were obtained for the first batch of water samples. The spikes contained all compounds of interest except 1,1-biphenyl. The project goal is to obtain one MS and MSD analysis for each quarter of ground water samples. Since there were seven water samples, the number of MS and MSD results supports this goal.

Surrogates (2,4,6-tribromophenol, 2-fluorobiphenyl, 2-fluorophenol, nitrobenzene-d5, phenol-d5, p-terphenyl-d14) were added to each sample, MB, LCS, MS, and MSD.

2.10.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for SVOA by method 8260B are specified in VET-1405-PLN-03, Rev. 0. The holding time to extraction is 7 days for water samples. Forty additional days after extraction are allowed to complete the analysis. All results were generated within the holding time limits.

2.10.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The required detection limits in water samples are 0.2 µg/L for polycyclic aromatice hydrocarbons (PAHs) and 5 µg/L for other analytes. Most compounds in the MBs were nondetects; the detection limits exceeded the RQL in all cases. However, the validation rules do not require qualification of results for high detection limits.

One or more phthalates (common laboratory contaminants) were found in the MBs for the second batch, as shown in Table 2-25. Detect results associated with the respective analytes and batches that were less than ten times the blank result were qualified as estimated nondetects and

flagged "UJ". Any of these results that were less than the RQL were raised to the level of the RQL. Nondetect results were not qualified.

Table 2-25. SVOCs Found in Method Blanks.

Batch ID	Matrix	Analyte	CAS	Result	Q	RQL	Units
08LE0358	W	Di-n-butylphthalate	84-74-2	3	J	5	µg/L
08LE0358	W	bis (2-Ethylhexyl)phthalate	117-81-7	9	J	5	µg/L

CAS - Chemical Abstracts System
Q - laboratory qualifier
RQL - required quantitation limit
SVOC - semi-volatile organic compound
W - water

2.10.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The required detection limits in water samples are 0.2 µg/L for PAHs and 5 µg/L for other analytes. None of the nondetect results met these requirements. However, the validation rules do not require qualification of the results.

2.10.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, MSD, and surrogates meet the accuracy criteria?

The statistical QC limits determined by the laboratory for surrogate compounds are listed in Table 2-26. Table 2-27 lists the cases where these limits were not achieved. In one case, the surrogate recoveries were below the lower control limit (LCL). Note that recoveries for 2,4,6-tribromophenol in batch 08LE0135 were low both in the sample and the MB.

All sample results associated with these cases were nondetects. They were qualified as estimates and flagged "UJ." Results were not qualified for inadequate surrogate recovery in the MB samples because QC samples are required to be qualified by the validation criteria.

Table 2-26. Semi-Volatile Surrogate Recovery Limits.

Compound	Water (%)
Nitrobenzene-d5	35 to 114
2-fluorobiphenyl	43 to 116
Terphenyl-d14	33 to 141
Phenol-d6	10 to 94
2-fluorophenol	21 to 100
2,4,6-tribromophenol	10 to 123

Table 2-27. Instances in Which the SVOA Surrogate Recovery Was Not in Limits.

Batch ID	Matrix	Client ID	Lab ID	Analyte	CAS	Rec. (%)
08LE0348	W	G023	0807L491-003	Terphenyl-d14	1718-51-0	22

CAS - Chemical Abstracts Service
SVOA- semi-volatile organic analysis
W - water

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS/MSD recoveries must be within the statistical limits set by the lab. These limits are shown in Table 2-28.

Table 2-28. Lionville Laboratory SVOA Limits for LCS, MS, and MSD. (3 Pages)

Analyte	CAS	Water Samples	
		LCL (%)	UCL (%)
1,2,4-Trichlorobenzene	120-82-1	40	100
1,2-Diphenylhydrazine	122-66-7	50	110
1-Methylnaphthalene	90-12-0	40	110
2,2'-oxybis(1-Chloropropane)	108-60-1	40	110
2,4,5-Trichlorophenol	95-95-4	50	110
2,4,6-Trichlorophenol	88-06-2	50	110
2,4-Dichlorophenol	120-83-2	45	110
2,4-Dimethylphenol	105-67-9	30	110
2,4-Dinitrophenol	51-28-5	15	130
2,4-Dinitrotoluene	121-14-2	50	120
2,6-Dinitrotoluene	606-20-2	50	110
2-Chloronaphthalene	91-58-7	50	110
2-Chlorophenol	95-57-8	40	140
2-Methylnaphthalene	91-57-6	40	110
2-Methylphenol	95-48-7	40	110
2-Nitroaniline	88-74-4	50	110
2-Nitrophenol	88-75-5	40	110
3,3'-Dichlorobenzidine	91-94-1	0	120
3-and/or 4-Methylphenol	1319-77-3	40	110
3-Nitroaniline	99-09-2	10	120
4,6-Dinitro-2-Methylphenol	534-52-1	40	130
4-Bromophenyl phenyl ether	101-55-3	50	110
4-Chloro-3-Methylphenol	59-50-7	40	110
4-Chloroaniline	106-47-8	10	100
4-Chlorophenyl phenyl ether	7005-72-3	50	120

Table 2-28. Lionville Laboratory SVOA Limits for LCS, MS, and MSD. (3 Pages)

Analyte	CAS	Water Samples	
		LCL (%)	UCL (%)
4-Nitroaniline	100-01-6	10	100
4-Nitrophenol	100-02-7	10	110
Acenaphthene	83-32-9	50	110
Acenaphthylene	208-96-8	50	110
Aniline	62-53-3	5	120
Anthracene	120-12-7	50	120
Benzidine	92-87-5	0	110
Benzo(a)anthracene	56-55-3	50	120
Benzo(a)pyrene	50-32-8	50	140
Benzo(b)fluoranthene	205-99-2	50	140
Benzo(g,h,i)perylene	191-24-2	50	140
Benzo(k)fluoranthene	207-08-9	50	140
Benzoic Acid	65-85-0	0	112
Benzyl Alcohol	100-51-6	40	110
Bis(2-Chloroethoxy)methane	111-91-1	45	105
Bis(2-Chloroethyl) ether	111-44-4	40	120
Bis(2-Ethylhexyl) phthalate	117-81-7	50	140
Butylbenzylphthalate	85-68-7	40	140
Carbazole	86-74-8	20	120
Chrysene	218-01-9	50	120
Dibenzo(a,h)anthracene	53-70-3	50	140
Dibenzofuran	132-64-9	60	110
Diethyl phthalate	84-66-2	40	130
Dimethyl phthalate	131-11-3	55	120
Di-n-Butyl phthalate	84-74-2	40	130
Di-n-octyl phthalate	117-84-0	40	140
Fluoranthene	206-44-0	50	120
Fluorene	86-73-7	60	110
Hexachloro-1,3-butadiene	87-68-3	40	100
Hexachlorobenzene	118-74-1	50	110
Hexachlorocyclopentadiene	77-47-4	20	100
Hexachloroethane	67-72-1	35	110
Indeno(1,2,3-cd)pyrene	193-39-5	50	140
Isophorone	78-59-1	40	110
Naphthalene	91-20-3	40	105
Nitrobenzene	98-95-3	40	100

Table 2-28. Lionville Laboratory SVOA Limits for LCS, MS, and MSD. (3 Pages)

Analyte	CAS	Water Samples	
		LCL (%)	UCL (%)
N-Nitroso-Di-N-Propylamine	621-64-7	40	120
N-Nitrosodiphenylamine	86-30-6	50	110
Pentachlorophenol	87-86-5	15	130
Phenanthrene	85-01-8	50	120
Phenol	108-95-2	30	110
Pyrene	129-00-0	50	130
Pyridine	110-86-1	15	100

CAS - Chemical Abstracts System
LCL - lower control limit
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
SVOA - semi-volatile organic analysis
UCL - upper control limit

Table 2-29 shows the LCS recoveries that were outside the control limits. All results for the analytes in the batches indicated in the table were qualified as approximate. All results qualified were nondetects, so they were flagged "UJ."

Table 2-29. SVOA LCS Recoveries That Did Not Satisfy QC Limits.

Batch ID	Matrix	Analyte	CAS	Rec (%)
08LE0348	W	1,2,4-Trichlorobenzene	120-82-1	29
08LE0348	W	2,4,5-Trichlorophenol	95-95-4	23
08LE0348	W	2,4,6-Trichlorophenol	88-06-2	25
08LE0348	W	2,4-Dichlorophenol	120-83-2	27
08LE0348	W	2-Chlorophenol	95-57-8	29
08LE0348	W	2-Nitrophenol	88-75-5	17
08LE0348	W	3-Nitroaniline	99-09-2	0
08LE0348	W	4,6-Dinitro-2-methylphenol	534-52-1	32
08LE0348	W	4-Chloroaniline	106-47-8	3
08LE0348	W	bis(2-Chloroethoxy)methane	111-91-1	42
08LE0348	W	Hexachlorobutadiene	87-68-3	22
08LE0348	W	Hexachloroethane	67-72-1	16
08LE0348	W	Naphthalene	91-20-3	37
08LE0348	W	N-Nitrosodiphenylamine (1)	86-30-6	39
08LE0358	W	Hexachloroethane	67-72-1	27

CAS - Chemical Abstracts Service
LCS - laboratory control sample
QC - quality control
Rec - recovery (%)
SVOA- semi-volatile organic analysis
W - water

Table 2-30 shows the MS and MSD recoveries that were outside the QC limits. All these recoveries were below the lower control limit (LCL). Associated sample results were qualified as estimated. All of the sample results were nondetects and flagged with "UJ".

Table 2-30. SVOA MS and MSD Recoveries That Did Not Satisfy QC Limits.

Batch ID	Matrix	QC Type	Analyte	CAS	Sample	Sample Result	Q	Units	Spiked Result	Q	Spike Conc.	Rec. (%)	LCL (%)	UCL (%)
08LE0348	W	MS	1,2,4-Trichlorobenzene	120-82-1	0807L484-004	10	U	µg/L	22.8		60.000	38	40	100
08LE0348	W	MS	Hexachlorobutadiene	87-68-3	0807L484-004	10	U	µg/L	18		60.000	30	40	100
08LE0348	W	MS	Hexachloroethane	67-72-1	0807L484-004	10	U	µg/L	9.6		60.000	16	35	110
08LE0348	W	MSD	Hexachlorobutadiene	87-68-3	0807L484-004	10	U	µg/L	22.2		60.000	37	40	100
08LE0348	W	MSD	Hexachloroethane	67-72-1	0807L484-004	10	U	µg/L	13.2		60.000	22	35	110

CAS - Chemical Abstracts System
Conc. - concentration
LCL - lower control limit
MS - matrix spike
MSD - matrix spike duplicate
Q - laboratory qualifier
QC - quality control
Rec. - recovery (%)
SVOA- semi-volatile organic analysis
UCL - upper control limit
W - water

2.10.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the RPD between MS and MSD must be less than the criteria set by the laboratory. These criteria are listed in Table 2-31. The lab has not set criteria for all analytes; RPDs were evaluated only for those compounds for which an RPD limit is specified.

Table 2-32 lists the RPD exceedances in this batch of data. All associated sample results were qualified as estimates. All results were nondetects and flagged "UJ".

Table 2-31. Relative Percent Difference Limits Set by Lionville Laboratory for SVOA MS/MSDs. (3 Pages)

Analyte	CAS	RPD (%) For Water Matrix
1,2,4-Trichlorobenzene	120-82-1	20
1,2-Diphenylhydrazine	122-66-7	20
1-Methylnaphthalene	90-12-0	20
2,2'-oxybis(1-Chloropropane)	108-60-1	20
2,4,5-Trichlorophenol	95-95-4	20
2,4,6-Trichlorophenol	88-06-2	20
2,4-Dichlorophenol	120-83-2	20
2,4-Dimethylphenol	105-67-9	20
2,4-Dinitrophenol	51-28-5	20
2,4-Dinitrotoluene	121-14-2	20
2,6-Dinitrotoluene	606-20-2	20
2-Chloronaphthalene	91-58-7	20
2-Chlorophenol	95-57-8	20
2-Methylnaphthalene	91-57-6	20
2-Methylphenol	95-48-7	20
2-Nitroaniline	88-74-4	20
2-Nitrophenol	88-75-5	20
3,3'-Dichlorobenzidine	91-94-1	100
3-and/or 4-Methylphenol	1319-77-3	20
3-Nitroaniline	99-09-2	20
4,6-Dinitro-2-Methylphenol	534-52-1	20
4-Bromophenyl phenyl ether	101-55-3	20
4-Chloro-3-Methylphenol	59-50-7	20
4-Chloroaniline	106-47-8	20

Table 2-31. Relative Percent Difference Limits Set by Lionville Laboratory for SVOA MS/MSDs. (3 Pages)

Analyte	CAS	RPD (%) For Water Matrix
4-Chlorophenyl phenyl ether	7005-72-3	20
4-Nitroaniline	100-01-6	20
4-Nitrophenol	100-02-7	20
Acenaphthene	83-32-9	20
Acenaphthylene	208-96-8	20
Aniline	62-53-3	20
Anthracene	120-12-7	20
Benzidine	92-87-5	100
Benzo(a)anthracene	56-55-3	20
Benzo(a)pyrene	50-32-8	20
Benzo(b)fluoranthene	205-99-2	20
Benzo(g,h,i)perylene	191-24-2	20
Benzo(k)fluoranthene	207-08-9	20
Benzoic Acid	65-85-0	60
Benzyl Alcohol	100-51-6	20
Bis(2-Chloroethoxy)methane	111-91-1	20
Bis(2-Chloroethyl) ether	111-44-4	20
Bis(2-Ethylhexyl) phthalate	117-81-7	20
Butylbenzylphthalate	85-68-7	20
Carbazole	86-74-8	20
Chrysene	218-01-9	20
Dibenzo(a,h)anthracene	53-70-3	20
Dibenzofuran	132-64-9	20
Diethyl phthalate	84-66-2	20
Dimethyl phthalate	131-11-3	20
Di-n-Butyl phthalate	84-74-2	20
Di-n-octyl phthalate	117-84-0	20
Fluoranthene	206-44-0	20
Fluorene	86-73-7	20
Hexachloro-1,3-butadiene	87-68-3	20
Hexachlorobenzene	118-74-1	20
Hexachlorocyclopentadiene	77-47-4	20
Hexachloroethane	67-72-1	20
Indeno(1,2,3-cd)pyrene	193-39-5	20
Isophorone	78-59-1	20
Naphthalene	91-20-3	20

Table 2-31. Relative Percent Difference Limits Set by Lionville Laboratory for SVOA MS/MSDs. (3 Pages)

Analyte	CAS	RPD (%) For Water Matrix
Nitrobenzene	98-95-3	20
N-Nitroso-Di-N-Propylamine	621-64-7	60
N-Nitrosodiphenylamine	86-30-6	60
Pentachlorophenol	87-86-5	40
Phenanthrene	85-01-8	20
Phenol	108-95-2	20
Pyrene	129-00-0	20
Pyridine	110-86-1	40

CAS - Chemical Abstracts System
MS - matrix spike
MSD - matrix spike duplicate
RPD - relative percent difference
SVOA - semi-volatile organic analysis

Table 2-32. SVOA RPDs Outside QC Criteria.

Batch ID	Matrix	Analyte	CAS	Original Sample	MS Rec (%)	MSD Rec (%)	RPD
08LE0348	W	Aniline	62-53-3	0807L484-004	56	72	25
08LE0348	W	Hexachlorobutadiene	87-68-3	0807L484-004	30	37	20.9
08LE0348	W	2,4-Dimethylphenol	105-67-9	0807L484-004	52	64	20.7
08LE0348	W	Hexachloroethane	67-72-1	0807L484-004	16	22	31.6
08LE0348	W	Benzyl alcohol	100-51-6	0807L484-004	49	61	21.8
08LE0348	W	bis(2-Chloroethyl)ether	111-44-4	0807L484-004	54	68	23

CAS - Chemical Abstracts System
MS - matrix spike
MSD - matrix spike duplicate
QC - quality control
Rec. - recovery (%)
RPD - relative percent difference
SVOA - semi-volatile organic analysis
W - water

Environmental Quality Management, Inc.

EQM-DVAL-USE-006, Rev. 0

Data Verification and Data Validation of US Ecology Site Data, Chains of Custody 72, 73, 74, 75, 76, 77, 78, and 79

Submitted to:

Vista Engineering

Date:
December 8, 2008

VISTA
ENGINEERING TECHNOLOGIES

EXECUTIVE SUMMARY

Samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for volatile organic compounds by method TO-15.

All analyses were performed by Southwest Research Institute (SwRI), San Antonio, Texas, following the *Specification for Analytical Laboratory Services: Select Soil Gas Volatiles by Method TO-15* (VET-1405-SPEC-01, Rev. 3). In addition to printed data packages for each sample delivery group, the laboratory provided electronic data deliverables (EDDs), consisting of two Microsoft Excel® files containing tables of results and associated quality control (QC).

This data validation report presents the results of validating the analyses reported in the second group of EDDs prepared by the laboratory. This group of EDDs provided the results and QC data for the samples delivered to the laboratory under the chain-of custody documents listed in Table ES-1.

Table ES-1. Chains Of Custody Applicable To The Data Validated In This Report.

VET-1405-COC-072	VET-1405-COC-073	VET-1405-COC-074
VET-1405-COC-075	VET-1405-COC-076	VET-1405-COC-077
VET-1405-COC-078	VET-1405-COC-079	

COC - chain of custody

The data validation was performed using an electronic data checker to evaluate whether batch QC met criteria. The electronic data checker identified any QC results that exceed applicable criteria. The data validation process was completed by the data validation chemist, who evaluated the impacts of the exceedances and added data validation qualifiers.

Please note that duplicate failures (relative percent difference [RPD] > 25%) do not lead to qualification of data per the validation rules. However, RPDs that are greater than 25% indicate significant sampling heterogeneity. Table 2-2 lists numerous results with RPDs >25%.

No data were rejected as a result of this validation process.

Table ES-2 summarizes the validation result.

Table ES-2. Summary Validation Results by Analysis.

Analysis	Number of Results	Number of Qualified Results	Summary
TO-15	4855	0	No data were qualified.

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ACRONYMS

CAS	Chemical Abstracts Service (column heading)
COC	chain of custody
Conc.	concentration (column heading)
DUP	duplicate sample (laboratory duplicate)
EDD	electronic data deliverable
LCL	lower control limit
LCS	laboratory control sample
MB	method blank
MDL	minimum detection limit (column heading)
MS	matrix spike
MSD	matrix spike duplicate
ppb(v/v)	parts per billion by volume
Q	laboratory qualifier (column heading)
QC	quality control
RPD	relative percent difference
SwRI	Southwest Research Institute
TIC	tentatively identified compound
UCL	upper control limit
VOA	volatile organic analysis
VOC	volatile organic compound

SwRI Qualifiers

D	This flag indicates the result was from a dilution
E	This flag indicates compounds whose concentrations exceeded the calibration range
U	Analyte is not detected, the associated quantitation limit is given

1. INTRODUCTION – APPROACH TO VALIDATION

Soil gas samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for volatile organic compounds (VOCs) by method TO-15.

All analyses were conducted by Southwest Research Institute (SwRI), San Antonio, Texas, following the *Specification for Analytical Laboratory Services: Select Soil Gas Volatiles by Method TO-15* (VET-1405-SPEC-01, Rev. 3). The results of these analyses were presented in a printed data package for each sample delivery group. In addition, the laboratory provided an electronic data deliverable (EDD) for each sample delivery group. The EDDs were Microsoft Excel® files containing tables of results and associated quality control (QC).

This data validation report presents the results of validating the analyses reported in the second group of EDDs received from the laboratory. This group of EDDs and the corresponding chain-of-custody documents are identified in Table 1-1 below. The data contained in these EDDs included the analysis of VOCs by TO-15, only.

Table 1-1. Chains of Custody and Electronic Data Deliverables Applicable to the Data Validated.

Chain of Custody	EDD	
	File Name	Date Received
VET-1405-COC-072	344193.xls	10/20/2008
VET-1405-COC-073	344193.xls	10/20/2008
VET-1405-COC-074	344193.xls, 344256.xls	10/20/2008
VET-1405-COC-075	344193.xls	10/20/2008
VET-1405-COC-076	344256.xls	10/20/2008
VET-1405-COC-077	344256.xls	10/20/2008
VET-1405-COC-078	344256.xls	10/20/2008
VET-1405-COC-079	344256.xls	10/20/2008

EDD - electronic data deliverable

This validation was performed in a two-tiered approach.

1. Completeness: an assessment of the completeness was made on the pdf file of the "hard copy" data.
2. Electronic holding time and QC evaluation.

The approach is summarized in Table 1-2. The electronic review was performed on all incoming EDDs. The EDDs were evaluated to assure consistency with the hard copy data. By using electronic review of all QC, appropriate qualification of all the data can be made.

Table 1-2. Data Validation and Verification Approach.

Review item	Manually Done	Electronic	All Samples
Verification of deliverables	X		X
Requested vs reported analyses		X	X
Holding times		X	X
Blank contamination		X	X
Detection Limits		X	X
LCS		X	X
Surrogates		X	X
Laboratory duplicates		X	X

LCS - laboratory control sample

The remainder of this report consists of the details for data validation of Method TO-15 data. It explains the details of the overall validation process and provides reasons for any data qualifiers that were applied. The automated data validation process determined whether the following facets of laboratory quality control had been achieved.

- Was a method blank (MB) analyzed each day?
- Were surrogates added to each sample and batch QC samples for each method where surrogates are required?
- Was precision checked with a field duplicate (DUP)?
- Were holding time requirements for preparation and analysis satisfied?
- Were the MB results less than the required quantitation limits?
- Did the quantitation limit for nondetect results meet the required detection limit?
- Did the recoveries for the laboratory control sample (LCS) and surrogates, where required, meet the accuracy criteria?
- Did the DUP relative percent differences meet the precision criteria?

After this automated checking, the “no” answers to these questions were investigated manually, the effect on each sample result was determined, and the results were qualified according to the validation rules in TO-15 DV #1, Rev. 0. TO-15 DV#1 was written to validate TO-15 data for Level C for the US Ecology project. It is based on Level C of *Data Validation Procedure for Chemical Analyses* (HNF-20433). The evaluations of the automated checking results that were determined to have a potential impact on data quality were appropriately qualified and are presented in the remainder of this report.

2. DATA VALIDATION REPORT

2.1. DATA VALIDATION REPORT FOR VOLATILE ORGANIC COMPOUNDS (METHOD TO-15)

Fifty-seven compounds were requested for each of the 43 samples in this group. All 57 compounds were reported in the EDDs for each sample.

The table listing the results is too large to include here; refer to the Microsoft® Excel file on the accompanying CD-ROM.

2.1.1. Batch Size and Completeness of QC Analysis

QC Requirements --

- Was a MB analyzed each day?
- Were surrogates added to each sample and batch QC samples for each method where surrogates are required?
- Was precision checked with a field duplicate?

Analysis was performed in two batches of vapor samples. Batch 344193 contained 39 samples (where a dilution is counted as a separate sample) and 3 blanks. Batch 344256 contained 43 samples (where a dilution is counted as a separate sample) and 4 blanks. Because a blank was analyzed on each day that samples were analyzed, QC requirements were met for batches 344193 and 344256.

There were two field duplicates analyzed for the 43 samples that were submitted by Vista. This satisfies method field duplicate requirements.

Though it is not required by the method, a LCS was analyzed on each day as required by VET-1405-SPEC-01, Rev. 3. This LCS contained 16 of the analytes of interest.

Surrogates are required for MB and LCS. Though not required by the method, surrogates (1,2-dichloroethane-d4, bromofluorobenzene, and toluene-d8) were added to each sample, as well as the MB and LCS.

2.1.2. Holding Times

QC Requirement --

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for volatile organic analysis by method TO-15 are specified in VET-1405-PLN-03, Rev. 0, as 30 days for summa canisters. All sample analytical results were generated within this limit.

2.1.3. Method Blanks

QC Requirement --

- Were the MB results less than the required quantitation limits?

The required quantitation limits (VET-1405-PLN-03, Rev. 0) for all VOCs by Method TO-15 are 0.5 parts per billion by volume [ppb (v/v)]. There were no VOCs detected in the method blanks. However, none of the target analyte detection limits met the required quantitation limits. The detection limit for all compounds in the MB was 1.1 ppb(v/v). The validation criteria do not require that data be qualified due to laboratory detection limits failing to meet required quantitation limits.

2.1.4. Detection Limits

QC Requirement --

- Did the quantitation limit for nondetect results meet the required detection limit?

All target analyte nondetects exceeded the required detection limit of 0.5 ppbv based on the sampling and analysis plan (VET-1405-PLN-03, Rev. 0). Detection limits ranged from 1.1 ppb(v/v) to 24000 ppb(v/v) for diluted samples. According to the validation criteria, exeedence of the required detection limit does not require qualification of data.

2.1.5. QC Checks for Accuracy

QC Requirement --

- Did the recoveries for the LCS and surrogates, where required, meet the accuracy criteria?

There is no requirement for the addition of surrogates to VOC samples in Summa canisters. However surrogates are required in the LCS and MB samples. As no limits for surrogate recoveries were listed in project documents for the QC samples, the laboratory derived limits were used to evaluate surrogate recoveries. The statistical QC limits determined by the laboratory for surrogate compounds are listed in Table 2-1. Surrogate recoveries in the required QC samples were within these limits.

Table 2-1. Statistical Limits for VOA Surrogate Compounds

Surrogate	Vapor Samples	
	LCL (%)	UCL (%)
1,2-Dichloroethane-d4	69	137
Toluene-d8	84	117
Bromofluorobenzene	52	139

LCL - lower control limit
UCL - upper control limit
VOA - volatile organic analysis

There is no requirement for the analysis of LCS in method TO-15. However, LCS are required by the VET-1405-SPEC-01, Rev. 3, and were analyzed in these batches. As specified in the laboratory's analytical package narratives and TO-15 DV #1, Rev. 0, target analyte recoveries in LCS must be within 70% to 130%. LCS recoveries for the sixteen compounds monitored by the laboratory were within this range.

2.1.6. QC Check for Precision

- Did the DUP relative percent differences meet the precision criteria?

The limit for precision is 25% between field replicate samples per Method TO-15, Section 11.3.2. There are two field replicates included in this sample set. The failures are included in Table 2-2. All relative percent differences (RPDs) for detected target analytes in duplicate sample 344256 (Vista ID V056) are above the 25% limit. The RPDs for 1,1,1-trichloroethane and trichloroethene in duplicate sample 344201 are high, as well. As there is no field duplicate criteria specified in project documents, the VOC criteria from TO-15 DV #1, Rev. 0 are used. TO-15 DV #1, Rev. 0 does not require that data be qualified due to poor field replicate RPDs.

Table 2-2. Field Replicate RPDs That Failed to Meet Method Acceptance Criteria.[a,b] (2 Pages)

Analyte	CAS	Batch ID	Original Sample			Duplicate Sample			Units	RPD
			Conc.	Q	MDL	Conc.	Q	MDL		
1,1,1-trichloroethane	71-55-6	344193[c]	1500		110	1100		110	ppb(v/v)	30.8%
trichloroethene	79-01-6	344193	470		110	340		110	ppb(v/v)	32.1%
1,1,1-trichloroethane	71-55-6	344256[d]	6100		590	1.1	U	1.1	ppb(v/v)	199.9%
1,1,1-trichloroethane	71-55-6	344256	6200	D	5900	11	U	11	ppb(v/v)	199.3%
1,1,2-trichlorotrifluoroethane	76-13-1	344256	46000		590	2.6		1.1	ppb(v/v)	200.0%
1,1,2-trichlorotrifluoroethane	76-13-1	344256	34000	D	5900	11	U	11	ppb(v/v)	199.9%
1,1-dichloroethane	75-34-3	344256	5500		590	1.1	U	1.1	ppb(v/v)	199.9%
1,1-dichloroethene	75-35-4	344256	1100		590	1.1	U	1.1	ppb(v/v)	199.6%
acetone	67-64-1	344256	1900		590	8.5		1.1	ppb(v/v)	198.2%
chloroform	67-66-3	344256	30000		590	8.6		1.1	ppb(v/v)	199.9%
chloroform	67-66-3	344256	26000	D	5900	11	U	11	ppb(v/v)	199.8%
cis-1,2-dichloroethene	156-59-2	344256	88000	E	590	39		1.1	ppb(v/v)	199.8%
cis-1,2-dichloroethene	156-59-2	344256	69000	D	5900	31	D	11	ppb(v/v)	199.8%
dichlorodifluoromethane	75-71-8	344256	710		590	1.1	U	1.1	ppb(v/v)	199.4%
methylene chloride	75-09-2	344256	590	U	590	1.5		1.1	ppb(v/v)	199.0%
tetrachloroethene	127-18-4	344256	590	U	590	1.4		1.1	ppb(v/v)	199.1%
toluene	108-88-3	344256	590	U	590	2.4		1.1	ppb(v/v)	198.4%
trichloroethene	79-01-6	344256	300000	E	590	370	E	1.1	ppb(v/v)	199.5%
trichloroethene	79-01-6	344256	170000	D	5900	200	D	11	ppb(v/v)	199.5%
trichlorofluoromethane (r11)	75-69-4	344256	2700		590	1.1	U	1.1	ppb(v/v)	199.8%
1,1,1-trichloroethane	71-55-6	344193	1500		110	1100		110	ppb(v/v)	30.8%
trichloroethene	79-01-6	344193	470		110	340		110	ppb(v/v)	32.1%
1,1,1-trichloroethane	71-55-6	344256	6100		590	1.1	U	1.1	ppb(v/v)	199.9%

Table 2-2. Field Replicate RPDs That Failed to Meet Method Acceptance Criteria.[a,b] (2 Pages)

Analyte	CAS	Batch ID	Original Sample			Duplicate Sample			Units	RPD
			Conc.	Q	MDL	Conc.	Q	MDL		

a. Results are reported only for compounds that were present above the detection limit in at least one of the replicate samples.
b. Compounds that were not detected in both replicates (U-flagged) are not listed. RPDs for U-flagged compounds are 0% by definition but the value has no significance in data validation activities.
c. The original sample for batch 344193 is 344201 (Vista ID V053) and the duplicate sample is 344202 (Vista ID V054).
d. The original sample for batch 344256 is 344256 (Vista ID V056) and the duplicate sample is 344257 (Vista ID V057).

CAS - Chemical Abstracts Service
Conc. - concentration (column heading)
MDL - minimum detection limit (column heading)
ppb(v/v) - parts per billion by volume
Q - laboratory qualifier (column heading)
RPD - relative percent difference

2.2. Tentatively Identified Compounds (TIC)

Per the VET-1405-SPEC-001, Table 1 many compounds were listed as tentatively identified compounds (TICs). TICs are compounds that are identified by comparison with a Mass spectral libraray. No standards are run on the gas chromatograph/mass spectrometer for these. The quantitiy is estimated by ratioing the concentration to the nearest internal standard. None of the TICs listed in VET-1405-SPEC-001, Table 1 were identified in these samples.

However, other TICs were identified. Table 2-3 lists the TICs and their estimated concentrations. One of the TICs is silane, difluorodimethyl-CAS #353-66-2. Silanes are typically due to the septa of the instrument or from the column used in the instrument. This was identified once and is an instrument artifact.

Because TICs are not calibrated and are impractical to calibrate, only those with many repeated hits in multiple samples should be considered further. Five Compounds were identified in more than 10 samples. The following lists these compounds that were frequently identified.

Table 2-3. Frequently Identified TICs and Estimated Concentrations.

Compound	CAS	Present in X Number of Samples
1,2-Dichloro-1,1,2-Trifluoro-Ethane	354-23-4	38
Chlorotrifluoroethene	79-38-9	37
Isobutane	75-28-5	30
Dichlorofluoro-Methane	75-43-4	27
Phenol	108-95-2	11

CAS - Chemical Abstracts Service TIC - tentatively identified compound

Environmental Quality Management, Inc.

EQM-DVAL-USE-007, Rev. 0

Data Verification and Data Validation of US Ecology Site Data, Chains of Custody 80, 81, 82, 83, 84, and 85

Submitted to:

Vista Engineering

Date:
March 02, 2009

EXECUTIVE SUMMARY

Samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, volatile organic compounds, semi-volatile organic compounds, and polychlorinated biphenyls.

All analyses were conducted by Lionville Laboratory, Inc., Lionville, Pennsylvania, (LVL) following the *Specification for Analytical Laboratory Services: Soil and Water Analysis* (VET-1405-SPEC-03, Rev. 1). In addition to printed data packages for each sample delivery group, the laboratory provided electronic data deliverables (EDDs), consisting of a number of Microsoft® Excel files containing tables of results and associated quality control (QC) data.

This data validation report presents the results of validating the analyses reported in the EDDs prepared by the laboratory for the fourth quarter groundwater samples. This group of EDDs provided the results and QC data for the samples delivered to the laboratory under the chain-of custody documents listed in Table ES-1.

Table ES-1. Chains Of Custody Applicable To The Data Validated In This Report.

VET-1405-COC-080	VET-1405-COC-081	VET-1405-COC-082
VET-1405-COC-083	VET-1405-COC-084	VET-1405-COC-085

COC - chain of custody

The data validation was performed using an electronic data checker to evaluate whether batch QC met criteria. The electronic data checker identifies any QC results that exceed applicable criteria. The data validation process is completed by the data validation chemist, who evaluates the impacts of the exceedances and adds data validation qualifiers.

No data were rejected as a result of this validation process.

Table ES-2 summarizes the validation results by analysis.

Table ES-2. Summary Validation Results by Analysis. (2 Pages)

Analysis	Number of Results	Number of Qualified Results	Summary
Metals	232	0	No results were qualified.
Mercury	8	0	Mercury was not detected in any samples. No results were qualified.
Chromium (VI)	8	3	Three results were qualified as estimated due to missed hold times.
Cyanide	8	0	Cyanide was not detected in the samples. No data were qualified.

Table ES-2. Summary Validation Results by Analysis. (2 Pages)

Analysis	Number of Results	Number of Qualified Results	Summary
Sulfide	8	0	Sulfide was not detected in any samples. No results were qualified.
Anions	56	3	Three phosphate results were qualified as estimated due to missed hold times. No data were rejected.
Total phenols	8	0	Phenols were not detected in any samples. No data were qualified.
PCBs	56	0	PCBs were not detected in any samples. No data were qualified.
VOCs	858	0	No results were qualified.
SVOCs	579	0	No data were qualified.

PCB - polychlorinated biphenyl VOC - volatile organic compound
SVOC - semi-volatile organic compound

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ACRONYMS

BLK	Blank (column heading)
CAS	Chemical Abstracts Service (column heading)
COC	chain of custody
Conc.	concentration (column heading)
DUP	Duplicate sample (laboratory duplicate)
EDD	electronic data deliverable
ICP	inductively coupled plasma
LCS	laboratory control sample
LVL	Lionville Laboratory, Lionville, Pennsylvania
MB	method blank
MS	matrix spike
MSD	matrix spike duplicate
PCB	polychlorinated biphenyl
Q	Laboratory qualifier (column heading)
QC	quality control
RPD	relative percent difference
RQL	required quantitation limit
Surr	surrogate (column heading)
SVOA	semi-volatile organic analysis
SVOC	semi-volatile organic compound
V	Validation qualifier (column heading)
VOA	volatile organic analysis
VOC	volatile organic compound
W	water

Lionville Qualifiers

U	Analyte is not detected, the associated quantitation limit is given

Data Validation Applied Qualifiers

J	Indicates the compound was analyzed for and detected in the sample. The associated concentration is an estimate, but the data are usable for decision making purposes

1. INTRODUCTION – APPROACH TO VALIDATION

Groundwater samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and polychlorinated biphenyls (PCBs).

All analyses were conducted by Lionville Laboratory, Inc., Lionville, Pennsylvania (LVL), following the *Specification for Analytical Laboratory Services: Soil and Water Analysis* (VET-1405-SPEC-03, Rev. 1). The results of these analyses were presented in a printed data package for each sample delivery group. In addition, the laboratory provided an electronic data deliverable (EDD) for each sample delivery group. The EDDs are Microsoft Excel® files containing tables of results and associated quality control (QC) data.

This data validation report presents the results of validating the analyses reported in the EDDs received from the laboratory that include the fourth quarter groundwater samples. This group of EDDs and the corresponding chain-of-custody documents are identified in Table 1-1 below. The data contained in these EDDs includes the analysis of metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, VOCs, SVOCs, and PCBs.

Table 1-1. Chains of Custody and Electronic Data Deliverables Applicable to the Data Validated.

Chain of Custody	EDD	
	File Name	Date Received
VET-1405-COC-080	L0811056.xls	1/13/2009
VET-1405-COC-081	L0811056.xls	1/13/2009
VET-1405-COC-082	L0811072.xls	1/13/2009
VET-1405-COC-083	L0811072.xls	1/13/2009
VET-1405-COC-084	L0811072.xls	1/13/2009
VET-1405-COC-085	L0811083.xls	1/13/2009

EDD - electronic data deliverable

In accordance with VET-1405-PLN-03, Rev. 0, the data were validated using *Data Validation Procedure for Chemical Analyses* (HNF-20433). This validation was performed to Level A (as described in HNF-20433) using a two-tiered approach.

1. Completeness: an assessment of the completeness is made on the pdf file of the "hard copy" data.
2. Electronic holding time and detection limit evaluation.

The approach is summarized in Table 1-2. The electronic review is performed on all incoming EDDs. The EDDs are evaluated to assure consistency with the hard copy data. By using electronic review of all QC, appropriate qualification of all the data can be made.

Table 1-2. Data Validation and Verification Approach.

Review item	Manually Done	Electronic	All Samples
Verification of deliverables	X		X
Requested vs reported analyses		X	X
Holding times		X	X
Detection Limits		X	X

The remainder of this report consists of several chapters, with each chapter providing the details for data validation of a particular method of analysis. Most chapters begin with a summary table of the analytical results validated and the validation qualifiers that have been applied. These tables are also provided in an accompanying Microsoft Excel® file along with any summary tables that were too large to include in this data validation report. After the summary table, if it is included here, each chapter explains the details of the validation process and provides reasons for any data qualifiers that may have been applied. The automated data validation process determines whether the following facets of laboratory quality control have been achieved:

- Were there 20 or fewer samples in each preparation batch?
- Were a method blank (MB), a laboratory control sample (LCS), and a matrix spike sample (MS) prepared with each batch of samples?
- Were surrogates added to each sample and batch QC samples for each method where surrogates are required?
- Was precision checked with a matrix spike duplicate (MSD) or sample duplicate (DUP)?
- Were holding time requirements for preparation and analysis satisfied?
- Did the quantitation limit for nondetect results meet the required detection limit?

After this automated checking, the "no" answers to these questions were investigated manually, the effect on each sample result was determined, and the results were qualified according to the validation rules in *Data Validation Procedure for Chemical Analyses* (HNF-20433). These evaluations are presented on the following pages.

2. DATA VALIDATION REPORTS

2.1. DATA VALIDATION REPORT FOR ICP METALS (METHOD 6010B)

Results for 29 metals (aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, molybdenum, nickel, potassium, selenium, silicon, silver, sodium, strontium, thallium, tin, titanium, uranium, vanadium and zinc) were requested for each of the 8 samples in this group. The table listing the results is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM for the analytical results for inductively coupled plasma (ICP) metals, as well as the flags applied during validation and the reasons for the flags.

2.1.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-1 shows the number of each type of sample in each preparation batch.

Table 2-1. ICP Metals Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
08L0423	W	Aluminum	7429-90-5	1	1	1	1	1	8
08L0423	W	Iron	7439-89-6	1	1	1	1	1	8
08L0423	W	Lead	7439-92-1	1	1	1	1	1	8
08L0423	W	Magnesium	7439-95-4	1	1	1	1	1	8
08L0423	W	Manganese	7439-96-5	1	1	1	1	1	8
08L0423	W	Molybdenum	7439-98-7	1	1	1	1	1	8
08L0423	W	Nickel	7440-02-0	1	1	1	1	1	8
08L0423	W	Potassium	7440-09-7	1	1	1	1	1	8
08L0423	W	Silicon	7440-21-3	1	1	1	1	1	8
08L0423	W	Silver	7440-22-4	1	1	1	1	1	8
08L0423	W	Sodium	7440-23-5	1	1	1	1	1	8
08L0423	W	Strontium	7440-24-6	1	1	1	1	1	8
08L0423	W	Thallium	7440-28-0	1	1	1	1	1	8
08L0423	W	Tin	7440-31-5	1	1	1	1	1	8
08L0423	W	Titanium	7440-32-6	1	1	1	1	1	8
08L0423	W	Antimony	7440-36-0	1	1	1	1	1	8
08L0423	W	Arsenic	7440-38-2	1	1	1	1	1	8
08L0423	W	Barium	7440-39-3	1	1	1	1	1	8
08L0423	W	Beryllium	7440-41-7	1	1	1	1	1	8
08L0423	W	Boron	7440-42-8	1	1	1	1	1	8
08L0423	W	Cadmium	7440-43-9	1	1	1	1	1	8
08L0423	W	Chromium	7440-47-3	1	1	1	1	1	8
08L0423	W	Cobalt	7440-48-4	1	1	1	1	1	8

Table 2-1. ICP Metals Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
08L0423	W	Copper	7440-50-8	1	1	1	1	1	8
08L0423	W	Uranium	7440-61-1	1	1	1	1	1	8
08L0423	W	Vanadium	7440-62-2	1	1	1	1	1	8
08L0423	W	Zinc	7440-66-6	1	1	1	1	1	8
08L0423	W	Calcium	7440-70-2	1	1	1	1	1	8
08L0423	W	Selenium	7782-49-2	1	1	1	1	1	8

CAS - Chemical Abstracts Service
DUP - duplicate
ICP - inductively coupled plasma
LCS - laboratory control sample
MB - method blank
MS - matrix spike
MSD - matrix spike duplicate
W - water

ICP metals analysis was performed in one batch. The batch had fewer than 20 field samples. All analytes were included in the batch. The batch had one MB, DUP, LCS, MS and MSD. All accuracy and precision frequency requirements were met for the metals batch.

No data were qualified for missing QC samples.

2.1.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for ICP metals analysis by method 6010B are specified in VET-1405-PLN-03, Rev. 0, as 180 days from sampling to analysis. All results were generated within these limits.

2.1.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The required quantitation limits (RQLs) (VET-1405-PLN-03, Rev. 0) are shown in Table 2-2.

Table 2-2. Required Quantitation Limit for ICP Metals. (2 Pages)

Analyte	Water (µg/L)
Aluminum	50
Antimony	40
Arsenic	50
Barium	5
Beryllium	5
Boron	50
Cadmium	5
Calcium	50
Chromium	5

Table 2-2. Required Quantitation Limit for ICP Metals. (2 Pages)

Analyte	Water (µg/L)
Cobalt	5
Copper	5
Iron	50
Lead	50
Magnesium	50
Manganese	10
Molybdenum	5
Nickel	10
Potassium	500
Selenium	50
Silicon	50
Silver	10
Sodium	50
Strontium	5
Thallium	50
Tin	50
Titanium	10
Uranium	5
Vanadium	5
Zinc	10

ICP - inductively coupled plasma

The quantitation limits for nondetect results always met the required detection limits.

2.2. DATA VALIDATION REPORT FOR MERCURY (METHOD 7470A)

Table 2-3 is a summary of the validated results for mercury.

Table 2-3. Summary of Mercury Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	RQL	Q	V	Reason
0811L056-001	G025	W	08C0206	0.06	µg/L	0.06	U		
0811L056-002	G026	W	08C0206	0.06	µg/L	0.06	U		
0811L056-003	G027	W	08C0206	0.06	µg/L	0.06	U		
0811L072-001	G028	W	08C0206	0.06	µg/L	0.06	U		
0811L072-002	G029	W	08C0206	0.06	µg/L	0.06	U		
0811L072-003	G030	W	08C0206	0.06	µg/L	0.06	U		
0811L083-001	G031	W	08C0207	0.06	µg/L	0.06	U		
0811L083-002	G032	W	08C0207	0.06	µg/L	0.06	U		

Conc. - concentration
RQL - required quantitation limit
Q - laboratory qualifier
V - validation flag
W - water

2.2.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-4 shows the number of each type of sample in each preparation batch.

Table 2-4. Mercury Preparation Batch Summary.

Batch ID	Matrix	BLK	DUP	LCS	MS	MSD	Sample
08C0206	W	1	1	1	1		6
08C0207	W	1		1			2

BLK - blank
DUP - duplicate
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
W - water

Mercury analysis was performed in two batches. Each batch contained fewer than 20 field samples. Each batch included a method blank and a LCS.

Batch 08C0206 included a DUP, MS and MSD. Batch 08C0207 did not include a duplicate, MS, or MSD. The sampling plan calls for a MS and a MSD or DUP for every 20 field samples. There was a DUP, MS and MSD for the eight water samples included in these two batches. Therefore, the intent of the sampling plan was met and precision and accuracy frequency requirements were met for these batches.

2.2.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for mercury analysis by method 7470A is specified in VET-1405-PLN-03, Rev. 0, as 28 days. All results were generated within this limit.

2.2.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The RQL (VET-1405-PLN-03, Rev. 0) is shown in Table 2-5.

Table 2-5. Required Quantitation Limit for Mercury.

Analyte	Water (µg/L)
Mercury	0.05

None of the quantitation limits for the nondetect results met the required detection limit. Per *Data Validation Procedure for Chemical Analyses* (HNF-20433, Rev.0), no data were qualified.

2.3. DATA VALIDATION REPORT FOR HEXAVALENT CHROMIUM (METHOD 7196A)

Table 2-6 is a summary of the validated results for hexavalent chromium.

Table 2-6. Summary of Hexavalent Chromium Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	RQL	Q	V	Reason
0811L056-001	G025	W	08LVI073	0.052	mg/L	0.02		J	Hold Time
0811L056-002	G026	W	08LVI073	0.059	mg/L	0.02		J	Hold Time
0811L056-003	G027	W	08LVI073	0.072	mg/L	0.02		J	Hold Time
0811L072-001	G028	W	08LVI073	0.057	mg/L	0.02			
0811L072-002	G029	W	08LVI073	0.033	mg/L	0.02			
0811L072-003	G030	W	08LVI073	0.033	mg/L	0.02			
0811L083-001	G031	W	08LVI074	0.024	mg/L	0.02			
0811L083-002	G032	W	08LVI074	0.091	mg/L	0.02			

Conc. - concentration
Q - laboratory qualifier
RQL - required quantitation limit
V - validator flag
W - water

2.3.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, and a MS sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-7 shows the number of each type of sample in each preparation batch.

Table 2-7. Hexavalent Chromium Preparation Batch Summary.

Batch ID	Matrix	BLK	LCS	DUP	MS	MSD	Sample
08LVI073	W	1	2	1	1		6
08LVI074	W	1	2	1	1		2

BLK - blank
DUP - duplicate
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
W - water

Hexavalent chromium analysis was performed in two batches. Each batch contained fewer than 20 field samples. At least one MB, LCS, DUP and MS were analyzed in each sample batch. No

MSD were analyzed in either batch; however, no MSD is required where a DUP is present. All QC sample frequency requirements were met.

2.3.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for chromium (VI) analysis by method 7196A is specified in VET-1405-PLN-03, Rev. 0, as one day for water samples. Samples 0811L056-001 (G025), 0811L056-002 (G026), and 0811L056-003 (G027) were analyzed two days after sampling. The results for these samples were qualified as estimated and flagged with "J".

All other results were generated within these limits.

2.3.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for chromium (VI). Chromium (VI) was detected in all samples.

2.4. DATA VALIDATION REPORT FOR CYANIDE (METHOD 9014)

Table 2-8 is a summary of the validated results for cyanide.

Table 2-8. Summary of Cyanide Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	RQL	Q	V	Reason
0811L056-001	G025	W	08LCA56	5.00	µg /L	5	U		
0811L056-002	G026	W	08LCA56	5.00	µg /L	5	U		
0811L056-003	G027	W	08LCA56	5.00	µg /L	5	U		
0811L072-001	G028	W	08LCA56	5.00	µg /L	5	U		
0811L072-002	G029	W	08LC057	5.00	µg /L	5	U		
0811L072-003	G030	W	08LC057	5.00	µg /L	5	U		
0811L083-001	G031	W	08LC057	5.00	µg /L	5	U		
0811L083-002	G032	W	08LC057	5.00	µg /L	5	U		

Conc. - concentration
RQL - required quantitation limit
Q - laboratory qualifier
V - validation qualifier
W - water

2.4.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-9 shows the number of each type of sample in each preparation batch.

Table 2-9. Cyanide Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	DUP	MS	Sample
08LCA56	W	1	2	1	1	4
08LC057	W	1	2			4

DUP - duplicate
LCS - laboratory control sample
MB - method blank
MS - matrix spike
W - water

Cyanide analysis was performed in two batches of samples. Each batch contained fewer than 20 field samples. At least one MB and LCS were analyzed in each sample batch. One batch had an MS and DUP included. The sampling plan requires that there be one MS and MSD or DUP per every 20 field samples, so accuracy frequency requirements were met. All other QC requirements were met.

2.4.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for cyanide analysis by method 9014 is specified in VET-1405-PLN-03, Rev. 0, as 14 days. All results were generated within these limits.

2.4.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for cyanide. Cyanide was not detected in any of the samples. Detection limits were 5 µg/L for water samples.

2.5. DATA VALIDATION REPORT FOR SULFIDE (METHOD 9034)

Table 2-10 is a summary of the validated results for sulfide.

