ATTACHMENT 1: QUALITY ASSURANCE/QUALITY CONTROL SUMMARY

This attachment summarizes the field and laboratory quality assurance (QA), data verification and data validation procedures utilized for the JPL groundwater monitoring program. Data validation was performed by an independent contractor, Laboratory Data Consultants, Inc., of Carlsbad, California. Data verification and validation indicated that all volatile organic compounds (VOCs), perchlorate, and metals results obtained from the second quarter 2020 groundwater monitoring event were acceptable for their intended use of characterizing the aquifer quality.

ATTACHMENT 1: QUALITY ASSURANCE/QUALITY CONTROL SUMMARY

Field and laboratory quality control (QC) samples were collected and analyzed to fulfill quality assurance/quality control requirements. Proper sample collection and handling procedures were utilized to ensure the integrity of the analytical results. A comprehensive QA/QC plan for groundwater monitoring is described in the *Work Plan for Performing a Remedial Investigation/Feasibility Study* (Ebasco, 1993).

FIELD QUALITY ASSURANCE/QUALITY CONTROL

The field QA/QC samples collected for JPL groundwater monitoring included field duplicate samples, equipment rinsate blanks, trip blanks and source blanks. The QC sample results (equipment rinsate blanks, trip blanks and source blanks) were used for the qualitative evaluation of the data. Table 1-1 summarizes analytical results for the field QC samples during the second quarter 2020 groundwater monitoring event.

Field Duplicate Samples. Duplicate samples were collected to evaluate the precision of the sample collection process. During the second quarter 2020 groundwater monitoring event, duplicate samples for VOCs, perchlorate, metals were collected from monitoring wells:

- MW-1,
- MW-11 (Screen 3),
- MW-12 (Screen 3,
- MW-15,
- MW-17 (Screen 2),
- MW-19 (Screen 3),
- MW-21 (Screen 2),
- and MW-23 (Screen 3).

The analytical results for the field duplicates were compared to the results of the original samples for VOCs (Table 1) and metals (Table 2). Relative percent difference between sample and duplicate pairs are shown in Table 1-2, grouped by monitoring well.

Table 1-2. Sample and Field Duplicate Result Pairs

Monitoring Well	Parameter	Sample		Duplicate		Relative Percent Difference
MW-11 (Screen 3)	Arsenic	1.7	J	1.6	J	6%
	Hexavalent Chromium	0.1	J	0.04	J	86%
	Total Chromium	6.7		3	U	76%
	Lead	0.2	J	1	U	133%
MW-12 (Screen 3)	Perchlorate	4		4.4		10%
	Carbon Tetrachloride	1.4		1.2		15%
	Chloroform	0.9		0.8		12%
MW-19 (Screen 3)	Perchlorate	3.7		3.9		5%
	TCE	0.3	J	0.2	J	40%
	PCE	0.7		0.5		33%

Monitoring Well	Parameter	Sample		Duplicate		Relative Percent Difference
	Chloroform	2.1		1.9		10%
	Hexavalent Chromium	0.9		1.9		71%
	Total Chromium	1.9	J	2	J	5%
MW-21 (Screen 2)	Perchlorate	1.9		1.8		5%
	TCE	0.3	J	0.2	J	40%
	PCE	2		1.8		11%
	Chloroform	0.5	J	0.4	J	22%
	Hexavalent Chromium	0.2	U	0.4		67%
	Total Chromium	7		0.9	J	154%
MW-23 (Screen 3)	Perchlorate	3.5		3.2		9%
	Hexavalent Chromium	2.3		2.9		23%
	Total Chromium	3.2		3.5		9%
J Analyte concentration is an estimated value						
U Analyte was analyzed for but not detected at or above the stated limit						

The source of the differences is unknown.

Equipment Rinsate Blanks. Equipment rinsate blanks were collected each day that non-dedicated sampling equipment was used. The equipment rinsate blanks, consisting of distilled water run through the sampling equipment after decontamination, were analyzed for all contaminants of concern to monitor possible cross-contamination of the samples due to inadequate decontamination.

Contaminants detected in equipment rinsate blanks include total chromium and hexavalent chromium. No other VOC contaminants, metals or tentatively identified compounds (TICs) were detected in the equipment blanks as shown in Table 1-1.

Total chromium was detected in EB-7-061720 at an estimated concentration of 1.4J µg/L with a reporting limit of 3.0 µg/L. The data validator determined that no contaminants were found in EB-5-061520 and EB-9-061920 so the reported total chromium concentration was modified to non-detect (i.e., 0.5U and 0.6U µg/L, respectively).

