

**Laboratory Data Consultants, Inc.
Data Validation Report**

Project/Site Name: NASA JPL
Collection Date: August 25, 2003
LDC Report Date: October 17, 2003
Matrix: Water
Parameters: Wet Chemistry
Validation Level: EPA Level III
Laboratory: Applied P & Ch Laboratory
Sample Delivery Group (SDG): 03-4842

Sample Identification

MW-5
MW-8
MW-10
MW-5MS
MW-5MSD

Introduction

This data review covers 5 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 314.0 for Perchlorate and EPA SW 846 Method 7196 for Hexavalent Chromium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (February 1994) as there are no current guidelines for the methods stated above.

A table summarizing all data qualification is provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section IX.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

- U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.
- J Indicates an estimated value.
- R Quality control indicates the data is not usable.
- N Presumptive evidence of presence of the constituent.
- UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.
- A Indicates the finding is based upon technical validation criteria.
- P Indicates the finding is related to a protocol/contractual deviation.
- None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration were met.

b. Calibration Verification

Calibration verification frequency and analysis criteria were met for each method when applicable with the following exceptions:

Date	Lab. Reference/ID	Analyte	%R (Limits)	Associated Samples	Flag	A or P
8/28/03	CCV2	Perchlorate	115 (90-110)	MW-5 MW-8 MW-10	J (all detects)	P
8/28/03	CCV1	Perchlorate	115 (90-110)	MB	J (all detects)	P

III. Blanks

Method blanks were reviewed for each matrix as applicable. No contaminant concentrations were found in the method blanks.

IV. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

V. Duplicates

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable.

VI. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

VII. Sample Result Verification

Raw data were not reviewed for this SDG.

VIII. Overall Assessment of Data

Data flags are summarized at the end of this report.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Field Blanks

No field blanks were identified in this SDG.

Applied P & Ch Laboratory
Wet Analysis Results for Method 7196

Client Name: GEOFON, Inc.
Project ID: JPL

Project No: 04-4428.10
Service ID: 34842

Anal. Method: 7196
Collected by: J. Robinson

Component Name: Chromium (VI)
CAS No: 1333-82-0

Lab ID	Sample ID	Matrix	Coll. Date	Rcv Date	Anal. Date	Batch	Unit	RL	Result	Q
03-4842-1	MW-5	Water	08/25/03	08/25/03	08/25/03	03W4238	mg/L	0.01	<0.01	U
03-4842-2	MW-8	Water	08/25/03	08/25/03	08/25/03	03W4238	mg/L	0.01	<0.01	U
03-4842-3	MW-10	Water	08/25/03	08/25/03	08/25/03	03W4238	mg/L	0.01	<0.01	U
03W4238-MB-01	03W4238-MB-01	Water	08/25/03	08/25/03	08/25/03	03W4238	mg/L	0.01	<0.01	U

Not Detected is shown as PQL, with dilution and moisture corrected if applicable.

Note: Q - Qualifier.

Qualifier: U - Not Detected or less than MDL

B - Less than RL (PQL, EQL or CRDL), but greater than MDL.

Handwritten signature and date: 10/18/07

NASA JPL**Wet Chemistry - Data Qualification Summary - SDG 03-4842**

SDG	Sample	Analyte	Flag	A or P	Reason
03-4842	MW-5 MW-8 MW-10	Perchlorate	J (all detects)	P	Calibration verification (%R)

NASA JPL**Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 03-4842**

No Sample Data Qualified in this SDG

Applied P & Ch Laboratory
Wet Analysis Results for Method 314.0

Client Name: GEOFON, Inc.
Project ID: JPL

Project No: 04-4428.10
Service ID: 34842

Anal. Method 314.0
Collected by: J. Robinson

Component Name: Perchlorate
CAS No:

Lab ID	Sample ID	Matrix	Coll. Date	Rcv Date	Anal. Date	Batch	Unit	RL	Result	Q
03-4842-1	MW-5	Water	08/25/03	08/25/03	08/28/03	03W4284	µg/L	4	<4	U
03-4842-2	MW-8	Water	08/25/03	08/25/03	08/28/03	03W4284	µg/L	4	9.7	J
03-4842-3	MW-10	Water	08/25/03	08/25/03	08/28/03	03W4284	µg/L	4	43.6	J
03W4284-MB-01	03W4284-MB-01	Water	08/28/03	08/28/03	08/28/03	03W4284	µg/L	4	<4	U

Not Detected is shown as PQL, with dilution and moisture corrected if applicable.

Note: Q - Qualifier.

Qualifier: U - Not Detected or less than MDL

B - Less than RL (PQL, EQL or CRDL), but greater than MDL.

*K
08/28/03*

LDC #: 10962D6

VALIDATION COMPLETENESS WORKSHEET

SDG #: 03-4842

Level III

Laboratory: Applied P & Ch Laboratory

Date: 10/14/03

Page: 1 of 1

Reviewer: MB

2nd Reviewer: **METHOD:** Hexavalent chromium (EPA SW 846 Method 7196) Perchlorate (EPA Method 314.0)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 8/25/03
IIa.	Initial calibration	A	
IIb.	Calibration verification	SW	
III.	Blanks	A	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	A	MS/MSD
IVb.	Laboratory control samples	A	LCs/LCSD
V.	Sample result verification	N	
VI.	Overall assessment of data	A	
VII.	Field duplicates	N	
VIII.	Field blanks	N	

Note: A = Acceptable
N = Not provided/applicable
SW = See worksheet

ND = No compounds detected
R = Rinsate
FB = Field blank

D = Duplicate
TB = Trip blank
EB = Equipment blank

Validated Samples: 10

1	MW-5	11		21		31	
2	MW-8	12		22		32	
3	MW-10	13		23		33	
4	MW-5MS	14		24		34	
5	MW-5MSD	15		25		35	
6	MB	16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Notes: _____

Page: of
 Reviewer:
 2nd Reviewer:

LDC #: 1096296
SDG #: 03-4842

METHOD: Inorganics, EPA Method See color

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?

☒ Yes ☐ No ☐ N/A

	(Y) N	N/A
Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?		
Were initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110%?		

Were all initial and continuing calibration	Y	N/A
Are all correlation coefficients >0.995 ?	N	N/A

(Y) N N/A

Y N ~~N/A~~ Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recalculation Worksheet for recalculations.

Y	N	N/A
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Y	N	N/A
Y	N	N/A

[illegible]

Comments:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL
Collection Date: August 26, 2003
LDC Report Date: October 17, 2003
Matrix: Water
Parameters: Wet Chemistry
Validation Level: EPA Level III
Laboratory: Applied P & Ch Laboratory
Sample Delivery Group (SDG): 03-4854

Sample Identification

MW-7
MW-13
MW-16
MW-16MS
MW-16MSD

Introduction

This data review covers 5 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 314.0 for Perchlorate and EPA SW 846 Method 7196 for Hexavalent Chromium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (February 1994) as there are no current guidelines for the methods stated above.

A table summarizing all data qualification is provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section IX.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

- U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.
- J Indicates an estimated value.
- R Quality control indicates the data is not usable.
- N Presumptive evidence of presence of the constituent.
- UU Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.
- A Indicates the finding is based upon technical validation criteria.
- P Indicates the finding is related to a protocol/contractual deviation.
- None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration were met.

b. Calibration Verification

Calibration verification frequency and analysis criteria were met for each method when applicable with the following exceptions:

Date	Lab. Reference/ID	Analyte	%R (Limits)	Associated Samples	Flag	A or P
8/28/03	CCV1	Perchlorate	115 (90-110)	MW-16 MB	J (all detects)	P
8/28/03	CCV2	Perchlorate	115 (90-110)	MW-7 MW-13 MW-16MS MW-16MSD	J (all detects)	P

III. Blanks

Method blanks were reviewed for each matrix as applicable. No contaminant concentrations were found in the method blanks.