Table 2-10. Summary of Sulfide Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	RQL	Q	V	Reason
0811L056-001	G025	W	08LSDA59	1.0	mg/L	1	U		
0811L056-002	G026	W	08LSDA59	1.0	mg/L	1	U		
0811L056-003	G027	W	08LSDA59	1.0	mg/L	1	U		
0811L072-001	G028	W	08LSDA59	1.0	mg/L	1	U		
0811L072-002	G029	W	08LSDA59	1.0	mg/L	1	U		
0811L072-003	G030	W	08LSDA59	1.0	mg/L	1	U		
0811L083-001	G031	W	08LSDA59	1.0	mg/L	1	U		
0811L083-002	G032	W	08LSDA59	1.0	mg/L	1	U		

Conc. - concentration
RQL - required quantitation limit
Q - laboratory qualifier
V - validation qualifier
W - water

2.5.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-11 shows the number of each type of sample in each preparation batch.

Table 2-11. Sulfide Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	DUP	MS	Sample
08LSDA59	W	1	2	1	1	8

DUP - duplicate
LCS - laboratory control sample
MB - method blank
MS - matrix spike
W - water

Sulfide analysis was performed in one batch. This batch contained fewer than 20 field samples. At least one MB, LCS, DUP, and MS were analyzed in the sample batch. The sampling plan requires one MS and one DUP for every 20 field samples. These numbers satisfy all requirements for frequency of QC sample analysis.

2.5.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for sulfide analysis by method 9034 are specified in VET-1405-PLN-03, Rev. 0, as 7 days. All results were generated within these limits.

2.5.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for sulfide. The detection limit was 1 mg/L for all samples.

2.6. DATA VALIDATION REPORT FOR ANIONS (METHOD 9056)

Results for six anions (chloride, fluoride, nitrate, nitrite, phosphate, and sulfate) were requested for each of the 8 samples in this group. The table listing the results is not included here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM for the analytical results for anions, as well as the flags applied during validation and the reasons for the flags. Note that results for bromide were reported by the laboratory, but were not required by the sampling and analysis plan. Bromide results are listed in the Microsoft® Excel file, but were not validated.

2.6.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-12 shows the number of each type of sample in each preparation batch.

Table 2-12. Anion Preparation Batch Summary.

Batch ID	Matrix	Analyte	CAS	MB	LCS	DUP	MS	Sample
08LIC088	W	Nitrate	14797-55-8	1	1			3
08LIC088	W	Nitrite	14797-65-0	1	1			3
08LIC088	W	Sulfate	14808-79-8	1	1			3
08LIC088	W	Chloride	16887-00-6	1	1			3
08LIC088	W	Fluoride	16984-48-8	1	1			3
08LIC089	W	Nitrate	14797-55-8	1	1	1	1	5
08LIC089	W	Nitrite	14797-65-0	1	1	1	1	5
08LIC089	W	Sulfate	14808-79-8	1	1	1	1	5
08LIC089	W	Chloride	16887-00-6	1	1	1	1	5
08LIC089	W	Fluoride	16984-48-8	1	1	1	1	5
08LICA88	W	Bromide	24959-67-9	1	1			3
08LICA89	W	Bromide	24959-67-9	1	1	1	1	5
08LICB89	W	Phosphate	14265-44-2	1	1	1	1	8

CAS - Chemical Abstracts System
DUP - duplicate
LCS - laboratory control sample
MB - method blank
MS - matrix spike
W - water

From the information in Table 2-12, it may be shown that anion analysis was performed on 8 samples in two batches for each anion except for phosphate which was analyzed in one batch. (Note each anion batch does not include all anions requested.) Each batch contained fewer than 20 field samples. At least one MB and one LCS were analyzed in each sample batch.

The sampling plan requires one MS and one DUP be analyzed for every 20 field samples. There were eight samples between the two anion batches and one MS and one DUP for those eight samples. Thus, the intent of the sampling plan was met and accuracy and precision frequency requirements were met for these batches.

2.6.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for analysis by method 9056 is specified in VET-1405-PLN-03, Rev. 0, as 48 hours. The phosphate results for samples 0811L056-001 (G025), 0811L056-002 (G026) and 0811L056-003 (G027) were obtained 3 days after collection. These results were nondetects and, per the validation criteria, were qualified as estimated and flagged with “UJ”.

All other sample results met hold times.

2.6.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The required quantitation limit was exceeded for nitrite and fluoride in all samples where these analytes were not detected. The validation criteria do not require that these results be qualified. Other nondetect anion results met the required quantitation limit.

2.7. DATA VALIDATION REPORT FOR TOTAL PHENOLS (METHOD 9066)

Table 2-13 is a summary of the validated results for analysis of total phenols.

Table 2-13. Summary of Total Phenols Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	RQL	Q	V	Reason
0811L056-001	G025	W	08LPL018	5.0	µg /L	5	U		
0811L056-002	G026	W	08LPL018	5.0	µg /L	5	U		
0811L056-003	G027	W	08LPL018	5.0	µg /L	5	U		
0811L072-001	G028	W	08LPL018	5.0	µg /L	5	U		
0811L072-002	G029	W	08LPL018	5.0	µg /L	5	U		
0811L072-003	G030	W	08LPL018	5.0	µg /L	5	U		
0811L083-001	G031	W	08LPL018	5.0	µg /L	5	U		
0811L083-002	G032	W	08LPL018	5.0	µg /L	5	U		

Conc. - concentration
RQL - required quantitation limit
Q - laboratory qualifier
V - validation qualifier
W - water

2.7.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-14 shows the number of each type of sample in each preparation batch.

Table 2-14. Total Phenols Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	DUP	MS	Sample
08LPL018	W	1	2	1	1	8

DUP - duplicate
LCS - laboratory control sample
MB - method blank
MS - matrix spike
W - water

Total phenol analysis was performed in one batch. The batch contained fewer than 20 field samples. At least one MB, LCS, MS, and DUP were analyzed in the batch. All requirements for frequency of QC sample analysis were achieved.

2.7.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for total phenol analysis by method 9066 is specified in VET-1405-PLN-03, Rev. 0, as 28 days. All results were generated within these limits.

2.7.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for total phenol. Detection limits for phenols were 5 µg/L for water samples.

2.8. DATA VALIDATION REPORT FOR POLYCHLORINATED BIPHENYL COMPOUNDS (METHOD 8082)

Results for seven Aroclors (Aroclor-1016, Aroclor-1221, Aroclor-1232, Aroclor-1242, Aroclor-1248, Aroclor-1254, Aroclor-1260) were requested for each of the 8 samples in this group. The table listing the results is not included here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM for the analytical results for anions, as well as the flags applied during validation and the reasons for the flags.

2.8.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each field sample and each QC sample?
- Was precision checked with an MSD?

Table 2-15 shows the number of each type of sample in each preparation batch.

Table 2-15. PCB Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	Analyte	CAS	MB	LCS	MS	MSD	Surr	Sample
08LE0609	W	Aroclor-1016	12674-11-2	1	1	1	1		8
08LE0609	W	Aroclor-1221	11104-28-2	1					8
08LE0609	W	Aroclor-1232	11141-16-5	1					8
08LE0609	W	Aroclor-1242	53469-21-9	1					8

Table 2-15. PCB Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	Analyte	CAS	MB	LCS	MS	MSD	Surr	Sample
08LE0609	W	Aroclor-1248	12672-29-6	1					8
08LE0609	W	Aroclor-1254	11097-69-1	1					8
08LE0609	W	Aroclor-1260	11096-82-5	1	1	1	1		8
08LE0609	W	Decachlorobiphenyl	2051-24-3					12	
08LE0609	W	Tetrachloro-m-xylene	877-09-8					12	

CAS - Chemical Abstracts System
LCS - laboratory control sample
MB - method blank
MS - matrix spike
MSD - matrix spike duplicate
PCB - polycholorinated biphenyl
Surr - Surrogate
W - water

PCB analysis was performed on one batch of water samples. This batch contained fewer than 20 field samples. A MB, LCS, MS and MSD were analyzed in the batch. The LCS and MS/MSD contained at least Aroclor-1016 and Aroclor-1260

Surrogates were added to and analyzed in every sample, LCS, MB, MS, and MSD.

2.8.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for PCB analysis by method 8082 are specified in VET-1405-PLN-03, Rev. 0, as 14 days for water samples. U.S. Environmental Protection Agency (SW-846, Chapter 2) lists the holding time limit to extraction of PCBs as 7 days for water samples. Method 8082 indicates that samples should be analyzed within 40 days after extraction. The SW-846 limits of 7 days to extraction and 40 days after extraction to analysis were used.

All sample results met the holding time limits.

2.8.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The required quantiation limits (VET-1405-PLN-03, Rev. 0) are 1 µg/L in groundwater samples. All results were nondetects. Detection limits met the requirements.

2.9. DATA VALIDATION REPORT FOR VOLATILE ORGANIC COMPOUNDS (METHOD 8260)

Eighty compounds were requested for each of the 8 samples in this group. Results were reported in the EDDs for the 78 compounds that the laboratory commonly reports. The remaining two, 1,4-difluorobenzene and tetrahydrofuran, are not expected to be detected regularly. The laboratory is performing a spectral search for those, and is reporting the results for any that are detected in the data package narrative.

The table listing the results is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM.

2.9.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each sample and each batch QC sample?
- Was precision checked with a MSD or DUP?

The sample batches for volatile organic analysis are outlined in Table 2-16.

Table 2-16. VOA Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	MS	MSD	Surr	Sample
08LVG197	W	1	1	1	1	15	11

LCS - laboratory control sample
MB - method blank
MS - matrix spike
MSD - matrix spike duplicate
Surr - Surrogate
VOA - volatile organic analysis
W - water

Volatile organic analysis was performed in one batch of water samples. This batch contained fewer than 20 field samples. Results for 78 compounds were reported for each of the 11 samples (including trip blanks). A MB result was reported for each of the 78 compounds in the batch. A LCS containing 48 of the compounds of interest was prepared and analyzed with the batch. There were one MS and MSD included in the batch.

Surrogates (1,2-dichloroethane-d4, bromofluorobenzene, and toluene-d8) were added to each sample, MB, LCS, MS, and MSD.

It should be noted that, as in previous reports, not all trip blanks were analyzed by the laboratory. Only one trip blank was analyzed per sample delivery group (SDG) and, since trip blanks did not have unique field identifiers, there is no way to know which chain of custody (COC) contained the analyzed trip blank. Results were not reported for three of the six trip blanks delivered to the laboratory.

2.9.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for volatile organic analysis by method 8260B are specified in VET-1405-PLN-03, Rev. 0, as 14 days for water samples. All results were generated within this limit.

2.9.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The RQLs (VET-1405-PLN-03, Rev. 0) for all VOCs are 5 µg/L for water samples.

Of 858 results reported, 198 were nondetects exceeding the required detection limit of 5 µg/L. Detection limit exceedances are not required to be qualified. Most of the exceedances were reported at 10 µg/L which is an industry norm for water volatile organic analyses (VOAs).

2.10. DATA VALIDATION REPORT FOR SEMIVOLATILE ORGANIC COMPOUNDS (METHOD 8270C)

Eighty-five SVOCs were requested for the 8 samples in this group. Semi-volatile organic analysis (SVOA) results were reported in the EDDs for the 69 of these compounds that the laboratory commonly reports. Of the 16 SVOCs requested, but not reported by method 8270C, 1,2-dichlorobenzene, 1,3-dichlorobenzene and 1,4-dichlorobenzene, are reported as VOCs (method 8260B). For the remaining 13 (2,6-dimethylnaphthalene, 1,6,7-trimethylnaphthalene, 1-methyl-9H-fluorene, dibenzothiophene, 2-methylphenanthrene, 1-methylphenanthrene, 4,6-dimethyldibenzothiophene, 3,6-dimethylphenanthrene, 2-methylfluoranthene, retene, 5-methylchrysene, benzo(e)pyrene, and perylene) the laboratory is performing a spectral search, and is reporting the results for any that are detected in the data package narrative.

The table listing the analytical results and the results of the validation for SVOCs is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM.

2.10.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each sample and each batch QC sample?
- Was precision checked with a MSD or DUP?

Table 2-17 the numbers of QC and field samples analyzed in each batch.

Table 2-17. SVOA Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	MS	MSD	Surr	Sample
08LE0605	W	1	2			6	3
08LE0607	W	1	1			7	5

LCS - laboratory control sample
MB - method blank
MS - matrix spike
MSD - matrix spike duplicate
Surr - Surrogate
SVOA - semi-volatile organic analysis
W - water

Semivolatile organic analysis was performed in two batches. Each batch contained fewer than 20 field samples. A MB result was reported for each of the reported compounds in every batch.

A LCS was reported in every batch for every requested analyte except 1,1-biphenyl. The LCS is not required to contain all compounds of interest. Therefore, no results were qualified for missing LCS.

No MS, MSD or DUP results were obtained for either batch. Due to the missing QC samples, data were qualified as estimated and flagged with "J" for detects and "UJ" for nondetects. Three results were rejected because they are aldol condensate TICs that are instrument artifacts. All bis(2-ethylhexyl)phthalate results were flagged "UJ" despite being detects. Bis(2-ethylhexyl)phthalate is a common laboratory contaminant.

Surrogates (2,4,6-tribromophenol, 2-fluorobiphenyl, 2-fluorophenol, nitrobenzene-d5, phenol-d5, p-terphenyl-d14) were added to each sample, MB, and LCS.

2.10.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for SVOA by method 8270C are specified in VET-1405-PLN-03, Rev. 0. The holding time to extraction is 7 days for water samples. Forty additional days after extraction are allowed to complete the analysis. All results were generated within the holding time limits.

2.10.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The required detection limits in water samples are 0.2 µg/L for polycyclic aromatic hydrocarbons and 5 µg/L for other analytes. None of the nondetect results met these requirements. However, the validation rules do not require qualification of the results.

Environmental Quality Management, Inc.

EQM-DVAL-USE-008, Rev. 0

Data Verification and Data Validation of US Ecology Site Data, Chains of Custody 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, and 96

Submitted to:

Vista Engineering

Date:
January 30, 2009

VISTA
ENGINEERING TECHNOLOGIES

EXECUTIVE SUMMARY

Samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for volatile organic compounds by method TO-15.

All analyses were performed by Southwest Research Institute (SwRI), San Antonio, Texas, following the *Specification for Analytical Laboratory Services: Select Soil Gas Volatiles by Method TO-15* (VET-1405-SPEC-01, Rev. 3). In addition to printed data packages for each sample delivery group, the laboratory provided electronic data deliverables (EDDs), consisting of two Microsoft® Excel files containing tables of results and associated quality control (QC).

This data validation report presents the results of validating the analyses reported in the third group of EDDs prepared by the laboratory. This group of EDDs provided the results and QC data for the samples delivered to the laboratory under the chain-of custody documents listed in Table ES-1.

Table ES-1. Chains Of Custody Applicable To The Data Validated In This Report.

VET-1405-COC-086	VET-1405-COC-087	VET-1405-COC-088
VET-1405-COC-089	VET-1405-COC-090	VET-1405-COC-091
VET-1405-COC-092	VET-1405-COC-093	VET-1405-COC-094
VET-1405-COC-095	VET-1405-COC-096	

COC - chain of custody

The data validation was performed using an electronic data checker to evaluate whether batch QC met criteria. The electronic data checker identified any QC results that exceed applicable criteria. The data validation process was completed by the data validation chemist, who evaluated the impacts of the exceedances and added data validation qualifiers.

One tentatively identified compound (TIC) was rejected as column bleed.

Table ES-2 summarizes the validation result.

Table ES-2. Summary Validation Results by Analysis.

Analysis	Number of Results	Number of Qualified Results	Summary
TO-15	2526	1	One silane result was rejected as column bleed.

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ACRONYMS

CAS	Chemical Abstracts Service
COC	chain of custody
DUP	duplicate sample (laboratory duplicate)
EDD	electronic data deliverable
LCS	laboratory control sample
MB	method blank
QC	quality control
SwRI	Southwest Research Institute
TIC	tentatively identified compound
VOC	volatile organic compound

Data Validation Applied Qualifiers

R	Indicates the compound was analyzed for, and due to an identified QC deficiency, the data are unusable.

1. INTRODUCTION – APPROACH TO VALIDATION

Soil gas samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for volatile organic compounds (VOCs) by method TO-15.

All analyses were conducted by Southwest Research Institute (SwRI), San Antonio, Texas, following the *Specification for Analytical Laboratory Services: Select Soil Gas Volatiles by Method TO-15* (VET-1405-SPEC-01, Rev. 3). The results of these analyses were presented in a printed data package for each sample delivery group. In addition, the laboratory provided an electronic data deliverable (EDD) for each sample delivery group. The EDDs were Microsoft® Excel files containing tables of results and associated quality control (QC).

This data validation report presents the results of validating the analyses reported in the third group of EDDs received from the laboratory. This group of EDDs and the corresponding chain-of-custody documents are identified in Table 1-1 below. The data contained in these EDDs included the analysis of VOCs by TO-15, only.

Table 1-1. Chains of Custody and Electronic Data Deliverables Applicable to the Data Validated.

Chain of Custody	EDD	
	File Name	Date Received
VET-1405-COC-086	355200.xls	1/13/2009
VET-1405-COC-087	355200.xls; 355206.xls	1/13/2009
VET-1405-COC-088	355200.xls	1/13/2009
VET-1405-COC-089	355200.xls	1/13/2009
VET-1405-COC-090	355200.xls	1/13/2009
VET-1405-COC-091	355200.xls; 355206.xls	1/13/2009
VET-1405-COC-092	355206.xls	1/13/2009
VET-1405-COC-093	355206.xls	1/13/2009
VET-1405-COC-094	355206.xls	1/13/2009
VET-1405-COC-095	355206.xls	1/13/2009
VET-1405-COC-096	355206.xls	1/13/2009

EDD - electronic data deliverable

This Level A validation was performed in a two-tiered approach.

1. Completeness: an assessment of the completeness was made on the pdf file of the "hard copy" data.
2. Electronic holding time evaluation.

The approach is summarized in Table 1-2. The electronic review was performed on all incoming EDDs. The EDDs were evaluated to assure consistency with the hard copy data. By using electronic review of all QC, appropriate qualification of all the data can be made.

Table 1-2. Data Validation and Verification Approach.

Review item	Manually Done	Electronic	All Samples
Verification of deliverables	X		X
Requested vs reported analyses		X	X
Holding times		X	X

The remainder of this report consists of the details for data validation of Method TO-15 data. It explains the details of the overall validation process and provides reasons for any data qualifiers that were applied. The automated data validation process determined whether the following facets of laboratory quality control had been achieved.

- Was a method blank (MB) analyzed each day?
- Were surrogates added to each sample and batch QC samples for each method where surrogates are required?
- Was precision checked with a field duplicate (DUP)?
- Were holding time requirements for preparation and analysis satisfied?

After this automated checking, the “no” answers to these questions were investigated manually, the effect on each sample result was determined, and the results were qualified according to the validation rules in TO-15 DV #1, Rev. 0. TO-15 DV#1 was written to validate TO-15 data for Levels A and C for the US Ecology project. It is based on *Data Validation Procedure for Chemical Analyses* (HNF-20433). The evaluations of the automated checking results that were determined to have a potential impact on data quality were appropriately qualified and are presented in the remainder of this report.

2. DATA VALIDATION REPORT

2.1. DATA VALIDATION REPORT FOR VOLATILE ORGANIC COMPOUNDS (METHOD TO-15)

Fifty-seven compounds were requested for each of the 43 samples in this group. All 57 compounds were reported in the EDDs for each sample.

The table listing the results is too large to include here; refer to the Microsoft® Excel file on the accompanying CD-ROM.

2.1.1. Batch Size and Completeness of QC Analysis

QC Requirements --

- Was a MB analyzed each day?
- Were surrogates added to each sample and batch QC samples for each method where surrogates are required?
- Was precision checked with a field duplicate?

Analysis was performed in two batches of vapor samples. Batch 355200 contained 20 samples and 2 blanks. Batch 355206 contained 23 samples and 4 blanks. Because a blank was analyzed on each day that samples were analyzed, QC requirements were met for batches 355200 and 355206.

There were two field duplicates analyzed for the 41 samples that were submitted by Vista. This satisfies method field duplicate requirements.

Though it is not required by the method, a laboratory control sample (LCS) was analyzed on each day as required by VET-1405-SPEC-01, Rev. 3. This LCS contained 16 of the analytes of interest.

Surrogates are required for MB and LCS. Though not required by the method, surrogates (1,2-dichloroethane-d4, bromofluorobenzene, and toluene-d8) were added to each sample, as well as the MB and LCS.

2.1.2. Holding Times

QC Requirement --

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for volatile organic analysis by method TO-15 are specified in VET-1405-PLN-03, Rev. 0, as 30 days for summa canisters. All sample analytical results were generated within this limit.

2.2. Tentatively Identified Compounds (TIC)

Per the VET-1405-SPEC-001, Table 1, many compounds were listed as tentatively identified compounds (TICs). TICs are compounds that are identified by comparison with a mass spectral libraray. No standards are run on the gas chromatograph/mass spectrometer for TICs. The quantitiy is estimated by ratioing the concentration to the nearest internal standard. None of the TICs listed in VET-1405-SPEC-001, Table 1, were identified in these samples.

However, other TICs were identified. The second sheet of the accompanying Microsoft® Excel file lists the TICs and their estimated concentrations. One of the TICs is silane, difluorodimethyl- Chemical Abstract Service (CAS) #353-66-2. Silanes are typically due to column bleed of the instrument or from the column used in the instrument. This was identified once and is an instrument artifact. The one silane result was rejected.

Because TICs are not calibrated and are impractical to calibrate, only those with many repeated hits in multiple samples should be considered further. Three compounds were identified in more than four samples. Table 2-1 lists these compounds that were frequently identified.

Table 2-1. Frequently Identified TICs and Estimated Concentrations.

Compound	CAS	Present in X Number of Samples
2-Ethyl-1-hexanol	104-76-7	4
1,2-Dichloro-1,1,2-Trifluoro-Ethane	354-23-4	20
Chlorotrifluoroethene	79-38-9	25
Dichlorofluoromethane	75-43-4	4
Isobutane	75-28-5	15
Hexafluoropropene	116-15-4	4

CAS - Chemical Abstracts Service TIC - tentatively identified compound

Environmental Quality Management, Inc.

EQM-DVAL-USE-009, Rev. 0

Data Verification and Data Validation of US Ecology Site Data, Chains of Custody 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, and 113

Submitted to:

Vista Engineering

Date:
April 2, 2009

VISTA
ENGINEERING TECHNOLOGIES

EXECUTIVE SUMMARY

Samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for volatile organic compounds by method TO-15.

All analyses were performed by Southwest Research Institute (SwRI), San Antonio, Texas, following the *Specification for Analytical Laboratory Services: Select Soil Gas Volatiles by Method TO-15* (VET-1405-SPEC-01, Rev. 3). In addition to printed data packages for each sample delivery group, the laboratory provided electronic data deliverables (EDDs), consisting of two Microsoft® Excel files containing tables of results and associated quality control (QC).

This data validation report presents the results of validating the analyses reported in the fourth group of EDDs prepared by the laboratory. This group of EDDs provided the results and QC data for the samples delivered to the laboratory under the chain-of custody documents listed in Table ES-1.

Table ES-1. Chains Of Custody Applicable To The Data Validated In This Report.

VET-1405-COC-103	VET-1405-COC-104	VET-1405-COC-105
VET-1405-COC-106	VET-1405-COC-107	VET-1405-COC-108
VET-1405-COC-109	VET-1405-COC-110	VET-1405-COC-111
VET-1405-COC-112	VET-1405-COC-113	

COC - chain of custody

The data validation was performed using an electronic data checker to evaluate whether batch QC met criteria. The electronic data checker identified any QC results that exceed applicable criteria. The data validation process was completed by the data validation chemist, who evaluated the impacts of the exceedances and added data validation qualifiers.

One tentatively identified compound (TIC) was rejected as column bleed.

Table ES-2 summarizes the validation result.

Table ES-2. Summary Validation Results by Analysis.

Analysis	Number of Results	Number of Qualified Results	Summary
TO-15	2777	1	One silane result was rejected as column bleed.

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ACRONYMS

CAS	Chemical Abstracts Service
COC	Chain of Custody
DUP	Duplicate Sample (laboratory duplicate)
EDD	Electronic Data Deliverable
LCS	Laboratory Control Sample
MB	Method Blank
QC	Quality Control
SwRI	Southwest Research Institute
TIC	Tentatively Identified Compound
VOC	Volatile Organic Compound

SwRI Qualifiers

D	This flag indicates the result was from a dilution
E	This flag indicates compounds whose concentrations exceeded the calibration range
J	This flag indicates an estimated value
NJ	Indicates presumptive evidence of a compound. Indicates an estimated value , where a 1:1 response is assumed
U	Indicates compound was analyzed for, but not detected

Data Validation Applied Qualifiers

R	Indicates the compound was analyzed for, and due to an identified QC deficiency, the data are unusable.

1. INTRODUCTION – APPROACH TO VALIDATION

Soil gas samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for volatile organic compounds (VOCs) by method TO-15.

All analyses were conducted by Southwest Research Institute (SwRI), San Antonio, Texas, following the *Specification for Analytical Laboratory Services: Select Soil Gas Volatiles by Method TO-15* (VET-1405-SPEC-01, Rev. 3). The results of these analyses were presented in a printed data package for each sample delivery group. In addition, the laboratory provided an electronic data deliverable (EDD) for each sample delivery group. The EDDs were Microsoft® Excel files containing tables of results and associated quality control (QC).

This data validation report presents the results of validating the analyses reported in the fourth group of EDDs received from the laboratory. This group of EDDs and the corresponding chain-of-custody documents are identified in Table 1-1 below. The data contained in these EDDs included the analysis of VOCs by TO-15, only.

Table 1-1. Chains of Custody and Electronic Data Deliverables Applicable to the Data Validated.

Chain of Custody	EDD	
	File Name	Date Received
VET-1405-COC-103	365127.xls	3/18/2009
VET-1405-COC-104	365127.xls	3/18/2009
VET-1405-COC-105	365127.xls	3/18/2009
VET-1405-COC-106	365127.xls	3/18/2009
VET-1405-COC-107	365127.xls	3/18/2009
VET-1405-COC-108	365285.xls	3/18/2009
VET-1405-COC-109	365285.xls	3/18/2009
VET-1405-COC-110	365285.xls	3/18/2009
VET-1405-COC-111	365285.xls	3/18/2009
VET-1405-COC-112	365285.xls	3/18/2009
VET-1405-COC-113	365285.xls	3/18/2009

EDD - electronic data deliverable

This Level A validation was performed in a two-tiered approach.

1. Completeness: an assessment of the completeness was made on the .pdf file of the "hard copy" data.
2. Electronic holding time evaluation.

The approach is summarized in Table 1-2. The electronic review was performed on all incoming EDDs. The EDDs were evaluated to assure consistency with the hard copy data. By using electronic review of all QC, appropriate qualification of all the data can be made.

Table 1-2. Data Validation and Verification Approach.

Review item	Manually Done	Electronic	All Samples
Verification of deliverables	X		X
Requested vs reported analyses		X	X
Holding times		X	X

The remainder of this report consists of the details for data validation of Method TO-15 data. It explains the details of the overall validation process and provides reasons for any data qualifiers that were applied. The automated data validation process determined whether the following facets of laboratory quality control had been achieved.

- Was a method blank (MB) analyzed each day?
- Were surrogates added to each sample and batch QC samples for each method where surrogates are required?
- Was precision checked with a field duplicate (DUP)?
- Were holding time requirements for preparation and analysis satisfied?

After this automated checking, the “no” answers to these questions were investigated manually, the effect on each sample result was determined, and the results were qualified according to the validation rules in TO-15 DV #1, Rev. 0. TO-15 DV#1 was written to validate TO-15 data for Levels A and C for the US Ecology project. It is based on *Data Validation Procedure for Chemical Analyses* (HNF-20433). The evaluations of the automated checking results that were determined to have a potential impact on data quality were appropriately qualified and are presented in the remainder of this report.

2. DATA VALIDATION REPORT

2.1. DATA VALIDATION REPORT FOR VOLATILE ORGANIC COMPOUNDS (METHOD TO-15)

Fifty-seven compounds were requested for each of the 43 samples in this group. All 57 compounds were reported in the EDDs for each sample. Per emails from R. Holm and P, Piccini, Vista sample V158 was not analyzed because it was received with the valve stuck in the open position. The location was resampled. The sample number for the replacement sample was V175.

Note samples V152 and V162 had all results reported twice, diluted and undiluted. For decision making purposes, it is recommended that the greater of two detected results be used. If one result is a detect and one is a nondetect, it is recommended that the positive result be used.

The table listing the results is too large to include here; refer to the Microsoft® Excel file on the accompanying CD-ROM.

2.1.1. Batch Size and Completeness of QC Analysis

QC Requirements --

- Was a MB analyzed each day?
- Were surrogates added to each sample and batch QC samples for each method where surrogates are required?
- Was precision checked with a field duplicate?

Analysis was performed in two batches of vapor samples. Batch 365127 contained 20 samples and 2 blanks. Batch 365285 contained 23 samples and 4 blanks. Because a blank was analyzed on each day that samples were analyzed, QC requirements were met for batches 365127 and 365285.

There were two field duplicates analyzed for the 41 samples that were submitted by Vista. This satisfies method field duplicate requirements.

Though it is not required by the method, a laboratory control sample (LCS) was analyzed on each day as required by VET-1405-SPEC-01, Rev. 3. This LCS contained 16 of the analytes of interest.

Surrogates are required for MB and LCS. Though not required by the method, surrogates (1,2-dichloroethane-d4, bromofluorobenzene, and toluene-d8) were added to each sample, as well as the MB and LCS.

2.1.2. Holding Times

QC Requirement --

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for volatile organic analysis by method TO-15 are specified in VET-1405-PLN-03, Rev. 0, as 30 days for summa canisters. All sample analytical results were generated within this limit.

2.2. Tentatively Identified Compounds (TIC)

Per the VET-1405-SPEC-001, Table 1, many compounds were listed as tentatively identified compounds (TICs). TICs are compounds that are identified by comparison with a mass spectral library. No standards are run on the gas chromatograph/mass spectrometer for TICs. The quantitiy is estimated by ratioing the concentration to the nearest internal standard. None of the TICs listed in VET-1405-SPEC-001, Table 1, were identified in these samples.

However, other TICs were identified. The second sheet of the accompanying Microsoft® Excel file lists the TICs and their estimated concentrations. One of the TICs is silane, difluorodimethyl- Chemical Abstract Service (CAS) #353-66-2. Silanes are typically due to column bleed of the instrument or from the column used in the instrument. This was identified once and is an instrument artifact. The one silane result was rejected.

Because TICs are not calibrated and are impractical to calibrate, only those with many repeated hits in multiple samples should be considered further. Fourteen compounds were identified in four or more samples. Table 2-1 lists these compounds that were frequently identified.

Table 2-1. Frequently Identified TICs and Estimated Concentrations.

Compound	CAS	Present in X Number of Samples
1-Propene, 2-methyl-	115-11-7	35
2,4-Dimethyl-1-heptene	19549-87-2	4
2-Propanol, 2-methyl-	75-65-0	4
Butanoic acid, heptafluoro-, ethyl	356-27-4	4
Ethane, 1,2-dichloro-1,1,2-trifluoro	354-23-4	37
Ethanol	64-17-5	21
Ethene, chlorotrifluoro-	79-38-9	40
Heptane, hexadecafluoro-	335-57-9	7
Hexane, tetradecafluoro-	355-42-0	6
Isobutane	75-28-5	42
Methane, dichlorofluoro-	75-43-4	9
Oxetane, 2,2-dimethyl-	6245-99-4	4
Perfluoro[1,2-bis(tetrahydrofuryl)ethane]	1000222-75-5	7
Propane, 2-ethoxy-2-methyl-	637-92-3	4

CAS - Chemical Abstracts Service TIC - tentatively identified compound

Environmental Quality Management, Inc.

EQM-DVAL-USE-010, Draft, Rev. 0

Data Verification and Data Validation of US Ecology Site Data, Chains of Custody 97, 98, 99, 100, 101, and 102

Submitted to:

Vista Engineering

Date:
June 24, 2009

VISTA
ENGINEERING TECHNOLOGIES

EXECUTIVE SUMMARY

Samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, volatile organic compounds, semi-volatile organic compounds, and polychlorinated biphenyls.

All analyses were conducted by Lionville Laboratory, Inc., Lionville, Pennsylvania, (LVL) following the *Specification for Analytical Laboratory Services: Soil and Water Analysis* (VET-1405-SPEC-03, Rev. 1). In addition to printed data packages for each sample delivery group, the laboratory provided electronic data deliverables (EDDs), consisting of a number of Microsoft® Excel files containing tables of results and associated quality control (QC) data.

This data validation report presents the results of validating the analyses reported in the EDDs prepared by the laboratory for the fifth quarter groundwater samples. This group of EDDs provided the results and QC data for the samples delivered to the laboratory under the chain-of custody documents listed in Table ES-1.

Table ES-1. Chains Of Custody Applicable To The Data Validated In This Report.

VET-1405-COC-097	VET-1405-COC-098	VET-1405-COC-099
VET-1405-COC-100	VET-1405-COC-101	VET-1405-COC-102

COC - chain of custody

The data validation was performed using an electronic data checker to evaluate whether batch QC met criteria. The electronic data checker identifies any QC results that exceed applicable criteria. The data validation process is completed by the data validation chemist, who evaluates the impacts of the exceedances and adds data validation qualifiers.

Three nitrite, two phosphate, and seven PCB nondetect results were rejected due to hold times missed by greater than twice the limit

Table ES-2 summarizes the validation results by analysis.

Table ES-2. Summary Validation Results by Analysis. (2 Pages)

Analysis	Number of Results	Number of Qualified Results	Summary
Metals	232	0	No results were qualified.
Mercury	8	5	Mercury was not detected in the samples. Results were qualified as estimated due to missed hold times.
Chromium (VI)	8	3	Three results were qualified as estimated due to missed hold times.

Table ES-2. Summary Validation Results by Analysis. (2 Pages)

Analysis	Number of Results	Number of Qualified Results	Summary
Cyanide	8	0	Cyanide was not detected in the samples. No data were qualified.
Sulfide	8	0	Sulfide was not detected in any samples. No results were qualified.
Anions	56	9	Three nitrate and one phosphate results were qualified as estimated due to missed hold times. Three nitrite and two phosphate nondetect results were rejected due to missed hold times by greater than twice the limit.
Total phenols	8	0	Phenols were not detected in any samples. No data were qualified.
PCBs	58	7	PCBs were not detected in any samples. Seven results (from one sample) were rejected due to missed hold times.
VOCs	858	0	No results were qualified.
SVOCs	625	0	No data were qualified.

PCB - polychlorinated biphenyl VOC - volatile organic compound
SVOC - semi-volatile organic compound

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ACRONYMS

BLK	Blank (column heading)
CAS	Chemical Abstracts Service (column heading)
COC	chain of custody
Conc.	concentration (column heading)
DUP	Duplicate sample (laboratory duplicate)
EDD	electronic data deliverable
ICP	inductively coupled plasma
LCS	laboratory control sample
LVL	Lionville Laboratory, Lionville, Pennsylvania
MB	method blank
MS	matrix spike
MSD	matrix spike duplicate
PCB	polychlorinated biphenyl
Q	Laboratory qualifier (column heading)
QC	quality control
RPD	relative percent difference
RQL	required quantitation limit
Surr	surrogate (column heading)
SVOA	semi-volatile organic analysis
SVOC	semi-volatile organic compound
V	Validation qualifier (column heading)
VOA	volatile organic analysis
VOC	volatile organic compound
W	water

Lionville Qualifiers

U	Analyte was analyzed for but not detected; the associated quantitation limit is given
J	The reported value is estimated
B	The analyte is found in the associated blank as well as in the sample
D	The result is reported from a dilution

Data Validation Applied Qualifiers

J	Indicates the compound was analyzed for and detected in the sample. The associated concentration is an estimate, but the data are usable for decision making purposes
UJ	The constituent was analyzed for ans was not detected. Due to a QC deficiency identified during data validation, the value reported may not accurately reflect the minimum detection limit. The data should be considered usable for decision-making purposes.
UR	Indicates that the constituent was analyzed for and not detected; however, due to an identified QC deficiency, the data should be considered unusable for decision-making purposes.

1. INTRODUCTION – APPROACH TO VALIDATION

Groundwater samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and polychlorinated biphenyls (PCBs).

All analyses were conducted by Lionville Laboratory, Inc., Lionville, Pennsylvania (LVL), following the *Specification for Analytical Laboratory Services: Soil and Water Analysis* (VET-1405-SPEC-03, Rev. 1). The results of these analyses were presented in a pdf file data package for each sample delivery group. In addition, the laboratory provided an electronic data deliverable (EDD) for each sample delivery group. The EDDs are Microsoft Excel® files containing tables of results and associated quality control (QC) data.

This data validation report presents the results of validating the analyses reported in the EDDs received from the laboratory that include the fifth quarter groundwater samples. This group of EDDs and the corresponding chain-of-custody documents are identified in Table 1-1 below. The data contained in these EDDs includes the analysis of metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, VOCs, SVOCs, and PCBs.

Table 1-1. Chains of Custody and Electronic Data Deliverables Applicable to the Data Validated.

Chain of Custody	EDD	
	File Name	Date Received
VET-1405-COC-097	0902034.xls, VistaEDD_Addons.xls	5/15/2009, 5/29/2009
VET-1405-COC-098	0902034.xls, VistaEDD_Addons.xls	5/15/2009, 5/29/2009
VET-1405-COC-099	0902039.xls, VistaEDD_Addons.xls	5/15/2009, 5/29/2009
VET-1405-COC-100	0902057.xls, VistaEDD_Addons.xls	5/15/2009, 5/29/2009
VET-1405-COC-101	0902057.xls, VistaEDD_Addons.xls	5/15/2009, 5/29/2009
VET-1405-COC-102	0902057.xls, VistaEDD_Addons.xls	5/15/2009, 5/29/2009

EDD - electronic data deliverable

In accordance with VET-1405-PLN-03, Rev. 0, the data were validated using *Data Validation Procedure for Chemical Analyses* (HNF-20433). This validation was performed to Level A (as described in HNF-20433) using a two-tiered approach:

1. Completeness: an assessment of the completeness as made on the pdf files of the "hard copy" data.

2. Electronic holding time and detection limit evaluation.

The approach is summarized in Table 1-2. The electronic review was performed on all incoming EDDs. The EDDs were evaluated to assure consistency with the hard copy data. By using electronic review of all QC, appropriate qualification of all the data can be made.

Table 1-2. Level A Data Validation and Verification Approach.

Review item	Manually Done	Electronic	All Samples
Verification of deliverables	X		X
Requested vs reported analyses		X	X
Holding times		X	X
Detection Limits		X	X

The remainder of this report consists of several chapters, with each chapter providing the details for data validation of a particular method of analysis. Most chapters begin with a summary table of the analytical results validated and the validation qualifiers that have been applied. These tables are also provided in an accompanying Microsoft Excel® file along with any summary tables that were too large to include in this data validation report. The remainder of each chapter explains the details of the validation process and provides reasons for any data qualifiers that may have been applied. The automated data validation process determines whether the following facets of laboratory quality control were achieved:

- Were there 20 or fewer samples in each preparation batch?
- Were a method blank (MB), a laboratory control sample (LCS), and a matrix spike sample (MS) prepared with each batch of samples?
- Were surrogates added to each sample and batch QC samples for each method where surrogates are required?
- Was precision checked with a matrix spike duplicate (MSD) or sample duplicate (DUP)?
- Were holding time requirements for preparation and analysis satisfied?
- Did the quantitation limit for nondetect results meet the required detection limit?

After this automated checking, the "no" answers to these questions were investigated manually, the effect on each sample result was determined, and the results were qualified according to the validation rules in *Data Validation Procedure for Chemical Analyses* (HNF-20433). These evaluations are presented on the following pages.

Please note laboratory data qualifiers are defined in the "Lionville Qualifiers" table that follows the table of contents. EQM, Inc. checks laboratory qualifiers for consistency with validation qualifiers, but does not edit or change laboratory qualifiers in any way.

2. DATA VALIDATION REPORTS

2.1. DATA VALIDATION REPORT FOR ICP METALS (METHOD 6010B)

Results for 29 metals (aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, molybdenum, nickel, potassium, selenium, silicon, silver, sodium, strontium, thallium, tin, titanium, uranium, vanadium and zinc) were requested for each of the 8 samples in this group. The table listing the results is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM for the analytical results for inductively coupled plasma (ICP) metals, as well as the flags applied during validation and the reasons for the flags.

2.1.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-1 shows the number of each type of sample in each preparation batch.

Table 2-1. ICP Metals Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
L903071	W	Aluminum	7429-90-5	1	1	1	1	1	8
L903071	W	Iron	7439-89-6	1	1	1	1	1	8
L903071	W	Lead	7439-92-1	1	1	1	1	1	8
L903071	W	Magnesium	7439-95-4	1	1	1	1	1	8
L903071	W	Manganese	7439-96-5	1	1	1	1	1	8
L903071	W	Molybdenum	7439-98-7	1	1	1	1	1	8
L903071	W	Nickel	7440-02-0	1	1	1	1	1	8
L903071	W	Potassium	7440-09-7	1	1	1	1	1	8
L903071	W	Silicon	7440-21-3	1	1	2	1	1	8
L903071	W	Silver	7440-22-4	1	1	1	1	1	8
L903071	W	Sodium	7440-23-5	1	1	1	1	1	8
L903071	W	Strontium	7440-24-6	1	1	1	1	1	8
L903071	W	Thallium	7440-28-0	1	1	1	1	1	8
L903071	W	Tin	7440-31-5	1	1	1	1	1	8
L903071	W	Titanium	7440-32-6	1	1	1	1	1	8
L903071	W	Antimony	7440-36-0	1	1	1	1	1	8
L903071	W	Arsenic	7440-38-2	1	1	1	1	1	8
L903071	W	Barium	7440-39-3	1	1	1	1	1	8
L903071	W	Beryllium	7440-41-7	1	1	1	1	1	8
L903071	W	Boron	7440-42-8	1	1	1	1	1	8
L903071	W	Cadmium	7440-43-9	1	1	1	1	1	8
L903071	W	Chromium	7440-47-3	1	1	1	1	1	8

Table 2-1. ICP Metals Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
L903071	W	Cobalt	7440-48-4	1	1	1	1	1	8
L903071	W	Copper	7440-50-8	1	1	1	1	1	8
L903071	W	Uranium	7440-61-1	1	1	1	1	1	8
L903071	W	Vanadium	7440-62-2	1	1	1	1	1	8
L903071	W	Zinc	7440-66-6	1	1	1	1	1	8
L903071	W	Calcium	7440-70-2	1	1	1	1	1	8
L903071	W	Selenium	7782-49-2	1	1	1	1	1	8

CAS - Chemical Abstracts Service
DUP - duplicate
ICP - inductively coupled plasma
LCS - laboratory control sample
MB - method blank
MS - matrix spike
MSD - matrix spike duplicate
W - water

ICP metals analysis was performed in one batch. The batch had fewer than 20 field samples. All analytes were included in the batch. The batch had at least one MB, DUP, LCS, MS and MSD. All accuracy and precision frequency requirements were met for the metals batch.

Note silicon has two LCS samples due to being reanalyzed at a 12-fold dilution.

No data were qualified for missing QC samples.

2.1.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for ICP metals analysis by method 6010B are specified in VET-1405-PLN-03, Rev. 0, as 180 days from sampling to analysis. All results were generated within these limits.

2.1.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The required quantitation limits (RQLs) (VET-1405-PLN-03, Rev. 0) are shown in Table 2-2.

Table 2-2. Required Quantitation Limit for ICP Metals. (2 Pages)

Analyte	Water (µg/L)
Aluminum	50
Antimony	40
Arsenic	50
Barium	5
Beryllium	5
Boron	50

Table 2-2. Required Quantitation Limit for ICP Metals. (2 Pages)

Analyte	Water (µg/L)
Cadmium	5
Calcium	50
Chromium	5
Cobalt	5
Copper	5
Iron	50
Lead	50
Magnesium	50
Manganese	10
Molybdenum	5
Nickel	10
Potassium	500
Selenium	50
Silicon	50
Silver	10
Sodium	50
Strontium	5
Thallium	50
Tin	50
Titanium	10
Uranium	5
Vanadium	5
Zinc	10

ICP - inductively coupled plasma

The quantitation limit for uranium nondetect results exceeded the RQL at 15 ug/L. Each of the uranium results for the fifth quarter were nondetect.

All other quantitation limits for nondetect results met the required detection limits.

2.2. DATA VALIDATION REPORT FOR MERCURY (METHOD 7470A)

Table 2-3 is a summary of the validated results for mercury.

Table 2-3. Summary of Mercury Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0902034-01	G033	W	L903024	0.0600	µg/L	0.2	U	UJ	Hold time
0902034-02	G034	W	L903024	0.0600	µg/L	0.2	U	UJ	Hold time
0902034-03	G035	W	L903024	0.0600	µg/L	0.2	U	UJ	Hold time
0902039-01	G036	W	L903024	0.0600	µg/L	0.2	U	UJ	Hold time
0902039-02	G037	W	L903024	0.0600	µg/L	0.2	U	UJ	Hold time

Table 2-3. Summary of Mercury Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0902057-01	G038	W	L903024	0.0600	µg/L	0.2	U		
0902057-02	G039	W	L903024	0.0600	µg/L	0.2	U		
0902057-03	G040	W	L903024	0.0600	µg/L	0.2	U		

Conc. - concentration
RQL - required quantitation limit
Q - laboratory qualifier
V - validation flag
W - water

2.2.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-4 shows the number of each type of sample in each preparation batch.

Table 2-4. Mercury Preparation Batch Summary.

Batch ID	Matrix	BLK	DUP	LCS	MS	MSD	Sample
L903024	W	1	1	1	1	1	8

BLK - blank
DUP - duplicate
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
W - water

Mercury analysis was performed in one batch. Each batch contained fewer than 20 field samples. The batch included a method blank, LCS, duplicate, MS and MSD. The number of QC samples met batch criteria.

2.2.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for mercury analysis by method 7470A is specified in VET-1405-PLN-03, Rev. 0, as 28 days.

Samples in SDGs 0902034 and 0902039 were analyzed 35 and 34 days after sampling, respectively. All mercury results in these SDGs were qualified as estimated and flagged “UJ”.

2.2.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The RQL (VET-1405-PLN-03, Rev. 0) is shown in Table 2-5.

Table 2-5. Required Quantitation Limit for Mercury.

Analyte	Water (µg/L)
Mercury	0.05

None of the quantitation limits for the nondetect results met the required detection limit. Per *Data Validation Procedure for Chemical Analyses* (HNF-20433, Rev.0), no data were qualified.

2.3. DATA VALIDATION REPORT FOR HEXAVALENT CHROMIUM (METHOD 7196A)

Table 2-6 is a summary of the validated results for hexavalent chromium.

Table 2-6. Summary of Hexavalent Chromium Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0902L034-001	G033	W	09LVI005	0.065	mg/L	0.02			
0902L034-002	G034	W	09LVI005	0.068	mg/L	0.02			
0902L034-003	G035	W	09LVI005	0.077	mg/L	0.02			
0902L039-001	G036	W	09LVI006	0.20	mg/L	0.02			
0902L039-002	G037	W	09LVI006	0.020	mg/L	0.02	U		
0902L057-001	G038	W	09LVI005	0.032	mg/L	0.02		J	Hold time
0902L057-002	G039	W	09LVI005	0.030	mg/L	0.02		J	Hold time
0902L057-003	G040	W	09LVI005	0.09	mg/L	0.02		J	Hold time

Conc. - concentration
Q - laboratory qualifier
RQL - required quantitation limit
V - validator flag
W - water

2.3.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, and a MS sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-7 shows the number of each type of sample in each preparation batch.

Table 2-7. Hexavalent Chromium Preparation Batch Summary.

Batch ID	Matrix	BLK	LCS	DUP	MS	MSD	Sample
09LVI005	W	1	3	1	1		6
09LVI006	W	1	2				2

BLK - blank
DUP - duplicate
LCS - laboratory control sample
MS - matrix spike
MSD - matrix spike duplicate
W - water

Hexavalent chromium analysis was performed in two batches. Each batch contained fewer than 20 field samples. At least one MB and LCS were analyzed in each sample batch. One batch also included a duplicate and a MS. The sampling plan requires one MS and one MSD or duplicate per every 20 samples. Therefore, QC sample frequency requirements were met.

2.3.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for chromium (VI) analysis by method 7196A is specified in VET-1405-PLN-03, Rev. 0, as one day for water samples. Samples 0902L057-001 (G038), 0902L057-002 (G039), 0902L057-003 (G040) and the matrix spike sample were analyzed two days after sampling. The results for the samples were qualified as estimated and flagged with "J". The MS did not require qualification for missed hold time.

All other results were generated within the holding time limit.

2.3.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for chromium (VI). The quantitation limit for the one nondetect result was 0.02 mg/L.

2.4. DATA VALIDATION REPORT FOR CYANIDE (METHOD 9014)

Table 2-8 is a summary of the validated results for cyanide.

Table 2-8. Summary of Cyanide Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0902L034-001	G033	W	09LC009	5.00	µg/L	5	U		
0902L034-002	G034	W	09LC009	5.00	µg/L	5	U		
0902L034-003	G035	W	09LC009	5.00	µg/L	5	U		
0902L039-001	G036	W	09LC011	5.00	µg/L	5	U		
0902L039-002	G037	W	09LC011	5.00	µg/L	5	U		
0902L057-001	G038	W	09LC010	5.00	µg/L	5	U		
0902L057-002	G039	W	09LC010	5.00	µg/L	5	U		
0902L057-003	G040	W	09LC010	5.00	µg/L	5	U		

Conc. - concentration
RQL - required quantitation limit
Q - laboratory qualifier
V - validation qualifier
W - water

2.4.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?