Hexavalent chromium was detected at an estimated concentration of 0.04J µg/L in EB-3-061120, Eb-4-061220, EB-6-061620, and EB-7-061720, and at an estimated concentration of 0.06J µg/L in EB-10-062220 all with a reporting limit of 0.2 µg/L. The data validator determined that no contaminants were found in EB-2-061020, EB-8-061820, EB-9-061920, and EB-11-062320 so the reported hexavalent chromium concentrations were modified to non-detect (i.e., 0.1U, 0.06U, 0.03U, and 0.06U µg/L, respectively).

The source of total chromium could not be determined. The source of hexavalent chromium may be related to the source water as one source blank also had an estimated detection of hexavalent chromium (see Table 1-1).

Detected total and hexavalent chromium concentrations in the equipment blanks were compared to the detected concentrations in the associated monitoring wells during the data validation process to determine if data validation qualifiers were necessary.

Trip Blanks. Trip blanks, which consisted of reagent-grade water in vials transported with the sample bottles to and from the field, were submitted to the laboratory with each shipment of groundwater samples. Trip blanks were used to help identify cross-contamination of groundwater samples during transport and sample handling procedures. No VOC contaminants or TICs were detected in the trip blanks as shown in Table 1-1.

Source Blanks. Two source blanks which consisted of distilled water used by sampling personnel for equipment decontamination were collected during the sampling event. These QC samples serve as a check for any contamination present in the source water.

Hexavalent chromium was detected in source blank SB-1-061120 at the estimated concentrations 0.1J µg/L. The data validator determined that no contaminants were found in SB-2-061920 so the reported hexavalent chromium concentration was modified to non-detect (i.e. 0.1U µg/L).

LABORATORY QUALITY ASSURANCE/QUALITY CONTROL

Laboratory QC samples included surrogate compounds (for VOC analyses), matrix spike samples, blank spike samples, and method blanks. The results of the laboratory QC samples were used by the laboratory to determine the accuracy and precision of the analytical techniques, and to identify anomalous results due to laboratory contamination or instrument malfunction.

DATA VERIFICATION AND VALIDATION

The purpose of data verification and validation is to ensure that the data collected meet the data quality objectives (DQOs) outlined in the Quality Assurance Project Plan of the Groundwater Monitoring Plan (Ebasco, 1993).

Data Verification. Data verification is a review of the analytical data that includes confirming that the sample identification numbers on the laboratory reports match those on the chain-of-custody records. Data verification also includes a review of the analytical data reports to confirm that all samples were analyzed and all required analytes were quantified for each sample.

Data Validation. Data validation is a systematic review of the analytical data to determine the compliance with established method performance criteria. Validation of a data package included review of the technical holding time requirements, review of sample preparation, review of the initial and continuing calibration data, review, and recalculation of the laboratory QC sample data, review of the equipment performance, reconciliation of the raw data with the reduced results, identification of data anomalies, and qualification of data to identify data usability limitations.

Data verification and validation was performed by an independent contractor, Laboratory Data Consultants, Inc., of Carlsbad, CA. All of the data provided by BC Laboratories, Inc., of Bakersfield, California were validated. Ninety percent of the data were subjected to Level III validation and 10 percent of the data were subjected to Level IV validation in accordance with the EPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review (U.S. EPA, 2017; 2017).

Data Validation Qualifiers. Analytical data were qualified based on the data validation. Data qualifiers were assigned in accordance with EPA guidelines.

All samples were analyzed for VOCs, perchlorate and metals within the analytical holding times. Data validation indicated that all of the data from the second quarter 2020 groundwater monitoring event were acceptable for their intended use of characterizing aquifer quality. The data validation reports are included in Attachment 2.

REFERENCES

Ebasco. 1993. *Work Plan for Performing a Remedial Investigation/Feasibility Study*. National Aeronautics and Space Administration Jet Propulsion Laboratory, Pasadena, California. December.

U.S. EPA. 2017. *USEPA National Functional Guidelines for Organic Superfund Methods Data Review*. January.

U.S. EPA. 2017. *USEPA National Functional Guidelines for Inorganic Superfund Methods Data Review*. January.