IV. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

V. Duplicates

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable.

VI. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

VII. Sample Result Verification

Raw data were not reviewed for this SDG.

VIII. Overall Assessment of Data

Data flags are summarized at the end of this report.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Field Blanks

No field blanks were identified in this SDG.

NASA JPL**Wet Chemistry - Data Qualification Summary - SDG 03-4854**

SDG	Sample	Analyte	Flag	A or P	Reason
03-4854	MW-16 MW-7 MW-13	Perchlorate	J (all detects)	P	Calibration verification (%R)

NASA JPL**Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 03-4854**

No Sample Data Qualified in this SDG

Applied P & Ch Laboratory
Wet Analysis Results for Method 7196

Client Name: GEOFON, Inc.

Project No: 04-4428.10

Anal. Method 7196

Project ID:

Service ID: 34854

Collected by:

Component Name: Chromium (VI)

CAS No: 1333-82-0

Lab ID	Sample ID	Matrix	Coll. Date	Rcv Date	Anal. Date	Batch	Unit	RL	Result	Q
03-4854-1	MW-7	Water	08/26/03	08/26/03	08/26/03	03W4245	mg/L	0.01	<0.01	U
03-4854-2	MW-13	Water	08/26/03	08/26/03	08/26/03	03W4245	mg/L	0.01	<0.01	U
03-4854-3	MW-16	Water	08/26/03	08/26/03	08/26/03	03W4245	mg/L	0.01	<0.01	U
03W4245-MB-01	03W4245-MB-01	Water	08/26/03	08/26/03	08/26/03	03W4245	mg/L	0.01	<0.01	U

Not Detected is shown as PQL, with dilution and moisture corrected if applicable.

Note: Q - Qualifier.

Qualifier: U - Not Detected or less than MDL

B - Less than RL (PQL, EQL or CRDL), but greater than MDL.

9/10/18/03

Applied P & Ch Laboratory
Wet Analysis Results for Method 314.0

Client Name: GEOFON, Inc.

Project No: 04-4428.10

Anal. Method 314.0

Project ID:

Service ID: 34854

Collected by:

Component Name: Perchlorate

CAS No:

Lab ID	Sample ID	Matrix	Coll. Date	Rcv Date	Anal. Date	Batch	Unit	RL	Result	Q
03-4854-1	MW-7	Water	08/26/03	08/26/03	08/28/03	03W4284	µg/L	200	1920	J
03-4854-2	MW-13	Water	08/26/03	08/26/03	08/28/03	03W4284	µg/L	16	159	J
03-4854-3	MW-16	Water	08/26/03	08/26/03	08/28/03	03W4284	µg/L	100	1520	J
03W4284-MB-01	03W4284-MB-01	Water	08/28/03	08/28/03	08/28/03	03W4284	µg/L	4	<4	U

Not Detected is shown as PQL, with dilution and moisture corrected if applicable.

Note: Q - Qualifier.

Qualifier: U - Not Detected or less than MDL

B - Less than RL (PQL, EQL or CRDL), but greater than MDL.

10/18/07

LDC #: 10962E6

VALIDATION COMPLETENESS WORKSHEET

SDG #: 03-4854

Level III

Laboratory: Applied P & Ch Laboratory

Date: 10/14/03

Page: (of)

Reviewer: M6

2nd Reviewer: A

METHOD: Hexavalent chromium (EPA SW 846 Method 7196) Perchlorate (EPA Method 314.0)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 8/26/03
IIa.	Initial calibration	A	
IIb.	Calibration verification	SW	
III.	Blanks	A	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	A	MS/MSD
IVb.	Laboratory control samples	A	LOS/LOSD
V.	Sample result verification	N	
VI.	Overall assessment of data	A	
VII.	Field duplicates	N	
VIII.	Field blanks	N	

Note: A = Acceptable
N = Not provided/applicable
SW = See worksheet

ND = No compounds detected
R = Rinsate
FB = Field blank

D = Duplicate
TB = Trip blank
EB = Equipment blank

Validated Samples:

AQ

1	MW-7	11		21		31	
2	MW-13	12		22		32	
3	MW-16	13		23		33	
4	MW-16MS	14		24		34	
5	MW-16MSD	15		25		35	
6	MB	16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Notes:

LDC #: 1096266
SDG #: 03-4884

VALIDATION FINDINGS WORKSHEET

Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: MIT
2nd reviewer: [Signature]

All circled methods are applicable to each sample.

[illegible]

Comments: _____

VALIDATION FINDINGS WORKSHEET

LDC #: 10962 E6
SDG #: 03-4854

METHOD: Inorganics, EPA Method see column

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
 Were all instruments calibrated daily, each set-up time, and were the proper number of standards used? Y N N/A
 Were all initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110%? Y N N/A
 Are all correlation coefficients ≥ 0.995 ? Y N N/A

LEVEL IV/D ONLY:	
Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recalculation Worksheet for recalculations.	Y N N/A
Was a balance check conducted prior to the TDS analysis?	Y N N/A
Was the titrant normality checked?	Y N N/A

[illegible]

Comments:

**Laboratory Data Consultants, Inc.
Data Validation Report**

Project/Site Name: NASA JPL
Collection Date: August 27, 2003
LDC Report Date: October 20, 2003
Matrix: Water
Parameters: Wet Chemistry
Validation Level: EPA Level III
Laboratory: Applied P & Ch Laboratory
Sample Delivery Group (SDG): 03-4878

Sample Identification

DUPE-6-3-Q03
MW-6
MW-15
DUPE-6-3-Q03MS
DUPE-6-3-Q03MSD

Introduction

This data review covers 5 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 314.0 for Perchlorate and EPA SW 846 Method 7196 for Hexavalent Chromium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (February 1994) as there are no current guidelines for the methods stated above.

A table summarizing all data qualification is provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section IX.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

- U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.
- J Indicates an estimated value.
- R Quality control indicates the data is not usable.
- N Presumptive evidence of presence of the constituent.
- UU Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.
- A Indicates the finding is based upon technical validation criteria.
- P Indicates the finding is related to a protocol/contractual deviation.
- None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration were met.

b. Calibration Verification

Calibration verification frequency and analysis criteria were met for each method when applicable with the following exceptions:

Date	Lab. Reference/ID	Analyte	%R (Limits)	Associated Samples	Flag	A or P
8/28/03	CCV1	Perchlorate	115 (90-110)	MW-6 MB	J (all detects)	P

III. Blanks

Method blanks were reviewed for each matrix as applicable. No contaminant concentrations were found in the method blanks.

IV. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

V. Duplicates

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable.

VI. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

VII. Sample Result Verification

Raw data were not reviewed for this SDG.

VIII. Overall Assessment of Data

Data flags are summarized at the end of this report.

IX. Field Duplicates

Samples DUPE-6-3-Q03 and MW-15 were identified as field duplicates. No contaminant concentrations were detected in any of the samples.

X. Field Blanks

No field blanks were identified in this SDG.