- Was precision checked with a MSD or DUP?

Table 2-9 shows the number of each type of sample in each preparation batch.

Table 2-9. Cyanide Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	DUP	MS	Sample
09LC009	W	1	2			3
09LC010	W	1	2	1	1	3
09LC011	W	1	2			2

DUP - duplicate
LCS - laboratory control sample
MB - method blank
MS - matrix spike
W - water

Cyanide analysis was performed in three batches of samples. Each batch contained fewer than 20 field samples. At least one MB and LCS were analyzed in each sample batch. One batch had an MS and DUP included. The sampling plan requires that there be one MS and MSD or DUP per every 20 field samples. Accuracy and precision frequency requirements were met. All other QC requirements were met.

2.4.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for cyanide analysis by method 9014 is specified in VET-1405-PLN-03, Rev. 0, as 14 days. All results were generated within these limits.

2.4.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for cyanide. Cyanide was not detected in any of the samples. Detection limits were 5 µg/L for water samples.

2.5. DATA VALIDATION REPORT FOR SULFIDE (METHOD 9034)

Table 2-10 is a summary of the validated results for sulfide.

Table 2-10. Summary of Sulfide Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0902L034-001	G033	W	09LSD003	1.0	mg/L	1	U		
0902L034-002	G034	W	09LSD003	1.0	mg/L	1	U		
0902L034-003	G035	W	09LSD003	1.0	mg/L	1	U		
0902L039-001	G036	W	09LSD004	1.0	mg/L	1	U		
0902L039-002	G037	W	09LSD004	1.0	mg/L	1	U		
0902L057-001	G038	W	09LSD005	1.0	mg/L	1	U		
0902L057-002	G039	W	09LSD005	1.0	mg/L	1	U		

Table 2-10. Summary of Sulfide Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0902L057-003	G040	W	09LSD005	1.0	mg/L	1	U		

Conc. - concentration
RQL - required quantitation limit
Q - laboratory qualifier
V - validation qualifier
W - water

2.5.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-11 shows the number of each type of sample in each preparation batch.

Table 2-11. Sulfide Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	DUP	MS	Sample
09LSD003	W	1	2			3
09LSD004	W	1	2			2
09SD005	W	1	2	1	1	3

DUP - duplicate
LCS - laboratory control sample
MB - method blank
MS - matrix spike
W - water

Sulfide analysis was performed in three batches. Each batch contained fewer than 20 field samples. At least one MB and LCS were analyzed in each sample batch. One batch also included a duplicate and a MS. The sampling plan requires one MS and one dupliate for every 20 field samples. These numbers satisfy all requirements for frequency of QC sample analysis.

2.5.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for sulfide analysis by method 9034 are specified in VET-1405-PLN-03, Rev. 0, as 7 days. All results were generated within these limits.

2.5.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for sulfide. The detection limit was 1 mg/L for all samples.

2.6. DATA VALIDATION REPORT FOR ANIONS (METHOD 9056)

Results for six anions (chloride, fluoride, nitrate, nitrite, phosphate, and sulfate) were requested for each of the 8 samples in this group. Table 2-12 is a summary of the validation for anions. Note that results for bromide were reported by the laboratory, but were not required by the sampling and analysis plan. Bromide results are listed in Table 2-12, but were not validated.

Table 2-12. Summary of Anions Validation. (3 pages)

Lab ID	Client ID	Matrix	Analyte	CAS	Batch ID	Conc.	Units	EQL	Q	V	Reason
0902L034-001	G033	W	Bromide by IC	24959-67-9	09LIC004	0.25	mg/L	0.25	U		
0902L034-001	G033	W	Chloride by IC	16887-00-6	09LIC004	9.2	mg/L	0.25			
0902L034-001	G033	W	Fluoride by IC	16984-48-8	09LIC004	0.30	mg/L	0.25			
0902L034-001	G033	W	Nitrate by IC	14797-55-8	09LIC004	17.7	mg/L	1.25			
0902L034-001	G033	W	Nitrite by IC	14797-65-0	09LIC004	0.25	mg/L	0.25	U		
0902L034-001	G033	W	Phosphate by IC	14265-44-2	09LIC004	0.25	mg/L	0.25	U		
0902L034-001	G033	W	Sulfate by IC	14808-79-8	09LIC004	22.4	mg/L	1.2			
0902L034-002	G034	W	Bromide by IC	24959-67-9	09LIC004	0.25	mg/L	0.25	U		
0902L034-002	G034	W	Chloride by IC	16887-00-6	09LIC004	8.6	mg/L	0.25			
0902L034-002	G034	W	Fluoride by IC	16984-48-8	09LIC004	0.33	mg/L	0.25			
0902L034-002	G034	W	Nitrate by IC	14797-55-8	09LIC004	16.0	mg/L	1.25			
0902L034-002	G034	W	Nitrite by IC	14797-65-0	09LIC004	0.25	mg/L	0.25	U		
0902L034-002	G034	W	Phosphate by IC	14265-44-2	09LIC004	0.25	mg/L	0.25	U		
0902L034-002	G034	W	Sulfate by IC	14808-79-8	09LIC004	22.5	mg/L	1.2			
0902L034-003	G035	W	Bromide by IC	24959-67-9	09LIC004	0.25	mg/L	0.25	U		
0902L034-003	G035	W	Chloride by IC	16887-00-6	09LIC004	8.6	mg/L	0.25			
0902L034-003	G035	W	Fluoride by IC	16984-48-8	09LIC004	0.27	mg/L	0.25			
0902L034-003	G035	W	Nitrate by IC	14797-55-8	09LIC004	16.4	mg/L	1.25			
0902L034-003	G035	W	Nitrite by IC	14797-65-0	09LIC004	0.25	mg/L	0.25	U		

Table 2-12. Summary of Anions Validation. (3 pages)

Lab ID	Client ID	Matrix	Analyte	CAS	Batch ID	Conc.	Units	EQL	Q	V	Reason
0902L034-003	G035	W	Phosphate by IC	14265-44-2	09LIC004	0.25	mg/L	0.25	U		
0902L034-003	G035	W	Sulfate by IC	14808-79-8	09LIC004	22.8	mg/L	1.2			
0902L039-001	G036	W	Bromide by IC	24959-67-9	09LIC004	0.25	mg/L	0.25	U		
0902L039-001	G036	W	Chloride by IC	16887-00-6	09LIC004	8.6	mg/L	0.25			
0902L039-001	G036	W	Fluoride by IC	16984-48-8	09LIC004	0.28	mg/L	0.25			
0902L039-001	G036	W	Nitrate by IC	14797-55-8	09LIC004	16.4	mg/L	1.25			
0902L039-001	G036	W	Nitrite by IC	14797-65-0	09LIC004	0.25	mg/L	0.25	U		
0902L039-001	G036	W	Phosphate by IC	14265-44-2	09LIC004	0.25	mg/L	0.25	U		
0902L039-001	G036	W	Sulfate by IC	14808-79-8	09LIC004	22.7	mg/L	1.2			
0902L039-002	G037	W	Bromide by IC	24959-67-9	09LIC004	0.25	mg/L	0.25	U		
0902L039-002	G037	W	Chloride by IC	16887-00-6	09LIC004	8.7	mg/L	0.25			
0902L039-002	G037	W	Fluoride by IC	16984-48-8	09LIC004	0.31	mg/L	0.25			
0902L039-002	G037	W	Nitrate by IC	14797-55-8	09LIC004	16.0	mg/L	1.25			
0902L039-002	G037	W	Nitrite by IC	14797-65-0	09LIC004	0.25	mg/L	0.25	U		
0902L039-002	G037	W	Phosphate by IC	14265-44-2	09LIC004	0.25	mg/L	0.25	U		
0902L039-002	G037	W	Sulfate by IC	14808-79-8	09LIC004	22.2	mg/L	1.2			
0902L057-001	G038	W	Bromide by IC	24959-67-9	09LIC006	1.2	mg/L	1.2	U		
0902L057-001	G038	W	Chloride by IC	16887-00-6	09LIC006	6.5	mg/L	1.2			
0902L057-001	G038	W	Fluoride by IC	16984-48-8	09LIC006	1.2	mg/L	1.2	U		

Table 2-12. Summary of Anions Validation. (3 pages)

Lab ID	Client ID	Matrix	Analyte	CAS	Batch ID	Conc.	Units	EQL	Q	V	Reason
0902L057-001	G038	W	Nitrate by IC	14797-55-8	09LIC006	15.8	mg/L	1.25		J	Hold time
0902L057-001	G038	W	Nitrite by IC	14797-65-0	09LIC006	1.25	mg/L	1.25	U	UR	Hold time
0902L057-001	G038	W	Phosphate by IC	14265-44-2	09LIC006	0.25	mg/L	0.25	U	UR	Hold time
0902L057-001	G038	W	Sulfate by IC	14808-79-8	09LIC006	22.2	mg/L	1.2			
0902L057-002	G039	W	Bromide by IC	24959-67-9	09LIC006	1.2	mg/L	1.2	U		
0902L057-002	G039	W	Chloride by IC	16887-00-6	09LIC006	6.6	mg/L	1.2			
0902L057-002	G039	W	Fluoride by IC	16984-48-8	09LIC006	1.2	mg/L	1.2	U		
0902L057-002	G039	W	Nitrate by IC	14797-55-8	09LIC006	16.2	mg/L	1.25		J	Hold time
0902L057-002	G039	W	Nitrite by IC	14797-65-0	09LIC006	1.25	mg/L	1.25	U	UR	Hold time
0902L057-002	G039	W	Phosphate by IC	14265-44-2	09LIC006	0.58	mg/L	0.25		J	Hold time
0902L057-002	G039	W	Sulfate by IC	14808-79-8	09LIC006	22.4	mg/L	1.2			
0902L057-003	G040	W	Bromide by IC	24959-67-9	09LIC006	1.2	mg/L	1.2	U		
0902L057-003	G040	W	Chloride by IC	16887-00-6	09LIC006	7.2	mg/L	1.2			
0902L057-003	G040	W	Fluoride by IC	16984-48-8	09LIC006	1.2	mg/L	1.2	U		
0902L057-003	G040	W	Nitrate by IC	14797-55-8	09LIC006	17.9	mg/L	1.25		J	Hold time
0902L057-003	G040	W	Nitrite by IC	14797-65-0	09LIC006	1.25	mg/L	1.25	U	UR	Hold time

Table 2-12. Summary of Anions Validation. (3 pages)

Lab ID	Client ID	Matrix	Analyte	CAS	Batch ID	Conc.	Units	EQL	Q	V	Reason
0902L057-003	G040	W	Phosphate by IC	14265-44-2	09LIC006	0.25	mg/L	0.25	U	UR	Hold time
0902L057-003	G040	W	Sulfate by IC	14808-79-8	09LIC006	22.9	mg/L	1.2			

CAS - Chemical Abstracts System
Conc. - concentration
RQL - required quantitation limit
Q - laboratory qualifier
V - validation qualifier
W - water

2.6.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-13 shows the number of each type of sample in each preparation batch.

Table 2-13. Anion Preparation Batch Summary.

Batch ID	Matrix	Analyte	CAS	MB	LCS	DUP	MS	Sample
09LIC004	W	Phosphate by IC	14265-44-2	1	1			5
09LIC004	W	Nitrate by IC	14797-55-8	1	1			5
09LIC004	W	Nitrite by IC	14797-65-0	1	1			5
09LIC004	W	Sulfate by IC	14808-79-8	1	1			5
09LIC004	W	Chloride by IC	16887-00-6	1	1			5
09LIC004	W	Fluoride by IC	16984-48-8	1	1			5
09LIC004	W	Bromide by IC	24959-67-9	1	1			5
09LIC006	W	Phosphate by IC	14265-44-2	1	1	1	1	3
09LIC006	W	Nitrate by IC	14797-55-8	1	1	1	1	3
09LIC006	W	Nitrite by IC	14797-65-0	1	1	1	1	3
09LIC006	W	Sulfate by IC	14808-79-8	1	1	1	1	3
09LIC006	W	Chloride by IC	16887-00-6	1	1	1	1	3
09LIC006	W	Fluoride by IC	16984-48-8	1	1	1	1	3
09LIC006	W	Bromide by IC	24959-67-9	1	1	1	1	3

CAS - Chemical Abstracts System
DUP - duplicate
LCS - laboratory control sample
MB - method blank
MS - matrix spike
W - water

As shown in Table 2-13, anion analysis was performed on eight samples in two batches for each anion. Each batch contained fewer than 20 field samples. At least one MB and one LCS were analyzed in each sample batch.

The sampling plan requires one MS and one DUP be analyzed for every 20 field samples. There were eight samples between the two anion batches and one MS and one DUP for those eight samples. Thus, the intent of the sampling plan was met and accuracy and precision frequency requirements were met for these batches.

2.6.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for analysis of water samples by method 9056 is specified in VET-1405-PLN-03, Rev. 0, as 48 hours. The nitrate, nitrite, and phosphate results for samples 09L02057-001 (G038), 09L02057-002 (G039) and 09L02057-003 (G040) were obtained nine days, greater

than twice the hold time, after collection. Per the validation, all detected results were qualified as estimated and flagged "J". All nondetect results were rejected and flagged "UR".

All other sample results met hold times.

2.6.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The required detection limit (VET-1405-PLN-3, Rev. 0) for anions in water was 0.1 mg/L The required quantitation limit was exceeded for nitrite and fluoride in all samples where these analytes were not detected. The validation criteria do not require that these results be qualified. Other nondetect anion results met the required quantitation limit.

2.7. DATA VALIDATION REPORT FOR TOTAL PHENOLS (METHOD 9066)

Table 2-14 is a summary of the validated results for analysis of total phenols.

Table 2-14. Summary of Total Phenols Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0902L034-001	G033	W	09LPL001	5.0	µg/L	5	U		
0902L034-002	G034	W	09LPL001	5.0	µg/L	5	U		
0902L034-003	G035	W	09LPL001	5.0	µg/L	5	U		
0902L039-001	G036	W	09LPL001	5.0	µg/L	5	U		
0902L039-002	G037	W	09LPL001	5.0	µg/L	5	U		
0902L057-001	G038	W	09LPL001	5.0	µg/L	5	U		
0902L057-002	G039	W	09LPL001	5.0	µg/L	5	U		
0902L057-003	G040	W	09LPL001	5.0	µg/L	5	U		

Conc. - concentration
RQL - required quantitation limit
Q - laboratory qualifier
V - validation qualifier
W - water

2.7.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-15 shows the number of each type of sample in each preparation batch.

Table 2-15. Total Phenols Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	DUP	MS	Sample
09LPL001	W	1	2	1	1	8

DUP - duplicate
LCS - laboratory control sample
MB - method blank
MS - matrix spike
W - water

Total phenol analysis was performed in one batch. The batch contained fewer than 20 field samples. At least one MB, LCS, MS, and DUP were analyzed in the batch. All requirements for QC sample analysis were achieved.

2.7.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for total phenol analysis by method 9066 is specified in VET-1405-PLN-03, Rev. 0, as 28 days. All results were generated within these limits.

2.7.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for total phenol. Detection limits for phenols were 5 µg/L for all samples.

2.8. DATA VALIDATION REPORT FOR POLYCHLORINATED BIPHENYL COMPOUNDS (METHOD 8082)

Results for seven Aroclors (Aroclor-1016, Aroclor-1221, Aroclor-1232, Aroclor-1242, Aroclor-1248, Aroclor-1254, Aroclor-1260) were requested for each of the 8 samples in this group. Table 2-16 is a summary of the validation for polychlorinated biphenyl compounds.

Table 2-16. Summary of Anions Validation. (2 pages)

Lab ID	Client ID	Matrix	Analyte	CAS	Batch ID	Conc.	Units	EQL	Q	V	Reason
0902034-01	G033	W	Aroclor 1016	12674-11-2	L903143	0.400	µg/L	0.4	U	UR	Hold time
0902034-01	G033	W	Aroclor 1221	11104-28-2	L903143	0.400	µg/L	0.4	U	UR	Hold time
0902034-01	G033	W	Aroclor 1232	11141-16-5	L903143	0.400	µg/L	0.4	U	UR	Hold time
0902034-01	G033	W	Aroclor 1242	53469-21-9	L903143	0.400	µg/L	0.4	U	UR	Hold time
0902034-01	G033	W	Aroclor 1248	12672-29-6	L903143	0.400	µg/L	0.4	U	UR	Hold time
0902034-01	G033	W	Aroclor 1254	11097-69-1	L903143	0.400	µg/L	0.4	U	UR	Hold time
0902034-01	G033	W	Aroclor 1260	11096-82-5	L903143	0.400	µg/L	0.4	U	UR	Hold time
0902034-02	G034	W	Aroclor 1016	12674-11-2	L902116	0.10	µg/L	0.4	U		
0902034-02	G034	W	Aroclor 1221	11104-28-2	L902116	0.10	µg/L	0.4	U		
0902034-02	G034	W	Aroclor 1232	11141-16-5	L902116	0.10	µg/L	0.4	U		
0902034-02	G034	W	Aroclor 1242	53469-21-9	L902116	0.10	µg/L	0.4	U		
0902034-02	G034	W	Aroclor 1248	12672-29-6	L902116	0.10	µg/L	0.4	U		
0902034-02	G034	W	Aroclor 1254	11097-69-1	L902116	0.10	µg/L	0.4	U		
0902034-02	G034	W	Aroclor 1260	11096-82-5	L902116	0.10	µg/L	0.4	U		
0902034-03	G035	W	Aroclor 1016	12674-11-2	L902116	0.10	µg/L	0.4	U		
0902034-03	G035	W	Aroclor 1221	11104-28-2	L902116	0.10	µg/L	0.4	U		
0902034-03	G035	W	Aroclor 1232	11141-16-5	L902116	0.10	µg/L	0.4	U		
0902034-03	G035	W	Aroclor 1242	53469-21-9	L902116	0.10	µg/L	0.4	U		
0902034-03	G035	W	Aroclor 1248	12672-29-6	L902116	0.10	µg/L	0.4	U		
0902034-03	G035	W	Aroclor 1254	11097-69-1	L902116	0.10	µg/L	0.4	U		
0902034-03	G035	W	Aroclor 1260	11096-82-5	L902116	0.10	µg/L	0.4	U		
0902039-01	G036	W	Aroclor 1016	12674-11-2	L902116	0.10	µg/L	0.4	U		
0902039-01	G036	W	Aroclor 1221	11104-28-2	L902116	0.10	µg/L	0.4	U		
0902039-01	G036	W	Aroclor 1232	11141-16-5	L902116	0.10	µg/L	0.4	U		
0902039-01	G036	W	Aroclor 1242	53469-21-9	L902116	0.10	µg/L	0.4	U		
0902039-01	G036	W	Aroclor 1248	12672-29-6	L902116	0.10	µg/L	0.4	U		
0902039-01	G036	W	Aroclor 1254	11097-69-1	L902116	0.10	µg/L	0.4	U		
0902039-01	G036	W	Aroclor 1260	11096-82-5	L902116	0.10	µg/L	0.4	U		
0902039-02	G037	W	Aroclor 1016	12674-11-2	L902116	0.10	µg/L	0.4	U		
0902039-02	G037	W	Aroclor 1221	11104-28-2	L902116	0.10	µg/L	0.4	U		
0902039-02	G037	W	Aroclor 1232	11141-16-5	L902116	0.10	µg/L	0.4	U		

Table 2-16. Summary of Anions Validation. (2 pages)

Lab ID	Client ID	Matrix	Analyte	CAS	Batch ID	Conc.	Units	EQL	Q	V	Reason
0902039-02	G037	W	Aroclor 1242	53469-21-9	L902116	0.10	µg/L	0.4	U		
0902039-02	G037	W	Aroclor 1248	12672-29-6	L902116	0.10	µg/L	0.4	U		
0902039-02	G037	W	Aroclor 1254	11097-69-1	L902116	0.10	µg/L	0.4	U		
0902039-02	G037	W	Aroclor 1260	11096-82-5	L902116	0.10	µg/L	0.4	U		
0902057-01	G038	W	Aroclor 1016	12674-11-2	L902161	0.10	µg/L	0.4	U		
0902057-01	G038	W	Aroclor 1221	11104-28-2	L902161	0.10	µg/L	0.4	U		
0902057-01	G038	W	Aroclor 1232	11141-16-5	L902161	0.10	µg/L	0.4	U		
0902057-01	G038	W	Aroclor 1242	53469-21-9	L902161	0.10	µg/L	0.4	U		
0902057-01	G038	W	Aroclor 1248	12672-29-6	L902161	0.10	µg/L	0.4	U		
0902057-01	G038	W	Aroclor 1254	11097-69-1	L902161	0.10	µg/L	0.4	U		
0902057-01	G038	W	Aroclor 1260	11096-82-5	L902161	0.10	µg/L	0.4	U		
0902057-02	G039	W	Aroclor 1016	12674-11-2	L902161	0.10	µg/L	0.4	U		
0902057-02	G039	W	Aroclor 1221	11104-28-2	L902161	0.10	µg/L	0.4	U		
0902057-02	G039	W	Aroclor 1232	11141-16-5	L902161	0.10	µg/L	0.4	U		
0902057-02	G039	W	Aroclor 1242	53469-21-9	L902161	0.10	µg/L	0.4	U		
0902057-02	G039	W	Aroclor 1248	12672-29-6	L902161	0.10	µg/L	0.4	U		
0902057-02	G039	W	Aroclor 1254	11097-69-1	L902161	0.10	µg/L	0.4	U		
0902057-02	G039	W	Aroclor 1260	11096-82-5	L902161	0.10	µg/L	0.4	U		
0902057-03	G040	W	Aroclor 1016	12674-11-2	L902161	0.10	µg/L	0.4	U		
0902057-03	G040	W	Aroclor 1221	11104-28-2	L902161	0.10	µg/L	0.4	U		
0902057-03	G040	W	Aroclor 1232	11141-16-5	L902161	0.10	µg/L	0.4	U		
0902057-03	G040	W	Aroclor 1242	53469-21-9	L902161	0.10	µg/L	0.4	U		
0902057-03	G040	W	Aroclor 1248	12672-29-6	L902161	0.10	µg/L	0.4	U		
0902057-03	G040	W	Aroclor 1254	11097-69-1	L902161	0.10	µg/L	0.4	U		
0902057-03	G040	W	Aroclor 1260	11096-82-5	L902161	0.10	µg/L	0.4	U		
0902057-03	G040	W	Aroclor 1262	37324-23-5	L902161	0.10	µg/L	0.4	U		
0902057-03	G040	W	Aroclor 1268	11100-14-4	L902161	0.10	µg/L	0.4	U		

CAS - Chemical Abstracts System
Conc. - concentration
RQL - required quantitation limit
Q - laboratory qualifier
V - validation qualifier
W - water

2.8.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each field sample and each QC sample?
- Was precision checked with an MSD?

Table 2-17 shows the number of each type of sample in each preparation batch.

Table 2-17. PCB Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	Analyte	CAS	MB	LCS	MS	MSD	Surr	Sample
L902116	W	Aroclor 1016	12674-11-2	2	4				4
L902116	W	Aroclor 1221	11104-28-2	2					4
L902116	W	Aroclor 1232	11141-16-5	2					4
L902116	W	Aroclor 1242	53469-21-9	2					4
L902116	W	Aroclor 1248	12672-29-6	2					4
L902116	W	Aroclor 1254	11097-69-1	2					4
L902116	W	Aroclor 1260	11096-82-5	2	4				4
L902116	W	Decachlorobiphenyl	2051-24-3					10	
L902116	W	Tetrachloro-meta-xylene	877-09-8					10	
L902161	W	Aroclor 1016	12674-11-2	1	1	1	1		3
L902161	W	Aroclor 1221	11104-28-2	1					3
L902161	W	Aroclor 1232	11141-16-5	1					3
L902161	W	Aroclor 1242	53469-21-9	1					3
L902161	W	Aroclor 1248	12672-29-6	1					3
L902161	W	Aroclor 1254	11097-69-1	1					3
L902161	W	Aroclor 1260	11096-82-5	1	1	1	1		3
L902161	W	Decachlorobiphenyl	2051-24-3					7	
L902161	W	Tetrachloro-meta-xylene	877-09-8					7	
L903143	W	Aroclor 1016	12674-11-2	1	2				1
L903143	W	Aroclor 1221	11104-28-2	1					1
L903143	W	Aroclor 1232	11141-16-5	1					1
L903143	W	Aroclor 1242	53469-21-9	1					1
L903143	W	Aroclor 1248	12672-29-6	1					1
L903143	W	Aroclor 1254	11097-69-1	1					1
L903143	W	Aroclor 1260	11096-82-5	1	2				1
L903143	W	Decachlorobiphenyl	2051-24-3					4	
L903143	W	Tetrachloro-meta-xylene	877-09-8					4	

CAS - Chemical Abstracts System
LCS - laboratory control sample
MB - method blank
MS - matrix spike
MSD - matrix spike duplicate
PCB - polycholorinated biphenyl
Surr - Surrogate
W - water

PCB analysis was performed on three batches of water samples. Each batch contained fewer than 20 field samples. Each batch contained ast least one MB and LCS. One batch also contained a MS/MSD pair, satisfying the SAP requirement of one duplicate or MSD for every 20 samples. In accordance with requirements of the analytical method, the LCS and MS/MSD contained at least Aroclor-1016 and Aroclor-1260

Surrogates were added to and analyzed in every sample, LCS, MB, MS, and MSD.

2.8.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for PCB analysis by method 8082 are specified in VET-1405-PLN-03, Rev. 0, as 14 days for water samples. U.S. Environmental Protection Agency (SW-846, Chapter 2) lists the holding time limit to extraction of PCBs as 7 days for water samples. Method 8082 indicates that samples should be analyzed within 40 days after extraction. The SW-846 limits of 7 days to extraction and 40 days after extraction to analysis were used.

Sample 0902034-001 (G033) was extracted 35 days, greater than twice the limit, after sampling. All results for this sample were nondetects and were rejected per the validation criteria.

All other results were generated within holding times.

2.8.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The required quantiation limits (VET-1405-PLN-03, Rev. 0) are 1 µg/L in groundwater samples. All results were nondetects. Detection limits met the requirements.

2.9. DATA VALIDATION REPORT FOR VOLATILE ORGANIC COMPOUNDS (METHOD 8260)

Eighty compounds were requested for each of the 8 samples in this group. Results were reported in the EDDs for the 78 compounds that the laboratory commonly reports. The remaining two, 1,4-difluorobenzene and tetrahydrofuran, are not expected to be detected regularly. The laboratory performed a spectral search for those, and, as reported in the data package narratives, none were found.

The table listing the results is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM.

2.9.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each sample and each batch QC sample?

- Was precision checked with a MSD or DUP?

The sample batches for volatile organic analysis are outlined in Table 2-18.

Table 2-18. VOA Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	MS	MSD	Surr	Sample
L903152	W	1	1	1	1	11	7
L903182	W	1	1	1	1	8	4

LCS - laboratory control sample
MB - method blank
MS - matrix spike
MSD - matrix spike duplicate
Surr - Surrogate
VOA - volatile organic analysis
W - water

Volatile organic analysis was performed in two batches of water samples. Each batch contained fewer than 20 field samples. Results for 78 compounds were reported for each of the 11 samples (including trip blanks). A MB result was reported for each of the 78 compounds in each batch. A LCS containing 48 of the compounds of interest was prepared and analyzed with each batch. There were one MS and MSD included in each batch.

Surrogates (1,2-dichloroethane-d4, bromofluorobenzene, and toluene-d8) were added to each sample, MB, LCS, MS, and MSD.

It should be noted, as in previous reports, not all trip blanks were analyzed by the laboratory. Only one trip blank was analyzed per sample delivery group (SDG) and, since trip blanks did not have unique field identifiers, there is no way to know which chain of custody (COC) contained the analyzed trip blank. Results were not reported for three of the six trip blanks delivered to the laboratory.

2.9.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for volatile organic analysis by method 8260B are specified in VET-1405-PLN-03, Rev. 0, as 14 days for water samples. All results were generated within this limit.

2.9.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The RQLs (VET-1405-PLN-03, Rev. 0) for all VOCs are 5 µg/L for water samples.

Of 858 results reported, 205 were nondetects exceeding the required detection limit of 5 µg/L. Detection limit exceedances are not required to be qualified. Most of the exceedances were reported at 10 µg/L which is an industry norm for water volatile organic analyses (VOAs).

2.10. DATA VALIDATION REPORT FOR SEMIVOLATILE ORGANIC COMPOUNDS (METHOD 8270C)

Eighty-five SVOCs were requested for the 8 samples in this group. Semi-volatile organic analysis (SVOA) results were reported in the EDDs for the 69 of these compounds that the laboratory commonly reports. Of the 16 SVOCs requested, but not reported by method 8270C, 1,2-dichlorobenzene, 1,3-dichlorobenzene and 1,4-dichlorobenzene are reported as VOCs (method 8260B). For the remaining 13 (2,6-dimethylnaphthalene, 1,6,7-trimethylnaphthalene, 1-methyl-9H-fluorene, dibenzothiophene, 2-methylphenanthrene, 1-methylphenanthrene, 4,6-dimethyldibenzothiophene, 3,6-dimethylphenanthrene, 2-methylfluoranthene, retene, 5-methylchrysene, benzo(e)pyrene, and perylene) the laboratory performed a spectral search, and, as reported in the data package narrative, none were found.

The table listing the analytical results and the results of the validation for SVOCs is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM.

2.10.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each sample and each batch QC sample?
- Was precision checked with a MSD or DUP?

Table 2-19 lists the numbers of QC and field samples analyzed in each batch.

Table 2-19. SVOA Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	MS	MSD	Surr	Sample
L902117	W	1	2			8	5
L902160	W	1	2	1	1	8	3

LCS - laboratory control sample
MB - method blank
MS - matrix spike
MSD - matrix spike duplicate
Surr - Surrogate
SVOA - semi-volatile organic analysis
W - water

Semivolatile organic analysis was performed in two batches. Each batch contained fewer than 20 field samples. A MB result was reported for each of the reported compounds in every batch.

A LCS was reported in every batch for every requested analyte except 1,1-biphenyl. The LCS is not required to contain all compounds of interest. Therefore, no results were qualified for missing LCS.

One batch contained a MS/MSD pair. The sampling plan requires one MS and MSD or DUP per every 20 samples. The intent of the sampling plan was met.

Surrogates (2,4,6-tribromophenol, 2-fluorobiphenyl, 2-fluorophenol, nitrobenzene-d5, phenol-d5, p-terphenyl-d14) were added to each sample, MB, and LCS.

2.10.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for SVOA by method 8270C are specified in VET-1405-PLN-03, Rev. 0. The holding time to extraction is 7 days for water samples. Forty additional days after extraction are allowed to complete the analysis. All results were generated within the holding time limits.

2.10.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The required detection limits in water samples are 0.2 µg/L for polycyclic aromatic hydrocarbons and 5 µg/L for other analytes. None of the nondetect results met these requirements. However, the validation rules do not require qualification of the results.

Environmental Quality Management, Inc.

EQM-DVAL-USE-011, Rev. 0

Data Verification and Data Validation of US Ecology Site Data, Chains of Custody 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, and 124

Submitted to:

Vista Engineering

Date:
July 22, 2009

VISTA
ENGINEERING TECHNOLOGIES

EXECUTIVE SUMMARY

Samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for volatile organic compounds by method TO-15.

All analyses were performed by Southwest Research Institute (SwRI), San Antonio, Texas, following the *Specification for Analytical Laboratory Services: Select Soil Gas Volatiles by Method TO-15* (VET-1405-SPEC-01, Rev. 3). In addition to printed data packages for each sample delivery group, the laboratory provided electronic data deliverables (EDDs), consisting of two Microsoft® Excel files containing tables of results and associated quality control (QC).

This data validation report presents the results of validating the analyses reported in the fifth group of EDDs prepared by the laboratory. This group of EDDs provided the results and QC data for the samples delivered to the laboratory under the chain-of custody documents listed in Table ES-1.

Table ES-1. Chains Of Custody Applicable To The Data Validated In This Report.

VET-1405-COC-114	VET-1405-COC-115	VET-1405-COC-116
VET-1405-COC-117	VET-1405-COC-118	VET-1405-COC-119
VET-1405-COC-120	VET-1405-COC-121	VET-1405-COC-122
VET-1405-COC-123	VET-1405-COC-124	

COC - chain of custody

The data validation was performed using an electronic data checker to evaluate whether batch QC met criteria. The electronic data checker identified any QC results that exceed applicable criteria. The data validation process was completed by the data validation chemist, who evaluated the impacts of the exceedances and added data validation qualifiers.

Table ES-2 summarizes the validation result. Four tentaively idenfied compounds (TICs) were rejected because these are siloxanes generated from column bleed in the GC/MS.

Table ES-2. Summary Validation Results by Analysis.

Analysis	Number of Results	Number of Qualified Results	Summary
TO-15	2549	4	Four TICs rejcted due to column bleed.

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ACRONYMS

CAS	Chemical Abstracts Service
COC	Chain of Custody
DUP	Duplicate Sample (field duplicate)
EDD	Electronic Data Deliverable
LCS	Laboratory Control Sample
MB	Method Blank
QC	Quality Control
SwRI	Southwest Research Institute
TIC	Tentatively Identified Compound
VOC	Volatile Organic Compound

SwRI Qualifiers

D	This flag indicates the result was from a dilution
E	This flag indicates compounds whose concentrations exceeded the calibration range
J	This flag indicates an estimated value
NJ	Indicates presumptive evidence of a compound. Indicates an estimated value , where a 1:1 response is assumed
U	Indicates compound was analyzed for, but not detected

Data Validation Applied Qualifiers

R	Indicates the compound was analyzed for, and due to an identified QC deficiency, the data are unusable.

1. INTRODUCTION – APPROACH TO VALIDATION

Soil gas samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for volatile organic compounds (VOCs) by method TO-15.

All analyses were conducted by Southwest Research Institute (SwRI), San Antonio, Texas, following the *Specification for Analytical Laboratory Services: Select Soil Gas Volatiles by Method TO-15* (VET-1405-SPEC-01, Rev. 3). The results of these analyses were presented in a printed data package for each sample delivery group. In addition, the laboratory provided an electronic data deliverable (EDD) for each sample delivery group. The EDDs were Microsoft® Excel files containing tables of results and associated quality control (QC).

This data validation report presents the results of validating the analyses reported in the fifth group of EDDs received from the laboratory. This group of EDDs and the corresponding chain-of-custody documents are identified in Table 1-1 below. The data contained in these EDDs included the analysis of VOCs by TO-15, only.

Table 1-1. Chains of Custody and Electronic Data Deliverables Applicable to the Data Validated.

Chain of Custody	EDD	
	File Name	Date Received
VET-1405-COC-114	379517.xls	6/30/2009
VET-1405-COC-115	379517.xls	6/30/2009
VET-1405-COC-116	379517.xls	6/30/2009
VET-1405-COC-117	379517.xls, 379529.xls	6/30/2009
VET-1405-COC-118	379517.xls	6/30/2009
VET-1405-COC-119	379517.xls, 379529.xls	6/30/2009
VET-1405-COC-120	379529.xls	6/30/2009
VET-1405-COC-121	379517.xls, 379529.xls	6/30/2009
VET-1405-COC-122	379529.xls	6/30/2009
VET-1405-COC-123	379529.xls	6/30/2009
VET-1405-COC-124	379529.xls	6/30/2009

EDD - electronic data deliverable

This Level A validation was performed in a two-tiered approach.

1. Completeness: an assessment of the completeness was made on the .pdf file of the "hard copy" data.
2. Electronic holding time evaluation.

The approach is summarized in Table 1-2. The electronic review was performed on all incoming EDDs. The EDDs were evaluated to assure consistency with the hard copy data. By using electronic review of all QC, appropriate qualification of all the data can be made.

Table 1-2. Data Validation and Verification Approach.

Review item	Manually Done	Electronic	All Samples
Verification of deliverables	X		X
Requested vs reported analyses		X	X
Holding times		X	X

The remainder of this report consists of the details for data validation of Method TO-15 data. It explains the details of the overall validation process and provides reasons for any data qualifiers that were applied. The automated data validation process determined whether the following facets of laboratory quality control had been achieved.

- Was a method blank (MB) analyzed each day?
- Were surrogates added to each sample and batch QC samples for each method where surrogates are required?
- Was precision checked with a field duplicate (DUP)?
- Were holding time requirements for preparation and analysis satisfied?

After this automated checking, the “no” answers to these questions were investigated manually, the effect on each sample result was determined, and the results were qualified according to the validation rules in TO-15 DV #1, Rev. 0. TO-15 DV#1 was written to validate TO-15 data for Levels A and C for the US Ecology project. It is based on *Data Validation Procedure for Chemical Analyses* (HNF-20433). The evaluations of the automated checking results that were determined to have a potential impact on data quality were appropriately qualified and are presented in the remainder of this report.

Please note laboratory data qualifiers are defined in the “SwRI Qualifiers” table that follows the table of contents. EQM, Inc. checks laboratory qualifiers for consistency with validation qualifiers, but does not edit or change laboratory qualifiers in any way.

2. DATA VALIDATION REPORT

2.1. DATA VALIDATION REPORT FOR VOLATILE ORGANIC COMPOUNDS (METHOD TO-15)

Fifty-seven compounds were requested for each of the 43 samples in this group. All 57 compounds were reported in the EDDs for each sample.

The table listing the results is too large to include here; refer to the Microsoft® Excel file on the accompanying CD-ROM.

2.1.1. Batch Size and Completeness of QC Analysis

QC Requirements --

- Was a MB analyzed each day?
- Were surrogates added to each sample and batch QC samples for each method where surrogates are required?
- Was precision checked with a field duplicate?

Analysis was performed in two batches of vapor samples. Batch 379517 contained 20 samples and 3 blanks. Batch 379529 contained 23 samples and 2 blanks. Because a blank was analyzed on each day that samples were analyzed, QC requirements were met for batches 379517 and 379529.

There were two field duplicates analyzed for the 41 samples that were submitted by Vista Engineering. This satisfies method field duplicate requirements.

Though it is not required by the method, a laboratory control sample (LCS) was analyzed on each day as required by VET-1405-SPEC-01, Rev. 3. This LCS contained 16 of the analytes of interest.

Surrogates are required for MB and LCS. Though not required by the method, surrogates (1,2-dichloroethane-d4, bromofluorobenzene, and toluene-d8) were added to each sample, as well as the MB and LCS.

2.1.2. Holding Times

QC Requirement --

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for volatile organic analysis by method TO-15 are specified in VET-1405-PLN-03, Rev. 0, as 30 days for summa canisters. All sample analytical results were generated within this limit.

2.2. Tentatively Identified Compounds (TIC)

Per the VET-1405-SPEC-001, Table 1, many compounds were listed as tentatively identified compounds (TICs). TICs are compounds that are identified by comparison with a mass spectral library. No standards are run on the gas chromatograph/mass spectrometer for TICs. The quantity is estimated by ratioing the concentration to the nearest internal standard. None of the TICs listed in VET-1405-SPEC-001, Table 1, were identified in these samples.

However, other TICs were identified. The second sheet of the accompanying Microsoft® Excel file lists the TICs and their estimated concentrations.

Because TICs are not calibrated and are impractical to calibrate, only those with many repeated hits in multiple samples should be considered further. Seven compounds were identified in five or more samples. Table 2-1 lists these compounds that were frequently identified.

Table 2-1. Frequently Identified TICs and Estimated Concentrations.

Compound	CAS	Present in X Number of Samples
1-Hexanol, 2-ethyl-	104-76-7	8
1-Propene, 2-methyl-	115-11-7	6
Ethane, 1,2-dichloro-1,1,2-trifluoro	354-23-4	31
Ethene, chlorotrifluoro-	79-38-9	30
Hexane, tetradecafluoro-	355-42-0	5
Isobutane	75-28-5	8
Methane, dichlorofluoro-	75-43-4	5

CAS - Chemical Abstracts Service TIC - tentatively identified compound

The following TICS in Table 2-2 are due to column bleed within the GC/MS system. The following are qualified as rejected because these are siloxanes generated from instrument background.

Table 2-2. TICs Rejected

Sample ID	Client ID	Matrix	Analyte	CAS	QC Batch ID	Conc.	Q	Units
379520	V179	V	P-TRIMETHYLSILYLOXYPHENYL-BIS(TRIM	100007-00-0	379517	14000	NJ	PPB (V/V)
379521	V180	V	BENZALDEHYDE, 2,5-BIS[(TRIMETHYLSI	56114-69-3	379517	32000	NJ	PPB (V/V)
380072	V217	V	BENZALDEHYDE, 2,5-BIS[(TRIMETHYLSI	56114-69-3	379529	1900	NJ	PPB (V/V)
380073	V218	V	BENZOIC ACID, 2-[(TRIMETHYLSILYL)O	3789-85-3	379529	1800	NJ	PPB (V/V)

Environmental Quality Management, Inc.

EQM-DVAL-USE-012, Rev. 0

Data Verification and Data Validation of US Ecology Site Data, Chains of Custody 125, 126, 127, 128, and 129

Submitted to:

Vista Engineering

Date:
September 25, 2009

VISTA
ENGINEERING TECHNOLOGIES

EXECUTIVE SUMMARY

Samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, volatile organic compounds, semi-volatile organic compounds, and polychlorinated biphenyls.

All analyses were conducted by Lionville Laboratory, Inc., Lionville, Pennsylvania, (LVL) following the *Specification for Analytical Laboratory Services: Soil and Water Analysis* (VET-1405-SPEC-03, Rev. 1). In addition to printed data packages for each sample delivery group, the laboratory provided electronic data deliverables (EDDs), consisting of a number of Microsoft® Excel files containing tables of results and associated quality control (QC) data.

This data validation report presents the results of validating the analyses reported in the EDDs prepared by the laboratory for the sixth quarter groundwater samples. This group of EDDs provided the results and QC data for the samples delivered to the laboratory under the chain of custody documents listed in Table ES-1.

Table ES-1. Chains Of Custody Applicable to the Data Validated in This Report.

VET-1405-COC-125	VET-1405-COC-126	VET-1405-COC-127
VET-1405-COC-128	VET-1405-COC-129	

COC - Chain of Custody

The data validation was performed using an electronic data checker to evaluate whether batch QC met criteria. The electronic data checker identifies any QC results that exceed applicable criteria. The data validation process is completed by the data validation chemist, who evaluates the impacts of the exceedances and adds data validation qualifiers.

A Level C validation, including spike sample and duplicate analysis, was performed on the metals, volatiles and semivolatiles due to a high number of failed QC reported in the analysis narrative. A Level A validation was performed for all other analyses.

Two nitrite and two phosphate nondetect results were rejected due to hold times missed by greater than twice the limit.

Aldol condensation products were rejected as instrument artifacts in the semivolatile validation.

Table ES-2 summarizes the validation results by analysis.

Table ES-2. Summary Validation Results by Analysis.

Analysis	Number of Results	Number of Qualified Results	Summary
Metals	232	0	No results were qualified.
Mercury	8	0	No results were qualified.
Chromium (VI)	8	4	Four results were qualified as estimated due to missed hold times.
Cyanide	8	0	Cyanide was not detected in the samples. No data were qualified.
Sulfide	8	0	Sulfide was not detected in any samples. No results were qualified.
Anions	56	14	Two nitrate, four nitrite and four phosphate results were qualified as estimated due to missed hold times. Two nitrite and two phosphate nondetect results were rejected due to missed hold times by greater than twice the limit.
Total phenols	8	0	Phenols were not detected in any samples. No data were qualified.
PCBs	58	0	PCBs were not detected in any samples. No data were qualified.
VOCs	780	10	Results for dichlorodifluoromethane were qualified due to low LCS, MS and MSD recoveries.
SVOCs	601	198	Results were qualified due to low LCS, MS, and MSD results as well as for high MS/MSD RPDs. Aldol condensation products were rejected as instrument artifacts.

PCB - Polychlorinated Biphenyl
VOC - Volatile Organic Compound
SVOC - Semi-Volatile Organic Compound

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ACRONYMS

BLK	Blank (column heading)
CAS	Chemical Abstracts Service (column heading)
COC	Chain of Custody
Conc.	Concentration (column heading)
Diff.	Difference (column heading)
DUP	Duplicate sample (laboratory duplicate)
EDD	Electronic Data Deliverable
ICP	Inductively Coupled Plasma
LCL	Lower Control Limit
LCS	Laboratory Control Sample
LVL	Lionville Laboratory, Lionville, Pennsylvania
MB	Method Blank
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PCB	Polychlorinated Biphenyl
Q	Laboratory Qualifier (column heading)
QC	Quality Control
RDL	Required Detection Limit
RPD	Relative Percent Difference
RQL	Required Quantitation Limit
SDG	Sample Delivery Group
Surr	Surrogate (column heading)
SVOA	Semi-Volatile Organic Analysis
SVOC	Semi-Volatile Organic Compound
UCL	Upper Control Limit
V	Validation Qualifier (column heading)
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound
W	Water

Lionville Qualifiers

U	Analyte was analyzed for but not detected; the associated quantitation limit is given
J	The reported value is estimated
B	The analyte is found in the associated blank as well as in the sample
D	The result is reported from a dilution

Data Validation Applied Qualifiers

J	Indicates the compound was analyzed for and detected in the sample. The associated concentration is an estimate, but the data are usable for decision making purposes
UJ	The constituent was analyzed for and was not detected. Due to a QC deficiency identified during data validation, the value reported may not accurately reflect the minimum detection limit. The data should be considered usable for decision-making purposes.
UR	Indicates that the constituent was analyzed for and not detected; however, due to an identified QC deficiency, the data should be considered unusable for decision-making purposes.

1. INTRODUCTION – APPROACH TO VALIDATION

Groundwater samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and polychlorinated biphenyls (PCBs).

All analyses were conducted by Lionville Laboratory, Inc., Lionville, Pennsylvania (LVL), following the *Specification for Analytical Laboratory Services: Soil and Water Analysis* (VET-1405-SPEC-03, Rev. 1). The results of these analyses were presented in a PDF file data package for each sample delivery group. In addition, the laboratory provided an electronic data deliverable (EDD) for each sample delivery group. The EDDs are Microsoft Excel® files containing tables of results and associated quality control (QC) data.

This data validation report presents the results of validating the analyses reported in the EDDs received from the laboratory that include the sixth quarter groundwater samples. This group of EDDs and the corresponding chain-of-custody documents are identified in Table 1-1 below. The data contained in these EDDs includes the analysis of metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, VOCs, SVOCs, and PCBs.

Table 1-1. Chains of Custody and Electronic Data Deliverables Applicable to the Data Validated.

Chain of Custody	EDD	
	File Name	Date Received
VET-1405-COC-125	0906055.xls	7/28/2009
VET-1405-COC-126	0906055.xls	7/28/2009
VET-1405-COC-127	0906055.xls	7/28/2009
VET-1405-COC-128	0906055.xls	7/28/2009
VET-1405-COC-129	0906059.xls	7/28/2009

EDD - Electronic Data Deliverable

In accordance with VET-1405-PLN-03, Rev. 0, the data were validated using *Data Validation Procedure for Chemical Analyses* (HNF-20433). This validation was performed to Level A (as described in HNF-20433) using a two-tiered approach:

1. Completeness: an assessment of the completeness as made on the PDF files of the "hard copy" data.
2. Electronic holding time and detection limit evaluation.

In addition to the Level A validation, Level C validation was performed on the metals, volatile and semivolatile data. Level C validation includes all aspects of a Level A validation with the addition of an electronic quality control data evaluation.

The approach is summarized in Table 1-2. The electronic review was performed on all incoming EDDs. The EDDs were evaluated to assure consistency with the hard copy data. By using electronic review of all QC, appropriate qualification of all the data can be made.

Table 1-2. Data Validation and Verification Approach.

Review item	Manually Done	Electronic	All Samples
Verification of deliverables	X		X
Requested vs. reported analyses		X	X
Holding times		X	X
Blank contamination[1]		X	X
Detection Limits		X	X
MS/MSD and LCS[1]		X	X
Surrogates[1]		X	X
Laboratory duplicates[1]		X	X

[1] Component of Level C validation, only.
LCS - Laboratory Control Sample
MS - Matrix Spike
MSD - Matrix Spike Duplicate

The remainder of this report consists of several chapters, with each chapter providing the details for data validation of a particular method of analysis. Most chapters begin with a summary table of the analytical results validated and the validation qualifiers that have been applied. These tables are also provided in an accompanying Microsoft® Excel file along with any summary tables that were too large to include in this data validation report. The remainder of each chapter explains the details of the validation process and provides reasons for any data qualifiers that may have been applied. The automated data validation process determines whether the following facets of laboratory quality control were achieved:

- Were there 20 or fewer samples in each preparation batch?
- Were a Method Blank (MB), a laboratory control sample (LCS), and a matrix spike sample (MS) prepared with each batch of samples?
- Were surrogates added to each sample and batch QC samples for each method where surrogates are required?
- Was precision checked with a matrix spike duplicate (MSD) or sample duplicate (DUP)?
- Were holding time requirements for preparation and analysis satisfied?
- Were MB results less than the required quantitation limits?
- Did the quantitation limit for nondetect results meet the required detection limit?
- Did the recoveries for the LCS, MS, MSD, and surrogates, for analyses where they are required, meet the accuracy criteria?
- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

After this automated checking, the "no" answers to these questions were investigated manually, the effect on each sample result was determined, and the results were qualified according to the validation rules in *Data Validation Procedure for Chemical Analyses* (HNF-20433). These evaluations are presented on the following pages.