NASA JPL**Wet Chemistry - Data Qualification Summary - SDG 03-4878**

SDG	Sample	Analyte	Flag	A or P	Reason
03-4878	MW-6	Perchlorate	J (all detects)	P	Calibration verification (%R)

NASA JPL**Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 03-4878**

No Sample Data Qualified in this SDG

Applied P & Ch Laboratory
Wet Analysis Results for Method 314.0

Client Name: GEOFON, Inc.
Project ID: JPL

Project No: 04-4428.10
Service ID: 34878

Anal. Method 314.0
Collected by:

Component Name: Perchlorate
CAS No:

Lab ID	Sample ID	Matrix	Coll. Date	Rcv Date	Anal. Date	Batch	Unit	RL	Result	Q
03-4878-2	MW-6	Water	08/27/03	08/27/03	08/28/03	03W4284	µg/L	4	2.9	B J
03W4284-MB-01	03W4284-MB-01	Water	08/28/03	08/28/03	08/28/03	03W4284	µg/L	4	<4	U

Not Detected is shown as PQL, with dilution and moisture corrected if applicable.

Note: Q - Qualifier.

Qualifier: U - Not Detected or less than MDL

B - Less than RL (PQL, EQL or CRDL), but greater than MDL.

10/18/03

Applied P & Ch Laboratory
Wet Analysis Results for Method 7196

Client Name: GEOFON, Inc.

Project No: 04-4428.10

Anal. Method 7196

Project ID: JPL

Service ID: 34878

Collected by:

Component Name: Chromium (VI)

CAS No: 1333-82-0

Lab ID	Sample ID	Matrix	Coll. Date	Rcv Date	Anal. Date	Batch	Unit	RL	Result	Q
03-4878-1	DUPE-6-3-Q03	Water	08/27/03	08/27/03	08/27/03	03W4264	mg/L	0.01	<0.01	U
03-4878-2	MW-6	Water	08/27/03	08/27/03	08/27/03	03W4264	mg/L	0.01	<0.01	U
03-4878-3	MW-15	Water	08/27/03	08/27/03	08/27/03	03W4264	mg/L	0.01	<0.01	U
03W4264-MB-01	03W4264-MB-01	Water	08/27/03	08/27/03	08/27/03	03W4264	mg/L	0.01	<0.01	U

Not Detected is shown as PQL, with dilution and moisture corrected if applicable.

Note: Q - Qualifier.

Qualifier: U - Not Detected or less than MDL

B - Less than RL (PQL, EQL or CRDL), but greater than MDL.

10/12/03

LDC #: 10962F6

VALIDATION COMPLETENESS WORKSHEET

SDG #: 03-4878

Level III

Laboratory: Applied P & Ch Laboratory

Date: 10/14/03

Page: 1 of 1

Reviewer: MS

2nd Reviewer: A

METHOD: Hexavalent chromium (EPA SW 846 Method 7196) Perchlorate (EPA Method 314.0)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 8/29/03
IIa.	Initial calibration	CA	
IIb.	Calibration verification	SW	
III.	Blanks	A	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	A	MS/MSD
IVb.	Laboratory control samples	A	LC5/LCSD
V.	Sample result verification	N	
VI.	Overall assessment of data	A	
VII.	Field duplicates	ND	(1, 3)
VIII.	Field blanks	N	

Note: A = Acceptable
N = Not provided/applicable
SW = See worksheet

ND = No compounds detected
R = Rinsate
FB = Field blank

D = Duplicate
TB = Trip blank
EB = Equipment blank

Validated Samples:

1	✓ DUPE-6-3-Q03	11		21		31	
2	MW-6	12		22		32	
3	✓ MW-15	13		23		33	
4	DUPE-6-3-Q03MS	14		24		34	
5	DUPE-6-3-Q03MSD	15		25		35	
6	MB	16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Notes: _____

LDC #:
SDG #:

VALIDATION FINDINGS WORKSHEET

Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: MIT
2nd reviewer: AB

All circled methods are applicable to each sample.

[illegible]

Comments:

LDC #: 10962 Fb
SDG #: 034878

METHOD: Inorganics, EPA Method See below

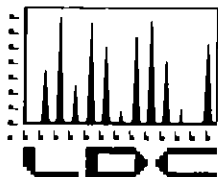
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> N/A	Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?
<input checked="" type="radio"/> Y	<input checked="" type="radio"/> N	<input type="radio"/> N/A	Were all initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110%?
<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> N/A	Are all correlation coefficients ≥ 0.995 ?

LEVEL IV/D ONLY:	
Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recalculation Worksheet for recalculations.	Y N N/A
Was a balance check conducted prior to the TDS analysis?	Y N N/A
Was the titrant normality checked?	Y N N/A

[illegible]

Comments:



LABORATORY DATA CONSULTANTS, INC.

7750 El Camino Real, Suite 2L Carlsbad, CA 92009 Phone: 760/634-0437 Fax: 760/634-0439

Geofon, Inc.
22632 Golden Springs Drive, Suite 270
Diamond Bar, CA 91765
ATTN: Mr. Leo Williamson

October 31, 2003

SUBJECT: NASA JPL, DO #01, Data Validation

Dear Mr. Williamson,

Enclosed are the final validation reports for the fraction listed below. These SDGs were received on October 20, 2003. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 11017:

<u>SDG #</u>	<u>Fraction</u>
03-4697, 03-4948	Chromium

The data validation was performed under EPA Level III and Level IV guidelines. The analyses were validated using the following documents, as applicable to each method:

- USEPA, Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, February 1994

Please feel free to contact us if you have any questions.

Sincerely,

Erlinda T. Rauto
Operations Manager/Senior Chemist

**NASA JPL
Data Validation Reports
LDC# 11017**

Chromium

**Laboratory Data Consultants, Inc.
Data Validation Report**

Project/Site Name: NASA JPL
Collection Date: August 11, 2003
LDC Report Date: October 30, 2003
Matrix: Water
Parameters: Chromium
Validation Level: EPA Level III & IV
Laboratory: Applied P & Ch Laboratory/Advanced Technology Laboratories

Sample Delivery Group (SDG): 03-4697/064876

Sample Identification

DUPE-5-3-Q03**
EB-7-8-11-03
MW-12-1
MW-12-2
MW-12-3
MW-22-1
MW-22-2
MW-22-3

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 8 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 200.8 for Chromium.

This review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (February 1994) as there are no current guidelines for the method stated above.

A table summarizing all data qualification flags is provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from specified protocols or is of technical advisory nature.

Blanks are summarized in Section III.

Field duplicates are summarized in Section XIII.

Samples indicated by a double asterisk on the front cover underwent a EPA Level IV review. A EPA Level III review was performed on all of the other samples. Raw data were not evaluated for the samples reviewed by Level III criteria since this review is based on QC data.

The following are definitions of the data qualifiers:

- U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.
- J Indicates an estimated value.
- R Quality control indicates the data is not usable.
- N Presumptive evidence of presence of the constituent.
- UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.
- A Indicates the finding is based upon technical validation criteria.
- P Indicates the finding is related to a protocol/contractual deviation.
- None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

An initial calibration was performed.

The frequency and analysis criteria of the initial calibration verification (ICV) and continuing calibration verification (CCV) were met.

III. Blanks

Method blanks were reviewed for each matrix as applicable.

Data qualification by the initial, continuing and preparation blanks (ICB/CCB/PBs) was based on the maximum contaminant concentration in the ICB/CCB/PBs in the analysis of each analyte. No contaminant concentrations were found in the initial, continuing and preparation blanks with the following exceptions:

Method Blank ID	Analyte	Maximum Concentration	Associated Samples
ICB/CCB	Chromium	0.132 ug/L	All samples in SDG 03-4697/064876

Sample concentrations were compared to the maximum contaminant concentrations detected in the ICB/CCB/PBs. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated method blanks.

IV. ICP Interference Check Sample (ICS) Analysis

ICP interference check was not required by the method.

V. Matrix Spike Analysis

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	RPD (Limits)	Flag	A or P
MW-16MS/MSD (All samples in SDG 03-4697/064876)	Chromium	-	79.1 (80-120)	-	J (all detects) UJ (all non-detects)	A

VI. Duplicate Sample Analysis

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

VII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

VIII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

IX. Furnace Atomic Absorption QC

Graphite furnace atomic absorption was not utilized in this SDG.

X. ICP Serial Dilution

ICP serial dilution was not required by the method.

XI. Sample Result Verification

All sample result verifications met validation criteria for samples on which a EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by Level III criteria.

XII. Overall Assessment of Data

Data flags have been summarized at the end of this report.

XIII. Field Duplicates

Samples DUPE-5-3-Q03** and MW-22-2 were identified as field duplicates. No chromium was detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD
	DUPE-5-3-Q03**	MW-22-2	
Chromium	2.5	2.7	8

XIV. Field Blanks

Sample EB-7-8-11-03 was identified as an equipment blank. No chromium contaminants were found in this blank.

NASA JPL**Chromium - Data Qualification Summary - SDG 03-4697/064876**

SDG	Sample	Analyte	Flag	A or P	Reason
03-4697/064876	DUPE-5-3-Q03** EB-7-8-11-03 MW-12-1 MW-12-2 MW-12-3 MW-22-1 MW-22-2 MW-22-3	Chromium	J (all detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicates (%R)

NASA JPL**Chromium - Laboratory Blank Data Qualification Summary - SDG
03-4697/064876**

No Sample Data Qualified in this SDG

Advanced Technology Laboratories

Date: 26-Sep-03

CLIENT: Applied P & Ch Laboratories

Client Sample ID: EB-7-8-11-03

Lab Order: 064876

Project: JPL, 4697

Collection Date: 8/11/2003 9:10:00 AM

Lab ID: 064876-008A

Matrix: WATER

Analyte	Result	Qual	MDL	PQL	Units	DF	Date Analyzed
ICP-MS METALS			EPA 200.8			Analyst: NS	
RunID: ICP4_030923B	QC Batch: R31161		PrepDate:				
Chromium	ND	UJ	0.11	1.0	µg/L	1	9/23/2003 1:06:36 PM

10/30/03

Qualifiers: ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H-Samples exceed holding time

Page 8 of 8

Results are wet unless otherwise specified

0015



Advanced Technology
Laboratories

3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

Advanced Technology Laboratories

Date: 26-Sep-03

CLIENT: Applied P & Ch Laboratories
Lab Order: 064876
Project: JPL, 4697
Lab ID: 064876-007A

Client Sample ID: Dupe-5-3-Q03

Collection Date: 8/11/2003 8:44:00 AM
Matrix: WATER

Analyte	Result	Qual	MDL	PQL	Units	DF	Date Analyzed
ICP-MS METALS			EPA 200.8			Analyst: NS	
RunID: ICP4_030923B	QC Batch: R31161		PrepDate:				
Chromium	2.5	J	0.11	1.0	µg/L	1	9/23/2003 1:04:05 PM

10/20/03

Qualifiers: ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H-Samples exceed holding time

Results are wet unless otherwise specified

Page 7 of 8

0014



Advanced Technology Laboratories

Date: 26-Sep-03

CLIENT: Applied P & Ch Laboratories
Lab Order: 064876
Project: JPL, 4697
Lab ID: 064876-003A

Client Sample ID: MW-12-1
Collection Date: 8/11/2003 11:44:00 AM
Matrix: WATER

Analyte	Result	Qual	MDL	PQL	Units	DF	Date Analyzed
ICP-MS METALS			EPA 200.8			Analyst: NS	
RunID: ICP4_030923B	QC Batch: R31161		PrepDate:				
Chromium	8.0	J	0.11	1.0	µg/L	1	9/23/2003 12:54:02 P

10/30/03

Qualifiers: ND - Not Detected at the Reporting Limit S - Spike Recovery outside accepted recovery limits
J - Analyte detected below quantitation limits R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank E - Value above quantitation range
* - Value exceeds Maximum Contaminant Level H-Samples exceed holding time

Results are wet unless otherwise specified

Page 3 of 8

0010



Advanced Technology Laboratories

Date: 26-Sep-03

CLIENT: Applied P & Ch Laboratories
Lab Order: 064876
Project: JPL, 4697
Lab ID: 064876-002A

Client Sample ID: MW-12-2
Collection Date: 8/11/2003 11:24:00 AM
Matrix: WATER

Analyte	Result	Qual	MDL	PQL	Units	DF	Date Analyzed
ICP-MS METALS		EPA 200.8		Analyst: NS			
RunID: ICP4_030923B	QC Batch: R31161	PrepDate:					
Chromium	3.8	J	0.11	1.0	µg/L	1	9/23/2003 12:51:32 P

10/30/03

Qualifiers: ND - Not Detected at the Reporting Limit S - Spike Recovery outside accepted recovery limits
J - Analyte detected below quantitation limits R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank E - Value above quantitation range
* - Value exceeds Maximum Contaminant Level H-Samples exceed holding time

Results are wet unless otherwise specified

Page 2 of 8

0009



Advanced Technology
Laboratories

3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

A

Advanced Technology Laboratories

Date: 26-Sep-03

CLIENT: Applied P & Ch Laboratories

Client Sample ID: MW-12-3

Lab Order: 064876

Project: JPL, 4697

Collection Date: 8/11/2003 11:04:00 AM

Lab ID: 064876-001A

Matrix: WATER

Analyte	Result	Qual	MDL	PQL	Units	DF	Date Analyzed
ICP-MS METALS			EPA 200.8			Analyst: NS	
RunID: ICP4_030923B	QC Batch:	R31161	PrepDate:				
Chromium	2.4	J	0.11	1.0	µg/L	1	9/23/2003 12:49:03 P

9/20/03

Qualifiers: ND - Not Detected at the Reporting Limit
 J - Analyte detected below quantitation limits
 B - Analyte detected in the associated Method Blank
 * - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits
 R - RPD outside accepted recovery limits
 E - Value above quantitation range
 H-Samples exceed holding time

Page 1 of 8

Results are wet unless otherwise specified

0008



Advanced Technology Laboratories

Date: 26-Sep-03

CLIENT: Applied P & Ch Laboratories
Lab Order: 064876
Project: JPL, 4697
Lab ID: 064876-006A

Client Sample ID: MW-22-1
Collection Date: 8/11/2003 9:14:00 AM
Matrix: WATER

Analyte	Result	Qual	MDL	PQL	Units	DF	Date Analyzed
ICP-MS METALS			EPA 200.8			Analyst: NS	
RunID: ICP4_030923B	QC Batch: R31161		PrepDate:				
Chromium	4.2	J	0.11	1.0	µg/L	1	9/23/2003 1:01:33 PM

10/20/03

Qualifiers: ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H-Samples exceed holding time