Please note laboratory data qualifiers are defined in the "Lionville Qualifiers" table that follows the table of contents. EQM, Inc. checks laboratory qualifiers for consistency with validation qualifiers, but does not edit or change laboratory qualifiers in any way.

2. DATA VALIDATION REPORTS

2.1. DATA VALIDATION REPORT FOR ICP METALS (METHOD 6010B)

Results for 29 metals, those listed in Table 2-1, were requested for each of the 8 samples in this group. The table listing the results is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM for the analytical results for inductively coupled plasma (ICP) metals, as well as the flags applied during validation and the reasons for the flags.

2.1.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-1 shows the number of each type of sample in each preparation batch.

Table 2-1. ICP Metals Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
L906192	W	Aluminum	7429-90-5	1	1	1	1	1	8
L906192	W	Iron	7439-89-6	1	1	1	1	1	8
L906192	W	Lead	7439-92-1	1	1	1	1	1	8
L906192	W	Magnesium	7439-95-4	1	1	1	1	1	8
L906192	W	Manganese	7439-96-5	1	1	1	1	1	8
L906192	W	Molybdenum	7439-98-7	1	1	1	1	1	8
L906192	W	Nickel	7440-02-0	1	1	1	1	1	8
L906192	W	Potassium	7440-09-7	1	1	1	1	1	8
L906192	W	Silicon	7440-21-3	1	1	1	1	1	8
L906192	W	Silver	7440-22-4	1	1	1	1	1	8
L906192	W	Sodium	7440-23-5	1	1	1	1	1	8
L906192	W	Strontium	7440-24-6	1	1	1	1	1	8
L906192	W	Thallium	7440-28-0	1	1	1	1	1	8
L906192	W	Tin	7440-31-5	1	1	1	1	1	8
L906192	W	Titanium	7440-32-6	1	1	1	1	1	8
L906192	W	Antimony	7440-36-0	1	1	1	1	1	8
L906192	W	Arsenic	7440-38-2	1	1	1	1	1	8
L906192	W	Barium	7440-39-3	1	1	1	1	1	8
L906192	W	Beryllium	7440-41-7	1	1	1	1	1	8
L906192	W	Boron	7440-42-8	1	1	1	1	1	8
L906192	W	Cadmium	7440-43-9	1	1	1	1	1	8
L906192	W	Chromium	7440-47-3	1	1	1	1	1	8
L906192	W	Cobalt	7440-48-4	1	1	1	1	1	8
L906192	W	Copper	7440-50-8	1	1	1	1	1	8
L906192	W	Uranium	7440-61-1	1	1	1	1	1	8

Table 2-1. ICP Metals Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
L906192	W	Vanadium	7440-62-2	1	1	1	1	1	8
L906192	W	Zinc	7440-66-6	1	1	1	1	1	8
L906192	W	Calcium	7440-70-2	1	1	1	1	1	8
L906192	W	Selenium	7782-49-2	1	1	1	1	1	8

CAS - Chemical Abstracts Service
DUP - Duplicate
ICP - Inductively Coupled Plasma
LCS - Laboratory Control Sample
MB - Method Blank
MS - Matrix Spike
MSD - Matrix Spike Duplicate
W - Water

ICP metals analysis was performed in one batch. The batch had fewer than 20 field samples. All analytes were included in the batch. The batch had at least one MB, DUP, LCS, MS and MSD. All accuracy and precision frequency requirements were met for the metals batch.

No data required qualification.

2.1.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for ICP metals analysis by Method 6010B are specified in VET-1405-PLN-03, Rev. 0, as 180 days from sampling to analysis. All results were generated within these limits.

2.1.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The required quantitation limits (RQLs) (VET-1405-PLN-03, Rev. 0) are shown in Table 2-2.

Table 2-2. Required Quantitation Limit for ICP Metals. (2 Pages)

Analyte	Water (µg/L)
Aluminum	50
Antimony	40
Arsenic	50
Barium	5
Beryllium	5
Boron	50
Cadmium	5
Calcium	50
Chromium	5
Cobalt	5
Copper	5
Iron	50

Table 2-2. Required Quantitation Limit for ICP Metals. (2 Pages)

Analyte	Water (µg/L)
Lead	50
Magnesium	50
Manganese	10
Molybdenum	5
Nickel	10
Potassium	500
Selenium	50
Silicon	50
Silver	10
Sodium	50
Strontium	5
Thallium	50
Tin	50
Titanium	10
Uranium	5
Vanadium	5
Zinc	10

ICP - Inductively Coupled Plasma

All method blank results were nondetects for this batch.

2.1.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The quantitation limit for five iron and two zinc results exceeded the required detection limits at 125 µg/L and 12.5 µg/L, respectively.

All other quantitation limits for nondetect results met the required detection limits.

2.1.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, and MSD meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS, MS, and MSD recoveries must be between 75% and 125%.

There were no LCS failures in this batch.

Table 2-3 outlines the analytes that had MS and/or MSD recoveries that were outside of limits. Silicon failed in both the MS and the MSD. However, the original sample result (21600 µg/L) was greater than four times the spike level (250 µg/L), so no results were qualified.

Table 2-3. ICP-Metals MS and MSD Recoveries Outside of Limits.

Batch ID	Matrix	QCCode	Analyte	CAS	Percent Recovery	LCL (%)	UCL (%)
L901692	W	MS	Silicon	7440-21-3	-1	75	125
L901692	W	MSD	Silicon	7440-21-3	-242	75	125

CAS - Chemical Abstracts Service
ICP - Inductively Coupled Plasma
LCL - Lower Control Limit
MS - Matrix Spike
MSD - Matrix Spike Duplicate
UCL - Upper Control Limit
W - Water

2.1.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the relative percent difference (RPD) between MS and MSD, as well as sample and duplicate, must be less than 20% for all samples. Table 2-4 shows the MS and MSD exceedances for RPD.

Silicon did not require qualification because the original sample result was greater than four times the spike level.

Table 2-4. ICP-Metals MS/MSD RPD Exceedances.

Batch ID	Matrix	Analyte	CAS	RPD	RPD Limit
L901692	W	Silicon	7440-21-3	198	20

CAS - Chemical Abstracts Service
ICP - Inductively Coupled Plasma
MS - Matrix Spike
MSD - Matrix Spike Duplicate
RPD - Relative Percent Difference
W - Water

There were three sample duplicate RPD failures as illustrated in Table 2-5. However, sample and duplicate results for the three analytes were ≤5x RDL, so the difference between the original and duplicate results was used. The limit was then 1x RDL. Using the difference, all sample duplicate results met acceptance criteria.

Table 2-5. ICP-Metals MS/MSD RPD Exceedances.

Batch ID	Matrix	Analyte	CAS	RPD	RPD Limit	Diff	Diff Limit
L901692	W	Aluminum	7429-90-5	27	20	6.2	50
L901692	W	Titanium	7440-32-6	73	20	0.68	10
L901692	W	Zinc	7440-66-6	39	20	1.2	10

CAS - Chemical Abstracts Service
Diff - Difference
ICP - Inductively Coupled Plasma
MS - Matrix Spike
MSD - Matrix Spike Duplicate
RPD - Relative Percent Difference
W - Water

2.2. DATA VALIDATION REPORT FOR MERCURY (METHOD 7470A)

Table 2-6 is a summary of the validated results for mercury.

Table 2-6. Summary of Mercury Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0906055-01	G041	W	L906196	0.189	µg/L	0.2	JB		
0906055-02	G042	W	L906196	0.180	µg/L	0.2	JB		
0906055-03	G043	W	L906196	0.164	µg/L	0.2	JB		
0906055-04	G044	W	L906196	0.160	µg/L	0.2	JB		
0906055-05	G045	W	L906196	0.131	µg/L	0.2	JB		
0906055-06	G046	W	L906196	0.0730	µg/L	0.2	JB		
0906059-01	G047	W	L906196	0.0770	µg/L	0.2	JB		
0906059-02	G048	W	L906196	0.0620	µg/L	0.2	JB		

Conc. - Concentration
RQL - Required Quantitation Limit
Q - Laboratory Qualifier
V - Validation Qualifier
W - Water

2.2.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-7 shows the number of each type of sample in each preparation batch.

Table 2-7. Mercury Preparation Batch Summary.

Batch ID	Matrix	BLK	DUP	LCS	MS	MSD	Sample
L906196	W	1	1	1	1	1	8

BLK - Blank
DUP - Duplicate
LCS - Laboratory Control Sample
MS - Matrix Spike
MSD - Matrix Spike Duplicate
W - Water

Mercury analysis was performed in one batch. Each batch contained fewer than 20 field samples. The batch included a method blank, LCS, duplicate, MS and MSD. The number of QC samples met batch criteria.

B flags are due to blank contamination. Though this is a Level A validation, the method blank results were assessed and were found to have no impact on data quality.

2.2.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for mercury analysis by Method 7470A is specified in VET-1405-PLN-03, Rev. 0, as 28 days. All holding times met criteria.

2.2.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The RQL (VET-1405-PLN-03, Rev. 0) is shown in Table 2-8.

Table 2-8. Required Quantitation Limit for Mercury.

Analyte	Water (µg/L)
Mercury	0.05

None of the quantitation limits met the required detection limit. However, no sample results were nondetects and no data required qualification.

2.3. DATA VALIDATION REPORT FOR HEXAVALENT CHROMIUM (METHOD 7196A)

Table 2-9 is a summary of the validated results for hexavalent chromium.

Table 2-9. Summary of Hexavalent Chromium Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0906055-01	G041	W	L906160	0.06	mg/L	0.05		J	Hold time
0906055-02	G042	W	L906160	0.05	mg/L	0.05		J	Hold time
0906055-03	G043	W	L906160	0.07	mg/L	0.05		J	Hold time
0906055-04	G044	W	L906160	0.06	mg/L	0.05		J	Hold time
0906055-05	G045	W	L906160	0.06	mg/L	0.05			
0906055-06	G046	W	L906160	0.05	mg/L	0.05			
0906059-01	G047	W	L907070	0.04	mg/L	0.02			
0906059-02	G048	W	L907070	0.10	mg/L	0.02			

Conc. - Concentration
Q - Laboratory Qualifier
RQL - Required Quantitation Limit
V - Validation Qualifier
W - Water

2.3.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, and a MS sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-10 shows the number of each type of sample in each preparation batch.

Table 2-10. Hexavalent Chromium Preparation Batch Summary.

Batch ID	Matrix	BLK	LCS	DUP	MS	MSD	Sample
L906160	W	1	1	1	1		6
L907070	W	1	1	1	1		2

BLK - Blank
DUP - Duplicate
LCS - Laboratory Control Sample
MS - Matrix Spike
MSD - Matrix Spike Duplicate
W - Water

Hexavalent chromium analysis was performed in two batches. Each batch contained fewer than 20 field samples. One MB, LCS, duplicate, and MS were analyzed in each sample batch. The sampling plan requires one MS and one MSD or duplicate per every 20 samples. Therefore, QC sample frequency requirements were met.

2.3.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for chromium (VI) analysis by Method 7196A is specified in VET-1405-PLN-03, Rev. 0, as one day for water samples. Samples 0906055-01 (G041), 0906055-02 (G042), 0906055-03 (G043), and 0906055-04 (G044) were analyzed two days after sampling. The results for the samples were qualified as estimated and flagged with "J".

All other results were generated within the holding time limit.

2.3.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for chromium (VI). There were no nondetect results for chromium (VI) in either batch.

2.4. DATA VALIDATION REPORT FOR CYANIDE (METHOD 9014)

Table 2-11 is a summary of the validated results for cyanide.

Table 2-11. Summary of Cyanide Validation. (2 pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0906055-01	G041	W	L906225	5.0	µg/L	5	U		
0906055-02	G042	W	L906225	5.0	µg/L	5	U		
0906055-03	G043	W	L906225	5.0	µg/L	5	U		
0906055-04	G044	W	L906226	5.0	µg/L	5	U		
0906055-05	G045	W	L906226	5.0	µg/L	5	U		
0906055-06	G046	W	L906226	5.0	µg/L	5	U		
0906059-01	G047	W	L906222	5.0	µg/L	5	U		

Table 2-11. Summary of Cyanide Validation. (2 pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0906059-02	G048	W	L906222	5.0	µg/L	5	U		

Conc. - Concentration
RQL - Required Quantitation Limit
Q - Laboratory Qualifier
V - Validation Qualifier
W - Water

2.4.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-12 shows the number of each type of sample in each preparation batch.

Table 2-12. Cyanide Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	DUP	MS	Sample
L906222	W	1	2	1		2
L906225	W	1	2			3
L906226	W	1	2	1	1	3

DUP - Duplicate
LCS - Laboratory Control Sample
MB - Method Blank
MS - Matrix Spike
W - Water

Cyanide analysis was performed in three batches of samples. Each batch contained fewer than 20 field samples. At least one MB and LCS were analyzed in each sample batch. One batch had an MS and two batches had a DUP included. The sampling plan requires that there be one MS and MSD or DUP per every 20 field samples. Accuracy and precision frequency requirements were met. All other QC requirements were met.

2.4.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for cyanide analysis by Method 9014 is specified in VET-1405-PLN-03, Rev. 0, as 14 days. All results were generated within these limits.

2.4.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for cyanide. Cyanide was not detected in any of the samples. Detection limits were 5 µg/L for water samples.

2.5. DATA VALIDATION REPORT FOR SULFIDE (METHOD 9034)

Table 2-13 is a summary of the validated results for sulfide.

Table 2-13. Summary of Sulfide Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0906055-01	G041	W	L906176	1.00	mg/L	1	U		
0906055-02	G042	W	L906176	1.00	mg/L	1	U		
0906055-03	G043	W	L906176	1.00	mg/L	1	U		
0906055-04	G044	W	L906176	1.00	mg/L	1	U		
0906055-05	G045	W	L906176	1.00	mg/L	1	U		
0906055-06	G046	W	L906176	1.00	mg/L	1	U		
0906059-01	G047	W	L906176	1.00	mg/L	1	U		
0906059-02	G048	W	L906176	1.00	mg/L	1	U		

Conc. - Concentration
RQL - Required Quantitation Limit
Q - Laboratory Qualifier
V - Validation Qualifier
W - Water

2.5.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-14 shows the number of each type of sample in each preparation batch.

Table 2-14. Sulfide Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	DUP	MS	Sample
L906176	W	1	2	1	1	8

DUP - Duplicate
LCS - Laboratory Control Sample
MB - Method Blank
MS - Matrix Spike
W - Water

Sulfide analysis was performed in one batch. The batch contained fewer than 20 field samples. At least one MB, LCS, duplicate, and MS was analyzed in the batch. The sampling plan requires one MS and one duplicate for every 20 field samples. These numbers satisfy all requirements for frequency of QC sample analysis.

2.5.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for sulfide analysis by Method 9034 are specified in VET-1405-PLN-03, Rev. 0, as 7 days. All results were generated within these limits.

2.5.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for sulfide. The detection limit was 1 mg/L for all samples.

2.6. DATA VALIDATION REPORT FOR ANIONS (METHOD 9056)

Results for six anions (chloride, fluoride, nitrate, nitrite, phosphate, and sulfate) were requested for each of the 8 samples in this group. Table 2-15 is a summary of the validation for anions. Note results for bromide were reported by the laboratory, but were not required by the sampling and analysis plan. Bromide results are listed in Table 2-15, but were not validated.

Table 2-15. Summary of Anions Validation. (2 pages)

Lab ID	Client ID	Matrix	Analyte	CAS	Batch ID	Conc.	Units	EQL	Q	V	Reason
0906055-01	G041	W	Bromide	24959-67-9	L907067	0.25	mg/L	0.25	U		
0906055-01	G041	W	Chloride	16887-00-6	L907067	8.40	mg/L	0.25			
0906055-01	G041	W	Fluoride	16984-48-8	L907067	0.35	mg/L	0.25			
0906055-01	G041	W	Nitrate	14797-55-8	L907067	16.8	mg/L	1.25			
0906055-01	G041	W	Nitrite	14797-65-0	L907067	0.25	mg/L	0.25	U	UJ	Hold Time
0906055-01	G041	W	Orthophosphate	14265-44-2	L907067	0.25	mg/L	0.25	U	UJ	Hold Time
0906055-01	G041	W	Sulfate	14808-79-8	L907067	22.4	mg/L	1.25			
0906055-02	G042	W	Bromide	24959-67-9	L907067	0.25	mg/L	0.25	U		
0906055-02	G042	W	Chloride	16887-00-6	L907067	8.34	mg/L	0.25			
0906055-02	G042	W	Fluoride	16984-48-8	L907067	0.36	mg/L	0.25			
0906055-02	G042	W	Nitrate	14797-55-8	L907067	16.5	mg/L	1.25			
0906055-02	G042	W	Nitrite	14797-65-0	L907067	0.25	mg/L	0.25	U	UJ	Hold Time
0906055-02	G042	W	Orthophosphate	14265-44-2	L907067	0.25	mg/L	0.25	U	UJ	Hold Time
0906055-02	G042	W	Sulfate	14808-79-8	L907067	23.4	mg/L	1.25			
0906055-03	G043	W	Bromide	24959-67-9	L907067	0.25	mg/L	0.25	U		
0906055-03	G043	W	Chloride	16887-00-6	L907067	9.05	mg/L	0.25			
0906055-03	G043	W	Fluoride	16984-48-8	L907067	0.35	mg/L	0.25			
0906055-03	G043	W	Nitrate	14797-55-8	L907067	18.6	mg/L	1.25			
0906055-03	G043	W	Nitrite	14797-65-0	L907067	0.25	mg/L	0.25	U	UJ	Hold Time
0906055-03	G043	W	Orthophosphate	14265-44-2	L907067	0.25	mg/L	0.25	U	UJ	Hold Time
0906055-03	G043	W	Sulfate	14808-79-8	L907067	23.6	mg/L	1.25			
0906055-04	G044	W	Bromide	24959-67-9	L907067	0.25	mg/L	0.25	U		
0906055-04	G044	W	Chloride	16887-00-6	L907067	9.04	mg/L	0.25			
0906055-04	G044	W	Fluoride	16984-48-8	L907067	0.30	mg/L	0.25			
0906055-04	G044	W	Nitrate	14797-55-8	L907067	17.5	mg/L	1.25			
0906055-04	G044	W	Nitrite	14797-65-0	L907067	0.25	mg/L	0.25	U	UJ	Hold Time
0906055-04	G044	W	Orthophosphate	14265-44-2	L907067	0.25	mg/L	0.25	U	UJ	Hold Time
0906055-04	G044	W	Sulfate	14808-79-8	L907067	21.8	mg/L	1.25			
0906055-05	G045	W	Bromide	24959-67-9	L907067	0.25	mg/L	0.25	U		
0906055-05	G045	W	Chloride	16887-00-6	L907067	8.24	mg/L	0.25			
0906055-05	G045	W	Fluoride	16984-48-8	L907067	0.29	mg/L	0.25			

Table 2-15. Summary of Anions Validation. (2 pages)

Lab ID	Client ID	Matrix	Analyte	CAS	Batch ID	Conc.	Units	EQL	Q	V	Reason
0906055-05	G045	W	Nitrate	14797-55-8	L907067	17.7	mg/L	1.25			
0906055-05	G045	W	Nitrite	14797-65-0	L907067	0.25	mg/L	0.25	U		
0906055-05	G045	W	Orthophosphate	14265-44-2	L907067	0.25	mg/L	0.25	U		
0906055-05	G045	W	Sulfate	14808-79-8	L907067	27.5	mg/L	1.25			
0906055-06	G046	W	Bromide	24959-67-9	L907067	0.25	mg/L	0.25	U		
0906055-06	G046	W	Chloride	16887-00-6	L907067	8.42	mg/L	0.25			
0906055-06	G046	W	Fluoride	16984-48-8	L907067	0.36	mg/L	0.25			
0906055-06	G046	W	Nitrate	14797-55-8	L907067	16.2	mg/L	1.25			
0906055-06	G046	W	Nitrite	14797-65-0	L907067	0.25	mg/L	0.25	U		
0906055-06	G046	W	Orthophosphate	14265-44-2	L907067	0.25	mg/L	0.25	U		
0906055-06	G046	W	Sulfate	14808-79-8	L907067	22.2	mg/L	1.25			
0906059-01	G047	W	Bromide	24959-67-9	L907068	0.25	mg/L	0.25	U		
0906059-01	G047	W	Chloride	16887-00-6	L907068	8.69	mg/L	0.25			
0906059-01	G047	W	Fluoride	16984-48-8	L907068	0.35	mg/L	0.25			
0906059-01	G047	W	Nitrate	14797-55-8	L907068	16.7	mg/L	1.25		J	Hold Time
0906059-01	G047	W	Nitrite	14797-65-0	L907068	0.25	mg/L	0.25	U	UR	Hold Time
0906059-01	G047	W	Orthophosphate	14265-44-2	L907068	0.25	mg/L	0.25	U	UR	Hold Time
0906059-01	G047	W	Sulfate	14808-79-8	L907068	23.3	mg/L	1.25			
0906059-02	G048	W	Bromide	24959-67-9	L907068	0.25	mg/L	0.25	U		
0906059-02	G048	W	Chloride	16887-00-6	L907068	8.68	mg/L	0.25			
0906059-02	G048	W	Fluoride	16984-48-8	L907068	0.45	mg/L	0.25			
0906059-02	G048	W	Nitrate	14797-55-8	L907068	18.3	mg/L	1.25		J	Hold Time
0906059-02	G048	W	Nitrite	14797-65-0	L907068	0.25	mg/L	0.25	U	UR	Hold Time
0906059-02	G048	W	Orthophosphate	14265-44-2	L907068	0.25	mg/L	0.25	U	UR	Hold Time
0906059-02	G048	W	Sulfate	14808-79-8	L907068	23.3	mg/L	1.25			

CAS - Chemical Abstracts System
Conc. - Concentration
RQL - Required Quantitation Limit
Q - Laboratory Qualifier
V - Validation Qualifier
W - Water

2.6.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-16 shows the number of each type of sample in each preparation batch.

Table 2-16. Anion Preparation Batch Summary.

Batch ID	Matrix	Analyte	CAS	MB	LCS	DUP	MS	Sample
L907067	W	Orthophosphate	14265-44-2	1	1	1	1	6
L907067	W	Nitrate	14797-55-8	1	1	1	1	6
L907067	W	Nitrite	14797-65-0	1	1	1	1	6
L907067	W	Sulfate	14808-79-8	1	1	1	1	6
L907067	W	Chloride	16887-00-6	1	1	1	1	6
L907067	W	Fluoride	16984-48-8	1	1	1	1	6
L907067	W	Bromide	24959-67-9	1	1	1	1	6
L907068	W	Orthophosphate	14265-44-2	1	1			2
L907068	W	Nitrate	14797-55-8	1	1			2
L907068	W	Nitrite	14797-65-0	1	1			2
L907068	W	Sulfate	14808-79-8	1	1			2
L907068	W	Chloride	16887-00-6	1	1			2
L907068	W	Fluoride	16984-48-8	1	1			2
L907068	W	Bromide	24959-67-9	1	1			2

CAS - Chemical Abstracts System
DUP - Duplicate
LCS - Laboratory Control Sample
MB - Method Blank
MS - Matrix Spike
W - Water

As shown in Table 2-16, anion analysis was performed on eight samples in two batches for each anion. Each batch contained fewer than 20 field samples. At least one MB and one LCS were analyzed in each sample batch.

The sampling plan requires one MS and one DUP be analyzed for every 20 field samples. There were eight samples between the two anion batches and one MS and one DUP for those eight samples. Thus, the intent of the sampling plan was met and accuracy and precision frequency requirements were met for these batches.

2.6.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for analysis of water samples by Method 9056 is specified in VET-1405-PLN-03, Rev. 0, as 48 hours. The nitrite, and phosphate results for samples 0906055-01 (G041), 0906055-02 (G042), and 0906055-03 (G043) were obtained two days after collection. Per the

validation criteria all sample results for these two analytes were qualified as estimated nondetects and flagged with "UJ".

The nitrate, nitrite and phosphate results for samples 0906059-01 (G047) and 0906059-02 (G048) were obtained eight days, more than twice the hold time, past the limit. Per the validation, all detected results were qualified as estimated and flagged "J". All nondetect results were rejected and flagged "UR".

All other sample results met hold times.

2.6.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The required detection limit (VET-1405-PLN-3, Rev. 0) for anions in water is 0.1 mg/L. The required quantitation limit was exceeded for nitrite in all samples where this analyte was not detected. The validation criteria do not require that these results be qualified. Other nondetect anion results met the required quantitation limit.

2.7. DATA VALIDATION REPORT FOR TOTAL PHENOLS (METHOD 9066)

Table 2-17 is a summary of the validated results for analysis of total phenols.

Table 2-17. Summary of Total Phenols Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0906055-01	G041	W	L907016	5.0	µg/L	5	U		
0906055-02	G042	W	L907016	5.0	µg/L	5	U		
0906055-03	G043	W	L907016	5.0	µg/L	5	U		
0906055-04	G044	W	L907016	5.0	µg/L	5	U		
0906055-05	G045	W	L907016	5.0	µg/L	5	U		
0906055-06	G046	W	L907016	5.0	µg/L	5	U		
0906059-01	G047	W	L907016	5.0	µg/L	5	U		
0906059-02	G048	W	L907016	5.0	µg/L	5	U		

Conc. - Concentration
RQL - Required Quantitation Limit
Q - Laboratory Qualifier
V - Validation Qualifier
W - Water

2.7.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-18 shows the number of each type of sample in each preparation batch.

Table 2-18. Total Phenols Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	DUP	MS	Sample
L907016	W	1	2	1	1	8

DUP - Duplicate
LCS - Laboratory Control Sample
MB - Method Blank
MS - Matrix Spike
W - Water

Total phenol analysis was performed in one batch. The batch contained fewer than 20 field samples. At least one MB, LCS, MS, and DUP were analyzed in the batch. All requirements for QC sample analysis were achieved.

2.7.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for total phenol analysis by Method 9066 is specified in VET-1405-PLN-03, Rev. 0, as 28 days. All results were generated within these limits.

2.7.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for total phenol. Detection limits for phenols were 5 µg/L for all samples.

2.8. DATA VALIDATION REPORT FOR POLYCHLORINATED BIPHENYL COMPOUNDS (METHOD 8082)

Results for seven Aroclors (Aroclor-1016, Aroclor-1221, Aroclor-1232, Aroclor-1242, Aroclor-1248, Aroclor-1254, Aroclor-1260) were requested for each of the 8 samples in this group. Table 2-19 is a summary of the validation for polychlorinated biphenyl compounds.

Table 2-19. Summary of PCB Validation. (3 pages)

Lab ID	Client ID	Matrix	Analyte	CAS	Batch ID	Conc.	Units	EQL	Q	V	Reason
0906055-01	G041	W	Aroclor 1016	12674-11-2	L906171	0.400	µg/L	0.4	U		
0906055-01	G041	W	Aroclor 1221	11104-28-2	L906171	0.400	µg/L	0.4	U		
0906055-01	G041	W	Aroclor 1232	11141-16-5	L906171	0.400	µg/L	0.4	U		
0906055-01	G041	W	Aroclor 1242	53469-21-9	L906171	0.400	µg/L	0.4	U		
0906055-01	G041	W	Aroclor 1248	12672-29-6	L906171	0.400	µg/L	0.4	U		
0906055-01	G041	W	Aroclor 1254	11097-69-1	L906171	0.400	µg/L	0.4	U		
0906055-01	G041	W	Aroclor 1260	11096-82-5	L906171	0.400	µg/L	0.4	U		
0906055-01	G041	W	Aroclor 1262	37324-23-5	L906171	0.400	µg/L	0.4	U		
0906055-01	G041	W	Aroclor 1268	11100-14-4	L906171	0.400	µg/L	0.4	U		
0906055-02	G042	W	Aroclor 1016	12674-11-2	L906171	0.400	µg/L	0.4	U		
0906055-02	G042	W	Aroclor 1221	11104-28-2	L906171	0.400	µg/L	0.4	U		
0906055-02	G042	W	Aroclor 1232	11141-16-5	L906171	0.400	µg/L	0.4	U		
0906055-02	G042	W	Aroclor 1242	53469-21-9	L906171	0.400	µg/L	0.4	U		
0906055-02	G042	W	Aroclor 1248	12672-29-6	L906171	0.400	µg/L	0.4	U		
0906055-02	G042	W	Aroclor 1254	11097-69-1	L906171	0.400	µg/L	0.4	U		
0906055-02	G042	W	Aroclor 1260	11096-82-5	L906171	0.400	µg/L	0.4	U		
0906055-02	G042	W	Aroclor 1262	37324-23-5	L906171	0.400	µg/L	0.4	U		
0906055-02	G042	W	Aroclor 1268	11100-14-4	L906171	0.400	µg/L	0.4	U		
0906055-03	G043	W	Aroclor 1016	12674-11-2	L906171	0.400	µg/L	0.4	U		
0906055-03	G043	W	Aroclor 1221	11104-28-2	L906171	0.400	µg/L	0.4	U		
0906055-03	G043	W	Aroclor 1232	11141-16-5	L906171	0.400	µg/L	0.4	U		
0906055-03	G043	W	Aroclor 1242	53469-21-9	L906171	0.400	µg/L	0.4	U		
0906055-03	G043	W	Aroclor 1248	12672-29-6	L906171	0.400	µg/L	0.4	U		
0906055-03	G043	W	Aroclor 1254	11097-69-1	L906171	0.400	µg/L	0.4	U		
0906055-03	G043	W	Aroclor 1260	11096-82-5	L906171	0.400	µg/L	0.4	U		
0906055-03	G043	W	Aroclor 1262	37324-23-5	L906171	0.400	µg/L	0.4	U		
0906055-03	G043	W	Aroclor 1268	11100-14-4	L906171	0.400	µg/L	0.4	U		
0906055-04	G044	W	Aroclor 1016	12674-11-2	L906171	0.400	µg/L	0.4	U		
0906055-04	G044	W	Aroclor 1221	11104-28-2	L906171	0.400	µg/L	0.4	U		
0906055-04	G044	W	Aroclor 1232	11141-16-5	L906171	0.400	µg/L	0.4	U		
0906055-04	G044	W	Aroclor 1242	53469-21-9	L906171	0.400	µg/L	0.4	U		

Table 2-19. Summary of PCB Validation. (3 pages)

Lab ID	Client ID	Matrix	Analyte	CAS	Batch ID	Conc.	Units	EQL	Q	V	Reason
0906055-04	G044	W	Aroclor 1248	12672-29-6	L906171	0.400	µg/L	0.4	U		
0906055-04	G044	W	Aroclor 1254	11097-69-1	L906171	0.400	µg/L	0.4	U		
0906055-04	G044	W	Aroclor 1260	11096-82-5	L906171	0.400	µg/L	0.4	U		
0906055-04	G044	W	Aroclor 1262	37324-23-5	L906171	0.400	µg/L	0.4	U		
0906055-04	G044	W	Aroclor 1268	11100-14-4	L906171	0.400	µg/L	0.4	U		
0906055-05	G045	W	Aroclor 1016	12674-11-2	L906171	0.400	µg/L	0.4	U		
0906055-05	G045	W	Aroclor 1221	11104-28-2	L906171	0.400	µg/L	0.4	U		
0906055-05	G045	W	Aroclor 1232	11141-16-5	L906171	0.400	µg/L	0.4	U		
0906055-05	G045	W	Aroclor 1242	53469-21-9	L906171	0.400	µg/L	0.4	U		
0906055-05	G045	W	Aroclor 1248	12672-29-6	L906171	0.400	µg/L	0.4	U		
0906055-05	G045	W	Aroclor 1254	11097-69-1	L906171	0.400	µg/L	0.4	U		
0906055-05	G045	W	Aroclor 1260	11096-82-5	L906171	0.400	µg/L	0.4	U		
0906055-05	G045	W	Aroclor 1262	37324-23-5	L906171	0.400	µg/L	0.4	U		
0906055-05	G045	W	Aroclor 1268	11100-14-4	L906171	0.400	µg/L	0.4	U		
0906055-06	G046	W	Aroclor 1016	12674-11-2	L906171	0.400	µg/L	0.4	U		
0906055-06	G046	W	Aroclor 1221	11104-28-2	L906171	0.400	µg/L	0.4	U		
0906055-06	G046	W	Aroclor 1232	11141-16-5	L906171	0.400	µg/L	0.4	U		
0906055-06	G046	W	Aroclor 1242	53469-21-9	L906171	0.400	µg/L	0.4	U		
0906055-06	G046	W	Aroclor 1248	12672-29-6	L906171	0.400	µg/L	0.4	U		
0906055-06	G046	W	Aroclor 1254	11097-69-1	L906171	0.400	µg/L	0.4	U		
0906055-06	G046	W	Aroclor 1260	11096-82-5	L906171	0.400	µg/L	0.4	U		
0906055-06	G046	W	Aroclor 1262	37324-23-5	L906171	0.400	µg/L	0.4	U		
0906055-06	G046	W	Aroclor 1268	11100-14-4	L906171	0.400	µg/L	0.4	U		
0906059-01	G047	W	Aroclor 1016	12674-11-2	L906171	0.400	µg/L	0.4	U		
0906059-01	G047	W	Aroclor 1221	11104-28-2	L906171	0.400	µg/L	0.4	U		
0906059-01	G047	W	Aroclor 1232	11141-16-5	L906171	0.400	µg/L	0.4	U		
0906059-01	G047	W	Aroclor 1242	53469-21-9	L906171	0.400	µg/L	0.4	U		
0906059-01	G047	W	Aroclor 1248	12672-29-6	L906171	0.400	µg/L	0.4	U		
0906059-01	G047	W	Aroclor 1254	11097-69-1	L906171	0.400	µg/L	0.4	U		
0906059-01	G047	W	Aroclor 1260	11096-82-5	L906171	0.400	µg/L	0.4	U		
0906059-01	G047	W	Aroclor 1262	37324-23-5	L906171	0.400	µg/L	0.4	U		

Table 2-19. Summary of PCB Validation. (3 pages)

Lab ID	Client ID	Matrix	Analyte	CAS	Batch ID	Conc.	Units	EQL	Q	V	Reason
0906059-01	G047	W	Aroclor 1268	11100-14-4	L906171	0.400	µg/L	0.4	U		
0906059-02	G048	W	Aroclor 1016	12674-11-2	L906171	0.400	µg/L	0.4	U		
0906059-02	G048	W	Aroclor 1221	11104-28-2	L906171	0.400	µg/L	0.4	U		
0906059-02	G048	W	Aroclor 1232	11141-16-5	L906171	0.400	µg/L	0.4	U		
0906059-02	G048	W	Aroclor 1242	53469-21-9	L906171	0.400	µg/L	0.4	U		
0906059-02	G048	W	Aroclor 1248	12672-29-6	L906171	0.400	µg/L	0.4	U		
0906059-02	G048	W	Aroclor 1254	11097-69-1	L906171	0.400	µg/L	0.4	U		
0906059-02	G048	W	Aroclor 1260	11096-82-5	L906171	0.400	µg/L	0.4	U		
0906059-02	G048	W	Aroclor 1262	37324-23-5	L906171	0.400	µg/L	0.4	U		
0906059-02	G048	W	Aroclor 1268	11100-14-4	L906171	0.400	µg/L	0.4	U		

CAS - Chemical Abstracts System
Conc. - Concentration
RQL - Required Quantitation Limit
Q - Laboratory Qualifier
V - Validation Qualifier
W - Water

2.8.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each field sample and each QC sample?
- Was precision checked with an MSD?

Table 2-20 shows the number of each type of sample in each preparation batch.

Table 2-20. PCB Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	Analyte	CAS	MB	LCS	MS	MSD	Surr	Sample
L906171	W	Aroclor 1016	12674-11-2	1	1	1	1		8
L906171	W	Aroclor 1221	11104-28-2	1					8
L906171	W	Aroclor 1232	11141-16-5	1					8
L906171	W	Aroclor 1242	53469-21-9	1					8
L906171	W	Aroclor 1248	12672-29-6	1					8
L906171	W	Aroclor 1254	11097-69-1	1					8
L906171	W	Aroclor 1260	11096-82-5	1	1	1	1		8
L906171	W	Decachlorobiphenyl	2051-24-3					12	
L906171	W	Tetrachloro-meta-xylene	877-09-8					12	

CAS - Chemical Abstracts System
LCS - Laboratory Control Sample
MB - Method Blank
MS - Matrix Spike
MSD - Matrix Spike Duplicate
PCB - Polycholorinated Biphenyl
Surr - Surrogate
W - Water

PCB analysis was performed on one batch of water samples. Each batch contained fewer than 20 field samples. The batch contained one MB, LCS, MS and MSD, satisfying the SAP requirement of one MS and one duplicate or MSD for every 20 samples. In accordance with requirements of the analytical method, the LCS and MS/MSD contained at least Aroclor-1016 and Aroclor-1260

Surrogates were added to and analyzed in every sample, LCS, MB, MS, and MSD.

2.8.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for PCB analysis by Method 8082 are specified in VET-1405-PLN-03, Rev. 0, as 14 days for water samples. U.S. Environmental Protection Agency (SW-846, Chapter 2) lists the holding time limit to extraction of PCBs as 7 days for water samples. Method 8082 indicates that samples should be analyzed within 40 days after extraction. The SW-846 limits of 7 days to extraction and 40 days after extraction to analysis were used.

All results were generated within holding times.

2.8.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The required quantitation limits (VET-1405-PLN-03, Rev. 0) are 1 µg/L in groundwater samples. All results were nondetects. Detection limits met the requirements.

2.9. DATA VALIDATION REPORT FOR VOLATILE ORGANIC COMPOUNDS (METHOD 8260)

Eighty compounds were requested for each of the 8 samples in this group. Results were reported in the EDDs for the 78 compounds that the laboratory commonly reports. The remaining two, 1,4-difluorobenzene and tetrahydrofuran, are not expected to be detected regularly. The laboratory performed a spectral search for those, and, as reported in the data package narratives, none were found.

The table listing the results is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM.

2.9.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each sample and each batch QC sample?
- Was precision checked with a MSD or DUP?

The sample batches for volatile organic analysis are outlined in Table 2-21.

Table 2-21. VOA Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	MS	MSD	Surr	Sample
L906220	W	1	1	1	1	14	10

LCS - Laboratory Control Sample
MB - Method Blank
MS - Matrix Spike
MSD - Matrix Spike Duplicate
Surr - Surrogate
VOA - Volatile Organic Analysis
W - Water

Volatile organic analysis was performed in one batch of water samples. The batch contained fewer than 20 field samples. Results for 78 compounds were reported for each of the 10 samples (including trip blanks). A MB result was reported for each of the 78 compounds in the batch. A LCS containing 47 of the compounds of interest was prepared and analyzed with the batch. There was one MS and MSD pair included in the batch.

Surrogates (1,2-dichloroethane-d4, bromofluorobenzene, and toluene-d8) were added to each sample, MB, LCS, MS, and MSD.

It should be noted, as in previous reports, not all trip blanks were analyzed by the laboratory. Only one trip blank was analyzed per sample delivery group (SDG) and, since trip blanks did not have unique field identifiers, there is no way to know which chain of custody (COC) contained the analyzed trip blank, except in the case of VET-1405-COC-129, which was the only COC in SDG# 0906059. Results were not reported for three of the four other trip blanks delivered to the laboratory. One of the three was supposed to have been analyzed, however, it was lost and there is no way of knowing which COC the missing trip blank belonged to.

2.9.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for volatile organic analysis by Method 8260B are specified in VET-1405-PLN-03, Rev. 0, as 14 days for water samples. All results were generated within this limit.

2.9.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The RQLs (VET-1405-PLN-03, Rev. 0) for all VOCs are 5 µg/L for water samples. No VOCs were detected in any samples.

2.9.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Of 780 results reported, 180 were nondetects exceeding the required detection limit of 5 µg/L. Detection limit exceedances are not required to be qualified. Most of the exceedances were reported at 10 µg/L which is an industry norm for water volatile organic analyses (VOAs).

2.9.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, MSD, and surrogates meet the accuracy criteria?

The statistical QC limits determined by the laboratory for surrogate compounds are listed in Table 2-22. The surrogate recoveries were reviewed, and none were found to lie outside the acceptable range.

Table 2-22. Statistical Limits for VOA Surrogate Compounds

Surrogate	Water Samples	
	LCL (%)	UCL (%)
1,2-Dichloroethane-d4	64	140
Toluene-d8	70	130
4-Bromofluorobenzene	81	115

LCL - Lower Control Limit
UCL - Upper Control Limit
VOA - Volatile Organic Analysis

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS/MSD recoveries must be within the statistical limits set by the lab. These limits are shown in Table 2-23.

Table 2-23. Lionville Laboratory Limits for VOA LCS, MS, and MSD Recovery (Water Samples). (2 Pages)

Analyte	CAS	LCL (%)	UCL (%)
1,1,1-Trichloroethane	71-55-6	60	140
1,1,2,2-Tetrachloroethane	79-34-5	70	130
1,1,2-Trichloroethane	79-00-5	70	130
1,1-Dichloroethane	75-34-3	60	140
1,1-Dichloroethene	75-35-4	60	130
1,2,4-Trichlorobenzene	120-82-1	65	135
1,2-Dibromo-3-chloropropane	96-12-8	50	130
1,2-Dibromoethane	106-93-4	60	150
1,2-Dichlorobenzene	95-50-1	70	130
1,2-Dichloroethane	107-06-2	60	140
1,2-Dichloroethene (total)	540-59-0	60	140
1,2-Dichloropropane	78-87-5	70	130
1,3-Dichlorobenzene	541-73-1	75	125
1,4-Dichlorobenzene	106-46-7	75	125
2-Butanone	78-93-3	20	200
2-Hexanone	591-78-6	20	200
4-Methyl-2-pentanone	108-10-1	50	150
Acetone	67-64-1	20	200
Benzene	71-43-2	70	130
Bromodichloromethane	75-27-4	60	140
Bromoform	75-25-2	60	140
Bromomethane	74-83-9	50	180
Carbon Disulfide	75-15-0	60	140
Carbon Tetrachloride	56-23-5	60	140
Chlorobenzene	108-90-7	70	130
Chloroethane	75-00-3	50	180
Chloroform	67-66-3	60	140
Chloromethane	74-87-3	50	180
cis-1,2-Dichloroethene	156-59-2	60	140
cis-1,3-Dichloropropene	10061-01-5	70	130
Dibromochloromethane	124-48-1	70	130
Dichlorodifluoromethane	75-71-8	60	140
Ethylbenzene	100-41-4	70	130

Table 2-23. Lionville Laboratory Limits for VOA LCS, MS, and MSD Recovery (Water Samples). (2 Pages)

Analyte	CAS	LCL (%)	UCL (%)
Isopropylbenzene	98-82-8	75	125
m- and p-Xylene	M+P_XYLENE	70	130
Methylene Chloride	75-09-2	50	180
Methyl-T-Butylether	1634-04-4	70	130
O-Xylene	95-47-6	70	130
Styrene	100-42-5	70	130
Tetrachloroethene	127-18-4	60	140
Toluene	108-88-3	70	130
trans-1,2-Dichloroethene	156-60-5	60	140
trans-1,3-Dichloropropene	10061-02-6	70	130
Trichloroethene	79-01-6	70	130
Trichlorofluoromethane	75-69-4	60	145
Vinyl Chloride	75-01-4	50	180
Xylene (total)	1330-20-7	70	130

CAS - Chemical Abstracts System
LCL - Lower Control Limit
LCS - Laboratory Control Sample
MS - Matrix Spike
MSD - Matrix Spike Duplicate
UCL - Upper Control Limit
VOA - Volatile Organic Analysis

Dichlorodifluoromethane failed low in the LCS at 56% recovery. Dichlorodifluoromethane also failed in the MS and MSD at 55% and 58% recoveries, respectively. All dichlorodifluoromethane results were qualified as estimated and flagged 'UJ'.

All other LCS, MS and MSD recoveries were within these control limits.

2.9.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

The limit for MS/MSD RPDs is 20%. All MS/MSD RPDs were less than this limit.

2.10. DATA VALIDATION REPORT FOR SEMIVOLATILE ORGANIC COMPOUNDS (METHOD 8270C)

Eighty-five SVOCs were requested for the 8 samples in this group. Semivolatile organic analysis (SVOA) results were reported in the EDDs for the 69 of these compounds that the laboratory commonly reports. Of the 16 SVOCs requested, but not reported by Method 8270C, 1,2-dichlorobenzene, 1,3-dichlorobenzene and 1,4-dichlorobenzene are reported as VOCs (Method 8260B). For the remaining 13 (2,6-dimethylnaphthalene, 1,6,7-trimethylnaphthalene, 1-methyl-9H-fluorene, dibenzothiophene, 2-methylphenanthrene, 1-methylphenanthrene, 4,6-

dimethyldibenzothiophene, 3,6-dimethylphenanthrene, 2-methylfluoranthene, retene, 5-methylchrysene, benzo(e)pyrene, and perylene) the laboratory performed a spectral search, and, as reported in the data package narrative, none were found.

The table listing the analytical results and the results of the validation for SVOCs is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM.

2.10.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each sample and each batch QC sample?
- Was precision checked with a MSD or DUP?

Table 2-24 lists the numbers of QC and field samples analyzed in each batch.

Table 2-24. SVOA Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	MS	MSD	Surr	Sample
L906169	W	1	1	1	1	12	8

LCS - Laboratory Control Sample
MB - Method Blank
MS - Matrix Spike
MSD - Matrix Spike Duplicate
Surr - Surrogate
SVOA - Semi-Volatile Organic Analysis
W - Water

Semivolatile organic analysis was performed in one batch of fewer than 20 field samples. A MB result was reported for each of the reported compounds.

A LCS was reported for every requested analyte except 1,1-biphenyl. The LCS is not required to contain all compounds of interest. Therefore, no results were qualified for missing LCS.

The batch contained a MS/MSD pair. The sampling plan requires one MS and MSD or DUP per every 20 samples. The intent of the sampling plan was met.

Surrogates (2,4,6-tribromophenol, 2-fluorobiphenyl, 2-fluorophenol, nitrobenzene-d5, phenol-d5, p-terphenyl-d14) were added to each sample, MB, and LCS.

2.10.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for SVOA by Method 8270C are specified in VET-1405-PLN-03, Rev. 0. The holding time to extraction is 7 days for water samples. Forty additional days after extraction are allowed to complete the analysis. All results were generated within the holding time limits.

2.10.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The required detection limits in water samples are 0.2 µg/L for polycyclic aromatic hydrocarbons (PAHs) and 5 µg/L for other analytes. Most compounds in the MBs were nondetects; the detection limits exceeded the RQL in all cases. However, the validation rules do not require qualification of results for high detection limits.

Several aldol condensation products were detected in the method blank. These are false positives due to reactions of the ketones in the injection port. These products were rejected as false positives in all samples.

2.10.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The required detection limits in water samples are 0.2 µg/L for polycyclic aromatic hydrocarbons and 5 µg/L for other analytes. None of the nondetect results met these requirements. However, the validation rules do not require qualification of the results.

2.10.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, MSD, and surrogates meet the accuracy criteria?

The statistical QC limits determined by the laboratory for surrogate compounds are listed in Table 2-25.

Table 2-25. Semi-Volatile Surrogate Recovery Limits.

Compound	Water (%)
Nitrobenzene-d5	35 to 114
2-fluorobiphenyl	43 to 116
Terphenyl-d14	33 to 141
Phenol-d5	10 to 94
2-fluorophenol	21 to 100
2,4,6-tribromophenol	10 to 123

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS/MSD recoveries must be within the statistical limits set by the lab. These limits are shown in Table 2-26.