Page 6 of 8

Results are wet unless otherwise specified

0013



Advanced Technology Laboratories

Date: 26-Sep-03

CLIENT: Applied P & Ch Laboratories

Client Sample ID: MW-22-2

Lab Order: 064876

Project: JPL, 4697

Collection Date: 8/11/2003 8:13:00 AM

Lab ID: 064876-005A

Matrix: WATER

Analyte	Result	Qual	MDL	PQL	Units	DF	Date Analyzed
ICP-MS METALS			EPA 200.8			Analyst: NS	
RunID: ICP4_030923B	QC Batch: R31161		PrepDate:				
Chromium	2.7	J	0.11	1.0	µg/L	1	9/23/2003 12:59:02 P

Qualifiers: ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H-Samples exceed holding time

Results are wet unless otherwise specified

Page 5 of 8

0012



Advanced Technology Laboratories

Date: 26-Sep-03

CLIENT: Applied P & Ch Laboratories

Client Sample ID: MW-22-3

Lab Order: 064876

Project: JPL, 4697

Collection Date: 8/11/2003 7:41:00 AM

Lab ID: 064876-004A

Matrix: WATER

Analyte	Result	Qual	MDL	PQL	Units	DF	Date Analyzed
ICP-MS METALS			EPA 200.8			Analyst: NS	
RunID: ICP4_030923B	QC Batch: R31161		PrepDate:				
Chromium	2.9	J	0.11	1.0	µg/L	1	9/23/2003 12:56:32 P

Qualifiers: ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H - Samples exceed holding time

Results are wet unless otherwise specified

Page 4 of 8

0011



Advanced Technology
Laboratories

3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

METHOD: Chromium (EPA Method 200.8)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 8-11-03
II.	Calibration	A	
III.	Blanks	SW	
IV.	ICP Interference Check Sample (ICS) Analysis	N	Not required
V.	Matrix Spike Analysis	SW	MS/MSD (SDG: 03-4948/064877)
VI.	Duplicate Sample Analysis	A	DDP (↓)
VII.	Laboratory Control Samples (LCS)	A	LCS
VIII.	Internal Standard (ICP-MS)	A	
IX.	Furnace Atomic Absorption QC	N	Not utilized
X.	ICP Serial Dilution	N	Not required
XI.	Sample Result Verification	A	Not reviewed for Level III validation.
XII.	Overall Assessment of Data	A	
XIII.	Field Duplicates	SW	D=1+7
XIV.	Field Blanks	ND	EB=2

Note: A = Acceptable
N = Not provided/applicable
SW = See worksheet

ND = No compounds detected
R = Rinsate
FB = Field blank

D = Duplicate
TB = Trip blank
EB = Equipment blank

Validated Samples: ** Indicates sample underwent Level IV validation.

all water

1	DUPE-5-3-Q03**	11		21		31	
2	EB-7-8-11-03	12		22		32	
3	MW-12-1	13		23		33	
4	MW-12-2	14		24		34	
5	MW-12-3	15		25		35	
6	MW-22-1	16		26		36	
7	MW-22-2	17		27		37	
8	MW-22-3	18		28		38	
9	PB W	19		29		39	
10		20		30		40	

Notes: _____

LDC #: 11017A4
SDG #: 03-4697/064876

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: MG
2nd Reviewer: ky

Method: Metals (EPA SW 826 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury and 85-115% for cyanide) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995 ?	✓			
Was a midrange cyanide standard distilled?			✓	
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.	✓			
IV. ICP Interference Check Sample				
Were ICP interference check samples performed daily?		✓		
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?			✓	
IV. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) $\leq 20\%$ for waters and $\leq 35\%$ for soil samples? A control limit of $\pm 2X$ RL for soil was used for samples that were $\leq 5X$ the RL, including when only one of the duplicate sample values were $\leq 5X$ the RL.	✓			
V. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			
VI. Furnace Atomic Absorption QC				
If MSA was performed, was the correlation coefficients ≥ 0.995 ?			✓	
Do all applicable analyses have duplicate injections?			✓	

LDC #: 11017A4
 SDG #: 03-4697/064876

VALIDATION FINDINGS CHECKLIST

Page: 2 of 2
 Reviewer: MG
 2nd Reviewer: LM

Validation Area	Yes	No	NA	Findings/Comments
For sample concentrations > RL, are applicable duplicate injection RSD values < 20%?			✓	
Were analytical spike recoveries within the 85-115% QC limits?			✓	
VII. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the IDL?		✓		
Were all percent differences (%Ds) ≤ 10%?			✓	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			✓	
VIII. Internal Standards (EPA SW 845 Method 6020)				
Were all the percent recoveries (%R) within the 60-120% ⁶⁰⁻¹²⁵ of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 11017A4

SDG #: 03-4697/064876

VALIDATION FINDINGS WORKSHEET
PB/ICB/CCB QUALIFIED SAMPLES

METHOD: Trace Metals (EPA SW 846 Method 6010/7000) Soil preparation factor applied: NA

Sample Concentration units, unless otherwise noted: $\mu\text{g/L}$ Associated Samples: 211Page: 1 of 1
Reviewer: MG
2nd Reviewer: K

Sample Identification																				
Analyte	Maximum PB* (mg/kg)	Maximum PB* ($\mu\text{g/L}$)	Maximum ICB/CCB* ($\mu\text{g/L}$)	Blank Action Limit	—	No	findings													
Al																				Al
Sb																				Sb
As																				As
Ba																				Ba
Be																				Be
Cd																				Cd
Ca																				Ca
Cr			0.132	0.66																Cr
Co																				Co
Cu																				Cu
Fe																				Fe
Pb																				Pb
Mg																				Mg
Mn																				Mn
Hg																				Hg
Ni																				Ni
K																				K
Se																				Se
Ag																				Ag
Na																				Na
Ti																				Ti
V																				V
Zn																				Zn
B																				B
Mo																				Mo
Sr																				Sr

Samples with analyte concentrations within five times the associated ICB, CCB or PB concentration are listed above with the identifications from the Validation Completeness Worksheet. These sample results were qualified as not detected, "U".

Note: a - The listed analyte concentration is the highest ICB, CCB, or PB detected in the analysis of each element.

LDC #: 11017A4

SDG #: 03-4697/064876

VALIDATION FINDINGS WORKSHEET

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Page: 1 of 1
Reviewer: MG
2nd Reviewer: My

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Was a matrix spike analyzed for each matrix in this SDG?

Y	N	N/A

Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Were all duplicate sample relative differences (RPD) $\leq 20\%$ for water samples and $\leq 35\%$ for soil samples?
or 4 or more, no action was taken.

<input checked="" type="checkbox"/> N	<input type="checkbox"/> N/A
EVERI	IV ONI V.

LEVEL IV ONLY:

Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

[illegible]

Comments:

LDC #: 11017A4
SDG #: 03-4697/064876

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: MG
2nd reviewer: Luy

METHOD: Trace Metals (EPA SW 846 Method 6010/7000)

☒ N N/A
☒ N N/A

Were field duplicate pairs identified in this SDG?
Were target analytes detected in the field duplicate pairs?

Analyte	Concentration ($\mu\text{g/L}$)		RPD (Limits)	Difference (Limits)	Qualifications
	1	7			
Aluminum					
Antimony					
Arsenic					
Barium					
Beryllium					
Cadmium					
Calcium					
Chromium	2.5	2.7	8		
Cobalt					
Copper					
Iron					
Lead					
Magnesium					
Manganese					
Mercury					
Nickel					
Potassium					
Selenium					
Silver					
Sodium					
Thallium					
Vanadium					
Zinc					
Cyanide					
Boron					
Molybdenum					
Strontium					
Silicon					

Notes:

LDC #: 11017A4
SDG #: 03-4697/064876

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Verification

Page: 1 of 1
Reviewer: MG
2nd Reviewer: JMY

METHOD: Trace Metals (EPA SW 846 Method 6010/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$\%R = \frac{\text{Found}}{\text{True}} \times 100$ Where Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated	Reported	Acceptable (Y/N)
					%R	%R	
ICV	ICP (Initial calibration) ICP-MS	Cu	9.995	10.0	100	100	Y
	GFAA (Initial calibration)						
	CVAA (Initial calibration)						
	ICP (Continuing calibration) ICP-MS	(level IV sample was run after ICV, so				no CCV)	Y
	GFAA (Continuing calibration)						
	CVAA (Continuing calibration)						
	Cyanide (Initial calibration)						
	Cyanide (Continuing calibration)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 11017A4
SDG #: 03-4697/064876

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: bz

METHOD: Trace Metals (EPA SW 846 Method 6010/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$$\%R = \frac{\text{Found} - \text{True}}{\text{True}} \times 100$$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation,
True = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$$RPD = \frac{|S-D|}{(S+D)/2} \times 100$$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$$\%D = \frac{|I-SDR|}{I} \times 100$$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated		Reported		Acceptable (Y/N)
					%R / RPD / %D	%R / RPD / %D	%R / RPD / %D	%R / RPD / %D	
—	ICP Interference check	—	—	—	—	—	—	—	—
LCS	Laboratory control sample	Cr	10.01 (µg/L)	10 (µg/L)	100	100	100	100	Y
MW-16 MS	Matrix spike	Cr	(SSR-SR) 8.056 (µg/L)	10 (µg/L)	80.6	80.6	80.6	80.6	↓
MW-16 MS/MSD	Duplicate	Cr	2.674 (µg/L)	2.635 (µg/L)	1.47	1.47	1.47	1.47	↓
—	ICP serial dilution	—	—	—	—	—	—	—	—

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

VALIDATION FINDINGS WORKSHEET

Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [Signature]

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

☒ Y ☐ N ☐ N/A Have results been reported and calculated correctly?
☒ Y ☐ N ☐ N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
☒ Y ☐ N ☐ N/A Are all detection limits below the CRDL?

$$\text{Concentration} = \frac{(\text{RD})(\text{FV})(\text{Dil})}{(\text{In. Vol.})(\%S)}$$
$$\frac{(2.453 \text{ } \mu\text{g/L})(0.010 \text{ L})(1)}{0.010 \text{ L}} = 2.453 \text{ } \mu\text{g/L}$$
[illegible]

**Laboratory Data Consultants, Inc.
Data Validation Report**

Project/Site Name: NASA JPL
Collection Date: August 25 through August 25, 2003
LDC Report Date: October 29, 2003
Matrix: Water
Parameters: Chromium
Validation Level: EPA Level III & IV
Laboratory: Applied P & Ch Laboratory/Advanced Technology Laboratories

Sample Delivery Group (SDG): 03-4948/064877

Sample Identification

DUPE-6-3-Q03**
MW-5
MW-6
MW-7
MW-8
MW-10
MW-13
MW-15
MW-16
MW-16DUP
MW-16MS
MW-16MSD
MW-8DUP

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 13 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 200.8 for Chromium.

This review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (February 1994) as there are no current guidelines for the method stated above.

A table summarizing all data qualification flags is provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from specified protocols or is of technical advisory nature.

Blanks are summarized in Section III.

Field duplicates are summarized in Section XIII.

Samples indicated by a double asterisk on the front cover underwent a EPA Level IV review. A EPA Level III review was performed on all of the other samples. Raw data were not evaluated for the samples reviewed by Level III criteria since this review is based on QC data.

The following are definitions of the data qualifiers:

- U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.
- J Indicates an estimated value.
- R Quality control indicates the data is not usable.
- N Presumptive evidence of presence of the constituent.
- UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.
- A Indicates the finding is based upon technical validation criteria.
- P Indicates the finding is related to a protocol/contractual deviation.
- None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

An initial calibration was performed.

The frequency and analysis criteria of the initial calibration verification (ICV) and continuing calibration verification (CCV) were met.

III. Blanks

Method blanks were reviewed for each matrix as applicable.

Data qualification by the initial, continuing and preparation blanks (ICB/CCB/PBs) was based on the maximum contaminant concentration in the ICB/CCB/PBs in the analysis of each analyte. No contaminant concentrations were found in the initial, continuing and preparation blanks with the following exceptions:

Method Blank ID	Analyte	Maximum Concentration	Associated Samples
ICB/CCB	Chromium	0.132 ug/L	All samples in SDG 03-4948/064877

Sample concentrations were compared to the maximum contaminant concentrations detected in the ICB/CCB/PBs. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated method blanks.

IV. ICP Interference Check Sample (ICS) Analysis

ICP interference check was not required by the method.

V. Matrix Spike Analysis

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	RPD (Limits)	Flag	A or P
MW-16MS/MSD (All samples in SDG 03-4948/064877)	Chromium	-	79.1 (80-120)	-	J (all detects) UJ (all non-detects)	A

VI. Duplicate Sample Analysis

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

VII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

VIII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

IX. Furnace Atomic Absorption QC

Graphite furnace atomic absorption was not utilized in this SDG.

X. ICP Serial Dilution

ICP serial dilution was not required by the method.

XI. Sample Result Verification

All sample result verifications met validation criteria for samples on which a EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by Level III criteria.

XII. Overall Assessment of Data

Data flags have been summarized at the end of this report.

XIII. Field Duplicates

Samples DUPE-6-3-Q03** and MW-15 were identified as field duplicates. No chromium was detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD
	DUPE-6-3-Q03**	MW-15	
Chromium	3.6	3.9	8

XIV. Field Blanks

No field blanks were identified in this SDG.

NASA JPL**Chromium - Data Qualification Summary - SDG 03-4948/064877**

SDG	Sample	Analyte	Flag	A or P	Reason
03-4948/064877	DUPE-6-3-Q03** MW-5 MW-6 MW-7 MW-8 MW-10 MW-13 MW-15 MW-16	Chromium	J (all detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicates (%R)

NASA JPL**Chromium - Laboratory Blank Data Qualification Summary - SDG
03-4948/064877**

No Sample Data Qualified in this SDG

Advanced Technology Laboratories

Date: 26-Sep-03

CLIENT: Applied P & Ch Laboratories

Client Sample ID: Dupe-6-3-Q03

Lab Order: 064877

Project: JPL, #4948

Collection Date: 8/27/2003 7:29:00 AM

Lab ID: 064877-008A

Matrix: WATER

Analyte	Result	Qual	MDL	PQL	Units	DF	Date Analyzed
ICP-MS METALS			EPA 200.8			Analyst: NS	
RunID: ICP4_030923B	QC Batch: R31161		PrepDate:				
Chromium	3.6	J	0.11	1.0	µg/L	1	9/23/2003 1:36:55 PM

10/30/03

Qualifiers: ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H-Samples exceed holding time