Table 2-26. Lionville Laboratory SVOA Limits for LCS, MS, and MSD. (2 Pages)

Analyte	CAS	Water Samples	
		LCL (%)	UCL (%)
1,2,4-Trichlorobenzene	120-82-1	40	100
1,2-Diphenylhydrazine	122-66-7	50	110
1-Methylnaphthalene	90-12-0	40	105
2,2'-oxybis(1-Chloropropane)	108-60-1	40	110
2,4,5-Trichlorophenol	95-95-4	50	110
2,4,6-Trichlorophenol	88-06-2	50	110
2,4-Dichlorophenol	120-83-2	45	110
2,4-Dimethylphenol	105-67-9	30	110
2,4-Dinitrophenol	51-28-5	15	130
2,4-Dinitrotoluene	121-14-2	50	120
2,6-Dinitrotoluene	606-20-2	50	110
2-Chloronaphthalene	91-58-7	50	110
2-Chlorophenol	95-57-8	40	140
2-Methylnaphthalene	91-57-6	40	110
2-Methylphenol	95-48-7	40	110
2-Nitroaniline	88-74-4	50	110
2-Nitrophenol	88-75-5	40	110
3,3'-Dichlorobenzidine	91-94-1	0	120
3-and/or 4-Methylphenol	1319-77-3	40	110
3-Nitroaniline	99-09-2	10	120
4,6-Dinitro-2-Methylphenol	534-52-1	40	130
4-Bromophenyl phenyl ether	101-55-3	50	110
4-Chloro-3-Methylphenol	59-50-7	40	110
4-Chloroaniline	106-47-8	10	100
4-Chlorophenyl phenyl ether	7005-72-3	50	120
4-Nitroaniline	100-01-6	10	100
4-Nitrophenol	100-02-7	10	110
Acenaphthene	83-32-9	50	110
Acenaphthylene	208-96-8	50	110
Aniline	62-53-3	5	120
Anthracene	120-12-7	50	120
Benzidine	92-87-5	0	110
Benzo(a)anthracene	56-55-3	50	120
Benzo(a)pyrene	50-32-8	50	140
Benzo(b)fluoranthene	205-99-2	50	140

Table 2-26. Lionville Laboratory SVOA Limits for LCS, MS, and MSD. (2 Pages)

Analyte	CAS	Water Samples	
		LCL (%)	UCL (%)
Benzo(g,h,i)perylene	191-24-2	50	140
Benzo(k)fluoranthene	207-08-9	50	140
Benzoic Acid	65-85-0	0	112
Benzyl Alcohol	100-51-6	40	110
Bis(2-Chloroethoxy)methane	111-91-1	45	105
Bis(2-Chloroethyl) ether	111-44-4	40	120
Bis(2-Ethylhexyl) phthalate	117-81-7	40	140
Butylbenzylphthalate	85-68-7	40	140
Carbazole	86-74-8	20	120
Chrysene	218-01-9	50	120
Dibenzo(a,h)anthracene	53-70-3	50	140
Dibenzofuran	132-64-9	60	110
Diethyl phthalate	84-66-2	40	130
Dimethyl phthalate	131-11-3	40	130
Di-n-Butyl phthalate	84-74-2	40	130
Di-n-octyl phthalate	117-84-0	40	140
Fluoranthene	206-44-0	50	120
Fluorene	86-73-7	60	110
Hexachloro-1,3-butadiene	87-68-3	40	100
Hexachlorobenzene	118-74-1	50	110
Hexachlorocyclopentadiene	77-47-4	20	100
Hexachloroethane	67-72-1	35	110
Indeno(1,2,3-cd)pyrene	193-39-5	50	140
Isophorone	78-59-1	40	110
Naphthalene	91-20-3	40	105
Nitrobenzene	98-95-3	40	100
N-Nitroso-Di-N-Propylamine	621-64-7	40	120
N-Nitrosodiphenylamine	86-30-6	50	110
Pentachlorophenol	87-86-5	15	130
Phenanthrene	85-01-8	50	120
Phenol	108-95-2	30	110
Pyrene	129-00-0	50	130
Pyridine	110-86-1	15	100

CAS - Chemical Abstracts System
LCL - Lower Control Limit
LCS - Laboratory Control Sample
MS - Matrix Spike
MSD - Matrix Spike Duplicate
SVOA - Semi-Volatile Organic Analysis
UCL - Upper Control Limit

Table 2-27 shows the LCS recoveries that were outside the control limits. All results for the analytes in the batches indicated in the table were qualified as approximate. All results qualified were nondetects and were flagged "UJ."

Table 2-27. SVOA LCS Recoveries That Did Not Satisfy QC Limits.

Batch ID	Matrix	Analyte	CAS	Rec (%)
L906169	W	Benzyl alcohol	100-51-6	19
L906169	W	Bis(2-Chloroethoxy) methane	111-91-1	0
L906169	W	4-Chloroaniline	106-47-8	0
L906169	W	Acenaphthylene	208-96-8	12
L906169	W	3-Nitroaniline	99-09-2	0
L906169	W	4-Nitroaniline	100-01-6	0
L906169	W	N-Nitrosodiphenylamine	86-30-6	24
L906169	W	1,2-Diphenylhydrazine	122-66-7	15
L906169	W	Carbazole	86-74-8	9
L906169	W	Pyrene	129-00-0	44
L906169	W	Butylbenzylphthalate	85-68-7	25

CAS - Chemical Abstracts Service
LCS - Laboratory Control Sample
QC - quality control
Rec - Recovery (%)
SVOA- Semi-Volatile Organic Analysis
W - Water

Table 2-28 shows the MS and MSD recoveries that were outside QC limits. All these recoveries were below the lower control limit (LCL). Associated sample results were qualified as estimated. All sample results were nondetects and flagged with “UJ”.

Table 2-28. SVOA MS and MSD Recoveries That Did Not Satisfy QC Limits.

Batch ID	Matrix	QC Type	Analyte	CAS	Sample	Sample Result	Q	Units	Spiked Result	Q	Spike Conc.	Rec. (%)	LCL (%)	UCL (%)
L906169	W	MS	Bis(2-chloroethoxy) methane	111-91-1	0906055-05	10.0	U	µg/L	8.67		60.0	14	45	105
L906169	W	MS	4-Chloroaniline	106-47-8	0906055-05	25.0	U	µg/L	25.0	U	60.0	0	10	100
L906169	W	MS	Hexachlorocyclopentadiene	77-47-4	0906055-05	10.0	U	µg/L	9.62		60.0	16	20	100
L906169	W	MS	2-Nitroaniline	88-74-4	0906055-05	25.0	U	µg/L	11.0		60.0	18	50	110
L906169	W	MS	3-Nitroaniline	99-09-2	0906055-05	25.0	U	µg/L	25.0	U	60.0	0	10	120
L906169	W	MS	4-Nitroaniline	100-01-6	0906055-05	25.0	U	µg/L	25.0	U	60.0	0	10	100
L906169	W	MS	N-Nitrosodiphenylamine	86-30-6	0906055-05	10.0	U	µg/L	8.9		60.0	15	50	110
L906169	W	MS	1,2-Diphenylhydrazine	122-6-7	0906055-05	10.0	U	µg/L	26.3		60.0	44	50	110
L906169	W	MSD	Benzyl alcohol	100-51-6	0906055-05	10.0	U	µg/L	20.4		60.0	34	40	110
L906169	W	MSD	Bis(2-chloroethoxy) methane	111-91-1	0906055-05	10.0	U	µg/L	5.89		60.0	10	45	105
L906169	W	MSD	4-Chloroaniline	106-47-8	0906055-05	25.0	U	µg/L	25.0	U	60.0	0	10	100
L906169	W	MSD	Hexachlorocyclopentadiene	77-47-4	0906055-05	10.0	U	µg/L	6.03		60.0	10	20	100
L906169	W	MSD	2-Nitroaniline	88-74-4	0906055-05	25.0	U	µg/L	10.6		60.0	15	50	110
L906169	W	MSD	Acenaphthylene	208-96-8	0906055-05	10.0	U	µg/L	26.7		60.0	45	50	110
L906169	W	MSD	3-Nitroaniline	99-09-2	0906055-05	25.0	U	µg/L	25.0	U	60.0	0	10	120
L906169	W	MSD	4-Nitroaniline	100-01-6	0906055-05	25.0	U	µg/L	25.0	U	60.0	0	10	100
L906169	W	MSD	N-Nitrosodiphenylamine	86-30-6	0906055-05	10.0	U	µg/L	8.63		60.0	14	50	110
L906169	W	MSD	1,2-Diphenylhydrazine	122-6-7	0906055-05	10.0	U	µg/L	20.8		60.0	35	50	110

CAS - Chemical Abstracts System
Conc. - Concentration
LCL - Lower Control Limit
MS - Matrix Spike
MSD - Matrix Spike Duplicate
Q - Laboratory Qualifier
QC - quality control
Rec. - recovery (%)
SVOA- Semi-Volatile Organic Analysis
UCL - Upper Control Limit
W - Water

2.10.6. QC Check for Precision

- Did the MS/MSD and DUP relative percent differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the RPD between MS and MSD must be less than the criteria set by the laboratory. These criteria are listed in Table 2-29. The lab has not set criteria for all analytes; RPDs were evaluated only for those compounds for which an RPD limit is specified.

Table 2-30 lists the RPD exceedances in this batch of data. All associated sample results were qualified as estimates. All associated results were nondetects and flagged "UJ".

Table 2-29. Relative Percent Difference Limits Set by Lionville Laboratory for SVOA MS/MSDs. (3 Pages)

Analyte	CAS	RPD (%) For Water Matrix
1,2,4-Trichlorobenzene	120-82-1	20
1,2-Diphenylhydrazine	122-66-7	20
1-Methylnaphthalene	90-12-0	20
2,2'-oxybis(1-Chloropropane)	108-60-1	20
2,4,5-Trichlorophenol	95-95-4	20
2,4,6-Trichlorophenol	88-06-2	20
2,4-Dichlorophenol	120-83-2	20
2,4-Dimethylphenol	105-67-9	20
2,4-Dinitrophenol	51-28-5	20
2,4-Dinitrotoluene	121-14-2	20
2,6-Dinitrotoluene	606-20-2	20
2-Chloronaphthalene	91-58-7	20
2-Chlorophenol	95-57-8	20
2-Methylnaphthalene	91-57-6	20
2-Methylphenol	95-48-7	20
2-Nitroaniline	88-74-4	20
2-Nitrophenol	88-75-5	20
3,3'-Dichlorobenzidine	91-94-1	20
3-and/or 4-Methylphenol	1319-77-3	20
3-Nitroaniline	99-09-2	20
4,6-Dinitro-2-Methylphenol	534-52-1	20
4-Bromophenyl phenyl ether	101-55-3	20
4-Chloro-3-Methylphenol	59-50-7	20
4-Chloroaniline	106-47-8	20

Table 2-29. Relative Percent Difference Limits Set by Lionville Laboratory for SVOA MS/MSDs. (3 Pages)

Analyte	CAS	RPD (%) For Water Matrix
4-Chlorophenyl phenyl ether	7005-72-3	20
4-Nitroaniline	100-01-6	20
4-Nitrophenol	100-02-7	20
Acenaphthene	83-32-9	20
Acenaphthylene	208-96-8	20
Aniline	62-53-3	20
Anthracene	120-12-7	20
Benzidine	92-87-5	20
Benzo(a)anthracene	56-55-3	20
Benzo(a)pyrene	50-32-8	20
Benzo(b)fluoranthene	205-99-2	20
Benzo(g,h,i)perylene	191-24-2	20
Benzo(k)fluoranthene	207-08-9	20
Benzoic Acid	65-85-0	20
Benzyl Alcohol	100-51-6	20
Bis(2-Chloroethoxy)methane	111-91-1	20
Bis(2-Chloroethyl) ether	111-44-4	20
Bis(2-Ethylhexyl) phthalate	117-81-7	20
Butylbenzylphthalate	85-68-7	20
Carbazole	86-74-8	20
Chrysene	218-01-9	20
Dibenzo(a,h)anthracene	53-70-3	20
Dibenzofuran	132-64-9	20
Diethyl phthalate	84-66-2	20
Dimethyl phthalate	131-11-3	40
Di-n-Butyl phthalate	84-74-2	40
Di-n-octyl phthalate	117-84-0	40
Fluoranthene	206-44-0	20
Fluorene	86-73-7	20
Hexachloro-1,3-butadiene	87-68-3	20
Hexachlorobenzene	118-74-1	20
Hexachlorocyclopentadiene	77-47-4	20
Hexachloroethane	67-72-1	20
Indeno(1,2,3-cd)pyrene	193-39-5	20
Isophorone	78-59-1	20

Table 2-29. Relative Percent Difference Limits Set by Lionville Laboratory for SVOA MS/MSDs. (3 Pages)

Analyte	CAS	RPD (%) For Water Matrix
Naphthalene	91-20-3	20
Nitrobenzene	98-95-3	20
N-Nitroso-Di-N-Propylamine	621-64-7	20
N-Nitrosodiphenylamine	86-30-6	20
Pentachlorophenol	87-86-5	20
Phenanthrene	85-01-8	20
Phenol	108-95-2	20
Pyrene	129-00-0	20
Pyridine	110-86-1	20

CAS - Chemical Abstracts System
MS - Matrix Spike
MSD - Matrix Spike Duplicate
RPD - Relative Percent Difference
SVOA - Semi-Volatile Organic Analysis

Table 2-30. SVOA RPDs Outside QC Criteria.

Batch ID	Matrix	Analyte	CAS	Original Sample	MS Rec (%)	MSD Rec (%)	RPD
L906169	W	Benzyl alcohol	100-51-6	0906055-05	54	34	45
L906169	W	2-Methylphenol	95-48-7	0906055-05	69	56	21
L906169	W	N-Nitrosodi-n-propylamine	621-64-7	0906055-05	71	58	21
L906169	W	2,4-Dimethylphenol	105-67-9	0906055-05	77	62	22
L906169	W	Benzoic acid	65-85-0	0906055-05	70	45	43
L906169	W	Bis(2-chloroethoxy) methane	111-91-1	0906055-05	14	10	38
L906169	W	Hexachlorocyclopentadiene	77-47-4	0906055-05	16	10	46
L906169	W	2,4-Dinitrophenol	51-28-5	0906055-05	85	66	26
L906169	W	4-Nitrophenol	100-02-7	0906055-05	86	65	28
L906169	W	1,2-Diphenylhydrazine[1]	122-66-7	0906055-05	44	35	23
L906169	W	Pentachlorophenol	87-86-5	0906055-05	104	80	26
L906169	W	Carbazole	86-74-8	0906055-05	42	31	30
L906169	W	Indeno(1,2,3-cd) pyrene	193-39-5	0906055-05	96	74	25
L906169	W	Dibenzo(a,h) anthracene	53-70-3	0906055-05	105	84	22
L906169	W	Benzo(g,h,i) perylene	191-24-2	0906055-05	96	74	25

[1] These compounds are not COCs.

CAS - Chemical Abstracts System
MS - Matrix Spike
MSD - Matrix Spike Duplicate
QC - Quality Control
Rec. - Recovery (%)
RPD - Relative Percent Difference
SVOA - Semi-Volatile Organic Analysis
W - Water

2.10.7. Miscellaneous- Tentatively Identified Compounds

Several aldol condensation products were identified. These are false positives due to reactions of the ketones in the injection port. These products are rejected as false positives.

Environmental Quality Management, Inc.

EQM-DVAL-USE-013, Rev. 0

Data Verification and Data Validation of US Ecology Site Data, Chains of Custody 130, 131, 132, 133, 134, and 135

Submitted to:

Vista Engineering

Date:
October 29, 2009

VISTA
ENGINEERING TECHNOLOGIES

EXECUTIVE SUMMARY

Samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 2). Samples were analyzed for metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, volatile organic compounds, semi-volatile organic compounds, and polychlorinated biphenyls.

All analyses were conducted by Lionville Laboratory, Inc., Lionville, Pennsylvania, (LVL) following the *Specification for Analytical Laboratory Services: Soil and Water Analysis* (VET-1405-SPEC-03, Rev. 1). In addition to printed data packages for each sample delivery group, the laboratory provided electronic data deliverables (EDDs), consisting of a number of Microsoft® Excel files containing tables of results and associated quality control (QC) data.

This data validation report presents the results of validating the analyses reported in the EDDs prepared by the laboratory for the seventh quarter groundwater samples. This group of EDDs provided the results and QC data for the samples delivered to the laboratory under the chain of custody documents listed in Table ES-1.

Table ES-1. Chains Of Custody Applicable to the Data Validated in This Report.

VET-1405-COC-130	VET-1405-COC-131	VET-1405-COC-132
VET-1405-COC-133	VET-1405-COC-134	VET-1405-COC-135

COC - Chain of Custody

The data validation was performed using an electronic data checker to evaluate whether batch QC met criteria. The electronic data checker identifies any QC results that exceed applicable criteria. The data validation process is completed by the data validation chemist, who evaluates the impacts of the exceedances and adds data validation qualifiers.

A Level A validation was performed for all analyses. The SVOC data was additionally evaluated with respect to laboratory control samples, only, due to the high number of failures recorded in the laboratory narrative.

Aldol condensation products were rejected as instrument artifacts in the semivolatile validation.

Table ES-2 summarizes the validation results by analysis.

Table ES-2. Summary Validation Results by Analysis.

Analysis	Number of Results	Number of Qualified Results	Summary
Metals	232	0	No results were qualified.
Mercury	8	0	No results were qualified.
Chromium (VI)	8	8	All results were qualified as estimated due to missed hold times.
Cyanide	8	0	Cyanide was not detected in the samples. No data were qualified.
Sulfide	8	0	Sulfide was not detected in any samples. No results were qualified.
Anions	56	0	No results were qualified.
Total phenols	8	0	Phenols were not detected in any samples. No data were qualified.
PCBs	56	0	PCBs were not detected in any samples. No data were qualified.
VOCs	858	0	No results were qualified.
SVOCs	595	165	Results were qualified due to low LCS results. Aldol condensation products were rejected as instrument artifacts.

PCB - Polychlorinated Biphenyl
VOC - Volatile Organic Compound
SVOC - Semi-Volatile Organic Compound

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ACRONYMS

BLK	Blank (column heading)
CAS	Chemical Abstracts Service (column heading)
COC	Chain of Custody
Conc.	Concentration (column heading)
Diff.	Difference (column heading)
DUP	Duplicate sample (laboratory duplicate)
EDD	Electronic Data Deliverable
ICP	Inductively Coupled Plasma
LCL	Lower Control Limit
LCS	Laboratory Control Sample
LVL	Lionville Laboratory, Lionville, Pennsylvania
MB	Method Blank
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PCB	Polychlorinated Biphenyl
Q	Laboratory Qualifier (column heading)
QC	Quality Control
RDL	Required Detection Limit
RPD	Relative Percent Difference
RQL	Required Quantitation Limit
SAP	Sampling & Analysis Plan
SDG	Sample Delivery Group
Surr	Surrogate (column heading)
SVOA	Semi-Volatile Organic Analysis
SVOC	Semi-Volatile Organic Compound
TIC	Tentatively Identified Compounds
UCL	Upper Control Limit
V	Validation Qualifier (column heading)
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound
W	Water

Lionville Qualifiers

U	Analyte was analyzed for but not detected; the associated quantitation limit is given
J	The reported value is estimated
B	The analyte is found in the associated blank as well as in the sample
D	The result is reported from a dilution
A	Indicates that a TIC is a suspected aldol-condensation product

Data Validation Applied Qualifiers

J	Indicates the compound was analyzed for and detected in the sample. The associated concentration is an estimate, but the data are usable for decision making purposes
UJ	The constituent was analyzed for and was not detected. Due to a QC deficiency identified during data validation, the value reported may not accurately reflect the minimum detection limit. The data should be considered usable for decision-making purposes.
R	Indicates that the constituent was analyzed for and detected; however, due to an identified QC deficiency, the data should be considered unusable for decision-making purposes.

1. INTRODUCTION – APPROACH TO VALIDATION

Groundwater samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 2). Samples were analyzed for metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and polychlorinated biphenyls (PCBs).

All analyses were conducted by Lionville Laboratory, Inc., Lionville, Pennsylvania (LVL), following the *Specification for Analytical Laboratory Services: Soil and Water Analysis* (VET-1405-SPEC-03, Rev. 1). The results of these analyses were presented in a PDF file data package for each sample delivery group. In addition, the laboratory provided an electronic data deliverable (EDD) for each sample delivery group. The EDDs are Microsoft Excel® files containing tables of results and associated quality control (QC) data.

This data validation report presents the results of validating the analyses reported in the EDDs received from the laboratory that include the seventh quarter groundwater samples. This group of EDDs and the corresponding chain of custody documents are identified in Table 1-1 below. The data contained in these EDDs includes the analysis of metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, VOCs, SVOCs, and PCBs.

Table 1-1. Chains of Custody and Electronic Data Deliverables Applicable to the Data Validated.

Chain of Custody	EDD	
	File Name	Date Received
VET-1405-COC-130	0908005.xls	9/28/2009
VET-1405-COC-131	0908005.xls	9/28/2009
VET-1405-COC-132	0908009.xls	9/28/2009
VET-1405-COC-133	0908009.xls	9/28/2009
VET-1405-COC-134	0908017.xls	9/28/2009
VET-1405-COC-135	0908017.xls	9/28/2009

EDD - Electronic Data Deliverable

In accordance with VET-1405-PLN-03, Rev. 2, the data were validated using *Data Validation Procedure for Chemical Analyses* (HNF-20433). This validation was performed to Level A (as described in HNF-20433) using a two-tiered approach:

1. Completeness: an assessment of the completeness as made on the PDF files of the "hard copy" data.
2. Electronic holding time and detection limit evaluation.

In addition to the Level A validation, laboratory control samples (LCS) were evaluated for the semivolatile analysis due to a high number of LCS failures reported in the laboratory narrative.

The approach is summarized in Table 1-2. The electronic review was performed on all incoming EDDs. The EDDs were evaluated to assure consistency with the hard copy data. By using electronic review of all QC, appropriate qualification of all the data can be made.

Table 1-2. Data Validation and Verification Approach.

Review item	Manually Done	Electronic	All Samples
Verification of deliverables	X		X
Requested vs. reported analyses		X	X
Holding times		X	X
Blank contamination		X	X
Detection Limits		X	X
LCS[1]		X	X

[1] Evaluated for SVOA only.
LCS - Laboratory Control Sample

The remainder of this report consists of several chapters, with each chapter providing the details for data validation of a particular method of analysis. Most chapters begin with a summary table of the analytical results validated and the validation qualifiers that have been applied. These tables are also provided in an accompanying Microsoft® Excel file along with any summary tables that were too large to include in this data validation report. The remainder of each chapter explains the details of the validation process and provides reasons for any data qualifiers that may have been applied. The automated data validation process determines whether the following facets of laboratory quality control were achieved:

- Were there 20 or fewer samples in each preparation batch?
- Were a Method Blank (MB), a laboratory control sample (LCS), and a matrix spike sample (MS) prepared with each batch of samples?
- Were surrogates added to each sample and batch QC samples for each method where surrogates are required?
- Was precision checked with a matrix spike duplicate (MSD) or sample duplicate (DUP)?
- Were holding time requirements for preparation and analysis satisfied?
- Were MB results less than the required quantitation limits?
- Did the quantitation limit for nondetect results meet the required detection limit?
- Did the recoveries for the LCS for analyses where it is required, meet the accuracy criteria?

After this automated checking, the “no” answers to these questions were investigated manually, the effect on each sample result was determined, and the results were qualified according to the validation rules in *Data Validation Procedure for Chemical Analyses* (HNF-20433). These evaluations are presented on the following pages.

Please note laboratory data qualifiers are defined in the "Lionville Qualifiers" table that follows the table of contents. EQM, Inc. checks laboratory qualifiers for consistency with validation qualifiers, but does not edit or change laboratory qualifiers in any way.

2. DATA VALIDATION REPORTS

2.1. DATA VALIDATION REPORT FOR ICP METALS (METHOD 6010B)

Results for 29 metals, those listed in Table 2-1, were requested for each of the 8 samples in this group. The table listing the results is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM for the analytical results for inductively coupled plasma (ICP) metals, as well as the flags applied during validation and the reasons for the flags.

2.1.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-1 shows the number of each type of sample in each preparation batch.

Table 2-1. ICP Metals Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
L908084	W	Aluminum	7429-90-5	1	1	1	1	1	8
L908084	W	Iron	7439-89-6	1	1	1	1	1	8
L908084	W	Lead	7439-92-1	1	1	1	1	1	8
L908084	W	Magnesium	7439-95-4	1	1	1	1	1	8
L908084	W	Manganese	7439-96-5	1	1	1	1	1	8
L908084	W	Molybdenum	7439-98-7	1	1	1	1	1	8
L908084	W	Nickel	7440-02-0	1	1	1	1	1	8
L908084	W	Potassium	7440-09-7	1	1	1	1	1	8
L908084	W	Silicon	7440-21-3	1	1	1	1	1	8
L908084	W	Silver	7440-22-4	1	1	1	1	1	8
L908084	W	Sodium	7440-23-5	1	1	1	1	1	8
L908084	W	Strontium	7440-24-6	1	1	1	1	1	8
L908084	W	Thallium	7440-28-0	1	1	1	1	1	8
L908084	W	Tin	7440-31-5	1	1	1	1	1	8
L908084	W	Titanium	7440-32-6	1	1	1	1	1	8
L908084	W	Antimony	7440-36-0	1	1	1	1	1	8
L908084	W	Arsenic	7440-38-2	1	1	1	1	1	8
L908084	W	Barium	7440-39-3	1	1	1	1	1	8
L908084	W	Beryllium	7440-41-7	1	1	1	1	1	8
L908084	W	Boron	7440-42-8	1	1	1	1	1	8
L908084	W	Cadmium	7440-43-9	1	1	1	1	1	8
L908084	W	Chromium	7440-47-3	1	1	1	1	1	8
L908084	W	Cobalt	7440-48-4	1	1	1	1	1	8
L908084	W	Copper	7440-50-8	1	1	1	1	1	8
L908084	W	Uranium	7440-61-1	1	1	1	1	1	8

Table 2-1. ICP Metals Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
L908084	W	Vanadium	7440-62-2	1	1	1	1	1	8
L908084	W	Zinc	7440-66-6	1	1	1	1	1	8
L908084	W	Calcium	7440-70-2	1	1	1	1	1	8
L908084	W	Selenium	7782-49-2	1	1	1	1	1	8

CAS - Chemical Abstracts Service
DUP - Duplicate
ICP - Inductively Coupled Plasma
LCS - Laboratory Control Sample
MB - Method Blank
MS - Matrix Spike
MSD - Matrix Spike Duplicate
W - Water

ICP metals analysis was performed in one batch. The batch had fewer than 20 field samples. All analytes were included in the batch. The batch had at least one MB, DUP, LCS, MS and MSD. All accuracy and precision frequency requirements were met for the metals batch.

No data required qualification.

2.1.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for ICP metals analysis by Method 6010B are specified in VET-1405-PLN-03, Rev. 2, as 180 days from sampling to analysis. All results were generated within these limits.

2.1.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The required quantitation limits (RQLs) (VET-1405-PLN-03, Rev. 2) are shown in Table 2-2.

Table 2-2. Required Quantitation Limit for ICP Metals. (2 Pages)

Analyte	Water (µg/L)
Aluminum	50
Antimony	40
Arsenic	50
Barium	5
Beryllium	5
Boron	50
Cadmium	5
Calcium	50
Chromium	5
Cobalt	5
Copper	5
Iron	50

Table 2-2. Required Quantitation Limit for ICP Metals. (2 Pages)

Analyte	Water (µg/L)
Lead	50
Magnesium	50
Manganese	10
Molybdenum	5
Nickel	10
Potassium	500
Selenium	50
Silicon	50
Silver	10
Sodium	50
Strontium	5
Thallium	50
Tin	50
Titanium	10
Uranium	5
Vanadium	5
Zinc	10

ICP - Inductively Coupled Plasma

Table 2-3 lists the analytes that were detected in the method blank.

Table 2-3. ICP Metals Method Blank Exceedances.

Batch ID	Matrix	Analyte	CAS	Result	Q	3 Times the Detection Limit[1]	RQL
L908084	W	Barium	7440-39-3	0.0989	J	0.75	5
L908084	W	Manganese	7439-96-5	0.31	J	3.75	10
L908084	W	Silicon	7440-21-3	10	J	112.5	50
L908084	W	Zinc	7440-66-6	1.26	J	37.5	10

1. Units are µg/L for water.

CAS - Chemical Abstracts Service
ICP - inductively coupled plasma
Q - laboratory qualifier
RQL - required quantitation limit
W - water

All analytes detected in the method blank were detected at levels less than three times the instrument detection limit. Therefore no qualification of data was necessary due to method blank contamination.

All other blank results met acceptance criteria.

2.1.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The quantitation limit for five iron and two zinc results exceeded the required detection limits at 125 µg/L and 12.5 µg/L, respectively. No qualification of data is necessary for detection limits that exceed required detection limits.

All other quantitation limits for nondetect results met the required detection limits.

2.2. DATA VALIDATION REPORT FOR MERCURY (METHOD 7470A)

Table 2-4 is a summary of the validated results for mercury.

Table 2-4. Summary of Mercury Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0908005-01	G049	W	L908072	0.200	µg/L	0.2	U		
0908005-02	G050	W	L908072	0.200	µg/L	0.2	U		
0908005-03	G051	W	L908072	0.0700	µg/L	0.2	J		
0908009-01	G052	W	L908072	0.200	µg/L	0.2	U		
0908009-02	G053	W	L908072	0.200	µg/L	0.2	U		
0908017-01	G054	W	L908072	0.200	µg/L	0.2	U		
0908017-02	G055	W	L908072	0.200	µg/L	0.2	U		
0908017-03	G056	W	L908072	0.200	µg/L	0.2	U		

Conc. - Concentration
RQL - Required Quantitation Limit
Q - Laboratory Qualifier
V - Validation Qualifier
W - Water

2.2.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-5 shows the number of each type of sample in each preparation batch.

Table 2-5. Mercury Preparation Batch Summary.

Batch ID	Matrix	BLK	DUP	LCS	MS	MSD	Sample
L908072	W	1	1	1	1	1	8

BLK - Blank
DUP - Duplicate
LCS - Laboratory Control Sample
MS - Matrix Spike
MSD - Matrix Spike Duplicate
W - Water

Mercury analysis was performed in one batch. The batch contained fewer than 20 field samples. The batch included a method blank, LCS, duplicate, MS and MSD. The number of QC samples met batch criteria.

2.2.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for mercury analysis by Method 7470A is specified in VET-1405-PLN-03, Rev. 2, as 28 days. All holding times met criteria.

2.2.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The RQL (VET-1405-PLN-03, Rev. 2) is shown in Table 2-6.

Table 2-6. Required Quantitation Limit for Mercury.

Analyte	Water (µg/L)
Mercury	0.05

None of the quantitation limits met the required detection limit. One sample result was a low-level estimated detect. All other results were nondetects with detection limits exceeding the required detection limit. No qualification of data is necessary for nondetect results that do not meet the required detection limit.

2.3. DATA VALIDATION REPORT FOR HEXAVALENT CHROMIUM (METHOD 7196A)

Table 2-7 is a summary of the validated results for hexavalent chromium.

Table 2-7. Summary of Hexavalent Chromium Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0908005-01	G049	W	L908065	0.07	mg/L	0.05		J	Hold time
0908005-02	G050	W	L908065	0.07	mg/L	0.05		J	Hold time
0908005-03	G051	W	L908065	0.08	mg/L	0.05		J	Hold time
0908009-01	G052	W	L908067	0.05	mg/L	0.05		J	Hold time
0908009-02	G053	W	L908067	0.05	mg/L	0.05	U	UJ	Hold time
0908017-01	G054	W	L908068	0.04	mg/L	0.05	J	J	Hold time
0908017-02	G055	W	L908068	0.08	mg/L	0.02		J	Hold time
0908017-03	G056	W	L908068	0.10	mg/L	0.02		J	Hold time

Conc. - Concentration
Q - Laboratory Qualifier
RQL - Required Quantitation Limit
V - Validation Qualifier
W - Water

2.3.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, and a MS sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-8 shows the number of each type of sample in each preparation batch.

Table 2-8. Hexavalent Chromium Preparation Batch Summary.

Batch ID	Matrix	BLK	LCS	DUP	MS	MSD	Sample
L908065	W	1	2	1	1		3
L908067	W	1	2	1	1		2
L908068	W	1	2	1	1		3

BLK - Blank
DUP - Duplicate
LCS - Laboratory Control Sample
MS - Matrix Spike
MSD - Matrix Spike Duplicate
W - Water

Hexavalent chromium analysis was performed in three batches. Each batch contained fewer than 20 field samples. One MB, LCS, duplicate, and MS were analyzed in each sample batch. The sampling plan requires one MS and one MSD or duplicate per every 20 samples. Therefore, QC sample frequency requirements were met.

2.3.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for chromium (VI) analysis by Method 7196A is specified in VET-1405-PLN-03, Rev. 2, as 24 hours for water samples. None of the chromium (VI) results were generated within the 24 hour hold time. All results were generated within less than twice the hold time; therefore all chromium (VI) results were qualified as estimated and flagged 'J' for detects, 'UJ' for nondetects.

2.3.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for chromium (VI). The one nondetect result was reported at 0.05 mg/L.

2.4. DATA VALIDATION REPORT FOR CYANIDE (METHOD 9014)

Table 2-9 is a summary of the validated results for cyanide.

Table 2-9. Summary of Cyanide Validation. (2 pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0908005-01	G049	W	L908171	5.0	µg/L	5	U		
0908005-02	G050	W	L908171	5.0	µg/L	5	U		
0908005-03	G051	W	L908171	5.0	µg/L	5	U		
0908009-01	G052	W	L908171	5.0	µg/L	5	U		
0908009-02	G053	W	L908171	5.0	µg/L	5	U		
0908017-01	G054	W	L908171	5.0	µg/L	5	U		

Table 2-9. Summary of Cyanide Validation. (2 pages)

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0908017-02	G055	W	L908171	5.0	µg/L	5	U		
0908017-03	G056	W	L908185	5.0	µg/L	5	U		

Conc. - Concentration
RQL - Required Quantitation Limit
Q - Laboratory Qualifier
V - Validation Qualifier
W - Water

2.4.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-10 shows the number of each type of sample in each preparation batch.

Table 2-10. Cyanide Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	DUP	MS	Sample
L908171	W	1	2	1	1	7
L908185	W	1	2			1

DUP - Duplicate
LCS - Laboratory Control Sample
MB - Method Blank
MS - Matrix Spike
W - Water

Cyanide analysis was performed in two batches of samples. Each batch contained fewer than 20 field samples. At least one MB and LCS were analyzed in each sample batch. One batch had an MS and a DUP included. The sampling plan requires that there be one MS and MSD or DUP per every 20 field samples. Accuracy and precision frequency requirements were met. All other QC requirements were met.

2.4.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for cyanide analysis by Method 9014 is specified in VET-1405-PLN-03, Rev. 2, as 14 days. All results were generated within these limits.

2.4.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for cyanide. Cyanide was not detected in any of the samples. Detection limits were 5 µg/L for water samples.

2.5. DATA VALIDATION REPORT FOR SULFIDE (METHOD 9034)

Table 2-11 is a summary of the validated results for sulfide.

Table 2-11. Summary of Sulfide Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0908005-01	G049	W	L908138	1.00	mg/L	1	U		
0908005-02	G050	W	L908138	1.00	mg/L	1	U		
0908005-03	G051	W	L908138	1.00	mg/L	1	U		
0908009-01	G052	W	L908138	1.00	mg/L	1	U		
0908009-02	G053	W	L908138	1.00	mg/L	1	U		
0908017-01	G054	W	L908138	1.00	mg/L	1	U		
0908017-02	G055	W	L908138	1.00	mg/L	1	U		
0908017-03	G056	W	L908138	1.00	mg/L	1	U		

Conc. - Concentration
RQL - Required Quantitation Limit
Q - Laboratory Qualifier
V - Validation Qualifier
W - Water

2.5.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-12 shows the number of each type of sample in each preparation batch.

Table 2-12. Sulfide Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	DUP	MS	Sample
L908138	W	1	2	1	1	8

DUP - Duplicate
LCS - Laboratory Control Sample
MB - Method Blank
MS - Matrix Spike
W - Water

Sulfide analysis was performed in one batch. The batch contained fewer than 20 field samples. At least one MB, LCS, duplicate, and MS was analyzed in the batch. The sampling plan requires one MS and one duplicate for every 20 field samples. These numbers satisfy all requirements for frequency of QC sample analysis.

2.5.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for sulfide analysis by Method 9034 are specified in VET-1405-PLN-03, Rev. 2, as 7 days. All results were generated within these limits.

2.5.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for sulfide. The detection limit was 1 mg/L for all samples.

2.6. DATA VALIDATION REPORT FOR ANIONS (METHOD 9056)

Results for six anions (chloride, fluoride, nitrate, nitrite, orthophosphate, and sulfate) were requested for each of the 8 samples in this group. Table 2-13 is a summary of the validation for anions. Note results for bromide were reported by the laboratory, but were not required by the sampling and analysis plan. Bromide results are listed in Table 2-13, but were not validated.

Table 2-13. Summary of Anions Validation. (2 pages)

Lab ID	Client ID	Matrix	Analyte	CAS	Batch ID	Conc.	Units	EQL	Q	V	Reason
0908005-01	G049	W	Bromide	24959-67-9	L908167	0.25	mg/L	0.25	U		
0908005-01	G049	W	Chloride	16887-00-6	L908167	9.69	mg/L	0.5			
0908005-01	G049	W	Fluoride	16984-48-8	L908167	0.43	mg/L	0.25			
0908005-01	G049	W	Nitrate	14797-55-8	L908167	18.9	mg/L	1.25			
0908005-01	G049	W	Nitrite	14797-65-0	L908167	0.25	mg/L	0.25	U		
0908005-01	G049	W	Orthophosphate	14265-44-2	L908167	0.25	mg/L	0.25	U		
0908005-01	G049	W	Sulfate	14808-79-8	L908167	24.1	mg/L	1.25			
0908005-02	G050	W	Bromide	24959-67-9	L908167	0.25	mg/L	0.25	U		
0908005-02	G050	W	Chloride	16887-00-6	L908167	9.37	mg/L	0.25			
0908005-02	G050	W	Fluoride	16984-48-8	L908167	0.32	mg/L	0.25			
0908005-02	G050	W	Nitrate	14797-55-8	L908167	18.5	mg/L	1.25			
0908005-02	G050	W	Nitrite	14797-65-0	L908167	0.25	mg/L	0.25	U		
0908005-02	G050	W	Orthophosphate	14265-44-2	L908167	0.25	mg/L	0.25	U		
0908005-02	G050	W	Sulfate	14808-79-8	L908167	23.6	mg/L	1.25			
0908005-03	G051	W	Bromide	24959-67-9	L908167	0.25	mg/L	0.25	U		
0908005-03	G051	W	Chloride	16887-00-6	L908167	9.21	mg/L	0.25			
0908005-03	G051	W	Fluoride	16984-48-8	L908167	0.38	mg/L	0.25			
0908005-03	G051	W	Nitrate	14797-55-8	L908167	18.1	mg/L	1.25			
0908005-03	G051	W	Nitrite	14797-65-0	L908167	0.25	mg/L	0.25	U		
0908005-03	G051	W	Orthophosphate	14265-44-2	L908167	0.25	mg/L	0.25	U		
0908005-03	G051	W	Sulfate	14808-79-8	L908167	23.9	mg/L	1.25			
0908009-01	G052	W	Bromide	24959-67-9	L908167	0.25	mg/L	0.25	U		
0908009-01	G052	W	Chloride	16887-00-6	L908167	9.46	mg/L	0.25			
0908009-01	G052	W	Fluoride	16984-48-8	L908167	0.34	mg/L	0.25			
0908009-01	G052	W	Nitrate	14797-55-8	L908167	19.2	mg/L	1.25			
0908009-01	G052	W	Nitrite	14797-65-0	L908167	0.25	mg/L	0.25	U		
0908009-01	G052	W	Orthophosphate	14265-44-2	L908167	0.25	mg/L	0.25	U		
0908009-01	G052	W	Sulfate	14808-79-8	L908167	24.8	mg/L	1.25			
0908009-02	G053	W	Bromide	24959-67-9	L908167	0.25	mg/L	0.25	U		
0908009-02	G053	W	Chloride	16887-00-6	L908167	9.64	mg/L	0.25			
0908009-02	G053	W	Fluoride	16984-48-8	L908167	0.33	mg/L	0.25			

Table 2-13. Summary of Anions Validation. (2 pages)

Lab ID	Client ID	Matrix	Analyte	CAS	Batch ID	Conc.	Units	EQL	Q	V	Reason
0908009-02	G053	W	Nitrate	14797-55-8	L908167	19.0	mg/L	1.25			
0908009-02	G053	W	Nitrite	14797-65-0	L908167	0.25	mg/L	0.25	U		
0908009-02	G053	W	Orthophosphate	14265-44-2	L908167	0.25	mg/L	0.25	U		
0908009-02	G053	W	Sulfate	14808-79-8	L908167	24.9	mg/L	1.25			
0908017-01	G054	W	Bromide	24959-67-9	L908213	0.25	mg/L	0.25	U		
0908017-01	G054	W	Chloride	16887-00-6	L908213	9.72	mg/L	0.25			
0908017-01	G054	W	Fluoride	16984-48-8	L908213	0.41	mg/L	0.25			
0908017-01	G054	W	Nitrate	14797-55-8	L908213	18.7	mg/L	1.25			
0908017-01	G054	W	Nitrite	14797-65-0	L908213	0.25	mg/L	0.25	U		
0908017-01	G054	W	Orthophosphate	14265-44-2	L908213	0.25	mg/L	0.25	U		
0908017-01	G054	W	Sulfate	14808-79-8	L908213	24.2	mg/L	1.25			
0908017-02	G055	W	Bromide	24959-67-9	L908213	0.25	mg/L	0.25	U		
0908017-02	G055	W	Chloride	16887-00-6	L908213	9.49	mg/L	0.25			
0908017-02	G055	W	Fluoride	16984-48-8	L908213	0.44	mg/L	0.25			
0908017-02	G055	W	Nitrate	14797-55-8	L908213	20.4	mg/L	1.25			
0908017-02	G055	W	Nitrite	14797-65-0	L908213	0.25	mg/L	0.25	U		
0908017-02	G055	W	Orthophosphate	14265-44-2	L908213	0.25	mg/L	0.25	U		
0908017-02	G055	W	Sulfate	14808-79-8	L908213	24.4	mg/L	1.25			
0908017-03	G056	W	Bromide	24959-67-9	L908213	0.25	mg/L	0.25	U		
0908017-03	G056	W	Chloride	16887-00-6	L908213	9.50	mg/L	0.25			
0908017-03	G056	W	Fluoride	16984-48-8	L908213	0.44	mg/L	0.25			
0908017-03	G056	W	Nitrate	14797-55-8	L908213	20.7	mg/L	1.25			
0908017-03	G056	W	Nitrite	14797-65-0	L908213	0.25	mg/L	0.25	U		
0908017-03	G056	W	Orthophosphate	14265-44-2	L908213	0.25	mg/L	0.25	U		
0908017-03	G056	W	Sulfate	14808-79-8	L908213	24.7	mg/L	1.25			

CAS - Chemical Abstracts System
Conc. - Concentration
RQL - Required Quantitation Limit
Q - Laboratory Qualifier
V - Validation Qualifier
W - Water

2.6.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-14 shows the number of each type of sample in each preparation batch.

Table 2-14. Anion Preparation Batch Summary.

Batch ID	Matrix	Analyte	CAS	MB	LCS	DUP	MS	Sample
L908167	W	Orthophosphate	14265-44-2	1	1	2	2	5
L908167	W	Nitrate	14797-55-8	1	1	2	2	5
L908167	W	Nitrite	14797-65-0	1	1	2	2	5
L908167	W	Sulfate	14808-79-8	1	1	2	2	5
L908167	W	Chloride	16887-00-6	1	1	2	2	5
L908167	W	Fluoride	16984-48-8	1	1	2	2	5
L908167	W	Bromide	24959-67-9	1	1	2	2	5
L908213	W	Orthophosphate	14265-44-2	1	1			3
L908213	W	Nitrate	14797-55-8	1	1			3
L908213	W	Nitrite	14797-65-0	1	1			3
L908213	W	Sulfate	14808-79-8	1	1			3
L908213	W	Chloride	16887-00-6	1	1			3
L908213	W	Fluoride	16984-48-8	1	1			3
L908213	W	Bromide	24959-67-9	1	1			3

CAS - Chemical Abstracts System
DUP - Duplicate
LCS - Laboratory Control Sample
MB - Method Blank
MS - Matrix Spike
W - Water

As shown in Table 2-14, anion analysis was performed on eight samples in two batches for each anion. Each batch contained fewer than 20 field samples. At least one MB and one LCS were analyzed in each sample batch.

The sampling plan requires one MS and one DUP be analyzed for every 20 field samples. There were eight samples between the two anion batches and two MS and two DUPs for those eight samples. Thus, the intent of the sampling plan was met and accuracy and precision frequency requirements were met for these batches.

2.6.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for analysis of water samples by Method 9056 is specified in VET-1405-PLN-03, Rev. 2, as 48 hours. All sample results were generated within hold times.

2.6.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The required detection limit (VET-1405-PLN-3, Rev. 0) for anions in water is 0.1 mg/L. The required quantitation limit was exceeded for nitrite and orthophosphate in all samples where these analytes were not detected. The validation criteria do not require that these results be qualified. Other nondetect anion results met the required quantitation limit.

2.7. DATA VALIDATION REPORT FOR TOTAL PHENOLS (METHOD 9066)

Table 2-15 is a summary of the validated results for analysis of total phenols.

Table 2-15. Summary of Total Phenols Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0908005-01	G049	W	L908117	5.0	µg/L	5	U		
0908005-02	G050	W	L908117	5.0	µg/L	5	U		
0908005-03	G051	W	L908117	5.0	µg/L	5	U		
0908009-01	G052	W	L908117	5.0	µg/L	5	U		
0908009-02	G053	W	L908117	5.0	µg/L	5	U		
0908017-02	G055	W	L908117	5.0	µg/L	5	U		
0908017-03	G056	W	L908117	5.0	µg/L	5	U		
0908005-01	G049	W	L908117	5.0	µg/L	5	U		

Conc. - Concentration
RQL - Required Quantitation Limit
Q - Laboratory Qualifier
V - Validation Qualifier
W - Water

2.7.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-16 shows the number of each type of sample in each preparation batch.

Table 2-16. Total Phenols Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	DUP	MS	Sample
L908117	W	1	2	1	1	7

DUP - Duplicate
LCS - Laboratory Control Sample
MB - Method Blank
MS - Matrix Spike
W - Water

Total phenol analysis was performed in one batch. The batch contained fewer than 20 field samples. At least one MB, LCS, MS, and DUP were analyzed in the batch. All requirements for QC sample analysis were achieved.

Note only seven of the eight samples were analyzed. Per Orlette Johnson of LVL (email dated 10/14/2009), the sample vial for G054 was discovered to be broken upon receipt at the laboratory and the sample could not be analyzed for total phenols.

2.7.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for total phenol analysis by Method 9066 is specified in VET-1405-PLN-03, Rev. 2, as 28 days. All results were generated within these limits.

2.7.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for total phenol. Detection limits for phenols were 5 µg/L for all samples.

2.8. DATA VALIDATION REPORT FOR POLYCHLORINATED BIPHENYL COMPOUNDS (METHOD 8082)

Results for seven Aroclors (Aroclor-1016, Aroclor-1221, Aroclor-1232, Aroclor-1242, Aroclor-1248, Aroclor-1254, Aroclor-1260) were requested for each of the 8 samples in this group. Table 2-17 is a summary of the validation for polychlorinated biphenyl compounds.