Page 8 of 9

Results are wet unless otherwise specified

0015



Advanced Technology
Laboratories

3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

Advanced Technology Laboratories

Date: 26-Sep-03

CLIENT: Applied P & Ch Laboratories

Client Sample ID: MW-5

Lab Order: 064877

Project: JPL, #4948

Collection Date: 8/25/2003 11:17:00 AM

Lab ID: 064877-003A

Matrix: WATER

Analyte	Result	Qual	MDL	PQL	Units	DF	Date Analyzed
ICP-MS METALS			EPA 200.8			Analyst: NS	
RunID: ICP4_030923B	QC Batch: R31161		PrepDate:				
Chromium	3.1	J	0.11	1.0	µg/L	1	9/23/2003 1:21:58 PM

Qualifiers: ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H-Samples exceed holding time

Results are wet unless otherwise specified

Page 3 of 9

0010



Advanced Technology
Laboratories

3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

Advanced Technology Laboratories

Date: 26-Sep-03

CLIENT: Applied P & Ch Laboratories
Lab Order: 064877
Project: JPL, #4948
Lab ID: 064877-009A

Client Sample ID: MW-6

Collection Date: 8/27/2003 9:06:00 AM

Matrix: WATER

Analyte	Result	Qual	MDL	PQL	Units	DF	Date Analyzed
ICP-MS METALS			EPA 200.8			Analyst: NS	
RunID: ICP4_030923B	QC Batch: R31161		PrepDate:				
Chromium	6.6	J	0.11	1.0	µg/L	1	9/23/2003 1:44:33 PM

Qualifiers: ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H-Samples exceed holding time

Results are wet unless otherwise specified

Page 9 of 9

0016



Advanced Technology
Laboratories

3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

Advanced Technology Laboratories

Date: 26-Sep-03

CLIENT: Applied P & Ch Laboratories

Client Sample ID: MW-7

Lab Order: 064877

Project: JPL, #4948

Collection Date: 8/26/2003 11:47:00 AM

Lab ID: 064877-006A

Matrix: WATER

Analyte	Result	Qual	MDL	PQL	Units	DF	Date Analyzed
ICP-MS METALS			EPA 200.8			Analyst: NS	
RunID: ICP4_030923B	QC Batch: R31161		PrepDate:				
Chromium	4.6	J	0.11	1.0	µg/L	1	9/23/2003 1:31:58 PM

10/30/07

Qualifiers: ND - Not Detected at the Reporting Limit S - Spike Recovery outside accepted recovery limits
J - Analyte detected below quantitation limits R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank E - Value above quantitation range
* - Value exceeds Maximum Contaminant Level H-Samples exceed holding time

Page 6 of 9

Results are wet unless otherwise specified

0013



Advanced Technology
Laboratories

3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

Advanced Technology Laboratories

Date: 26-Sep-03

CLIENT: Applied P & Ch Laboratories
Lab Order: 064877
Project: JPL, #4948
Lab ID: 064877-002A

Client Sample ID: MW-8
Collection Date: 8/25/2003 9:34:00 AM
Matrix: WATER

Analyte	Result	Qual	MDL	PQL	Units	DF	Date Analyzed
ICP-MS METALS			EPA 200.8			Analyst: NS	
RunID: ICP4_030923B	QC Batch: R31161		PrepDate:				
Chromium	3.6	J	0.11	1.0	µg/L	1	9/23/2003 1:16:50 PM

10/20/03

Qualifiers: ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H-Samples exceed holding time

Page 2 of 9

Results are wet unless otherwise specified

0009



Advanced Technology
Laboratories

3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

B

Advanced Technology Laboratories

Date: 26-Sep-03

CLIENT:	Applied P & Ch Laboratories	Client Sample ID:	MW-10
Lab Order:	064877		
Project:	JPL, #4948	Collection Date:	8/25/2003 7:46:00 AM
Lab ID:	064877-001A	Matrix:	WATER

Analyte	Result	Qual	MDL	PQL	Units	DF	Date Analyzed
ICP-MS METALS			EPA 200.8			Analyst: NS	
RunID: ICP4_030923B	QC Batch: R31161		PrepDate:				
Chromium	11	J	0.11	1.0	µg/L	1	9/23/2003 1:14:18 PM

10/30/03

Qualifiers:	ND - Not Detected at the Reporting Limit	S - Spike Recovery outside accepted recovery limits
	J - Analyte detected below quantitation limits	R - RPD outside accepted recovery limits
	B - Analyte detected in the associated Method Blank	E - Value above quantitation range
	* - Value exceeds Maximum Contaminant Level	H-Samples exceed holding time

Page 1 of 9

Results are wet unless otherwise specified

0008



Advanced Technology
Laboratories

3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

Advanced Technology Laboratories

Date: 26-Sep-03

CLIENT: Applied P & Ch Laboratories
Lab Order: 064877
Project: JPL, #4948
Lab ID: 064877-004A

Client Sample ID: MW-13
Collection Date: 8/26/2003 7:40:00 AM
Matrix: WATER

Analyte	Result	Qual	MDL	PQL	Units	DF	Date Analyzed
ICP-MS METALS			EPA 200.8			Analyst: NS	
RunID: ICP4_030923B	QC Batch: R31161		PrepDate:				
Chromium	8.5	J	0.11	1.0	µg/L	1	9/23/2003 1:24:32 PM

10/20/03

Qualifiers: ND - Not Detected at the Reporting Limit S - Spike Recovery outside accepted recovery limits
J - Analyte detected below quantitation limits R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank E - Value above quantitation range
* - Value exceeds Maximum Contaminant Level H-Samples exceed holding time

Results are wet unless otherwise specified

Page 4 of 9



Advanced Technology
Laboratories

3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

0011

Advanced Technology Laboratories

Date: 26-Sep-03

CLIENT: Applied P & Ch Laboratories

Client Sample ID: MW-15

Lab Order: 064877

Project: JPL, #4948

Collection Date: 8/27/2003 7:23:00 AM

Lab ID: 064877-007A

Matrix: WATER

Analyte	Result	Qual	MDL	PQL	Units	DF	Date Analyzed
ICP-MS METALS			EPA 200.8			Analyst: NS	
RunID: ICP4_030923B	QC Batch: R31161		PrepDate:				
Chromium	3.9	J	0.11	1.0	µg/L	1	9/23/2003 1:34:26 PM

Qualifiers: ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H-Samples exceed holding time

Results are wet unless otherwise specified

Page 7 of 9



Advanced Technology
Laboratories

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0014

Advanced Technology Laboratories

Date: 26-Sep-03

CLIENT: Applied P & Ch Laboratories
Lab Order: 064877
Project: JPL, #4948
Lab ID: 064877-005A

Client Sample ID: MW-16
Collection Date: 8/26/2003 9:21:00 AM
Matrix: WATER

Analyte	Result	Qual	MDL	PQL	Units	DF	Date Analyzed
ICP-MS METALS			EPA 200.8			Analyst: NS	
RunID: ICP4_030923B	QC Batch: R31161		PrepDate:				
Chromium	2.7	J	0.11	1.0	µg/L	1	9/23/2003 1:27:03 PM

Qualifiers: ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H-Samples exceed holding time

Results are wet unless otherwise specified

Page 5 of 9



Advanced Technology
Laboratories

3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

0012

LDC #: 11017B4

VALIDATION COMPLETENESS WORKSHEET

Date: 10-28-03

SDG #: 03-4948/064877

Level III/IV

Page: 1 of 1

Laboratory: Applied P & Ch Laboratory/Advanced Technology Laboratories

Reviewer: MG

2nd Reviewer: mg

METHOD: Chromium (EPA Method 200.8)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 8-25-03 through 8-27-03
II.	Calibration	A	
III.	Blanks	SW	
IV.	ICP Interference Check Sample (ICS) Analysis	N	Not required
V.	Matrix Spike Analysis	SW	
VI.	Duplicate Sample Analysis	A	
VII.	Laboratory Control Samples (LCS)	A	LCS
VIII.	Internal Standard (ICP-MS)	A	
IX.	Furnace Atomic Absorption QC	N	Not utilized
X.	ICP Serial Dilution	N	Not required
XI.	Sample Result Verification	A	Not reviewed for Level III validation.
XII.	Overall Assessment of Data	A	
XIII.	Field Duplicates	SW	D = 1 + 8
XIV.	Field Blanks	N	