Table 2-17. Summary of PCB Validation. (3 pages)

Lab ID	Client ID	Matrix	Analyte	CAS	Batch ID	Conc.	Units	EQL	Q	V	Reason
0908005-01	G049	W	Aroclor 1016	12674-11-2	L908046	0.400	ug/L	0.4	U		
0908005-01	G049	W	Aroclor 1221	11104-28-2	L908046	0.400	ug/L	0.4	U		
0908005-01	G049	W	Aroclor 1232	11141-16-5	L908046	0.400	ug/L	0.4	U		
0908005-01	G049	W	Aroclor 1242	53469-21-9	L908046	0.400	ug/L	0.4	U		
0908005-01	G049	W	Aroclor 1248	12672-29-6	L908046	0.400	ug/L	0.4	U		
0908005-01	G049	W	Aroclor 1254	11097-69-1	L908046	0.400	ug/L	0.4	U		
0908005-01	G049	W	Aroclor 1260	11096-82-5	L908046	0.400	ug/L	0.4	U		
0908005-02	G050	W	Aroclor 1016	12674-11-2	L908046	0.400	ug/L	0.4	U		
0908005-02	G050	W	Aroclor 1221	11104-28-2	L908046	0.400	ug/L	0.4	U		
0908005-02	G050	W	Aroclor 1232	11141-16-5	L908046	0.400	ug/L	0.4	U		
0908005-02	G050	W	Aroclor 1242	53469-21-9	L908046	0.400	ug/L	0.4	U		
0908005-02	G050	W	Aroclor 1248	12672-29-6	L908046	0.400	ug/L	0.4	U		
0908005-02	G050	W	Aroclor 1254	11097-69-1	L908046	0.400	ug/L	0.4	U		
0908005-02	G050	W	Aroclor 1260	11096-82-5	L908046	0.400	ug/L	0.4	U		
0908005-03	G051	W	Aroclor 1016	12674-11-2	L908046	0.400	ug/L	0.4	U		
0908005-03	G051	W	Aroclor 1221	11104-28-2	L908046	0.400	ug/L	0.4	U		
0908005-03	G051	W	Aroclor 1232	11141-16-5	L908046	0.400	ug/L	0.4	U		
0908005-03	G051	W	Aroclor 1242	53469-21-9	L908046	0.400	ug/L	0.4	U		
0908005-03	G051	W	Aroclor 1248	12672-29-6	L908046	0.400	ug/L	0.4	U		
0908005-03	G051	W	Aroclor 1254	11097-69-1	L908046	0.400	ug/L	0.4	U		
0908005-03	G051	W	Aroclor 1260	11096-82-5	L908046	0.400	ug/L	0.4	U		
0908009-01	G052	W	Aroclor 1016	12674-11-2	L908046	0.400	ug/L	0.4	U		
0908009-01	G052	W	Aroclor 1221	11104-28-2	L908046	0.400	ug/L	0.4	U		
0908009-01	G052	W	Aroclor 1232	11141-16-5	L908046	0.400	ug/L	0.4	U		
0908009-01	G052	W	Aroclor 1242	53469-21-9	L908046	0.400	ug/L	0.4	U		
0908009-01	G052	W	Aroclor 1248	12672-29-6	L908046	0.400	ug/L	0.4	U		
0908009-01	G052	W	Aroclor 1254	11097-69-1	L908046	0.400	ug/L	0.4	U		
0908009-01	G052	W	Aroclor 1260	11096-82-5	L908046	0.400	ug/L	0.4	U		
0908009-02	G053	W	Aroclor 1016	12674-11-2	L908046	0.400	ug/L	0.4	U		
0908009-02	G053	W	Aroclor 1221	11104-28-2	L908046	0.400	ug/L	0.4	U		
0908009-02	G053	W	Aroclor 1232	11141-16-5	L908046	0.400	ug/L	0.4	U		

Table 2-17. Summary of PCB Validation. (3 pages)

Lab ID	Client ID	Matrix	Analyte	CAS	Batch ID	Conc.	Units	EQL	Q	V	Reason
0908009-02	G053	W	Aroclor 1242	53469-21-9	L908046	0.400	ug/L	0.4	U		
0908009-02	G053	W	Aroclor 1248	12672-29-6	L908046	0.400	ug/L	0.4	U		
0908009-02	G053	W	Aroclor 1254	11097-69-1	L908046	0.400	ug/L	0.4	U		
0908009-02	G053	W	Aroclor 1260	11096-82-5	L908046	0.400	ug/L	0.4	U		
0908017-01	G054	W	Aroclor 1016	12674-11-2	L908074	0.400	ug/L	0.4	U		
0908017-01	G054	W	Aroclor 1221	11104-28-2	L908074	0.400	ug/L	0.4	U		
0908017-01	G054	W	Aroclor 1232	11141-16-5	L908074	0.400	ug/L	0.4	U		
0908017-01	G054	W	Aroclor 1242	53469-21-9	L908074	0.400	ug/L	0.4	U		
0908017-01	G054	W	Aroclor 1248	12672-29-6	L908074	0.400	ug/L	0.4	U		
0908017-01	G054	W	Aroclor 1254	11097-69-1	L908074	0.400	ug/L	0.4	U		
0908017-01	G054	W	Aroclor 1260	11096-82-5	L908074	0.400	ug/L	0.4	U		
0908017-02	G055	W	Aroclor 1016	12674-11-2	L908074	0.400	ug/L	0.4	U		
0908017-02	G055	W	Aroclor 1221	11104-28-2	L908074	0.400	ug/L	0.4	U		
0908017-02	G055	W	Aroclor 1232	11141-16-5	L908074	0.400	ug/L	0.4	U		
0908017-02	G055	W	Aroclor 1242	53469-21-9	L908074	0.400	ug/L	0.4	U		
0908017-02	G055	W	Aroclor 1248	12672-29-6	L908074	0.400	ug/L	0.4	U		
0908017-02	G055	W	Aroclor 1254	11097-69-1	L908074	0.400	ug/L	0.4	U		
0908017-02	G055	W	Aroclor 1260	11096-82-5	L908074	0.400	ug/L	0.4	U		
0908017-03	G056	W	Aroclor 1016	12674-11-2	L908074	0.400	ug/L	0.4	U		
0908017-03	G056	W	Aroclor 1221	11104-28-2	L908074	0.400	ug/L	0.4	U		
0908017-03	G056	W	Aroclor 1232	11141-16-5	L908074	0.400	ug/L	0.4	U		
0908017-03	G056	W	Aroclor 1242	53469-21-9	L908074	0.400	ug/L	0.4	U		
0908017-03	G056	W	Aroclor 1248	12672-29-6	L908074	0.400	ug/L	0.4	U		
0908017-03	G056	W	Aroclor 1254	11097-69-1	L908074	0.400	ug/L	0.4	U		
0908017-03	G056	W	Aroclor 1260	11096-82-5	L908074	0.400	ug/L	0.4	U		
0908005-01	G049	W	Aroclor 1016	12674-11-2	L908046	0.400	ug/L	0.4	U		
0908005-01	G049	W	Aroclor 1221	11104-28-2	L908046	0.400	ug/L	0.4	U		
0908005-01	G049	W	Aroclor 1232	11141-16-5	L908046	0.400	ug/L	0.4	U		
0908005-01	G049	W	Aroclor 1242	53469-21-9	L908046	0.400	ug/L	0.4	U		
0908005-01	G049	W	Aroclor 1248	12672-29-6	L908046	0.400	ug/L	0.4	U		
0908005-01	G049	W	Aroclor 1254	11097-69-1	L908046	0.400	ug/L	0.4	U		

Table 2-17. Summary of PCB Validation. (3 pages)

Lab ID	Client ID	Matrix	Analyte	CAS	Batch ID	Conc.	Units	EQL	Q	V	Reason
0908005-01	G049	W	Aroclor 1260	11096-82-5	L908046	0.400	ug/L	0.4	U		
0908005-02	G050	W	Aroclor 1016	12674-11-2	L908046	0.400	ug/L	0.4	U		
0908005-02	G050	W	Aroclor 1221	11104-28-2	L908046	0.400	ug/L	0.4	U		
0908005-02	G050	W	Aroclor 1232	11141-16-5	L908046	0.400	ug/L	0.4	U		
0908005-02	G050	W	Aroclor 1242	53469-21-9	L908046	0.400	ug/L	0.4	U		
0908005-02	G050	W	Aroclor 1248	12672-29-6	L908046	0.400	ug/L	0.4	U		
0908005-02	G050	W	Aroclor 1254	11097-69-1	L908046	0.400	ug/L	0.4	U		
0908005-02	G050	W	Aroclor 1260	11096-82-5	L908046	0.400	ug/L	0.4	U		
0908005-03	G051	W	Aroclor 1016	12674-11-2	L908046	0.400	ug/L	0.4	U		
0908005-03	G051	W	Aroclor 1221	11104-28-2	L908046	0.400	ug/L	0.4	U		

CAS - Chemical Abstracts System
Conc. - Concentration
RQL - Required Quantitation Limit
Q - Laboratory Qualifier
V - Validation Qualifier
W - Water

2.8.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each field sample and each QC sample?
- Was precision checked with an MSD?

Table 2-18 shows the number of each type of sample in each preparation batch.

Table 2-18. PCB Preparation Batch Summary.

Batch ID	Matrix	Analyte	CAS	MB	LCS	MS	MSD	Surr	Sample
L908046	W	Aroclor 1016	12674-11-2	1	2	1	1		5
L908046	W	Aroclor 1221	11104-28-2	1					5
L908046	W	Aroclor 1232	11141-16-5	1					5
L908046	W	Aroclor 1242	53469-21-9	1					5
L908046	W	Aroclor 1248	12672-29-6	1					5
L908046	W	Aroclor 1254	11097-69-1	1					5
L908046	W	Aroclor 1260	11096-82-5	1	2	1	1		5
L908046	W	Decachlorobiphenyl	2051-24-3					11	
L908046	W	Tetrachloro-meta-xylene	877-09-8					11	
L908074	W	Aroclor 1016	12674-11-2	1	2				3
L908074	W	Aroclor 1221	11104-28-2	1					3
L908074	W	Aroclor 1232	11141-16-5	1					3
L908074	W	Aroclor 1242	53469-21-9	1					3
L908074	W	Aroclor 1248	12672-29-6	1					3
L908074	W	Aroclor 1254	11097-69-1	1					3
L908074	W	Aroclor 1260	11096-82-5	1	2				3
L908074	W	Decachlorobiphenyl	2051-24-3					6	
L908074	W	Tetrachloro-meta-xylene	877-09-8					6	

CAS - Chemical Abstracts System
LCS - Laboratory Control Sample
MB - Method Blank
MS - Matrix Spike
MSD - Matrix Spike Duplicate
PCB - Polycholorinated Biphenyl
Surr - Surrogate
W - Water

PCB analysis was performed on two batches of water samples. Each batch contained fewer than 20 field samples. Each batch contained at least one MB and LCS. One batch contained a MS/MSD pair, satisfying the SAP requirement of one MS and one duplicate or MSD for every 20 samples. In accordance with requirements of the analytical method, the LCS and MS/MSD contained at least Aroclor-1016 and Aroclor-1260.

Surrogates were added to and analyzed in every sample, LCS, MB, MS, and MSD.

2.8.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for PCB analysis by Method 8082 are specified in VET-1405-PLN-03, Rev. 2, as 14 days for water samples. U.S. Environmental Protection Agency (SW-846, Chapter 2) lists the holding time limit to extraction of PCBs as 7 days for water samples. Method 8082 indicates that samples should be analyzed within 40 days after extraction. The SW-846 limits of 7 days to extraction and 40 days after extraction to analysis were used.

All results were generated within holding times.

2.8.3. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The required quantitation limits (VET-1405-PLN-03, Rev. 2) are 1 µg/L in groundwater samples. All results were nondetects. Detection limits met the requirements.

2.9. DATA VALIDATION REPORT FOR VOLATILE ORGANIC COMPOUNDS (METHOD 8260)

Eighty compounds were requested for each of the 8 samples in this group. Results were reported in the EDDs for the 78 compounds that the laboratory commonly reports. The remaining two, 1,4-difluorobenzene and tetrahydrofuran, are not expected to be detected regularly. The laboratory performed a spectral search for those, and, as reported in the data package narratives, none were found.

The table listing the results is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM.

2.9.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each sample and each batch QC sample?
- Was precision checked with a MSD or DUP?

The sample batches for volatile organic analysis are outlined in Table 2-19.

Table 2-19. VOA Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	MB	LCS	MS	MSD	Surr	Sample
L908106	W	1	1	1	1	8	4
L908142	W	1	1	1	1	11	7

LCS - Laboratory Control Sample
MB - Method Blank
MS - Matrix Spike
MSD - Matrix Spike Duplicate
Surr - Surrogate
VOA - Volatile Organic Analysis
W - Water

Volatile organic analysis was performed in two batches of water samples. Each batch contained fewer than 20 field samples. Results for 78 compounds were reported for each of the 11 samples (including trip blanks). A MB result was reported for each of the 78 compounds in each batch. A LCS containing 47 of the compounds of interest was prepared and analyzed with each batch. There was one MS and MSD pair included in each batch.

Surrogates (1,2-dichloroethane-d4, bromofluorobenzene, and toluene-d8) were added to each sample, MB, LCS, MS, and MSD.

It should be noted, as in previous reports, not all trip blanks were analyzed by the laboratory. Only one trip blank was analyzed per sample delivery group (SDG) and, since trip blanks did not have unique field identifiers, there is no way to know which chain of custody (COC) contained the analyzed trip blank. Results were not reported for three of the six trip blanks delivered to the laboratory.

2.9.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for volatile organic analysis by Method 8260B are specified in VET-1405-PLN-03, Rev. 2, as 14 days for water samples. All results were generated within this limit.

2.9.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The RQLs (VET-1405-PLN-03, Rev. 2) for all VOCs are 5 µg/L for water samples. Acetone was detected in the MB for batch L908142 at 3.55 µg/L. This value is less than five times the detection limit for acetone, a common laboratory contaminant. Therefore, no qualification of data was necessary.

No other VOCs were detected in the method blanks.

2.9.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Of 858 results reported, 199 were nondetects exceeding the required detection limit of 5 µg/L. Detection limit exceedances are not required to be qualified. Most of the exceedances were reported at 10 µg/L which is an industry norm for water volatile organic analyses (VOAs).

2.10. DATA VALIDATION REPORT FOR SEMIVOLATILE ORGANIC COMPOUNDS (METHOD 8270C)

Eighty-five SVOCs were requested for the 8 samples in this group. Semivolatile organic analysis (SVOA) results were reported in the EDDs for the 69 of these compounds that the laboratory commonly reports. Of the 16 SVOCs requested, but not reported by Method 8270C, 1,2-dichlorobenzene, 1,3-dichlorobenzene and 1,4-dichlorobenzene are reported as VOCs

(Method 8260B). For the remaining 13 (2,6-dimethylnaphthalene, 1,6,7-trimethylnaphthalene, 1-methyl-9H-fluorene, dibenzothiophene, 2-methylphenanthrene, 1-methylphenanthrene, 4,6-dimethyldibenzothiophene, 3,6-dimethylphenanthrene, 2-methylfluoranthene, retene, 5-methylchrysene, benzo(e)pyrene, and perylene) the laboratory performed a spectral search, and, as reported in the data package narrative, none were found.

The table listing the analytical results and the results of the validation for SVOCs is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM.

2.10.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each sample and each batch QC sample?
- Was precision checked with a MSD or DUP?

Table 2-20 lists the numbers of QC and field samples analyzed in each batch.

Table 2-20. SVOA Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	MS	MSD	Surr	Sample
L908045	W	1	2	1	1	10	5
L908075	W	1	2			6	3

LCS - Laboratory Control Sample
MB - Method Blank
MS - Matrix Spike
MSD - Matrix Spike Duplicate
Surr - Surrogate
SVOA - Semi-Volatile Organic Analysis
W - Water

Semivolatile organic analysis was performed in two batches; each had fewer than 20 field samples. A MB result was reported for each of the reported compounds in each batch.

A LCS was reported for every requested analyte except 1,1-biphenyl in each batch. The LCS is not required to contain all compounds of interest. Therefore, no results were qualified for missing LCS.

One batch contained a MS/MSD pair. The sampling plan requires one MS and MSD or DUP per every 20 samples. The intent of the sampling plan was met.

Surrogates (2,4,6-tribromophenol, 2-fluorobiphenyl, 2-fluorophenol, nitrobenzene-d5, phenol-d5, p-terphenyl-d14) were added to each sample, MB, and LCS.

2.10.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for SVOA by Method 8270C are specified in VET-1405-PLN-03, Rev. 2. The holding time to extraction is 7 days for water samples. Forty additional days after extraction are allowed to complete the analysis. All results were generated within the holding time limits.

2.10.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The required detection limits in water samples are 0.2 µg/L for polycyclic aromatic hydrocarbons (PAHs) and 5 µg/L for other analytes. Most compounds in the MBs were nondetects; the detection limits exceeded the RQL in all cases. However, the validation rules do not require qualification of results for high detection limits.

Several aldol condensation products were detected in the method blank. These are false positives due to reactions of the ketones in the injection port. These products were rejected as false positives in all samples.

2.10.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The required detection limits in water samples are 0.2 µg/L for polycyclic aromatic hydrocarbons and 5 µg/L for other analytes. None of the nondetect results met these requirements. However, the validation rules do not require qualification of the results.

2.10.5. QC Checks for Accuracy

- Did the recoveries for the LCS meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 2, LCS recoveries must be within the statistical limits set by the lab. These limits are shown in Table 2-21.

Table 2-21. Lionville Laboratory SVOA Limits for LCS, MS, and MSD. (3 Pages)

Analyte	CAS	Water Samples	
		LCL (%)	UCL (%)
1,2,4-Trichlorobenzene	120-82-1	40	100
1,2-Diphenylhydrazine	122-66-7	50	110
1-Methylnaphthalene	90-12-0	40	105
2,2'-oxybis(1-Chloropropane)	108-60-1	40	110
2,4,5-Trichlorophenol	95-95-4	50	110

Table 2-21. Lionville Laboratory SVOA Limits for LCS, MS, and MSD. (3 Pages)

Analyte	CAS	Water Samples	
		LCL (%)	UCL (%)
2,4,6-Trichlorophenol	88-06-2	50	110
2,4-Dichlorophenol	120-83-2	45	110
2,4-Dimethylphenol	105-67-9	30	110
2,4-Dinitrophenol	51-28-5	15	130
2,4-Dinitrotoluene	121-14-2	50	120
2,6-Dinitrotoluene	606-20-2	50	110
2-Chloronaphthalene	91-58-7	50	110
2-Chlorophenol	95-57-8	40	140
2-Methylnaphthalene	91-57-6	40	110
2-Methylphenol	95-48-7	40	110
2-Nitroaniline	88-74-4	50	110
2-Nitrophenol	88-75-5	40	110
3,3'-Dichlorobenzidine	91-94-1	0	120
3-and/or 4-Methylphenol	1319-77-3	40	110
3-Nitroaniline	99-09-2	10	120
4,6-Dinitro-2-Methylphenol	534-52-1	40	130
4-Bromophenyl phenyl ether	101-55-3	50	110
4-Chloro-3-Methylphenol	59-50-7	40	110
4-Chloroaniline	106-47-8	10	100
4-Chlorophenyl phenyl ether	7005-72-3	50	120
4-Nitroaniline	100-01-6	10	100
4-Nitrophenol	100-02-7	10	110
Acenaphthene	83-32-9	50	110
Acenaphthylene	208-96-8	50	110
Aniline	62-53-3	5	120
Anthracene	120-12-7	50	120
Benzidine	92-87-5	0	110
Benzo(a)anthracene	56-55-3	50	120
Benzo(a)pyrene	50-32-8	50	140
Benzo(b)fluoranthene	205-99-2	50	140
Benzo(g,h,i)perylene	191-24-2	50	140
Benzo(k)fluoranthene	207-08-9	50	140
Benzoic Acid	65-85-0	0	112
Benzyl Alcohol	100-51-6	40	110
Bis(2-Chloroethoxy)methane	111-91-1	45	105
Bis(2-Chloroethyl) ether	111-44-4	40	120
Bis(2-Ethylhexyl) phthalate	117-81-7	40	140
Butylbenzylphthalate	85-68-7	40	140
Carbazole	86-74-8	20	120
Chrysene	218-01-9	50	120

Table 2-21. Lionville Laboratory SVOA Limits for LCS, MS, and MSD. (3 Pages)

Analyte	CAS	Water Samples	
		LCL (%)	UCL (%)
Dibenzo(a,h)anthracene	53-70-3	50	140
Dibenzofuran	132-64-9	60	110
Diethyl phthalate	84-66-2	40	130
Dimethyl phthalate	131-11-3	40	130
Di-n-Butyl phthalate	84-74-2	40	130
Di-n-octyl phthalate	117-84-0	40	140
Fluoranthene	206-44-0	50	120
Fluorene	86-73-7	60	110
Hexachloro-1,3-butadiene	87-68-3	40	100
Hexachlorobenzene	118-74-1	50	110
Hexachlorocyclopentadiene	77-47-4	20	100
Hexachloroethane	67-72-1	35	110
Indeno(1,2,3-cd)pyrene	193-39-5	50	140
Isophorone	78-59-1	40	110
Naphthalene	91-20-3	40	105
Nitrobenzene	98-95-3	40	100
N-Nitroso-Di-N-Propylamine	621-64-7	40	120
N-Nitrosodiphenylamine	86-30-6	50	110
Pentachlorophenol	87-86-5	15	130
Phenanthrene	85-01-8	50	120
Phenol	108-95-2	30	110
Pyrene	129-00-0	50	130
Pyridine	110-86-1	15	100

CAS - Chemical Abstracts System
LCL - Lower Control Limit
LCS - Laboratory Control Sample
MS - Matrix Spike
MSD - Matrix Spike Duplicate
SVOA - Semi-Volatile Organic Analysis
UCL - Upper Control Limit

Table 2-22 shows the LCS recoveries that were outside control limits. All results for the analytes in the batches indicated in the table were qualified as approximate. All results qualified were nondetects and were flagged "UJ."

Table 2-22. SVOA LCS Recoveries That Did Not Satisfy QC Limits. (3 Pages)

Batch ID	Matrix	Analyte	CAS	Rec (%)
L908045	W	Pyridine	110-86-1	7
L908045	W	Aniline	62-53-3	0
L908045	W	Benzyl alcohol	100-51-6	17
L908045	W	Bis(2-chloroethoxy) methane	111-91-1	0
L908045	W	4-Chloroaniline	106-47-8	0

Table 2-22. SVOA LCS Recoveries That Did Not Satisfy QC Limits. (3 Pages)

Batch ID	Matrix	Analyte	CAS	Rec (%)
L908045	W	2-Nitroaniline	88-74-4	35
L908045	W	Acenapthylene	208-96-8	7
L908045	W	3-Nitrolaniline	99-09-2	0
L908045	W	4-Nitroaniline	100-01-6	0
L908045	W	N-Nitrosodiphenylamine	86-30-6	9
L908045	W	1,2-Diphenylhydrazine	122-66-7	21
L908045	W	Carbazole	86-74-8	9
L908045	W	Pyrene	129-00-0	47
L908045	W	Butyl benzyl phthalate	85-68-7	29
L908045	W	Benzo[a] pyrene	50-32-8	31
L908045	W	Indeno [1,2,3-cd]pyrene	193-39-5	47
L908045	W	Benzo[g,h,i] perylene	191-24-2	40
L908045	W	Bis(2-chloroethoxy) methane	111-91-1	15
L908045	W	4-Chloroaniline	106-47-8	0
L908045	W	3-Nitrolaniline	99-09-2	0
L908045	W	4-Nitroaniline	100-01-6	0
L908045	W	N-Nitrosodiphenylamine	86-30-6	17
L908045	W	1,2-Diphenylhydrazine	122-66-7	42
L908075	W	Aniline	62-53-3	0
L908075	W	Benzyl alcohol	100-51-6	26
L908075	W	Bis(2-chloroethoxy) methane	111-91-1	7
L908075	W	4-Chloroaniline	106-47-8	0
L908075	W	2-Nitroaniline	88-74-4	48
L908075	W	Acenapthylene	208-96-8	29
L908075	W	3-Nitrolaniline	99-09-2	0
L908075	W	2,4-Dinitrophenol	51-28-5	149
L908075	W	4-Nitroaniline	100-01-6	0
L908075	W	N-Nitrosodiphenylamine	86-30-6	0
L908075	W	1,2-Diphenylhydrazine	122-66-7	47
L908075	W	Carbazole	86-74-8	6
L908075	W	Aniline	62-53-3	0
L908075	W	Benzyl alcohol	100-51-6	32
L908075	W	Bis(2-chloroethoxy) methane	111-91-1	6
L908075	W	4-Chloroaniline	106-47-8	0
L908075	W	2-Nitroaniline	88-74-4	25
L908075	W	3-Nitrolaniline	99-09-2	0
L908075	W	4-Nitroaniline	100-01-6	0
L908075	W	N-Nitrosodiphenylamine	86-30-6	0

Table 2-22. SVOA LCS Recoveries That Did Not Satisfy QC Limits. (3 Pages)

Batch ID	Matrix	Analyte	CAS	Rec (%)
L908075	W	1,2-Diphenylhydrazine	122-66-7	43

CAS - Chemical Abstracts Service
LCS - Laboratory Control Sample
QC - quality control
Rec - Recovery (%)
SVOA- Semi-Volatile Organic Analysis
W - Water

2.10.6. Miscellaneous- Tentatively Identified Compounds

Several aldol condensation products were identified. These are false positives due to reactions of the ketones in the injection port. These products are rejected as false positives.

Environmental Quality Management, Inc.

EQM-DVAL-USE-014, Rev. 0

Data Verification and Data Validation of US Ecology Site Data, Chains of Custody 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, and 147

Submitted to:

Vista Engineering

Date:
October 8, 2009

VISTA
ENGINEERING TECHNOLOGIES

EXECUTIVE SUMMARY

Samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 2). Samples were analyzed for volatile organic compounds by Method TO-15.

All analyses were performed by Southwest Research Institute (SwRI), San Antonio, Texas, following the *Specification for Analytical Laboratory Services: Select Soil Gas Volatiles by Method TO-15* (VET-1405-SPEC-01, Rev. 3). In addition to printed data packages for each sample delivery group (SDG), the laboratory provided electronic data deliverables (EDDs), consisting of two Microsoft® Excel files containing tables of results and associated quality control (QC).

This data validation report presents the results of validating the analyses reported in the sixth group of EDDs prepared by the laboratory. This group of EDDs provided the results and QC data for the samples delivered to the laboratory under the chain-of custody (COC) documents listed in Table ES-1.

Table ES-1. Chains Of Custody Applicable To The Data Validated In This Report.

VET-1405-COC-136	VET-1405-COC-137	VET-1405-COC-138
VET-1405-COC-139	VET-1405-COC-140	VET-1405-COC-141
VET-1405-COC-142	VET-1405-COC-143	VET-1405-COC-144
VET-1405-COC-145	VET-1405-COC-146	VET-1405-COC-147

COC - Chain of Custody

The data validation was performed using an electronic data checker to evaluate whether batch QC met criteria. The electronic data checker identified any QC results that exceed applicable criteria. The data validation process was completed by the data validation chemist, who evaluated the impacts of the exceedances and added data validation qualifiers.

Table ES-2 summarizes the validation result.

Table ES-2. Summary Validation Results by Analysis.

Analysis	Number of Results	Number of Qualified Results	Summary
TO-15	2660	59	Column bleed, a laboratory instrument artifact, was qualified as rejected (R).

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ACRONYMS

CAS	Chemical Abstracts Service
COC	Chain of Custody
DUP	Duplicate Sample (field duplicate)
DVAQ	Data Validation Applied Qualifiers
EDD	Electronic Data Deliverable
LCS	Laboratory Control Sample
MB	Method Blank
QC	Quality Control
SDG	Sample Delivery Group
SwRI	Southwest Research Institute
TIC	Tentatively Identified Compound
VOC	Volatile Organic Compound

SwRI Qualifiers

J	This flag indicates an estimated value
NJ	Indicates presumptive evidence of a compound. Indicates an estimated value , where a 1:1 response is assumed
U	Indicates compound was analyzed for, but not detected

Data Validation Applied Qualifiers

R	Indicates the constituent was analyzed for and detected; however, due to an identified QC deficiency, the data should be considered unusable for decision-making purposes.

1. INTRODUCTION – APPROACH TO VALIDATION

Soil gas samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 2). Samples were analyzed for volatile organic compounds (VOCs) by Method TO-15.

All analyses were conducted by Southwest Research Institute (SwRI), San Antonio, Texas, following the *Specification for Analytical Laboratory Services: Select Soil Gas Volatiles by Method TO-15* (VET-1405-SPEC-01, Rev. 3). The results of these analyses were presented in a printed data package for each sample delivery group. In addition, the laboratory provided an electronic data deliverable (EDD) for each sample delivery group. The EDDs are Microsoft® Excel files containing tables of results and associated quality control (QC).

This data validation report presents the results of validating the analyses reported in the sixth group of EDDs received from the laboratory. This group of EDDs and the corresponding chain of custody documents are identified in Table 1-1 below. The data contained in these EDDs included the analysis of VOCs by TO-15, only.

Table 1-1. Chains of Custody and Electronic Data Deliverables Applicable to the Data Validated.

Chain of Custody	EDD	
	File Name	Date Received
VET-1405-COC-136	391637.xls	9/18/2009
VET-1405-COC-137	391637.xls	9/18/2009
VET-1405-COC-138	391637.xls	9/18/2009
VET-1405-COC-139	391637.xls	9/18/2009
VET-1405-COC-140	391637.xls, 391653.xls	9/18/2009
VET-1405-COC-141	391637.xls, 391653.xls	9/18/2009
VET-1405-COC-142	391653.xls	9/18/2009
VET-1405-COC-143	391653.xls	9/18/2009
VET-1405-COC-144	391653.xls	9/18/2009
VET-1405-COC-145	391653.xls	9/18/2009
VET-1405-COC-146	391653.xls	9/18/2009
VET-1405-COC-147	391653.xls	9/18/2009

EDD - Electronic Data Deliverable

This Level A validation was performed in a two-tiered approach.

1. Completeness: an assessment of the completeness was made on the .pdf file of the "hard copy" data.
2. Electronic holding time evaluation.

The approach is summarized in Table 1-2. The electronic review was performed on all incoming EDDs. The EDDs were evaluated to assure consistency with the hard copy data. By using electronic review of all QC, appropriate qualification of all the data can be made.

Table 1-2. Data Validation and Verification Approach.

Review item	Manually Done	Electronic	All Samples
Verification of deliverables	X		X
Requested vs reported analyses		X	X
Holding times		X	X

The remainder of this report consists of the details for data validation of Method TO-15 data. It explains the details of the overall validation process and provides reasons for any data qualifiers that were applied. The automated data validation process determined whether the following facets of laboratory quality control had been achieved.

- Was a method blank (MB) analyzed each day?
- Were surrogates added to each sample and batch QC samples for each method where surrogates are required?
- Was precision checked with a field duplicate (DUP)?
- Were holding time requirements for preparation and analysis satisfied?

After this automated checking, the “no” answers to these questions were investigated manually, the effect on each sample result was determined, and the results were qualified according to the validation rules in TO-15 DV #1, Rev. 0. TO-15 DV#1 was written to validate TO-15 data for Levels A and C for the US Ecology project. It is based on *Data Validation Procedure for Chemical Analyses* (HNF-20433). The evaluations of the automated checking results that were determined to have a potential impact on data quality were appropriately qualified and are presented in the remainder of this report.

Please note laboratory data qualifiers are defined in the “SwRI Qualifiers” table that follows the table of contents. EQM, Inc. checks laboratory qualifiers for consistency with validation qualifiers, but does not edit or change laboratory qualifiers in any way.

2. DATA VALIDATION REPORT

2.1. DATA VALIDATION REPORT FOR VOLATILE ORGANIC COMPOUNDS (METHOD TO-15)

Fifty-seven compounds were requested for each of the 43 samples in this group. All 57 compounds were reported in the EDDs for each sample.

The table listing the results is too large to include here; refer to the Microsoft® Excel file on the accompanying CD-ROM.

2.1.1. Batch Size and Completeness of QC Analysis

QC Requirements --

- Was a MB analyzed each day?
- Were surrogates added to each sample and batch QC samples for each method where surrogates are required?
- Was precision checked with a field duplicate?

Analysis was performed in two batches of vapor samples. Batch 391637 contained 20 samples and 3 blanks. Batch 391653 contained 23 samples and 2 blanks. Because a blank was analyzed on each day that samples were analyzed, QC requirements were met for batches 391637 and 391653.

Two field duplicates were analyzed for the 41 samples submitted by Vista Engineering. This satisfies method field duplicate requirements.

Though it is not required by the method, a laboratory control sample (LCS) was analyzed on each day as required by VET-1405-SPEC-01, Rev. 3. This LCS contained 16 of the analytes of interest. All met criteria.

Surrogates are required for MB and LCS. Though not required by the method, surrogates (1,2-dichloroethane-d4, bromofluorobenzene, and toluene-d8) were added to each sample, as well as the MB and LCS. All met criteria.

2.1.2. Holding Times

QC Requirement --

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for volatile organic analysis by method TO-15 are specified in VET-1405-PLN-03, Rev. 2, as 30 days for summa canisters. All sample analytical results were generated within this limit.

2.2. Tentatively Identified Compounds (TIC)

Per the VET-1405-SPEC-001, Table 1, many compounds were listed as tentatively identified compounds (TICs). TICs are compounds that are identified by comparison with a mass spectral library. No standards are run on the gas chromatograph/mass spectrometer for TICs. The quantity is estimated by ratioing the concentration to the nearest internal standard. None of the TICs listed in VET-1405-SPEC-001, Table 1, were identified in these samples.

Many TICs were identified. The second sheet of the accompanying Microsoft® Excel file lists the TICs and their estimated concentrations.

Because TICs are not calibrated and are impractical to calibrate, only those with many repeated hits in multiple samples should be considered further. Six compounds were identified in five or more samples. Table 2-1 lists these compounds that were frequently identified.

Table 2-1. Frequently Identified TICs and Estimated Concentrations.

Compound	CAS	Present in X Number of Samples
1-HEXANOL, 2-ETHYL-	104-76-7	21
2-PROPANOL, 2-METHYL-	75-65-0	7
DECANE, 3,7-DIMETHYL-	17312-54-8	12
ETHANE, 1,2-DICHLORO-1,1,2-TRIFLUO	354-23-4	29
ETHENE, CHLOROTRIFLUORO-	79-38-9	34
HEPTANE, 2,4-DIMETHYL-	2213-23-2	13
ISOBUTANE	75-28-5	22

CAS - Chemical Abstracts Service TIC - Tentatively Identified Compound

Fifty nine TICs were listed as column bleed. These are silanes that are instrument artifacts from column bleed. These are not valid detections and are qualified as rejected.

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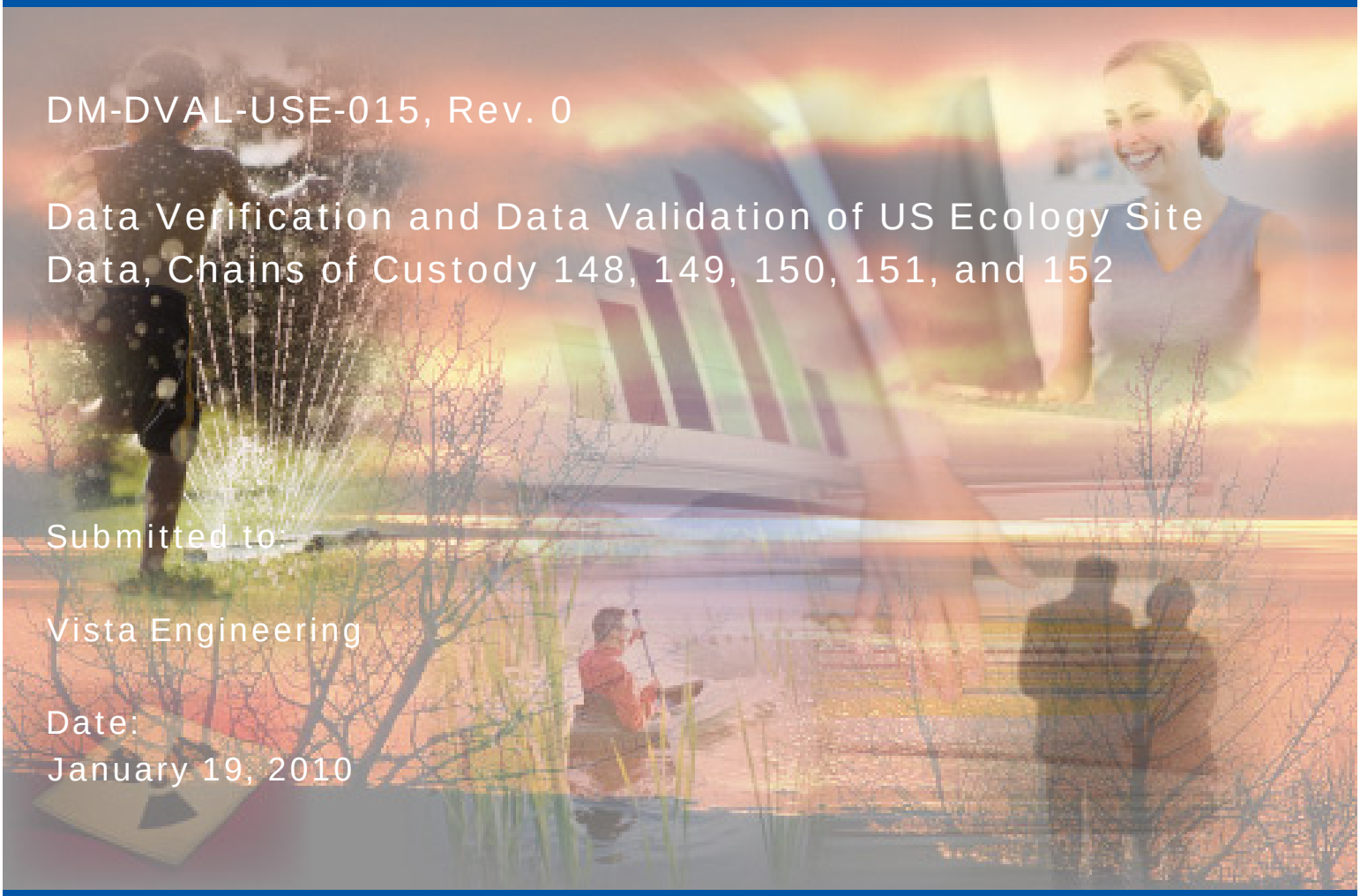

DM-DVAL-USE-015, Rev. 0

Data Verification and Data Validation of US Ecology Site Data, Chains of Custody 148, 149, 150, 151, and 152

Submitted to:

Vista Engineering

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VISTA
ENGINEERING TECHNOLOGIES

EXECUTIVE SUMMARY

Samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, volatile organic compounds, semi-volatile organic compounds, and polychlorinated biphenyls.

All analyses were conducted by Lionville Laboratory, Inc., Lionville, Pennsylvania, (LVL) following the *Specification for Analytical Laboratory Services: Soil and Water Analysis* (VET-1405-SPEC-03, Rev. 1). In addition to printed data packages for each sample delivery group, the laboratory provided electronic data deliverables (EDDs), consisting of a number of Microsoft® Excel files containing tables of results and associated quality control (QC).

This data validation report presents the results of validating the analyses reported in the EDDs prepared by the laboratory for the eighth, and final, quarter of groundwater samples. This group of EDDs provided the results and QC data for the samples delivered to the laboratory under the chain-of custody documents listed in Table ES-1.

Table ES-1. Chains Of Custody Applicable To The Data Validated In This Report.

VET-1405-COC-148	VET-1405-COC-150	VET-1405-COC-152
VET-1405-COC-149	VET-1405-COC-151	

COC - Chain of Custody

The data validation was performed using an electronic data checker to evaluate whether batch QC met criteria. The electronic data checker identifies any QC results that exceed applicable criteria. The data validation process is completed by the data validation chemist, who evaluates the impacts of the exceedances and adds data validation qualifiers.

Two TICs were rejected as column bleed.

Table ES-2 summarizes the validation results by analysis.

Table ES-2. Summary Validation Results by Analysis. (2 Pages)

Analysis	Number of Results	Number of Qualified Results	Summary
Metals	232	0	No data were qualified.
Mercury	8	0	Mercury was not detected in any samples. No results were qualified.
Chromium (VI)	8	6	Data were qualified for missed hold times.
Cyanide	8	0	No data were qualified.

Table ES-2. Summary Validation Results by Analysis. (2 Pages)

Analysis	Number of Results	Number of Qualified Results	Summary
Sulfide	8	0	Sulfide was not detected in any samples. No results were qualified.
Anions	56	12	Nitrite, nitrate, and orthophosphate data were qualified as estimated due to missed hold times. No data were rejected.
Total phenols	7	0	No data were qualified.
PCBs	56	0	PCBs were not detected in any samples. No data were qualified.
VOCs	858	22	Data were qualified due to low MS recovery and high MS/MSD RPD. No data were rejected.
SVOCs	584	234	Qualification was due to LCS recoveries, MS/MSD recoveries and MS/MSD RPDs. Two TICs were rejected as column bleed.

LCS - Laboratory Control Sample
MS - Matrix Spike
MSD - Matrix Spike Duplicate
PCB - Polychlorinated Biphenyl
RPD - Relative Percent Difference
SVOC - Semi-Volatile Organic Compound
VOC - Volatile Organic Compound

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ACRONYMS

BLK	Blank (column heading)
CAS	Chemical Abstracts Service (column heading)
COC	Chain of Custody
DUP	Duplicate sample (laboratory duplicate)
EDD	Electronic Data Deliverable
EQL	Estimated Quantitation Limit
IC	Ion Chromatography
ICP	Inductively Coupled Plasma
LCL	Lower Control Limit
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LVL	Lionville Laboratory, Lionville, Pennsylvania
MB	Method Blank
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
Q	Laboratory Qualifier (column heading)
QC	Quality Control
RL	Reporting Limit
RPD	Relative Percent Difference
RQL	Required Quantitation Limit
Surr	Surrogate (column heading)
SVOA	Semi-Volatile Organic Analysis
SVOC	Semi-Volatile Organic Compound
UCL	Upper Control Limit
V	Validation qualifier (column heading)
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound
W	Water

Lionville Qualifiers

J	Indicates an estimated value, either a TIC or less than the quantitation limit.
D	Results reported from a dilution; related reporting limits are elevated due to the presence of an interference or a high target value.
U	Analyte is not detected, the associated quantitation limit is given.
B	This flag is used when the analyte is found in the associated blank as in the sample. It indicates possible/probable blank contamination.

Data Validation Applied Qualifiers

UJ	Indicates the compound was analyzed for but not detected in the sample. Due to a QC deficiency identified during data validation, the associated quantitation limit is an estimate
J	Indicates the compound was analyzed for and detected in the sample. The associated concentration is an estimate, but the data are usable for decision making purposes

1. INTRODUCTION – APPROACH TO VALIDATION

Groundwater samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs), and Polychlorinated Biphenyls (PCBs).

All analyses were conducted by Lionville Laboratory, Inc., Lionville, Pennsylvania (LVL), following the *Specification for Analytical Laboratory Services: Soil and Water Analysis* (VET-1405-SPEC-03, Rev. 1). The results of these analyses were presented in a printed data package for each sample delivery group. In addition, the laboratory provided an electronic data deliverable (EDD) for each sample delivery group. The EDDs are Microsoft® Excel files containing tables of results and associated quality control (QC).

This data validation report presents the results of validating the analyses reported in the EDDs received from the laboratory that include the eighth, and final, quarter of groundwater samples. This group of EDDs and the corresponding chain-of-custody documents are identified in Table 1-1 below. The data contained in these EDDs includes the analysis of metals (including mercury), chromium (VI), cyanide, sulfide, inorganic anions, total phenols, VOCs, SVOCs, and PCBs.

Table 1-1. Chains of Custody and Electronic Data Deliverables Applicable to the Data Validated.

Chain of Custody	EDD	
	File Name	Date Received
VET-1405-COC-148	0910065.xls	12/2/2009
VET-1405-COC-149	0910065.xls	12/2/2009
VET-1405-COC-150	0910069.xls	12/2/2009
VET-1405-COC-151	0910069.xls	12/2/2009
VET-1405-COC-152	0910078.xls	12/2/2009

EDD - Electronic Data Deliverable

This validation was performed in a two-tiered approach.

1. Completeness: an assessment of the completeness is made on the pdf file of the "hard copy" data.
2. Electronic holding time and QC evaluation.

The approach is summarized in Table 1-2. The electronic review is performed on all incoming EDDs. The EDDs are evaluated to assure consistency with the hard copy data. By using electronic review of all QC, appropriate qualification of all the data can be made.

Table 1-2. Data Validation and Verification Approach.

Review item	Manually Done	Electronic	All Samples
Verification of deliverables	X		X
Requested vs reported analyses		X	X
Holding times		X	X
Blank contamination		X	X
Detection Limits		X	X
MS/MSD and LCS		X	X
Surrogates		X	X
Laboratory Duplicates		X	X

LCS - Laboratory Control Sample
MS - Matrix Spike
MSD - Matrix Spike Duplicate

The remainder of this report consists of several chapters, with each chapter providing the details for data validation of a particular method of analysis. Most chapters begin with a summary table of the analytical results validated and the validation qualifiers that have been applied. These tables are also provided in an accompanying Microsoft® Excel file along with any summary tables that were too large to include in this data validation report. After the summary table, if it is included here, each chapter explains the details of the validation process and provides reasons for any data qualifiers that may have been applied. The automated data validation process determines whether the following facets of laboratory quality control have been achieved:

- Were there 20 or fewer samples in each preparation batch?
- Were a method blank (MB), a Laboratory Control Sample (LCS), and a Matrix Spike sample (MS) prepared with each batch of samples?
- Were surrogates added to each sample and batch QC samples for each method where surrogates are required?
- Was precision checked with a Matrix Spike Duplicate (MSD) or sample Duplicate (DUP)?
- Were holding time requirements for preparation and analysis satisfied?
- Were the MB results less than the required quantitation limits?
- Did the quantitation limit for nondetect results meet the required detection limit?
- Did the recoveries for the LCS, MS, MSD, and surrogates, for analyses where they are required, meet the accuracy criteria?
- Did the MS/MSD and DUP Relative Percent Differences meet the precision criteria?

Note thi s a Level C validation after four quarters of Level A validation of groundwater results. Level C validation was performed because this is the eighth and final quarter of groundwater samples. Project data validation requirements, as defined in the SAP, were met at greater than 10% Level C validation over the course of the project.

After this automated checking, the "no" answers to these questions were investigated manually, the effect on each sample result was determined, and the results were qualified according to the validation rules in *Data Validation Procedure for Chemical Analyses* (HNF-20433). These evaluations are presented on the following pages.

Please note laboratory data qualifiers are defined in the "Lionville Qualifiers" table that follows the table of contents. Dade Moeller and Associates, Inc. checks laboratory qualifiers for consistency with validation qualifiers, but does not edit or change laboratory qualifiers in any way.

2. DATA VALIDATION REPORTS

2.1. DATA VALIDATION REPORT FOR ICP METALS (METHOD 6010B)

Results for 29 metals, those listed in Table 2-1, were requested for each of the 8 samples in this group. The table listing the results is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM for the analytical results for inductively coupled plasma (ICP) metals, as well as the flags applied during validation and the reasons for the flags.

2.1.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-1 shows the number of each type of sample in each preparation batch.

Table 2-1. ICP Metals Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
L910193	W	Aluminum	7429-90-5	1	1	1	1	1	8
L910193	W	Antimony	7440-36-0	1	1	1	1	1	8
L910193	W	Arsenic	7440-38-2	1	1	1	1	1	8
L910193	W	Barium	7440-39-3	1	1	1	1	1	8
L910193	W	Beryllium	7440-41-7	1	1	1	1	1	8
L910193	W	Boron	7440-42-8	1	1	1	1	1	8
L910193	W	Cadmium	7440-43-9	1	1	1	1	1	8
L910193	W	Calcium	7440-70-2	1	1	1	1	1	8
L910193	W	Chromium	7440-47-3	1	1	1	1	1	8
L910193	W	Cobalt	7440-48-4	1	1	1	1	1	8
L910193	W	Copper	7440-50-8	1	1	1	1	1	8
L910193	W	Iron	7439-89-6	1	1	1	1	1	8
L910193	W	Lead	7439-92-1	1	1	1	1	1	8
L910193	W	Magnesium	7439-95-4	1	1	1	1	1	8
L910193	W	Manganese	7439-96-5	1	1	1	1	1	8
L910193	W	Molybdenum	7439-98-7	1	1	1	1	1	8
L910193	W	Nickel	7440-02-0	1	1	1	1	1	8
L910193	W	Potassium	7440-09-7	1	1	1	1	1	8
L910193	W	Selenium	7782-49-2	1	1	1	1	1	8
L910193	W	Silicon	7440-21-3	1	1	1	1	1	8
L910193	W	Silver	7440-22-4	1	1	1	1	1	8
L910193	W	Sodium	7440-23-5	1	1	1	1	1	8
L910193	W	Strontium	7440-24-6	1	1	1	1	1	8
L910193	W	Thallium	7440-28-0	1	1	1	1	1	8
L910193	W	Tin	7440-31-5	1	1	1	1	1	8
L910193	W	Titanium	7440-32-6	1	1	1	1	1	8

Table 2-1. ICP Metals Preparation Batch Summary. (2 Pages)

Batch ID	Matrix	Analyte	CAS	MB	DUP	LCS	MS	MSD	Sample
L910193	W	Uranium	7440-61-1	1	1	1	1	1	8
L910193	W	Vanadium	7440-62-2	1	1	1	1	1	8
L910193	W	Zinc	7440-66-6	1	1	1	1	1	8

CAS - Chemical Abstracts Service
DUP - Duplicate
ICP - Inductively Coupled Plasma
LCS - Laboratory Control Sample
MB - Method Blank
MS - Matrix Spike
MSD - Matrix Spike Duplicate
W - Water

ICP metals analysis was performed in one batch. The batch had fewer than 20 field samples. All analytes were included in the batch. The batch had one MB, DUP, LCS, MS and MSD. All accuracy and precision frequency requirements were met for the metals batch.

No data were qualified for missing QC samples.

2.1.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for ICP metals analysis by method 6010B are specified in VET-1405-PLN-03, Rev. 0, as 180 days from sampling to analysis. All results were generated within these limits.

2.1.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The required quantitation limits (RQLs) derived from the reporting limits (RLs) in the SAP (VET-1405-PLN-03, Rev. 0) are shown in Table 2-2.

Table 2-2. Required Quantitation Limit for ICP Metals. (2 Pages)

Analyte	Water (µg/L)
Aluminum	50
Antimony	40
Arsenic	50
Barium	5
Beryllium	5
Boron	50
Cadmium	5
Calcium	50
Chromium	5
Cobalt	5
Copper	5

Table 2-2. Required Quantitation Limit for ICP Metals. (2 Pages)

Analyte	Water (µg/L)
Iron	50
Lead	50
Magnesium	50
Manganese	10
Molybdenum	5
Nickel	10
Potassium	500
Selenium	50
Silicon	50
Silver	10
Sodium	50
Strontium	5
Thallium	50
Tin	50
Titanium	10
Uranium	5
Vanadium	5
Zinc	10

ICP - Inductively Coupled Plasma

All method blank exceedances are included in Table 2-3.

Table 2-3. ICP Metals Method Blank Exceedances.

Batch ID	Matrix	Analyte	CAS	Result	Q	3 Times the Detection Limit[1]	RQL
L910193	W	Barium	7440-39-3	0.126	J	0.75	5
L910193	W	Magnesium	7439-95-4	7.62	J	37.5	50
L910193	W	Silicon	7440-21-3	9.73	J	112.5	50
L910193	W	Sodium	7440-23-5	13.4	J	150	50

1. Units are µg/L for Water.

CAS - Chemical Abstracts Service
ICP - Inductively Coupled Plasma
Q - Laboratory Qualifier
RQL - Required Quantitation Limit
W - Water

Barium, magnesium, silicon, and sodium were detected in the method blank at levels that were less than three times the detection limit. Therefore, no barium, magnesium, silicon, or sodium results were qualified due to blank contamination.

2.1.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The quantitation limit for zinc exceeded the limit at 12.5 µg/L. All other quantitation limits for nondetect results were less than the required detection limit.

2.1.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, and MSD meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS, MS, and MSD recoveries must be between 75% and 125%.

There were no LCS, MS or MSD failures in this batch.

2.1.6. QC Check for Precision

- Did the MS/MSD and DUP Relative Percent Differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the Relative Percent Difference (RPD) between MS and MSD, as well as sample and duplicate, must be less than 20% for all samples.

There were no MS/MSD or sample duplicate exceedances for RPD.

2.2. DATA VALIDATION REPORT FOR MERCURY (METHOD 7470A)

Table 2-4 is a summary of the validated results for mercury.

Table 2-4. Summary of Mercury Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0910065-01	G057	W	L910164	0.200	µg/L	0.2	U		
0910065-02	G058	W	L910164	0.200	µg/L	0.2	U		
0910065-03	G059	W	L910164	0.200	µg/L	0.2	U		
0910065-04	G060	W	L910164	0.200	µg/L	0.2	U		
0910069-01	G061	W	L910195	0.200	µg/L	0.2	U		
0910069-02	G062	W	L910195	0.200	µg/L	0.2	U		
0910078-01	G063	W	L910195	0.200	µg/L	0.2	U		
0910078-02	G064	W	L910195	0.200	µg/L	0.2	U		

Conc. - Concentration
EQL - Estimated Quantitation Limit
Q - Laboratory Qualifier
V - Validation Flag
W - Water

2.2.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?

- Was precision checked with a MSD or DUP?

Table 2-5 shows the number of each type of sample in each preparation batch.

Table 2-5. Mercury Preparation Batch Summary.

Batch ID	Matrix	BLK	DUP	LCS	MS	MSD	Sample
L910164	W	1		1			4
L910195	W	1	1	1	1	1	4

BLK - Blank
DUP - Duplicate
LCS - Laboratory Control Sample
MS - Matrix Spike
MSD - Matrix Spike Duplicate
W - Water

Mercury analysis was performed in two batches. Each batch contained fewer than 20 field samples. Each batch included a method blank and a LCS.

Batch L910195 included a DUP, MS and MSD. Batch L910164 did not include a duplicate, MS, or MSD. The sampling plan calls for a MS and a MSD or DUP for every 20 field samples. There was a DUP, MS and MSD for the eight water samples included in these two batches. Therefore, the intent of the sampling plan was met and precision and accuracy frequency requirements were met for these batches.

2.2.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for mercury analysis by method 7470A is specified in VET-1405-PLN-03, Rev. 0, as 28 days. All results were generated within this limit.

2.2.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The RQL derived from the RL in the SAP (VET-1405-PLN-03, Rev. 2) is shown in Table 2-6.

Table 2-6. Required Quantitation Limit for Mercury.

Analyte	Water (µg/L)
Mercury	0.05

All method blank results were below the instrument detection limits. However, the estimated quantitation limit of 0.2 µg/L exceeded the required quantitation limit of 0.05 µg/L. The data validation rules do not require that data be qualified for nondetect results that exceed the required quantitation limit.

2.2.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

None of the quantitation limits for the nondetect results met the required detection limit. Per *Data Validation Procedure for Chemical Analyses* (HNF-20433, Rev.0), no data were qualified.

2.2.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, and MSD meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS, MS, and MSD recoveries must be between 75% and 125%. All LCS and MS/MSD recoveries were within the accuracy limits. However, the LCS recovery for batch L910164 was outside of the laboratory limits (between 80% and 120%) at 79.8%. No data were qualified as the LCS recovery met validation acceptance criteria.

2.2.6. QC Check for Precision

- Did the MS/MSD and DUP Relative Percent Differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the RPD between MS and MSD, as well as sample and duplicate, must be less than 20% for all samples. All RPDs met this criterion.

2.3. DATA VALIDATION REPORT FOR HEXAVALENT CHROMIUM (METHOD 7196A)

Table 2-7 is a summary of the validated results for hexavalent chromium.

Table 2-7. Summary of Hexavalent Chromium Validation.

Client ID	Sample ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0910065-01	G057	W	L910180	0.07	mg/L	0.02		J	Hold time
0910065-02	G058	W	L910180	0.08	mg/L	0.02		J	Hold time
0910065-03	G059	W	L910180	0.08	mg/L	0.02		J	Hold time
0910065-04	G060	W	L910180	0.09	mg/L	0.02		J	Hold time
0910069-01	G061	W	L910180	0.09	mg/L	0.02		J	Hold time
0910069-02	G062	W	L910180	0.06	mg/L	0.02		J	Hold time
0910078-01	G063	W	L910188	0.02	mg/L	0.02	U		
0910078-02	G064	W	L910188	0.09	mg/L	0.02			

EQL - Estimated Quantitation Limit
MS - Matrix Spike
Q - Laboratory Qualifier
V - Validator Flag
W - Water

2.3.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, and a MS sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-8 shows the number of each type of sample in each preparation batch.

Table 2-8. Hexavalent Chromium Preparation Batch Summary.

Batch ID	Matrix	BLK	LCS	DUP	MS	MSD	Sample
L910180	W	1	1	1	1		6
L910188	W	1	1				2

BLK - Blank
DUP - Duplicate
LCS - Laboratory Control Sample
MS - Matrix Spike
MSD - Matrix Spike Duplicate
W - Water

Hexavalent chromium analysis was performed in two batches. Each batch contained fewer than 20 field samples. At least one LCS and MB were analyzed in each sample batch.

A MS/MSD or a MS and a DUP are to be analyzed for every 20 sample results of each matrix type, averaged over the project. A MS and a DUP result were obtained for one of the batches. Because there were eight total samples between the two batches, the intent of the sampling plan was met.

2.3.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for chromium (VI) analysis by method 7196A is specified in VET-1405-PLN-03, Rev. 0, as 24 hours for water samples. Samples 0910065-01 (G057), 0910065-02 (G058), 0910065-03 (G059), and 0910065-04 (G060) were analyzed greater than 48 hours (twice the hold time) after sampling. The results for these four samples were qualified as estimated and flagged “J”.

Samples 0910069-01 (G061), and 0910069-02 (G062) were analyzed greater than 24 hours after sampling. The results for these samples were qualified as estimated and flagged “J”.

All other results were generated within these limits.

2.3.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Project documentation does not specify a reporting limit and, therefore, a required quantitation limit for chromium (VI). Chromium (VI) was not detected in the method blanks. Detection limits in the blanks were 0.02 mg/L for water samples.

2.3.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a required quantitation limit for chromium (VI). The detection limit for the one nondetect result was 0.02 mg/L.

2.3.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, and MSD meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS, MS, and MSD recoveries must be between 75% and 125%. All LCS and MS recoveries were within these limits. There was no MSD analyzed with these samples.

2.3.6. QC Check for Precision

- Did the MS/MSD and DUP Relative Percent Differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the sample/duplicate RPD must be less than 20%. The RPD, as defined in the validation instructions, cannot be evaluated if the RQL is not specified. Therefore, no results were qualified for precision.

2.4. DATA VALIDATION REPORT FOR CYANIDE (METHOD 9014)

Table 2-9 is a summary of the validated results for cyanide.

Table 2-9. Summary of Cyanide Validation.

Client ID	Sample ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0910065-01	G057	W	L910210	1.8	µg/L	5			
0910065-02	G058	W	L910210	1.5	µg/L	5			
0910065-03	G059	W	L910210	1.8	µg/L	5			
0910065-04	G060	W	L910210	2.5	µg/L	5			
0910069-01	G061	W	L911004	5.0	µg/L	5	U		
0910069-02	G062	W	L911004	5.0	µg/L	5	U		
0910078-01	G063	W	L911004	5.0	µg/L	5	U		
0910078-02	G064	W	L911004	5.0	µg/L	5	U		

Conc. - Concentration
EQL - Estimated Quantitation Limit
Q - Laboratory Qualifier
V - Validation Qualifier
W - Water

2.4.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-10 shows the number of each type of sample in each preparation batch.

Table 2-10. Cyanide Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	DUP	MS	Sample
L910210	W	1	2			4
L911004	W	1	2	1	1	4

DUP - Duplicate
LCS - Laboratory Control Sample
MB - Method Blank
MS - Matrix Spike
W - Water

Cyanide analysis was performed in two batches of samples. Each batch contained fewer than 20 field samples. At least one MB and LCS were analyzed in each sample batch. One batch had a DUP and a MS included. The sampling plan requires that there be one MS and one MSD or DUP per every 20 field samples, so accuracy and precision frequency requirements were met. All other QC requirements were met.

2.4.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for cyanide analysis by method 9014 is specified in VET-1405-PLN-03, Rev. 0, as 14 days. All results were generated within these limits.

2.4.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Project documentation does not specify a reporting limit and, therefore, a required quantitation limit for cyanide. Cyanide was detected in the method blank for batch L910210 at 1.5 µg/L. However, this result is less than three times the instrument detection limit. Therefore no data were qualified due to blank contamination.

No cyanide was detected in the method blank for batch L911004. The detection limit was 5 µg/L.

2.4.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a reporting limit and, therefore, a required quantitation limit for cyanide. Cyanide was not detected in four of the samples. Detection limits were 5 µg/L for water samples.

2.4.5. QC Checks for Accuracy

- Did the LCS and MS recoveries meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS recoveries must be between 75% and 125%. All LCS and MS recoveries were within these limits.

2.4.6. QC Check for Precision

- Did the DUP Relative Percent Differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the sample/duplicate RPD must be less than 20%. The RPD, as defined in the validation instructions, cannot be evaluated if the RQL is not specified. Therefore, no results were qualified for precision.

2.5. DATA VALIDATION REPORT FOR SULFIDE (METHOD 9034)

Table 2-11 is a summary of the validated results for sulfide.

Table 2-11. Summary of Sulfide Validation.

Lab ID	Client ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0910065-01	G057	W	L910203	1.0	mg/L	1	U		
0910065-02	G058	W	L910203	1.0	mg/L	1	U		
0910065-03	G059	W	L910203	1.0	mg/L	1	U		
0910065-04	G060	W	L910203	1.0	mg/L	1	U		
0910069-01	G061	W	L910203	1.0	mg/L	1	U		
0910069-02	G062	W	L910203	1.0	mg/L	1	U		
0910078-01	G063	W	L910203	1.0	mg/L	1	U		
0910078-02	G064	W	L910203	1.0	mg/L	1	U		

Conc. - Concentration
EQL - Estimated Quantitation Limit
Q - Laboratory Qualifier
V - Validation Qualifier
W - Water

2.5.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-12 shows the number of each type of sample in each preparation batch.

Table 2-12. Sulfide Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	DUP	MS	Sample
L910203	W	1	2	1	1	8

DUP - Duplicate
LCS - Laboratory Control Sample
MB - Method Blank
MS - Matrix Spike
W - Water

Sulfide analysis was performed in one batch. This batch contained fewer than 20 field samples. At least one MB, LCS, MS and DUP were analyzed in this sample batch. These numbers satisfy all requirements for frequency of QC sample analysis.

2.5.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for sulfide analysis by method 9034 are specified in VET-1405-PLN-03, Rev. 0, as 7 days. All results were generated within these limits.

2.5.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Project documentation does not specify a reporting limit and, therefore, a required quantitation limit for sulfide. Sulfide was not detected in the method blanks. The detection limit in the blanks was 1 mg/L for water.

2.5.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a reporting limit and, therefore, a required quantitation limit for sulfide. No sulfide was detected in these samples. The detection limit was 1 mg/L for water.

2.5.5. QC Checks for Accuracy

- Did the recoveries for the LCS and MS results meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS recoveries must be between 75% and 125%. All LCS and MS recoveries were within these limits.

2.5.6. QC Check for Precision

- Did the DUP Relative Percent Differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, sample/duplicate RPDs must be less than 20%. All RPDs satisfied this criterion. The LCS/LCSD RPD was also less than 20%.

2.6. DATA VALIDATION REPORT FOR ANIONS (METHOD 9056)

Results for six anions (chloride, fluoride, nitrate, nitrite, phosphate, and sulfate) were requested for each of the 8 samples in this group. Table 2-13 is a summary of the validation for anions. Note that results for bromide were reported by the laboratory, but were not required by the sampling and analysis plan. Bromide results are listed in Table 2-13, but were not validated.

Table 2-13. Summary of Anions Validation. (2 pages)

Lab ID	Client ID	Matrix	Analyte	CAS	Batch ID	Conc.	Units	EQL	Q	V	Reason
0910065-01	G057	W	Bromide	24959-67-9	L911023	0.25	mg/L	0.25	U		
0910065-01	G057	W	Chloride	16887-00-6	L911023	9.72	mg/L	0.25			
0910065-01	G057	W	Fluoride	16984-48-8	L911023	0.29	mg/L	0.25			
0910065-01	G057	W	Nitrate	14797-55-8	L911023	19.3	mg/L	1.25		J	Hold time
0910065-01	G057	W	Nitrite	14797-65-0	L911023	0.25	mg/L	0.25	U	UJ	Hold time
0910065-01	G057	W	Orthophosphate	14265-44-2	L911023	0.25	mg/L	0.25	U	UJ	Hold time
0910065-01	G057	W	Sulfate	14808-79-8	L911023	22.7	mg/L	1.25			
0910065-02	G058	W	Bromide	24959-67-9	L911023	0.25	mg/L	0.25	U		
0910065-02	G058	W	Chloride	16887-00-6	L911023	9.04	mg/L	0.25			
0910065-02	G058	W	Fluoride	16984-48-8	L911023	0.29	mg/L	0.25			
0910065-02	G058	W	Nitrate	14797-55-8	L911023	18.3	mg/L	1.25		J	Hold time
0910065-02	G058	W	Nitrite	14797-65-0	L911023	0.25	mg/L	0.25	U	UJ	Hold time
0910065-02	G058	W	Orthophosphate	14265-44-2	L911023	0.25	mg/L	0.25	U	UJ	Hold time
0910065-02	G058	W	Sulfate	14808-79-8	L911023	22.9	mg/L	1.25			
0910065-03	G059	W	Bromide	24959-67-9	L911023	0.25	mg/L	0.25	U		
0910065-03	G059	W	Chloride	16887-00-6	L911023	9.26	mg/L	0.25			
0910065-03	G059	W	Fluoride	16984-48-8	L911023	0.30	mg/L	0.25			
0910065-03	G059	W	Nitrate	14797-55-8	L911023	18.1	mg/L	1.25		J	Hold time
0910065-03	G059	W	Nitrite	14797-65-0	L911023	0.25	mg/L	0.25	U	UJ	Hold time
0910065-03	G059	W	Orthophosphate	14265-44-2	L911023	0.25	mg/L	0.25	U	UJ	Hold time
0910065-03	G059	W	Sulfate	14808-79-8	L911023	23.2	mg/L	1.25			
0910065-04	G060	W	Bromide	24959-67-9	L911023	0.25	mg/L	0.25	U		
0910065-04	G060	W	Chloride	16887-00-6	L911023	9.24	mg/L	0.25			
0910065-04	G060	W	Fluoride	16984-48-8	L911023	0.30	mg/L	0.25			
0910065-04	G060	W	Nitrate	14797-55-8	L911023	18.2	mg/L	1.25		J	Hold time
0910065-04	G060	W	Nitrite	14797-65-0	L911023	0.25	mg/L	0.25	U	UJ	Hold time
0910065-04	G060	W	Orthophosphate	14265-44-2	L911023	0.25	mg/L	0.25	U	UJ	Hold time
0910065-04	G060	W	Sulfate	14808-79-8	L911023	23.2	mg/L	1.25			
0910069-01	G061	W	Bromide	24959-67-9	L911023	0.25	mg/L	0.25	U		
0910069-01	G061	W	Chloride	16887-00-6	L911023	8.95	mg/L	0.25			
0910069-01	G061	W	Fluoride	16984-48-8	L911023	0.28	mg/L	0.25			

Table 2-13. Summary of Anions Validation. (2 pages)

Lab ID	Client ID	Matrix	Analyte	CAS	Batch ID	Conc.	Units	EQL	Q	V	Reason
0910069-01	G061	W	Nitrate	14797-55-8	L911023	18.6	mg/L	1.25			
0910069-01	G061	W	Nitrite	14797-65-0	L911023	0.25	mg/L	0.25	U		
0910069-01	G061	W	Orthophosphate	14265-44-2	L911023	0.25	mg/L	0.25	U		
0910069-01	G061	W	Sulfate	14808-79-8	L911023	23.7	mg/L	1.25			
0910069-02	G062	W	Bromide	24959-67-9	L911023	0.25	mg/L	0.25	U		
0910069-02	G062	W	Chloride	16887-00-6	L911023	9.06	mg/L	0.25			
0910069-02	G062	W	Fluoride	16984-48-8	L911023	0.30	mg/L	0.25			
0910069-02	G062	W	Nitrate	14797-55-8	L911023	18.2	mg/L	1.25			
0910069-02	G062	W	Nitrite	14797-65-0	L911023	0.25	mg/L	0.25	U		
0910069-02	G062	W	Orthophosphate	14265-44-2	L911023	0.25	mg/L	0.25	U		
0910069-02	G062	W	Sulfate	14808-79-8	L911023	23.7	mg/L	1.25			
0910078-01	G063	W	Bromide	24959-67-9	L911023	0.25	mg/L	0.25	U		
0910078-01	G063	W	Chloride	16887-00-6	L911023	9.16	mg/L	0.25			
0910078-01	G063	W	Fluoride	16984-48-8	L911023	0.26	mg/L	0.25			
0910078-01	G063	W	Nitrate	14797-55-8	L911023	17.5	mg/L	1.25			
0910078-01	G063	W	Nitrite	14797-65-0	L911023	0.25	mg/L	0.25	U		
0910078-01	G063	W	Orthophosphate	14265-44-2	L911023	0.25	mg/L	0.25	U		
0910078-01	G063	W	Sulfate	14808-79-8	L911023	22.8	mg/L	1.25			
0910078-02	G064	W	Bromide	24959-67-9	L911023	0.25	mg/L	0.25	U		
0910078-02	G064	W	Chloride	16887-00-6	L911023	9.22	mg/L	0.25			
0910078-02	G064	W	Fluoride	16984-48-8	L911023	0.30	mg/L	0.25			
0910078-02	G064	W	Nitrate	14797-55-8	L911023	20.1	mg/L	1.25			
0910078-02	G064	W	Nitrite	14797-65-0	L911023	0.25	mg/L	0.25	U		
0910078-02	G064	W	Orthophosphate	14265-44-2	L911023	0.25	mg/L	0.25	U		
0910078-02	G064	W	Sulfate	14808-79-8	L911023	23.6	mg/L	1.25			

CAS - Chemical Abstracts System
Conc. - Concentration
EQL - Estimated Quantitation Limit
Q - Laboratory Qualifier
V - Validation Qualifier
W - Water

2.6.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-14 shows the number of each type of sample in each preparation batch.

Table 2-14. Anion Preparation Batch Summary.

Batch ID	Matrix	Analyte	CAS	MB	LCS	DUP	MS	Sample
L911023	W	Orthophosphate	14265-44-2	1	1	1	1	8
L911023	W	Nitrate	14797-55-8	1	1	1	1	8
L911023	W	Nitrite	14797-65-0	1	1	1	1	8
L911023	W	Sulfate	14808-79-8	1	1	1	1	8
L911023	W	Chloride	16887-00-6	1	1	1	1	8
L911023	W	Fluoride	16984-48-8	1	1	1	1	8
L911023	W	Bromide	24959-67-9	1	1	1	1	8

CAS - Chemical Abstracts System
DUP - Duplicate
LCS - Laboratory Control Sample
MB - Method Blank
MS - Matrix Spike
W - Water

Anion analysis was performed on one batch. This batch contained fewer than 20 field samples. At least one MB, LCS, MS, and DUP and one LCS were analyzed in the sample batch. All accuracy and precision frequency requirements were met.

2.6.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for analysis by method 9056 is specified in VET-1405-PLN-03, Rev. 0, as 48 hours. The nitrate, nitrite, and orthophosphate results for samples 0910065-01 (G057), 0910065-02 (G058), 0910065-03 (G059), and 0910065-04 (G060) were obtained greater than 2 days after collection. Per the validation criteria, these results were qualified as estimated and flagged with “J” for detects and “UJ” for nondetects.

All other sample results met hold times.

2.6.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Required quantitation limits as derived from from the reporting limits in the SAP (VET-1405-PLN-03) are giving in Table 2-15.

Table 2-15. Required Quantitation Limit for Anions.

Analyte	Water (mg/L)
Chloride	0.1
Fluoride	0.1
Nitrate	75
Nitrite	0.1
Orthophosphate	0.3
Sulfate	0.5

Required quantitation limits for water sample method blanks were achieved except for fluoride, chloride, and nitrite, for which the detection limit was 0.25 mg/L vs. the RQL of 0.1 mg/L. Analytes were not detected in any of the method blanks. No qualification of sample results was required.

2.6.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The required quantitation limit was exceeded for nitrite in all water samples. The validation criteria do not require that these results be qualified. Other nondetect anion results met the required quantitation limit.

2.6.5. QC Checks for Accuracy

- Did the recoveries for the LCS and MS meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS recoveries must be between 75% and 125%. All LCS and MS recoveries were within the required limits. However, it should be noted that the orthophosphate recovery in the LCS exceeded laboratory limits at 116%. No data were qualified because validation requirements were met.

2.6.6. QC Check for Precision

- Did the MS/MSD and DUP Relative Percent Differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the DUP RPDs must be less than 20%. This limit was met for all RPDs for water samples.

2.7. DATA VALIDATION REPORT FOR TOTAL PHENOLS (METHOD 9066)

Table 2-16 is a summary of the validated results for analysis of total phenols. Note sample 0910065-02 (G058) was not analyzed because the sample broke during transit to the laboratory. All other samples were analyzed and reported.

Table 2-16. Summary of Total Phenols Validation.

Client ID	Sample ID	Matrix	Batch ID	Conc.	Units	EQL	Q	V	Reason
0910065-01	G057	W	L911003	5.00	µg/L	5	U		
0910065-03	G059	W	L911003	5.00	µg/L	5	U		
0910065-04	G060	W	L911003	5.00	µg/L	5	U		
0910069-01	G061	W	L911003	5.00	µg/L	5	U		
0910069-02	G062	W	L911003	5.00	µg/L	5	U		
0910078-01	G063	W	L911003	4.25	µg/L	5	J		
0910078-02	G064	W	L911003	5.00	µg/L	5	U		

Conc. - Concentration
EQL - Estimated Quantitation Limit
Q - Laboratory Qualifier
V - Validation Qualifier
W - Water

2.7.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Was precision checked with a MSD or DUP?

Table 2-17 shows the number of each type of sample in each preparation batch.

Table 2-17. Total Phenols Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	DUP	MS	Sample
L911003	W	1	1	1	1	7

DUP - Duplicate
LCS - Laboratory Control Sample
MB - Method Blank
MS - Matrix Spike
W - Water

Total phenol analysis was performed in one batch. The batch contained fewer than 20 field samples. At least one MB, LCS, MS, and DUP were analyzed in the batch. All requirements for frequency of QC sample analysis were achieved.

2.7.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

The holding time limit for total phenol analysis is specified in VET-1405-PLN-03, Rev. 0, as 28 days. All results were generated within these limits.

2.7.3. Method Blanks

- Were the MB results less than the required quantitation limits?

Project documentation does not specify a reporting limit and, therefore, a required quantitation limit for total phenols. Phenols were not detected in the method blanks. The detection limit in the blanks was 5 µg/L for water.

2.7.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Project documentation does not specify a reporting limit and, therefore, a required quantitation limit for total phenols. Detection limits for phenols were 5 µg/L for water samples.

2.7.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, and MSD, meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS and, MS recoveries must be between 75% and 125%. All LCS and MS recoveries were within these limits.

2.7.6. QC Check for Precision

- Did the MS/MSD and DUP Relative Percent Differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the RPD must be less than 20%. The RPD, as defined in the validation instructions, cannot be evaluated if the RQL is not specified. Therefore, no results were qualified for precision.

2.8. DATA VALIDATION REPORT FOR POLYCHLORINATED BIPHENYL COMPOUNDS (METHOD 8082)

Results for seven Aroclors (Aroclor-1016, Aroclor-1221, Aroclor-1232, Aroclor-1242, Aroclor-1248, Aroclor-1254, Aroclor-1260) were requested for each of the 8 samples in this group. The validation results are listed in Table 2-18.

Table 2-18. Summary of PCB Validation. (2 pages)

Lab ID	Client ID	Matrix	Analyte	CAS	Batch ID	Conc.	Units	EQL	Q	V	Reason
0910065-01	G057	W	Aroclor 1016	12674-11-2	L910178	0.400	UG/L	0.4	U		
0910065-01	G057	W	Aroclor 1221	11104-28-2	L910178	0.400	UG/L	0.4	U		
0910065-01	G057	W	Aroclor 1232	11141-16-5	L910178	0.400	UG/L	0.4	U		
0910065-01	G057	W	Aroclor 1242	53469-21-9	L910178	0.400	UG/L	0.4	U		
0910065-01	G057	W	Aroclor 1248	12672-29-6	L910178	0.400	UG/L	0.4	U		
0910065-01	G057	W	Aroclor 1254	11097-69-1	L910178	0.400	UG/L	0.4	U		
0910065-01	G057	W	Aroclor 1260	11096-82-5	L910178	0.400	UG/L	0.4	U		
0910065-02	G058	W	Aroclor 1016	12674-11-2	L910178	0.400	UG/L	0.4	U		
0910065-02	G058	W	Aroclor 1221	11104-28-2	L910178	0.400	UG/L	0.4	U		
0910065-02	G058	W	Aroclor 1232	11141-16-5	L910178	0.400	UG/L	0.4	U		
0910065-02	G058	W	Aroclor 1242	53469-21-9	L910178	0.400	UG/L	0.4	U		
0910065-02	G058	W	Aroclor 1248	12672-29-6	L910178	0.400	UG/L	0.4	U		
0910065-02	G058	W	Aroclor 1254	11097-69-1	L910178	0.400	UG/L	0.4	U		
0910065-02	G058	W	Aroclor 1260	11096-82-5	L910178	0.400	UG/L	0.4	U		
0910065-03	G059	W	Aroclor 1016	12674-11-2	L910178	0.400	UG/L	0.4	U		
0910065-03	G059	W	Aroclor 1221	11104-28-2	L910178	0.400	UG/L	0.4	U		
0910065-03	G059	W	Aroclor 1232	11141-16-5	L910178	0.400	UG/L	0.4	U		
0910065-03	G059	W	Aroclor 1242	53469-21-9	L910178	0.400	UG/L	0.4	U		
0910065-03	G059	W	Aroclor 1248	12672-29-6	L910178	0.400	UG/L	0.4	U		
0910065-03	G059	W	Aroclor 1254	11097-69-1	L910178	0.400	UG/L	0.4	U		
0910065-03	G059	W	Aroclor 1260	11096-82-5	L910178	0.400	UG/L	0.4	U		
0910065-04	G060	W	Aroclor 1016	12674-11-2	L910178	0.400	UG/L	0.4	U		
0910065-04	G060	W	Aroclor 1221	11104-28-2	L910178	0.400	UG/L	0.4	U		
0910065-04	G060	W	Aroclor 1232	11141-16-5	L910178	0.400	UG/L	0.4	U		
0910065-04	G060	W	Aroclor 1242	53469-21-9	L910178	0.400	UG/L	0.4	U		
0910065-04	G060	W	Aroclor 1248	12672-29-6	L910178	0.400	UG/L	0.4	U		
0910065-04	G060	W	Aroclor 1254	11097-69-1	L910178	0.400	UG/L	0.4	U		
0910065-04	G060	W	Aroclor 1260	11096-82-5	L910178	0.400	UG/L	0.4	U		
0910069-01	G061	W	Aroclor 1016	12674-11-2	L910178	0.400	UG/L	0.4	U		
0910069-01	G061	W	Aroclor 1221	11104-28-2	L910178	0.400	UG/L	0.4	U		
0910069-01	G061	W	Aroclor 1232	11141-16-5	L910178	0.400	UG/L	0.4	U		

Table 2-18. Summary of PCB Validation. (2 pages)

Lab ID	Client ID	Matrix	Analyte	CAS	Batch ID	Conc.	Units	EQL	Q	V	Reason
0910069-01	G061	W	Aroclor 1242	53469-21-9	L910178	0.400	UG/L	0.4	U		
0910069-01	G061	W	Aroclor 1248	12672-29-6	L910178	0.400	UG/L	0.4	U		
0910069-01	G061	W	Aroclor 1254	11097-69-1	L910178	0.400	UG/L	0.4	U		
0910069-01	G061	W	Aroclor 1260	11096-82-5	L910178	0.400	UG/L	0.4	U		
0910069-02	G062	W	Aroclor 1016	12674-11-2	L910178	0.400	UG/L	0.4	U		
0910069-02	G062	W	Aroclor 1221	11104-28-2	L910178	0.400	UG/L	0.4	U		
0910069-02	G062	W	Aroclor 1232	11141-16-5	L910178	0.400	UG/L	0.4	U		
0910069-02	G062	W	Aroclor 1242	53469-21-9	L910178	0.400	UG/L	0.4	U		
0910069-02	G062	W	Aroclor 1248	12672-29-6	L910178	0.400	UG/L	0.4	U		
0910069-02	G062	W	Aroclor 1254	11097-69-1	L910178	0.400	UG/L	0.4	U		
0910069-02	G062	W	Aroclor 1260	11096-82-5	L910178	0.400	UG/L	0.4	U		
0910078-01	G063	W	Aroclor 1016	12674-11-2	L910244	0.400	UG/L	0.4	U		
0910078-01	G063	W	Aroclor 1221	11104-28-2	L910244	0.400	UG/L	0.4	U		
0910078-01	G063	W	Aroclor 1232	11141-16-5	L910244	0.400	UG/L	0.4	U		
0910078-01	G063	W	Aroclor 1242	53469-21-9	L910244	0.400	UG/L	0.4	U		
0910078-01	G063	W	Aroclor 1248	12672-29-6	L910244	0.400	UG/L	0.4	U		
0910078-01	G063	W	Aroclor 1254	11097-69-1	L910244	0.400	UG/L	0.4	U		
0910078-01	G063	W	Aroclor 1260	11096-82-5	L910244	0.400	UG/L	0.4	U		
0910078-02	G064	W	Aroclor 1016	12674-11-2	L910244	0.400	UG/L	0.4	U		
0910078-02	G064	W	Aroclor 1221	11104-28-2	L910244	0.400	UG/L	0.4	U		
0910078-02	G064	W	Aroclor 1232	11141-16-5	L910244	0.400	UG/L	0.4	U		
0910078-02	G064	W	Aroclor 1242	53469-21-9	L910244	0.400	UG/L	0.4	U		
0910078-02	G064	W	Aroclor 1248	12672-29-6	L910244	0.400	UG/L	0.4	U		
0910078-02	G064	W	Aroclor 1254	11097-69-1	L910244	0.400	UG/L	0.4	U		
0910078-02	G064	W	Aroclor 1260	11096-82-5	L910244	0.400	UG/L	0.4	U		

CAS - Chemical Abstracts System
Conc. - Concentration
EQL - Estimated Quantitation Limit
Q - Laboratory Qualifier
V - Validation Qualifier
W - Water

2.8.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each field sample and each QC sample?
- Was precision checked with an MSD?

Table 2-19 shows the number of each type of sample in each preparation batch.

Table 2-19. PCB Preparation Batch Summary.

Batch ID	Matrix	Analyte	CAS	MB	LCS	MS	MSD	Surr	Sample
L910178	W	Aroclor-1016	12674-11-2	1	1	1	1		6
L910178	W	Aroclor-1221	11104-28-2	1					6
L910178	W	Aroclor-1232	11141-16-5	1					6
L910178	W	Aroclor-1242	53469-21-9	1					6
L910178	W	Aroclor-1248	12672-29-6	1					6
L910178	W	Aroclor-1254	11097-69-1	1					6
L910178	W	Aroclor-1260	11096-82-5	1	1	1	1		6
L910178	W	Decachlorobiphenyl	2051-24-3					10	
L910178	W	Tetrachloro-m-xylene	877-09-8					10	
L910244	W	Arochlor-1016	12674-11-2	1	2				2
L910244	W	Arochlor-1221	11104-28-2	1					2
L910244	W	Arochlor-1232	11141-16-5	1					2
L910244	W	Arochlor-1242	53469-21-9	1					2
L910244	W	Arochlor-1248	12672-29-6	1					2
L910244	W	Arochlor-1254	11097-69-1	1					2
L910244	W	Arochlor-1260	11096-82-5	1	2				2
L910244	W	Decachlorobiphenyl	2051-24-3					5	
L910244	W	Tetrachloro-m-xylene	877-09-8					5	

CAS - Chemical Abstracts System
LCS - Laboratory Control Sample
MB - Method Blank
MS - Matrix Spike
MSD - Matrix Spike Duplicate
PCB - Polychlorinated Biphenyl
Surr - Surrogate
W - Water

PCB analysis was performed on 2 batches of water samples. Each batch contained fewer than 20 field samples. An MB was analyzed in each sample batch, and at least one LCS containing at least Aroclor-1016 and Aroclor-1260 was analyzed in each sample batch.

The project goal for MS and MSD analysis is to analyze one of each for every 20 field samples of each matrix type, averaged over the project. Aroclor-1016 and Aroclor-1260 are to be spiked into each MS and MSD. For this group of samples, MS and MSD results were reported for one of the two batches. There were 8 total samples, so the frequency of MS/MSD analyses exceeds the one-in-twenty average required for the project goal.

Surrogates (decachlorobiphenyl and tetrachloro-m-xylene) were added to and analyzed in every sample, LCS, MB, MS, and MSD.

2.8.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for PCB analysis by method 8082 are specified in VET-1405-PLN-03, Rev. 0, as 14 days for water samples. U.S. Environmental Protection Agency (SW-846, Chapter 2) lists the holding time limit to extraction of PCBs as 7 days for water samples. Method 8082 indicates that samples should be analyzed within 40 days after extraction. The SW-846 limits of 7 days to extraction and 40 days after extraction to analysis were used.

All sample results met the holding time limits.

2.8.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The required quantitation limits as derived from reporting limits in the SAP (VET-1405-PLN-03, Rev. 0) are 1 µg/L in groundwater samples.

PCBs were not detected in the MBs. Detection limits were below the required quantitation limits.

2.8.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

All results were nondetects. Detection limits met the requirements.

2.8.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, MSD, and surrogates meet the accuracy criteria?

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS/MSD recoveries must be within the statistical limits set by the lab. These limits are shown in Table 2-20.

Table 2-20. LCS, MS/MSD, and Surrogate Limits for PCBs.

Matrix	Analyte	CAS	LCL (%)	UCL (%)
Water	Aroclor-1016	12674-11-2	49	119
Water	Aroclor-1260	11096-82-5	53	128
Water	Decachlorobiphenyl	2051-24-3	22	131
Water	Tetrachloro-m-xylene	877-09-8	45	117

CAS - Chemical Abstracts System
LCL - Lower Control Limit
LCS - Laboratory Control Sample
MS - Matrix Spike
MSD - Matrix Spike Duplicate
PCB - Polychlorinated Biphenyl
UCL - Upper Control Limit

All LCS, MS, MSD, and surrogate recoveries were within the limits given in Table 2-20.

2.8.6. QC Check for Precision

- Did the MS/MSD Relative Percent Differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the RPD between MS and MSD must be less than 20%. All MS/MSD RPDs met the 20% criterion.

2.9. DATA VALIDATION REPORT FOR VOLATILE ORGANIC COMPOUNDS (METHOD 8260)

Eighty compounds were requested for each of the 8 samples in this group. Results were reported in the EDDs for the 78 compounds that the laboratory commonly reports. The remaining two, 1,4-difluorobenzene and tetrahydrofuran, are not expected to be detected regularly. The laboratory is performing a spectral search for those, and is reporting the results in the data package narrative.

The table listing the results is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM.

2.9.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each sample and each batch QC sample?
- Was precision checked with a MSD or DUP?

The sample batches for Volatile Organic Analysis are outlined in Table 2-21.

Table 2-21. VOA Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	MS	MSD	Surr	Sample
L911006	W	1	1	1	1	15	11

LCS - Laboratory Control Sample
MB - Method Blank
MS - Matrix Spike
MSD - Matrix Spike Duplicate
Surr - Surrogate
VOA - Volatile Organic Analysis
W - Water

Volatile organic analysis was performed in one batch of water samples. This batch contained fewer than 20 field samples. Results for 78 compounds were reported for each of the 11 samples (including trip blanks). An MB result was reported for each of the 78 compounds in each of the 3 batches. An LCS containing 48 of the compounds of interest was prepared and analyzed with the batch. A MS/MSD pair was analyzed with the batch, as well.

Surrogates (1,2-dichloroethane-d4, bromofluorobenzene, and toluene-d8) were added to each sample, MB, LCS, MS, and MSD.

Note three of five trip blanks were analyzed with these samples, one per sample delivery group (SDG). The trip blank associated with SDG 0910078 is from COC-152. However, there is no way to determine what COC the other two trip blanks are associated with.

2.9.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for Volatile Organic Analysis by method 8260B are specified in VET-1405-PLN-03, Rev. 0, as 14 days for water samples. All results were generated within this limit.

2.9.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The RQLs as derived from the reporting limits in the SAP (VET-1405-PLN-03, Rev. 0) for all VOCs are 5 µg/L for water samples. There were no compounds detected in the method blank.

2.9.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

Of 858 results reported, 200 were nondetects exceeding the required detection limit of 5 µg/L. Detection limit exceedances are not required to be qualified. Most of the exceedances were reported at 10 µg/L which is an industry norm for water volatile organic analyses (VOAs).

2.9.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, MSD, and surrogates meet the accuracy criteria?

The statistical QC limits determined by the laboratory for surrogate compounds are listed in Table 2-22. The surrogate recoveries were reviewed, and none were found to lie outside the acceptable range.

Table 2-22. Statistical Limits for VOA Surrogate Compounds

Surrogate	Water Samples	
	LCL (%)	UCL (%)
1,2-Dichloroethane-d4	64	140
Toluene-d8	70	130
4-Bromofluorobenzene	81	115

LCL - Lower Control Limit
UCL - Upper Control Limit
VOA - Volatile Organic Analysis

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS/MSD recoveries must be within the statistical limits set by the lab. These limits are shown in Table 2-23.

Table 2-23. Lionville Laboratory Limits for VOA LCS, MS, and MSD Recovery (Water Samples). (2 Pages)

Analyte	CAS	LCL (%)	UCL (%)
1,1,1-Trichloroethane	71-55-6	60	140
1,1,2,2-Tetrachloroethane	79-34-5	70	130
1,1,2-Trichloroethane	79-00-5	70	130
1,1-Dichloroethane	75-34-3	60	140
1,1-Dichloroethene	75-35-4	60	130
1,2,4-Trichlorobenzene	120-82-1	65	135
1,2-Dibromo-3-chloropropane	96-12-8	50	130
1,2-Dibromoethane	106-93-4	60	150
1,2-Dichlorobenzene	95-50-1	70	130
1,2-Dichloroethane	107-06-2	60	140
1,2-Dichloroethene (total)	540-59-0	60	140
1,2-Dichloropropane	78-87-5	70	130
1,3-Dichlorobenzene	541-73-1	75	125
1,4-Dichlorobenzene	106-46-7	75	125
2-Butanone	78-93-3	20	200
2-Hexanone	591-78-6	20	200
4-Methyl-2-pentanone	108-10-1	50	150
Acetone	67-64-1	20	200
Benzene	71-43-2	70	130
Bromodichloromethane	75-27-4	60	140
Bromoform	75-25-2	60	140
Bromomethane	74-83-9	50	180
Carbon Disulfide	75-15-0	60	140
Carbon Tetrachloride	56-23-5	60	140
Chlorobenzene	108-90-7	70	130
Chloroethane	75-00-3	50	180
Chloroform	67-66-3	60	140
Chloromethane	74-87-3	50	180
cis-1,2-Dichloroethene	156-59-2	60	140
cis-1,3-Dichloropropene	10061-01-5	70	130
Dibromochloromethane	124-48-1	70	130
Dichlorodifluoromethane	75-71-8	60	140
Ethylbenzene	100-41-4	70	130
Isopropylbenzene	98-82-8	75	125

Table 2-23. Lionville Laboratory Limits for VOA LCS, MS, and MSD Recovery (Water Samples). (2 Pages)

Analyte	CAS	LCL (%)	UCL (%)
m- and p-Xylene	M+P_XYLENE	70	130
Methylene Chloride	75-09-2	50	180
Methyl-T-Butylether	1634-04-4	70	130
O-Xylene	95-47-6	70	130
Styrene	100-42-5	70	130
Tetrachloroethene	127-18-4	60	140
Toluene	108-88-3	70	130
Trans-1,2-dichloroethene	156-60-5	60	140
Trans-1,3-Dichloropropene	10061-02-6	70	130
Trichloroethene	79-01-6	70	130
Trichlorofluoromethane	75-69-4	60	145
Vinyl Chloride	75-01-4	50	180
Xylene (total)	1330-20-7	75	130

CAS - Chemical Abstracts System
LCL - Lower Control Limit
LCS - Laboratory Control Sample
MS - Matrix Spike
MSD - Matrix Spike Duplicate
UCL - Upper Control Limit
VOA - Volatile Organic Analysis

One MS recovery was outside of control limits. The recovery for 1,2,4-trichlorobenzene was low at 55%. All sample results for 1,2,4-trichlorobenzene are nondetects that were qualified as estimated and flagged “UJ”.

All other LCS, MS and MSD recoveries were within control limits.

2.9.6. QC Check for Precision

- Did the MS/MSD and DUP Relative Percent Differences meet the precision criteria?

The limit for MS/MSD RPDs is 20%. Two MS/MSD RPDs exceeded this limit: 1,2,4-trichlorobenzene at 24% and 1,2-dibromo-3-chloropropane at 23%. All sample results for these two compounds were nondetects that were qualified as estimated and flagged “UJ”.

2.10. DATA VALIDATION REPORT FOR SEMIVOLATILE ORGANIC COMPOUNDS (METHOD 8270)

Eighty-five SVOCs were requested for the 8 samples in this group. Semi-Volatile Organic Analysis (SVOA) results were reported in the EDDs for the 69 of these compounds that the laboratory commonly reports. Of the 16 SVOCs requested, but not reported by method 8270C, 1,2-dichlorobenzene, 1,3-dichlorobenzene and 1,4-dichlorobenzene, are reported as VOCs (method 8260B). For the remaining 13 (2,6-dimethylnaphthalene, 1,6,7-trimethylnaphthalene,

1-methyl-9H-fluorene, dibenzothiophene, 2-methylphenanthrene, 1-methylphenanthrene, 4,6-dimethyldibenzothiophene, 3,6-dimethylphenanthrene, 2-methylfluoranthene, retene, 5-methylchrysene, benzo(e)pyrene, and perylene) the laboratory is performing a spectral search, and is reporting the results for them in the data package narrative.

The table listing the analytical results and the results of the validation for SVOCs is too large to include here. Please refer to the Microsoft® Excel file in the accompanying CD-ROM.

2.10.1. Batch Size and Completeness of QC Analysis

- Were there 20 or fewer samples in each preparation batch?
- Were a MB, a LCS, a MS sample, and a MSD sample prepared with each batch of samples?
- Were surrogates added to each sample and each batch QC sample?
- Was precision checked with a MSD or DUP?

Table 2-24 lists the numbers of QC and field samples analyzed in each batch.

Table 2-24. SVOA Preparation Batch Summary.

Batch ID	Matrix	MB	LCS	MS	MSD	Surr	Sample
L910212	W	1	1	1	1	12	8

LCS - Laboratory Control Sample
MB - Method Blank
MS - Matrix Spike
MSD - Matrix Spike Duplicate
Surr - Surrogate
SVOA - Semi-Volatile Organic Analysis
W - Water

Semivolatile organic analysis was performed in a single batch. This batch contained fewer than 20 field samples. A MB result was reported for each of the reported compounds in every batch.

A LCS was reported in every batch for every requested analyte except 1,1-biphenyl. The LCS is not required to contain all compounds of interest. Therefore, no results were qualified for missing LCS.

MS and MSD results were obtained in the batch of water samples. The spikes contained all compounds of interest except 1,1-biphenyl. The project goal is to obtain one MS and MSD analysis for each quarter of groundwater samples. This goal was met.

Surrogates (2,4,6-tribromophenol, 2-fluorobiphenyl, 2-fluorophenol, nitrobenzene-d5, phenol-d5, p-terphenyl-d14) were added to each sample, MB, LCS, MS, and MSD.

2.10.2. Holding Times

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for SVOA by method 8270C are specified in VET-1405-PLN-03, Rev. 0. The holding time to extraction is 7 days for water samples. Forty additional days after

extraction are allowed to complete the analysis. All results were generated within the holding time limits.

2.10.3. Method Blanks

- Were the MB results less than the required quantitation limits?

The required detection limits as derived from the reporting limits in the SAP (VET-1405-PLN-03, Rev.0) in water samples are 0.2 µg/L for polycyclic aromatic hydrocarbons (PAHs) and 5 µg/L for other analytes. Bis-2-ethylhexyl phthalate was detected in the method blank and several of the samples at levels well below the reporting limit. Concentrations were in the 1 to 4 µg/L range and all results were reported as nondetects. Therefore, no qualification of data was performed.

All other compounds in the MBs were nondetects; the detection limits exceeded the RQL in all cases. However, the validation rules do not require qualification of results for high detection limits.

2.10.4. Detection Limits

- Did the quantitation limit for nondetect results meet the required detection limit?

The required detection limits as derived from the reporting limits in the SAP (VET-1405-PLN-03, Rev. 0) in water samples are 0.2 µg/L for PAHs and 5 µg/L for other analytes. None of the nondetect results met these requirements. Detection limits for nondetect results were between 10 and 50 µg/L. However, the validation rules do not require qualification of the results.

2.10.5. QC Checks for Accuracy

- Did the recoveries for the LCS, MS, MSD, and surrogates meet the accuracy criteria?

The statistical QC limits determined by the laboratory for surrogate compounds are listed in Table 2-25. Table 2-26 lists the cases where these limits were not achieved. All surrogate failures were in the matrix spike sample for this batch. The validation criteria do not require data qualification for matrix spike surrogates that fail to meet criteria.

Table 2-25. Semi-Volatile Surrogate Recovery Limits.

Compound	Water (%)
Nitrobenzene-d5	35 to 114
2-Fluorobiphenyl	43 to 116
Terphenyl-d14	33 to 141
Phenol-d5	10 to 94
2-Fluorophenol	21 to 100
2,4,6-Tribromophenol	10 to 123

Table 2-26. Instances in Which the SVOA Surrogate Recovery Was Not in Limits.

Batch ID	Matrix	Client ID	Lab ID	Analyte	CAS	Rec. (%)
L910212	W	G061MS	L910212-MS1	2-Fluorophenol	367-12-4	106
L910212	W	G061MS	L910212-MS1	Phenol-d5	4165-62-2	105
L910212	W	G061MS	L910212-MS1	2,4,6-Tribromophenol	118-79-6	141

CAS - Chemical Abstracts Service
SVOA- Semi-Volatile Organic Analysis
W - Water

As specified in VET-1405-PLN-03, Rev. 0, LCS and MS/MSD recoveries must be within the statistical limits set by the lab. These limits are shown in Table 2-27.

Table 2-27. Lionville Laboratory SVOA Limits for LCS, MS, and MSD. (3 Pages)

Analyte	CAS	Water Samples	
		LCL (%)	UCL (%)
1,2,4-Trichlorobenzene	120-82-1	40	100
1,2-Diphenylhydrazine	122-66-7	50	110
1-Methylnaphthalene	90-12-0	40	105
2,2'-oxybis(1-Chloropropane)	108-60-1	40	110
2,4,5-Trichlorophenol	95-95-4	50	110
2,4,6-Trichlorophenol	88-06-2	50	110
2,4-Dichlorophenol	120-83-2	45	110
2,4-Dimethylphenol	105-67-9	30	110
2,4-Dinitrophenol	51-28-5	15	130
2,4-Dinitrotoluene	121-14-2	50	120
2,6-Dinitrotoluene	606-20-2	50	110
2-Chloronaphthalene	91-58-7	50	110
2-Chlorophenol	95-57-8	40	140
2-Methylnaphthalene	91-57-6	40	110
2-Methylphenol	95-48-7	40	110
2-Nitroaniline	88-74-4	50	110
2-Nitrophenol	88-75-5	40	110
3,3'-Dichlorobenzidine	91-94-1	0	120
3-and/or 4-Methylphenol	1319-77-3	40	110
3-Nitroaniline	99-09-2	10	120
4,6-Dinitro-2-Methylphenol	534-52-1	40	130
4-Bromophenyl phenyl ether	101-55-3	50	110
4-Chloro-3-Methylphenol	59-50-7	40	110
4-Chloroaniline	106-47-8	10	100

Table 2-27. Lionville Laboratory SVOA Limits for LCS, MS, and MSD. (3 Pages)

Analyte	CAS	Water Samples	
		LCL (%)	UCL (%)
4-Chlorophenyl phenyl ether	7005-72-3	50	120
4-Nitroaniline	100-01-6	10	100
4-Nitrophenol	100-02-7	10	110
Acenaphthene	83-32-9	50	110
Acenaphthylene	208-96-8	50	110
Aniline	62-53-3	5	120
Anthracene	120-12-7	50	120
Benzidine	92-87-5	0	110
Benzo(a)anthracene	56-55-3	50	120
Benzo(a)pyrene	50-32-8	50	140
Benzo(b)fluoranthene	205-99-2	50	140
Benzo(g,h,i)perylene	191-24-2	50	140
Benzo(k)fluoranthene	207-08-9	50	140
Benzoic Acid	65-85-0	0	112
Benzyl Alcohol	100-51-6	40	110
Bis(2-Chloroethoxy)methane	111-91-1	45	105
Bis(2-Chloroethyl) ether	111-44-4	40	120
Bis(2-Ethylhexyl) phthalate	117-81-7	40	140
Butylbenzylphthalate	85-68-7	40	140
Carbazole	86-74-8	20	120
Chrysene	218-01-9	50	120
Dibenzo(a,h)anthracene	53-70-3	50	140
Dibenzofuran	132-64-9	60	110
Diethyl phthalate	84-66-2	40	130
Dimethyl phthalate	131-11-3	40	130
Di-n-Butyl phthalate	84-74-2	40	130
Di-n-octyl phthalate	117-84-0	40	140
Fluoranthene	206-44-0	50	120
Fluorene	86-73-7	60	110
Hexachloro-1,3-butadiene	87-68-3	40	100
Hexachlorobenzene	118-74-1	50	110
Hexachlorocyclopentadiene	77-47-4	20	100
Hexachloroethane	67-72-1	35	110
Indeno(1,2,3-cd)pyrene	193-39-5	50	140
Isophorone	78-59-1	40	110
Naphthalene	91-20-3	40	105
Nitrobenzene	98-95-3	40	100

Table 2-27. Lionville Laboratory SVOA Limits for LCS, MS, and MSD. (3 Pages)

Analyte	CAS	Water Samples	
		LCL (%)	UCL (%)
N-Nitroso-Di-N-Propylamine	621-64-7	40	120
N-Nitrosodiphenylamine	86-30-6	50	110
Pentachlorophenol	87-86-5	15	130
Phenanthrene	85-01-8	50	120
Phenol	108-95-2	30	110
Pyrene	129-00-0	50	130
Pyridine	110-86-1	15	100

CAS - Chemical Abstracts System
LCL - Lower Control Limit
LCS - Laboratory Control Sample
MS - Matrix Spike
MSD - Matrix Spike Duplicate
SVOA - Semi-Volatile Organic Analysis
UCL - Upper Control Limit

Table 2-28 shows the LCS recoveries that were outside the control limits. All results for the analytes in the batches indicated in the table were qualified as approximate. All results qualified were nondetects and were flagged "UJ."