Note: A = Acceptable
N = Not provided/applicable
SW = See worksheet

ND = No compounds detected
R = Rinsate
FB = Field blank

D = Duplicate
TB = Trip blank
EB = Equipment blank

Validated Samples: ** Indicates sample underwent Level IV validation.

all water

1	DUPE-6-3-Q03**	11	MW- ¹⁶ BMS	21	mg.	31	
2	MW-5	12	MW- ¹⁶ BMSD	22	↓	32	
3	MW-6	13	MW-8DUP	23		33	
4	MW-7	14	PBW	24		34	
5	MW-8	15		25		35	
6	MW-10	16		26		36	
7	MW-13	17		27		37	
8	MW-15	18		28		38	
9	MW-16	19		29		39	
10	MW- ¹⁶ B MS DUP	20		30		40	

Notes:

LDC #: 1101734
SDG #: 03-4948/064077

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: MG
2nd Reviewer: my

Method: Metals (EPA SW 826 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury and 85-115% for cyanide) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995 ?	✓			
Was a midrange cyanide standard distilled?			✓	
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.	✓			
IV. ICP Interference Check Sample				
Were ICP interference check samples performed daily?		✓		
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?			✓	
IV. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) $\leq 20\%$ for waters and $\leq 35\%$ for soil samples? A control limit of $\pm 2X$ RL ($\pm 2X$ RL for soil) was used for samples that were $\leq 5X$ the RL, including when only one of the duplicate sample values were $\leq 5X$ the RL.	✓			
V. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			
VI. Furnace Atomic Absorption QC				
If MSA was performed, was the correlation coefficients ≥ 0.995 ?			✓	
Do all applicable analyses have duplicate injections?			✓	

LDC #: 1101734
SDG #: 03-4948/064877

VALIDATION FINDINGS CHECKLIST

Page: 2 of 2
Reviewer: MG
2nd Reviewer: ky

Validation Area	Yes	No	NA	Findings/Comments
For sample concentrations > RL, are applicable duplicate injection RSD values < 20%?			✓	
Were analytical spike recoveries within the 85-115% QC limits?			✓	
VII. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the IDL?		✓		
Were all percent differences (%Ds) ≤ 10%?			✓	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			✓	
VIII. Internal Standards (EPA SW 846 Method 6020)				
Were all the percent recoveries (%R) within the 30-120% of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 1101784
SDG #: 03-4948/064877

VALIDATION FINDINGS WORKSHEET
PB/ICB/CCB QUALIFIED SAMPLES

Page: 1 of 1
Reviewer: MG
2nd Reviewer: PM

METHOD: Trace Metals (EPA SW 846 Method 6010/7000) Soil preparation factor applied: NA
Sample Concentration units, unless otherwise noted: $\mu\text{g/L}$ Associated Samples: a 11

Sample Identification																				
Analyte	Maximum PB* (mg/Kg)	Maximum PB* (ug/L)	Maximum ICB/CCB* (ug/L)	Blank Action Limit	—	No	findings													
Al																				Al
Sb																				Sb
As																				As
Ba																				Ba
Be																				Be
Cd																				Cd
Ca																				Ca
Cr			0.132	0.66																Cr
Cc																				Co
Cu																				Cu
Fe																				Fe
Pb																				Pb
Mg																				Mg
Mn																				Mn
Hg																				Hg
Ni																				Ni
K																				K
Se																				Se
Ag																				Ag
Na																				Na
Ti																				Ti
V																				V
Zn																				Zn
B																				B
Mo																				Mo
Sr																				Sr

Samples with analyte concentrations within five times the associated ICB, CCB or PB concentration are listed above with the identifications from the Validation Completeness Worksheet. These sample results were qualified as not detected, "U".
Note: a - The listed analyte concentration is the highest ICB, CCB, or PB detected in the analysis of each element.

LDC #: 1101784

SDG #: 03-4948/064877

VALIDATION FINDINGS WORKSHEET

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

YN N/A

YN N/A

$$\overline{Y(N)N/A}$$

2

YN N/A

LEVEL IV C

Y/N N/A

Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

2

YN N/A

LEVEL IV C

Y/N N/A

[illegible]

Comments:

LDC #: 1101784
SDG #: 03-4948/064877

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: MG
2nd reviewer: ky

METHOD: Trace Metals (EPA SW 846 Method 6010/7000)

☒ N N/A
☒ N N/A

Were field duplicate pairs identified in this SDG?
Were target analytes detected in the field duplicate pairs?

Analyte	Concentration (<u>ug/L</u>)		RPD (Limits)	Difference (Limits)	Qualifications
	1	8			
Aluminum					
Antimony					
Arsenic					
Barium					
Beryllium					
Cadmium					
Calcium					
Chromium	<u>3.6</u>	<u>3.9</u>	<u>8</u>		
Cobalt					
Copper					
Iron					
Lead					
Magnesium					
Manganese					
Mercury					
Nickel					
Potassium					
Selenium					
Silver					
Sodium					
Thallium					
Vanadium					
Zinc					
Cyanide					
Boron					
Molybdenum					
Strontium					
Silicon					

Notes: _____

LDC #: 1101734
SDG #: 03-4948/064877

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd Reviewer: py

METHOD: Trace Metals (EPA SW 846 Method 6010/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$$\%R = \frac{\text{Found}}{\text{True}} \times 100 \quad \text{Where} \quad \begin{array}{l} \text{Found} = \text{concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution} \\ \text{True} = \text{concentration (in ug/L) of each analyte in the ICV or CCV source} \end{array}$$

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated		Reported		Acceptable (Y/N)
					%R		%R		
ICV	ICP (Initial calibration)	Cu	9.995	10.0	100		100		Y
	GFAA (Initial calibration)								
	CVAA (Initial calibration)								
CCV1	ICP (Continuing calibration)	Cu	9.932	10.0	99		99		Y
	GFAA (Continuing calibration)								
	CVAA (Continuing calibration)								
	Cyanide (Initial calibration)								
	Cyanide (Continuing calibration)								

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 11017B4
SDG #: 03-4948/064877

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: F

METHOD: Trace Metals (EPA SW 846 Method 6010/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{\text{Found} \times 100}{\text{True}}$ Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation,
Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$ Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analyte	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated		Reported		Acceptable (Y/N)
					%R / RPD / %D	%R / RPD / %D	%R / RPD / %D	%R / RPD / %D	
—	ICP interference check	—	—	—	—	—	—	—	—
LCS	Laboratory control sample	Cu	10.01 (µg/L)	10 (µg/L)	100	100	100	100	Y
11	Matrix spike	Cu	(SSR-SR) 8.056 (µg/L)	10 (µg/L)	80.6	80.6	80.6	80.6	↓
11/12	Duplicate	Cu	2.674 (µg/L)	2.635 (µg/L)	1.47	1.47	1.47	1.47	↓
—	ICP serial dilution	—	—	—	—	—	—	—	—

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