Table 2-28. SVOA LCS Recoveries That Did Not Satisfy QC Limits.

Batch ID	Matrix	Analyte	CAS	Rec (%)
L910212	W	Aniline	62-53-3	0
L910212	W	Bis(2-chloroethoxy) methane	111-91-1	40
L910212	W	3-Nitroaniline	99-09-2	0
L910212	W	4-Nitroaniline	100-01-6	0
L910212	W	N-Nitrosodiphenylamine	86-30-6	37

CAS - Chemical Abstracts Service
LCS - Laboratory Control Sample
QC - Quality Control
Rec - Recovery (%)
SVOA - Semi-Volatile Organic Analysis
W - Water

Table 2-29 shows the MS and MSD recoveries that were outside the QC limits. For every case where the MS or MSD recovery was greater than the Upper Control Limit (UCL), the sample result was a nondetect. Therefore, no data were qualified for high MS or MSD.

Where the MS and/or MSD recovery was less than the lower control limit (LCL), associated sample results were qualified as estimated. All of the sample results were nondetects and flagged with "UJ".

Table 2-29. SVOA MS and MSD Recoveries That Did Not Satisfy QC Limits. (2 pages)

Batch ID	Matrix	QC Type	Analyte	CAS	Sample	Sample Result	Q	Units	Spiked Result	Q	Spike Conc.	Rec. (%)	LCL (%)	UCL (%)
L910212	W	MS	Aniline	62-53-3	0910069-01	10.0	U	µg/L	10.0	U	60.0	0	5	120
L910212	W	MS	Benzyl alcohol	100-51-6	0910069-01	10.0	U	µg/L	6.64		60.0	11	40	110
L910212	W	MS	Benzoic acid	65-85-0	0910069-01	25.0	U	µg/L	85.6		60.0	143	0	112
L910212	W	MS	Bis(2-chloroethoxy) methane	111-91-1	0910069-01	10.0	U	µg/L	3.98		60.0	7	45	105
L910212	W	MS	2,4-Dichlorophenol	120-83-2	0910069-01	10.0	U	µg/L	69.9		60.0	117	45	110
L910212	W	MS	4-Chloro-3-methylphenol	59-50-7	0910069-01	10.0	U	µg/L	68.2		60.0	114	40	110
L910212	W	MS	2,4,6-Trichlorophenol	88-06-2	0910069-01	10.0	U	µg/L	71.4		60.0	119	50	110
L910212	W	MS	2,4,5-Trichlorophenol	95-95-4	0910069-01	10.0	U	µg/L	74.7		60.0	125	50	110
L910212	W	MS	2,6-Dinitrotoluene	606-20-2	0910069-01	10.0	U	µg/L	72.0		60.0	120	50	110
L910212	W	MS	Acenaphthylene	208-96-8	0910069-01	10.0	U	µg/L	10.0	U	60.00	0	50	110
L910212	W	MS	3-Nitroaniline	99-09-2	0910069-01	25.0	U	µg/L	25.0	U	60.0	0	10	120
L910212	W	MS	2,4,-Dinitropheonol	51-28-5	0910069-01	50.0	U	µg/L	90.9		60.0	151	15	130
L910212	W	MS	4-Nitrophenol	100-02-7	0910069-01	25.0	U	µg/L	72.4		60.0	121	10	110
L910212	W	MS	4-Nitroaniline	100-01-6	0910069-01	25.0	U	µg/L	25.0	U	60.0	0	10	100
L910212	W	MS	4,6-Dinitro-2-methylphenol	534-52-1	0910069-01	25.0	U	µg/L	89.6		60.0	149	10	130
L910212	W	MS	N-Nitrosodiphenylamine	86-30-6	0910069-01	10.0	U	µg/L	26.6		60.0	44	50	110
L910212	W	MS	1,2-Diphenylhydrazine	122-66-7	0910069-01	10.0	U	µg/L	7.16		60.0	12	50	110
L910212	W	MS	Hexachlorobenzene	118-74-1	0910069-01	10.0	U	µg/L	69.1		60.0	115	50	110
L910212	W	MS	Pentachlorophenol	87-86-5	0910069-01	25.0	U	µg/L	94.1		60.0	157	15	130
L910212	W	MS	Carbazole	86-74-8	0910069-01	10.0	U	µg/L	3.78		60.0	6	20	120
L910212	W	MS	Pyrene	129-00-0	0910069-01	10.0	U	µg/L	28.2		60.0	47	50	130
L910212	W	MS	Butyl benzyl phthalate	85-68-7	0910069-01	10.0	U	µg/L	2.92		60.0	5	40	140
L910212	W	MS	Chrysene	218-01-9	0910069-01	10.0	U	µg/L	73.2		60.0	122	50	120
L910212	W	MS	Benzo[b] fluoranthene	205-99-2	0910069-01	10.0	U	µg/L	85.0		60.0	142	50	140
L910212	W	MS	Benzo[a] pyrene	50-32-8	0910069-01	10.0	U	µg/L	16.3		60.0	27	50	140

Table 2-29. SVOA MS and MSD Recoveries That Did Not Satisfy QC Limits. (2 pages)

Batch ID	Matrix	QC Type	Analyte	CAS	Sample	Sample Result	Q	Units	Spiked Result	Q	Spike Conc.	Rec. (%)	LCL (%)	UCL (%)
L910212	W	MS	Benzo[g,h,i] perylene	191-24-2	0910069-01	10.0	U	µg/L	29.5		60.0	49	50	140
L910212	W	MSD	Aniline	62-53-3	0910069-01	10.0	U	µg/L	10.0	U	60.0	0	5	120
L910212	W	MSD	Benzoic acid	65-85-0	0910069-01	25.0	U	µg/L	69.2		60.0	115	0	112
L910212	W	MSD	2-Nitroaniline	88-74-4	0910069-01	25.0	U	µg/L	23.9		60.0	40	50	110
L910212	W	MSD	3-Nitroaniline	99-09-2	0910069-01	25.0	U	µg/L	25.0	U	60.0	0	10	120
L910212	W	MSD	4-Nitroaniline	100-01-6	0910069-01	25.0	U	µg/L	25.0	U	60.0	0	10	100
L910212	W	MSD	N-Nitrosodiphenylamine	86-30-6	0910069-01	10.0	U	µg/L	16.9		60.0	28	50	110

CAS - Chemical Abstracts System
Conc. - Concentration
LCL - Lower Control Limit
MS - Matrix Spike
MSD - Matrix Spike Duplicate
Q - Laboratory Qualifier
QC - Quality Control
Rec. - Recovery (%)
SVOA- Semi-Volatile Organic Analysis
UCL - Upper Control Limit
W - Water

2.10.6. QC Check for Precision

- Did the MS/MSD and DUP Relative Percent Differences meet the precision criteria?

As specified in VET-1405-PLN-03, Rev. 0, the RPD between MS and MSD must be less than the criteria set by the laboratory. These criteria are listed in Table 2-30. The lab has not set criteria for all analytes; RPDs were evaluated only for those compounds for which an RPD limit is specified.

Table 2-31 lists the RPD exceedances in this batch of data. All associated sample results were qualified as estimates. The results were flagged "J" for detects and "UJ" for nondetects.

Table 2-30. Relative Percent Difference Limits Set by Lionville Laboratory for SVOA MS/MSDs. (3 Pages)

Analyte	CAS	RPD (%) For Water Matrix
1,2,4-Trichlorobenzene	120-82-1	20
1,2-Diphenylhydrazine	122-66-7	20
1-Methylnaphthalene	90-12-0	20
2,2'-oxybis(1-Chloropropane)	108-60-1	20
2,4,5-Trichlorophenol	95-95-4	20
2,4,6-Trichlorophenol	88-06-2	20
2,4-Dichlorophenol	120-83-2	20
2,4-Dimethylphenol	105-67-9	20
2,4-Dinitrophenol	51-28-5	20
2,4-Dinitrotoluene	121-14-2	20
2,6-Dinitrotoluene	606-20-2	20
2-Chloronaphthalene	91-58-7	20
2-Chlorophenol	95-57-8	20
2-Methylnaphthalene	91-57-6	20
2-Methylphenol	95-48-7	20
2-Nitroaniline	88-74-4	20
2-Nitrophenol	88-75-5	20
3,3'-Dichlorobenzidine	91-94-1	20
3-and/or 4-Methylphenol	1319-77-3	20
3-Nitroaniline	99-09-2	20
4,6-Dinitro-2-Methylphenol	534-52-1	20
4-Bromophenyl phenyl ether	101-55-3	20
4-Chloro-3-Methylphenol	59-50-7	20
4-Chloroaniline	106-47-8	20
4-Chlorophenyl phenyl ether	7005-72-3	20
4-Nitroaniline	100-01-6	20

Table 2-30. Relative Percent Difference Limits Set by Lionville Laboratory for SVOA MS/MSDs. (3 Pages)

Analyte	CAS	RPD (%) For Water Matrix
4-Nitrophenol	100-02-7	20
Acenaphthene	83-32-9	20
Acenaphthylene	208-96-8	20
Aniline	62-53-3	20
Anthracene	120-12-7	20
Benzidine	92-87-5	20
Benzo(a)anthracene	56-55-3	20
Benzo(a)pyrene	50-32-8	20
Benzo(b)fluoranthene	205-99-2	20
Benzo(g,h,i)perylene	191-24-2	20
Benzo(k)fluoranthene	207-08-9	20
Benzoic Acid	65-85-0	20
Benzyl Alcohol	100-51-6	20
Bis(2-Chloroethoxy)methane	111-91-1	20
Bis(2-Chloroethyl) ether	111-44-4	20
Bis(2-Ethylhexyl) phthalate	117-81-7	20
Butylbenzylphthalate	85-68-7	20
Carbazole	86-74-8	20
Chrysene	218-01-9	20
Dibenzo(a,h)anthracene	53-70-3	20
Dibenzofuran	132-64-9	20
Diethyl phthalate	84-66-2	20
Dimethyl phthalate	131-11-3	40
Di-n-Butyl phthalate	84-74-2	40
Di-n-octyl phthalate	117-84-0	40
Fluoranthene	206-44-0	20
Fluorene	86-73-7	20
Hexachloro-1,3-butadiene	87-68-3	20
Hexachlorobenzene	118-74-1	20
Hexachlorocyclopentadiene	77-47-4	20
Hexachloroethane	67-72-1	20
Indeno(1,2,3-cd)pyrene	193-39-5	20
Isophorone	78-59-1	20
Naphthalene	91-20-3	20
Nitrobenzene	98-95-3	20
N-Nitroso-Di-N-Propylamine	621-64-7	20
N-Nitrosodiphenylamine	86-30-6	20

Table 2-30. Relative Percent Difference Limits Set by Lionville Laboratory for SVOA MS/MSDs. (3 Pages)

Analyte	CAS	RPD (%) For Water Matrix
Pentachlorophenol	87-86-5	20
Phenanthrene	85-01-8	20
Phenol	108-95-2	20
Pyrene	129-00-0	20
Pyridine	110-86-1	20

CAS - Chemical Abstracts System
MS - Matrix Spike
MSD - Matrix Spike Duplicate
RPD - Relative Percent Difference
SVOA - Semi-Volatile Organic Analysis

Table 2-31. SVOA RPDs Outside QC Criteria.

Batch ID	Matrix	Analyte	CAS	Original Sample	MS Rec (%)	MSD Rec (%)	RPD
L910212	W	Pyridine	110-86-1	0910069-01	58	23	87
L910212	W	Benzyl alcohol	100-51-6	0910069-01	11	80	151
L910212	W	Isophorone	78-59-1	0910069-01	92	75	21
L910212	W	Benzoic acid	65-85-0	0910069-01	143	115	21
L910212	W	Bis(2-chloroethoxy) methane	111-91-1	0910069-01	7	47	151
L910212	W	Hexachlorocyclopentadiene	77-47-4	0910069-01	36	29	22
L910212	W	2,4,6-Trichlorophenol	88-06-2	0910069-01	119	97	21
L910212	W	2-Nitroaniline	88-74-4	0910069-01	97	40	83
L910212	W	2,4-Dinitrophenol	51-28-5	0910069-01	151	122	22
L910212	W	Diethyl phthalate	84-66-2	0910069-01	69	94	31
L910212	W	4,6-Dinitro-2-methylphenol	534-52-1	0910069-01	149	116	26
L910212	W	N-Nitrosodiphenylamine	86-30-6	0910069-01	44	28	44
L910212	W	1,2-Diphenylhydrazine	122-66-7	0910069-01	12	72	143
L910212	W	Pentachlorophenol	87-86-5	0910069-01	157	121	26
L910212	W	Carbazole	86-74-8	0910069-01	6	62	163
L910212	W	Pyrene	129-00-0	0910069-01	47	88	61
L910212	W	Butyl benzyl phthalate	85-68-7	0910069-01	5	102	182
L910212	W	Bis(2-ethylhexyl) phthalate	117-81-7	0910069-01	72	105	37
L910212	W	Chrysene	218-01-9	0910069-01	122	94	26
L910212	W	Di-n-octyl phthalate	117-84-0	0910069-01	67	127	62
L910212	W	Benzo[b] fluoranthene	205-99-2	0910069-01	142	108	27
L910212	W	Benzo[a] pyrene	50-32-8	0910069-01	27	93	109
L910212	W	Indeno[1,2,3-dc] pyrene	193-39-5	0910069-01	63	102	48
L910212	W	Dibenz[a,h]anthracene	53-70-3	0910069-01	135	108	22
L910212	W	Benzo[g,h,i] perylene	191-24-2	0910069-01	49	99	67

CAS - Chemical Abstracts System
MS - Matrix Spike
MSD - Matrix Spike Duplicate
QC - Quality Control
Rec. - Recovery (%)
RPD - Relative Percent Difference
SVOA - Semi-Volatile Organic Analysis
W - Water

2.10.7. Tentatively Identified Compounds (TICs)

Two results were rejected as column bleed. Unknown 6 in sample 0910065-03 (G059) and Unknown 3 in sample 0910078-01 (G063) were identified through a library search by the instrument software as cyclotrisiloxane, hexamethyl- (CAS 541-05-9). Siloxanes are instrument artifacts and are rejected as such.

The validators asked the laboratory about blank contamination with regards to TICs. It did not seem to the validators that the compound in the blank was necessarily the same as the compound in the samples. In an email from Orlette Johnson of Lionville (1/6/2010) Carter Nulton, Lionville's General Manager, stated, "B flags are appropriate based on RTs and similarity of mass spectra (same primary ions). My opinion is that the presence in the blank of a low m/e 104 may well be spurious or lost in the sample spectra due to scaling." This explanation was acceptable to the validtors and B flags remain for Unknown 1 and Unknown 2.

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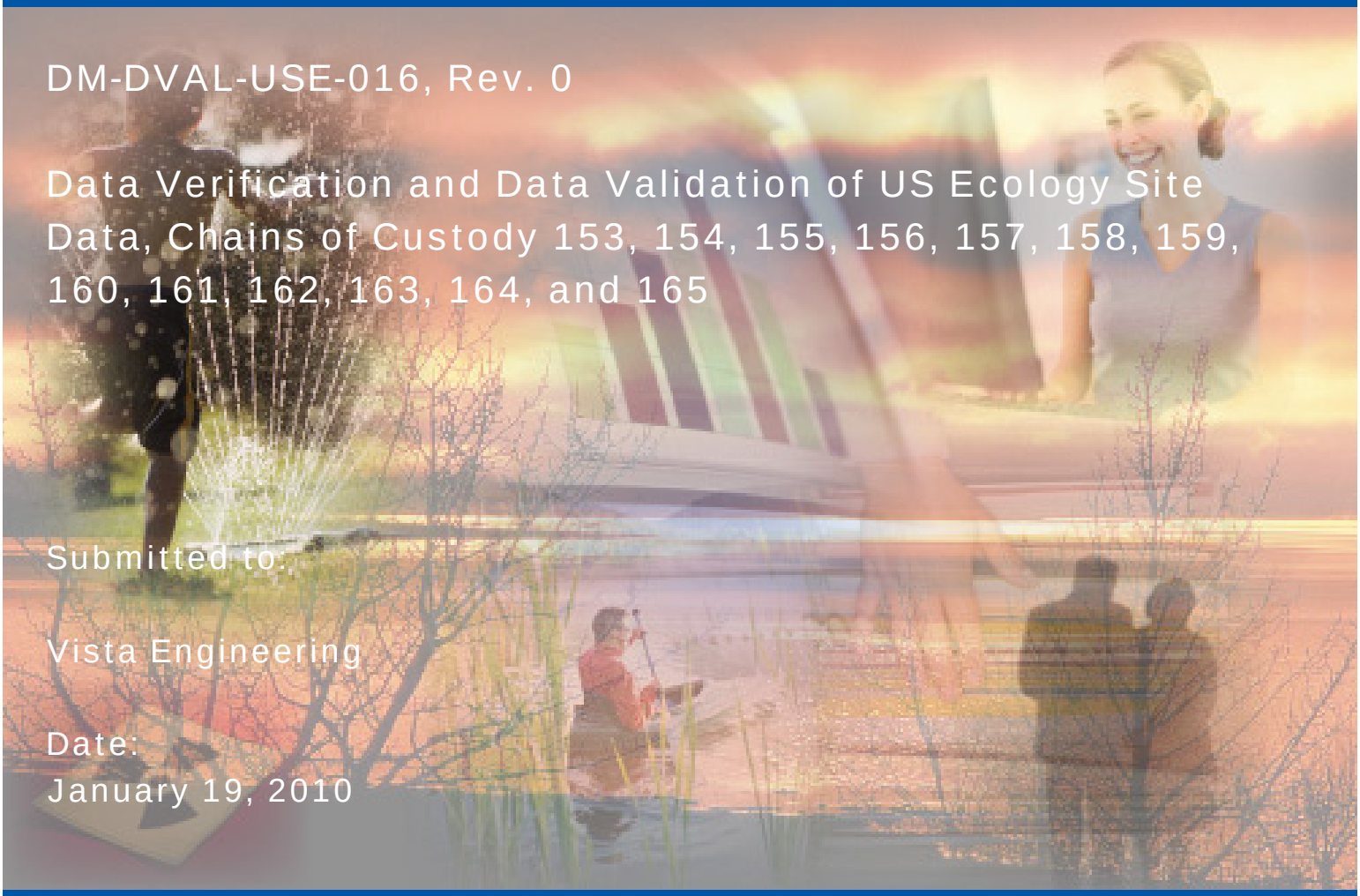

DM-DVAL-USE-016, Rev. 0

Data Verification and Data Validation of US Ecology Site Data, Chains of Custody 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, and 165

Submitted to:

Vista Engineering

Date:
January 19, 2010

VISTA
ENGINEERING TECHNOLOGIES

EXECUTIVE SUMMARY

Samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for volatile organic compounds by Method TO-15.

All analyses were performed by Southwest Research Institute (SwRI), San Antonio, Texas, following the *Specification for Analytical Laboratory Services: Select Soil Gas Volatiles by Method TO-15* (VET-1405-SPEC-01, Rev. 3). In addition to printed data packages for each sample delivery group (SDG), the laboratory provided electronic data deliverables (EDDs), consisting of two Microsoft® Excel files containing tables of results and associated quality control (QC).

This data validation report presents the results of validating the analyses reported in the seventh group of EDDs prepared by the laboratory. This group of EDDs provided the results and QC data for the samples delivered to the laboratory under the chain-of custody (COC) documents listed in Table ES-1.

Table ES-1. Chains Of Custody Applicable To The Data Validated In This Report.

VET-1405-COC-153	VET-1405-COC-154	VET-1405-COC-155
VET-1405-COC-156	VET-1405-COC-157	VET-1405-COC-158
VET-1405-COC-159	VET-1405-COC-160	VET-1405-COC-161
VET-1405-COC-162	VET-1405-COC-163	VET-1405-COC-164
VET-1405-COC-165	-	-

COC - Chain of Custody

The data validation was performed using an electronic data checker to evaluate whether batch QC met criteria. The electronic data checker identified any QC results that exceed applicable criteria. The data validation process was completed by the data validation chemist, who evaluated the impacts of the exceedances and added data validation qualifiers.

Table ES-2 summarizes the validation result.

Table ES-2. Summary Validation Results by Analysis.

Analysis	Number of Results	Number of Qualified Results	Summary
TO-15	2587	2	Two sample results were qualified due to the raw result exceeding the highest calibration standard concentration.

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ACRONYMS

CAS	Chemical Abstracts Service
COC	Chain of Custody
DUP	Duplicate Sample (field duplicate)
EDD	Electronic Data Deliverable
LCS	Laboratory Control Sample
MB	Method Blank
QC	Quality Control
SDG	Sample Delivery Group
SwRI	Southwest Research Institute
TIC	Tentatively Identified Compound
VOC	Volatile Organic Compound

SwRI Qualifiers

NJ	Indicates presumptive evidence of a compound. Indicates an estimated value, where a 1:1 response is assumed
U	Indicates compound was analyzed for, but not detected
E	This flag indicates compounds whose concentrations exceed the calibration range

Data Validation Applied Qualifiers

E	This flag indicates compounds whose concentrations exceed the calibration range

1. INTRODUCTION – APPROACH TO VALIDATION

Soil gas samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for volatile organic compounds (VOCs) by Method TO-15.

All analyses were conducted by Southwest Research Institute (SwRI), San Antonio, Texas, following the *Specification for Analytical Laboratory Services: Select Soil Gas Volatiles by Method TO-15* (VET-1405-SPEC-01, Rev. 3). The results of these analyses were presented in a printed data package for each sample delivery group. In addition, the laboratory provided an electronic data deliverable (EDD) for each sample delivery group. The EDDs are Microsoft® Excel files containing tables of results and associated quality control (QC).

This data validation report presents the results of validating the analyses reported in the seventh group of EDDs received from the laboratory. This group of EDDs and the corresponding chain of custody documents are identified in Table 1-1 below. The data contained in these EDDs included the analysis of VOCs by TO-15, only.

Table 1-1. Chains of Custody and Electronic Data Deliverables Applicable to the Data Validated.

Chain of Custody	EDD	
	File Name	Date Received
VET-1405-COC-153	402664.xls	1/5/2010
VET-1405-COC-154	402664.xls, 402668.xls	1/5/2010, 1/4/2010
VET-1405-COC-155	402664.xls	1/5/2010
VET-1405-COC-156	402664.xls	1/5/2010
VET-1405-COC-157	402664.xls	1/5/2010
VET-1405-COC-158	402668.xls	1/4/2010
VET-1405-COC-159	402668.xls	1/4/2010
VET-1405-COC-160	402668.xls	1/4/2010
VET-1405-COC-161	402668.xls	1/4/2010
VET-1405-COC-162	402668.xls	1/4/2010
VET-1405-COC-163	402668.xls	1/4/2010
VET-1405-COC-164	402668.xls	1/4/2010
VET-1405-COC-165	407593.xls	1/4/2010

EDD - Electronic Data Deliverable

This Level A validation was performed in a two-tiered approach.

1. Completeness: an assessment of the completeness was made on the .pdf file of the "hard copy" data.
2. Electronic holding time evaluation.

The approach is summarized in Table 1-2. The electronic review was performed on all incoming EDDs. The EDDs were evaluated to assure consistency with the hard copy data. By using electronic review of all QC, appropriate qualification of all the data can be made.

Table 1-2. Data Validation and Verification Approach.

Review item	Manually Done	Electronic	All Samples
Verification of deliverables	X		X
Requested vs reported analyses		X	X
Holding times		X	X

The remainder of this report consists of the details for data validation of Method TO-15 data. It explains the details of the overall validation process and provides reasons for any data qualifiers that were applied. The automated data validation process determined whether the following facets of laboratory quality control had been achieved.

- Was a method blank (MB) analyzed each day?
- Were surrogates added to each sample and batch QC samples for each method where surrogates are required?
- Was precision checked with a field duplicate (DUP)?
- Were holding time requirements for preparation and analysis satisfied?

After this automated checking, the “no” answers to these questions were investigated manually, the effect on each sample result was determined, and the results were qualified according to the validation rules in TO-15 DV #1, Rev. 0. TO-15 DV#1 was written to validate TO-15 data for Levels A and C for the US Ecology project. It is based on *Data Validation Procedure for Chemical Analyses* (HNF-20433). The evaluations of the automated checking results that were determined to have a potential impact on data quality were appropriately qualified and are presented in the remainder of this report.

Please note laboratory data qualifiers are defined in the “SwRI Qualifiers” table that follows the table of contents. Dade Moeller checks laboratory qualifiers for consistency with validation qualifiers, but does not edit or change laboratory qualifiers in any way.

2. DATA VALIDATION REPORT

2.1. DATA VALIDATION REPORT FOR VOLATILE ORGANIC COMPOUNDS (METHOD TO-15)

Fifty-seven compounds were requested for each of the 43 samples in this group. All 57 compounds were reported in the EDDs for each sample.

The table listing the results is too large to include here; refer to the Microsoft® Excel file on the accompanying CD-ROM.

Note samples V283 and V284 were overlooked for analysis by the laboratory within holding time. Recollection was deemed possible, and samples V306 and V307 were collected within the same quarter as replacement for these two samples. . Samples V283 and V284 were not analyzed.

2.1.1. Batch Size and Completeness of QC Analysis

QC Requirements --

- Was a MB analyzed each day?
- Were surrogates added to each sample and batch QC samples for each method where surrogates are required?
- Was precision checked with a field duplicate?

Analysis was performed in three batches of vapor samples. Batch 402664 contained 18 samples and two blanks. Batch 402668 contained 23 samples and seven blanks. Batch 407593 contained two samples and one blank. Because a blank was analyzed on each day that samples were analyzed, QC requirements were met for batches 402664, 402668, and 407593.

Two field duplicate pairs were analyzed for the 41 samples submitted by Vista Engineering. This satisfies project SAP field duplicate requirements.

Though it is not required by the method, a laboratory control sample (LCS) was analyzed on each day of sample analysis as required by VET-1405-SPEC-01, Rev. 3. This LCS contained 16 of the analytes of interest. All met criteria.

Surrogates are required for MB and LCS. Though not required by the method, surrogates (1,2-dichloroethane-d4, bromofluorobenzene, and toluene-d8) were added to each sample, as well as the MB and LCS. All met criteria.

2.1.2. Holding Times

QC Requirement --

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for volatile organic analysis by method TO-15 are specified in VET-1405-PLN-03, Rev. 0, as 30 days for summa canisters. All sample analytical results were generated within this limit.

2.2. Laboratory Qualifiers

1,1,2-Trichlorotrifluoroethane was reported in two samples at concentrations significantly higher than the highest calibration standard (75 ppb). The raw concentration was 5% higher in sample V281 and 20% higher in sample V304. The laboratory reported 1,1,2-trichlorofluoroethane with an E qualifier in both samples. The validator agrees with this approach and an E qualifier has been added as a validation flag, as well.

2.3. Tentatively Identified Compounds (TIC)

Per VET-1405-SPEC-01, Table 1, many compounds were listed as tentatively identified compounds (TICs). TICs are compounds identified by comparison with a mass spectral library. No standards are run on the gas chromatograph/mass spectrometer for TICs. The concentration of a TIC is estimated by ratioing the area to the nearest internal standard. None of the TICs listed in VET-1405-SPEC-01, Table 1, were identified in these samples.

However, many TICs were identified outside of those specified in VET-1405-SPEC-01. The second sheet of the accompanying Microsoft® Excel file lists the TICs and estimated concentrations.

TICs are not calibrated, and are impractical to calibrate. Only those TICs with many repeated hits in multiple samples should be considered further. Ten compounds were identified in five or more samples; Table 2-1 lists these frequently identified compounds.

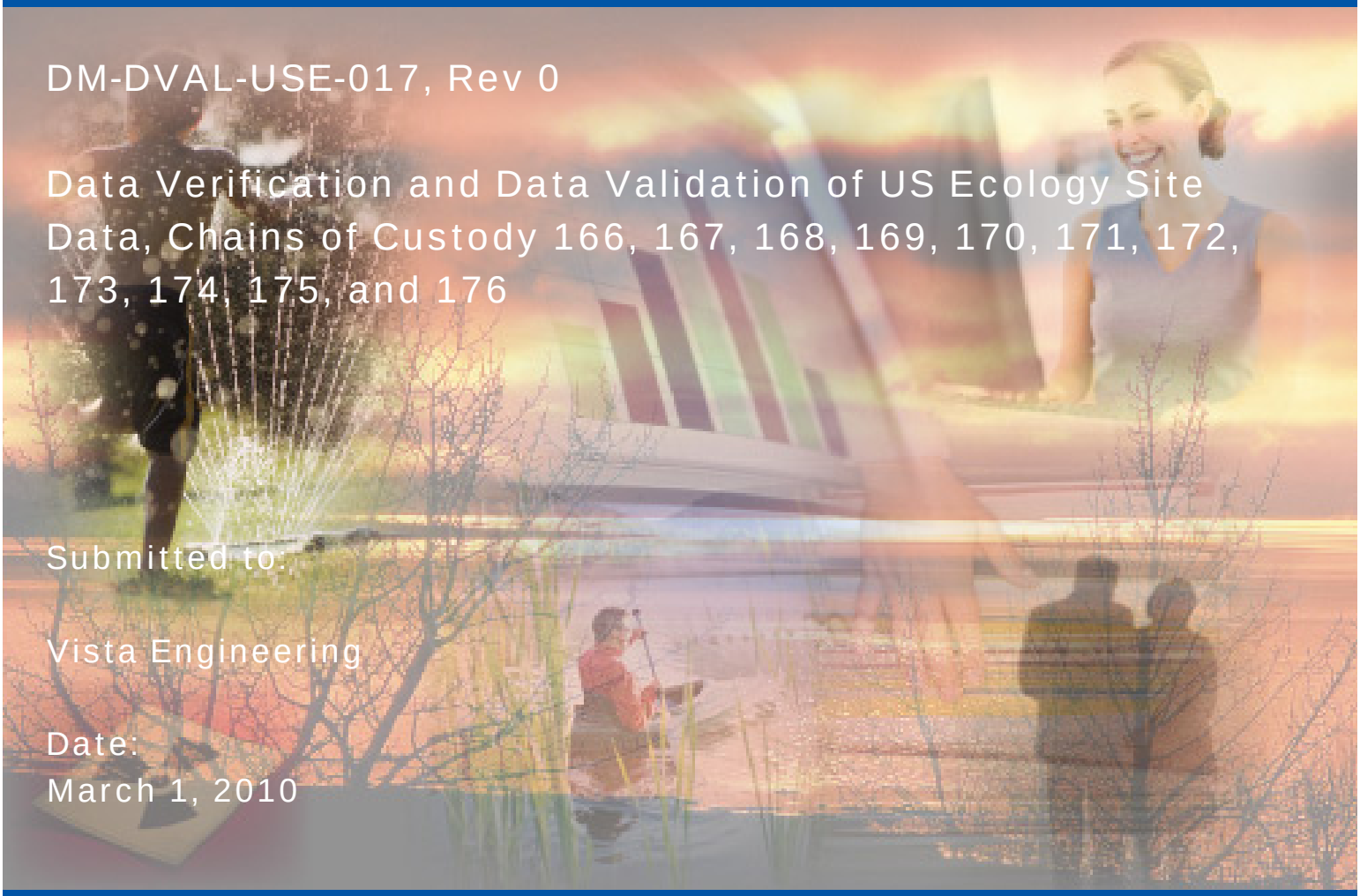
Table 2-1. Frequently Identified TICs and Estimated Concentrations.

Compound	CAS	Present in X Number of Samples
1-HEXANOL, 2-ETHYL-	104-76-7	15
1-PROPENE, 2-METHYL-	115-11-7	5
DECANE, 3,7-DIMETHYL-	17312-54-8	11
ETHANE, 1,2-DICHLORO-1,1,2-TRIFLUO	354-23-4	31
ETHENE, CHLOROTRIFLUORO-	79-38-9	34
HEPTANE, 2,4-DIMETHYL-	2213-23-2	9
HEXANE, TETRADECAFLUORO-	355-42-0	5
ISOBUTANE	75-28-5	21
METHANE, DICHLOROFLUORO-	75-43-4	5
UNDECANE, 4,7-DIMETHYL-	17301-32-5	6

CAS - Chemical Abstracts Service TIC - Tentatively Identified Compound

Dade Moeller®

Formerly Environmental Quality Management, Inc. (EQM, Inc.)



DM-DVAL-USE-017, Rev 0

Data Verification and Data Validation of US Ecology Site Data, Chains of Custody 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, and 176

Submitted to:

Vista Engineering

Date:
March 1, 2010

VISTA
ENGINEERING TECHNOLOGIES

EXECUTIVE SUMMARY

Samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for volatile organic compounds by Method TO-15.

All analyses were performed by Southwest Research Institute (SwRI), San Antonio, Texas, following the *Specification for Analytical Laboratory Services: Select Soil Gas Volatiles by Method TO-15* (VET-1405-SPEC-01, Rev. 3). In addition to printed data packages for each sample delivery group (SDG), the laboratory provided electronic data deliverables (EDDs), consisting of two Microsoft® Excel files containing tables of results and associated quality control (QC).

This data validation report presents the results of validating the analyses reported in the eighth, and final, group of EDDs prepared by the laboratory. This group of EDDs provided the results and QC data for the samples delivered to the laboratory under the chain-of custody (COC) documents listed in Table ES-1.

Table ES-1. Chains Of Custody Applicable To The Data Validated In This Report.

VET-1405-COC-166	VET-1405-COC-167	VET-1405-COC-168
VET-1405-COC-169	VET-1405-COC-170	VET-1405-COC-171
VET-1405-COC-172	VET-1405-COC-173	VET-1405-COC-174
VET-1405-COC-175	VET-1405-COC-176	-

COC - Chain of Custody

The data validation was performed using an electronic data checker to evaluate whether batch QC met criteria. The electronic data checker identified any QC results that exceed applicable criteria. The data validation process was completed by the data validation chemist, who evaluated the impacts of the exceedances and added data validation qualifiers.

Table ES-2 summarizes the validation result.

Table ES-2. Summary Validation Results by Analysis.

Analysis	Number of Results	Number of Qualified Results	Summary
TO-15	2581	1	One sample result was qualified due to the raw result exceeding the highest calibration standard concentration.

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ACRONYMS

CAS	Chemical Abstracts Service
COC	Chain of Custody
DUP	Duplicate Sample (field duplicate)
EDD	Electronic Data Deliverable
LCS	Laboratory Control Sample
MB	Method Blank
QC	Quality Control
SDG	Sample Delivery Group
SwRI	Southwest Research Institute
TIC	Tentatively Identified Compound
VOC	Volatile Organic Compound

SwRI Qualifiers

NJ	Indicates presumptive evidence of a compound. Indicates an estimated value, where a 1:1 response is assumed
J	Indicates an estimated value, where a 1:1 response is assumed.
U	Indicates compound was analyzed for, but not detected
E	This flag indicates compounds whose concentrations exceed the calibration range

Data Validation Applied Qualifiers

E	This flag indicates compounds whose concentrations exceed the calibration range

1. INTRODUCTION – APPROACH TO VALIDATION

Soil gas samples were collected from the low-level radioactive waste site operated by US Ecology on the Hanford Site. The samples were collected according to Vista Engineering's *Sampling and Analysis Plan for the US Ecology RI/FS* (VET-1405-PLN-03, Rev. 0). Samples were analyzed for volatile organic compounds (VOCs) by Method TO-15.

All analyses were conducted by Southwest Research Institute (SwRI), San Antonio, Texas, following the *Specification for Analytical Laboratory Services: Select Soil Gas Volatiles by Method TO-15* (VET-1405-SPEC-01, Rev. 3). The results of these analyses were presented in a printed data package for each sample delivery group. In addition, the laboratory provided an electronic data deliverable (EDD) for each sample delivery group. The EDDs are Microsoft® Excel files containing tables of results and associated quality control (QC).

This data validation report presents the results of validating the analyses reported in the eighth, and final, group of EDDs received from the laboratory. This group of EDDs represented the analytical results from two sample delivery groups. The corresponding chain of custody documents are identified in Table 1-1 below. The data contained in these EDDs included the analysis of VOCs by TO-15, only.

Table 1-1. Chains of Custody and Electronic Data Deliverables Applicable to the Data Validated.

Chain of Custody	EDD	
	File Name	Date Received
VET-1405-COC-166	410977_VTO-15.xls	2/18/2010
VET-1405-COC-167	410977_VTO-15.xls	2/18/2010
VET-1405-COC-168	410977_VTO-15.xls	2/18/2010
VET-1405-COC-169	410977_VTO-15.xls	2/18/2010
VET-1405-COC-170	410977_VTO-15.xls, 411258.xls	2/18/2010
VET-1405-COC-171	410977_VTO-15.xls, 411258.xls	2/18/2010
VET-1405-COC-172	411258.xls	2/18/2010
VET-1405-COC-173	411258.xls	2/18/2010
VET-1405-COC-174	411258.xls	2/18/2010
VET-1405-COC-175	411258.xls	2/18/2010
VET-1405-COC-176	411258.xls	2/18/2010

EDD - Electronic Data Deliverable

This Level C validation was performed in a two-tiered approach.

1. Completeness: an assessment of the completeness was made on the .pdf file of the "hard copy" data.
2. Electronic holding time and QC evaluation.

The approach is summarized in Table 1-2. The electronic review was performed on all incoming EDDs. The EDDs were evaluated to assure consistency with the hard copy data. The use of electronic review of all QC allows appropriate qualification of all data.

Table 1-2. Data Validation and Verification Approach.

Review item	Manually Done	Electronic	All Samples
Verification of deliverables	X		X
Requested vs reported analyses		X	X
Holding times		X	X
Blank Contamination		X	X
Detection Limits		X	X
LCS		X	X
Surrogates		X	X
Field Duplicates		X	X

The remainder of this report consists of details for validation of Method TO-15 data. It explains the overall validation process and provides reasons for any data qualifiers that were applied. The automated data validation process determined whether the following facets of laboratory quality control had been achieved.

- Was a method blank (MB) analyzed each day?
- Were surrogates added to each sample and batch QC samples for each method where surrogates are required?
- Was precision checked with a field duplicate (DUP)?
- Were holding time requirements for preparation and analysis satisfied?
- Were the MB results less than the required quantitation limits?
- Did the quantitation limit for nondetect results meet the required detection limit?
- Did the recoveries for the laboratory control sample (LCS) and surrogates, where required, meet the accuracy criteria?
- Did the field duplicate relative percent differences meet the precision criteria?

After this automated checking, the “no” answers to these questions were investigated manually, the effect on each sample result was determined, and results were qualified according to validation rules in TO-15 DV #1, Rev. 0. TO-15 DV#1 was written to validate TO-15 data for Levels A and C for the US Ecology project. It is based on *Data Validation Procedure for Chemical Analyses* (HNF-20433). The manual investigation of the automated checking results determined to have a potential impact on data quality were appropriately qualified and are presented in the remainder of this report.

Note this is a Level C validation after five quarters of Level A validation of soil gas results. Level C validation was performed because this is the eighth and final quarter of soil gas samples. Project data validation requirements, as defined in the SAP, were met at greater than 10% Level C validation over the course of the project.

Please note laboratory data qualifiers are defined in the "SwRI Qualifiers" table that follows the table of contents. Dade Moeller checks laboratory qualifiers for consistency with validation qualifiers, but does not edit or change laboratory qualifiers in any way.

2. DATA VALIDATION REPORT

2.1. DATA VALIDATION REPORT FOR VOLATILE ORGANIC COMPOUNDS (METHOD TO-15)

Fifty-seven compounds were requested for each of 43 samples in this group. All 57 compounds were reported in the EDDs for each sample.

The table listing the results is too large to include here; refer to the Microsoft® Excel file on the accompanying CD-ROM.

2.1.1. Batch Size and Completeness of QC Analysis

QC Requirements --

- Was a MB analyzed each day?
- Were surrogates added to each sample and batch QC samples for each method where surrogates are required?
- Was precision checked with a field duplicate?

Analysis was performed in two batches of vapor samples. Batch 410977 contained 20 samples and three blanks. Batch 411258 contained 23 samples and three blanks. Because a blank was analyzed on each day that samples were analyzed, QC requirements were met for batches 410977 and 411258.

Two field duplicate pairs were analyzed for the 41 samples submitted by Vista Engineering. This satisfies project SAP field duplicate requirements.

Though not required by the method, a laboratory control sample (LCS) was analyzed on each day of sample analysis as required by VET-1405-SPEC-01, Rev. 3. This LCS contained 16 of the analytes of interest. All met criteria.

Surrogates are required for MB and LCS. Though not required by the method, surrogates (1,2-dichloroethane-d4, bromofluorobenzene, and toluene-d8) were added to each sample, as well as the MB and LCS. All met criteria.

2.1.2. Holding Times

QC Requirement --

- Were holding time requirements for preparation and analysis satisfied?

Holding time limits for volatile organic analysis by method TO-15 are specified in VET-1405-PLN-03, Rev. 0, as 30 days for summa canisters. All sample analytical results were generated within this limit.

2.2. Method Blanks

QC Requirement –

- Were the MB results less than the required quantitation limits?

The required quantitation limits (VET-1405-PLN-03, Rev. 0) for all VOCs by Method TO-15 are 0.5 parts per billion by volume [ppb (v/v)]. There were no VOCs detected in the method blanks. However, no target analyte detection limits met required quantitation limits. The detection limit for all compounds in the MB was 1.1 ppb (v/v). The validation criteria do not require that data be qualified due to laboratory detection limits failing to meet required detection limits.

2.3. Detection Limits

QC Requirement –

- Did the quantiation limit for nondetect results meet the required detection limit?

All target analyte nondetects exceeded the required detection limit of 0.5 ppb (v/v) established by the sampling and analysis plan (VET-1405-PLN-03, Rev. 0). Detection limits ranged from 1.1 ppb (v/v) to 6400 ppb (v/v) for diluted samples. According to the validation criteria, exceedance of the required detection limit does not require qualification of data.

2.4. QC Checks for Accuracy

QC Requirement –

- Did the recoveries for the LCS and surrogates, where required, meet the accuracy criteria?

There is no requirement for addition of surrogates to VOC samples in Summa canisters. However surrogates are required in the LCS and MB samples. As no limits for surrogate recoveries were listed in project documents for QC samples, the laboratory limits were used to evaluate surrogate recoveries. The QC limits adopted by the laboratory for surrogate compounds are listed in Table 2-1. Surrogate recoveries in the required QC samples were within these limits.

Table 2-1. Acceptance Limits for VOA Surrogate Compound Recovery

Surrogate	Vapor Samples	
	LCL (%)	UCL (%)
1,2-Dichloroethane-d4	70	130
Toluene-d8	70	130
Bromofluorobenzene	70	130

LCL - lower control limit
UCL - upper control limit
VOA - volatile organic analysis

There is no requirement for analysis of LCS in method TO-15. However, LCS are required by VET-1405-SPEC-01, Rev. 3, and were analyzed in these batches. As specified in the laboratory's analytical package narratives and TO-15 DV #1, Rev. 0, target analyte recoveries in the LCS must be within 70% to 130%. LCS recoveries for the sixteen compounds monitored by the laboratory were within this range.

2.5. QC Check for Precision

QC Requirement –

- Did the DUP relative percent differences meet the precision criteria?

Method TO-15 suggest that a replicate (duplicate) precision value of 25% cab be achieved for TO-15 target compounds. There are two field duplicates included in this sample set. The failures are included in Table 2-2. Relative percent differences (RPDs) for 1,1,1,-trichloroethane, 1,1-dichloroethane, 1,1-dichlorethene, carbon tetrachloride, chloroform, n-butanol, and trichloroethene in sample 410990 (Vista ID V321) are above the 25% limit. The RPD for carbon tetrachloride in sample 411259 (Vista ID V325) is high, as well. As there is no field duplicate criteria specified in project documents the VOC criteria from TO-15 DV #1, Rev. 0 are used. TO-15 DV #1, Rev. 0 does not require that data be qualified due to poor field duplicate RPDs.

Table 2-2. Field Duplicate RPDs That Failed to Meet Method Acceptance Criteria.[a,b]

Analyte	CAS	Batch ID	Original Sample			Duplicate Sample			Units	RPD
			Conc.	Q	MDL	Conc.	Q	MDL		
1,1,1-TRICHLOROETHANE	71-55-6	410977[c]	360		110	530		110	ppb(v/v)	38%
1,1-DICHLOROETHANE	75-34-3	410977	130		110	170		110	ppb(v/v)	27%
1,1-DICHLOROETHENE	75-35-4	410977	160		110	210		110	ppb(v/v)	27%
CARBON TETRACHLORIDE	56-23-5	410977	110	U	110	660		110	ppb(v/v)	140%
CHLOROFORM	67-66-3	410977	580		110	920		110	ppb(v/v)	45%
n-BUTANOL	71-36-3	410977	170		110	110	U	110	ppb(v/v)	43%
TRICHLOROETHENE	79-01-6	410977	110	U	110	220		110	ppb(v/v)	67%
CARBON TETRACHLORIDE	56-23-5	411258[d]	140		22	230		22	ppb(v/v)	49%

a. Results are reported only for compounds that were present above the detection limit in at least one of the replicate samples.
b. Compounds that were not detected in both replicates (U-flagged) are not listed. RPDs for U-flagged compounds are 0% by definition but the value has no significance in data validation activities.
c. The original sample for batch 410977 is 410989 (Vista ID V320) and the duplicate sample is 410990 (Vista ID V321).
d. The original sample for batch 411258 is 411258 (Vista ID V324) and the duplicate sample is 411259 (Vista ID V325).

CAS - Chemical Abstracts Service
Conc. - concentration (column heading)
MDL - minimum detection limit (column heading)
ppb(v/v) - parts per billion by volume
Q - laboratory qualifier (column heading)
RPD - relative percent difference

2.6. Laboratory Qualifiers

1,1,2-Trichlorotrifluoroethane was reported in one sample at a concentration significantly higher than the highest calibration standard (75 ppb). The raw concentration was 26% higher in sample V335. The laboratory reported 1,1,2-trichlorofluoroethane with an E qualifier in this sample. The validator agrees with this approach and an E qualifier has been added as a validation flag, as well.

2.7. Tentatively Identified Compounds (TIC)

Per VET-1405-SPEC-01, Table 1, many compounds were listed as tentatively identified compounds (TICs). TICs are compounds identified by comparison with a mass spectral library. No standards are run on the gas chromatograph/mass spectrometer for TICs. The concentration of a TIC is estimated by ratioing the area to the nearest internal standard. None of the TICs listed in VET-1405-SPEC-01, Table 1, were identified in these samples.

However, many TICs were identified outside of those specified in VET-1405-SPEC-01. The second sheet of the accompanying Microsoft® Excel file lists the TICs and estimated concentrations.

TICs are not calibrated, and are impractical to calibrate. Only those TICs with many repeated hits in multiple samples should be considered further. Ten compounds were identified in five or more samples; Table 2-3 lists these frequently identified compounds.

Table 2-3. Frequently Identified TICs and Estimated Concentrations.

Compound	CAS	Present in X Number of Samples
1-HEXANOL, 2-ETHYL-	104-76-7	12
ETHANE, 1,2-DICHLORO-1,1,2-TRIFLUO	354-23-4	37
ETHENE, CHLOROTRIFLUORO-	79-38-9	40
ISOBUTANE	75-28-5	27
METHANE, DICHLOROFLUORO-	75-43-4	6
PENTADECANE	629-62-9	5
UNDECANE, 4,7-DIMETHYL-	17301-32-5	9

CAS - Chemical Abstracts Service TIC - Tentatively Identified Compound