Sample ID Number	Associated Samples	Total Chromium		Hexavalent Chromium		1, 2, 3-Trichloropropane		Methylene Chloride		2-Butanone		Other Organic Compounds			TICs		
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Compound	Result	Qualifier	Compound	Result	Qualifier
Equipment Blanks																	
EB-1-060920	MW-4-1, MW-4-2, MW-4-3, MW-4-4, MW-4-5	ND		ND		ND		ND		ND		ND			ND		
EB-2-061020	MW-18-3, MW-18-4, MW-18-5, MW-26-1, MW-26-2	ND		**0.1 J (U)**		ND		ND		ND		ND			ND		
EB-3-061120	MW-18-1, MW-18-2, MW-19-1, MW-19-2, MW-19-3, MW-19-4, MW-19-5	ND		**0.04 J**		ND		ND		ND		ND			ND		
EB-4-061220	MW-3-1, MW-3-2, MW-3-3, MW-3-4, MW-3-5	ND		**0.04 J**		ND		ND		ND		ND			ND		
EB-5-061520	MW-17-1, MW-17-2, MW-17-3, MW-17-4, MW-17-5	**0.5 J (U)**		ND		ND		ND		ND		ND			ND		
EB-6-061620	MW-20-2, MW-20-3, MW-20-4, MW-20-5, MW-24-3, MW-24-4	ND		**0.04 J**		ND		ND		ND		ND			ND		
EB-7-061720	MW-22-1, MW-22-2, MW-22-3, MW-22-4, MW-22-5, MW-24-1, MW-24-2, MW-24-5	**1.4 J**		**0.04 J**		ND		ND		ND		ND			ND		
EB-8-061820	MW-12-4, MW-12-5, MW-25-1, MW-25-2, MW-25-3, MW-25-4, MW-25-5	ND		**0.06 J (U)**		ND		ND		ND		ND			ND		
EB-9-061920	MW-12-1, MW-12-2, MW-12-3, MW-25-1, MW-25-2, MW-25-3, MW-25-4, MW-25-5	**0.6 J (U)**		**0.03 J (U)**		ND		ND		ND		ND			ND		
EB-10-062220	MW-11-1, MW-11-2, MW-11-3, MW-11-4, MW-11-5, MW-14-2, MW-14-4, MW-14-5	ND		**0.06 J**		ND		ND		ND		ND			ND		
EB-11-062320	MW-14-3, MW-21-2, MW-21-3, MW-21-4, MW-21-5	ND		**0.06 J (U)**		ND		ND		ND		ND			ND		
Source Blanks																	
SB-1-061120	MW-18-1, MW-18-2, MW-19-1, MW-19-2, MW-19-3, MW-19-4, MW-19-5	ND		**0.1 J**		ND		ND		ND		ND			ND		
SB-2-061920	MW-12-1, MW-12-2, MW-12-3, MW-25-1, MW-25-2, MW-25-3, MW-25-4, MW-25-5	ND		**0.1 J (U)**		ND		ND		ND		ND			ND		
Trip Blanks																	
TB-1-060920	MW-4-1, MW-4-2, MW-4-3, MW-4-4, MW-4-5	NA		NA		ND		ND		ND		ND			ND		
TB-2-061020	MW-18-3, MW-18-4, MW-18-5, MW-26-1, MW-26-2	NA		NA		ND		ND		ND		ND			ND		
TB-3-061120	MW-18-1, MW-18-2, MW-19-1, MW-19-2, MW-19-3, MW-19-4, MW-19-5	NA		NA		ND		ND		ND		ND			ND		
TB-4-061220	MW-3-1, MW-3-2, MW-3-3, MW-3-4, MW-3-5	NA		NA		ND		ND		ND		ND			ND		
TB-5-061520	MW-17-1, MW-17-2, MW-17-3, MW-17-4, MW-17-5	NA		NA		ND		ND		ND		ND			ND		
TB-6-061620	MW-20-2, MW-20-3, MW-20-4, MW-20-5, MW-24-3, MW-24-4	NA		NA		ND		ND		ND		ND			ND		
TB-7-061720	MW-22-1, MW-22-2, MW-22-3, MW-22-4, MW-22-5, MW-24-1, MW-24-2, MW-24-5	NA		NA		ND		ND		ND		ND			ND		
TB-8-061820	MW-12-4, MW-12-5, MW-25-1, MW-25-2, MW-25-3, MW-25-4, MW-25-5	NA		NA		ND		ND		ND		ND			ND		
TB-9-061920	MW-12-1, MW-12-2, MW-12-3, MW-25-1, MW-25-2, MW-25-3, MW-25-4, MW-25-5	NA		NA		ND		ND		ND		ND			ND		
TB-10-062220	MW-11-1, MW-11-2, MW-11-3, MW-11-4, MW-11-5, MW-14-2, MW-14-4, MW-14-5	NA		NA		ND		ND		ND		ND			ND		
TB-11-062320	MW-14-3, MW-21-2, MW-21-3, MW-21-4, MW-21-5	NA		NA		ND		ND		ND		ND			ND		
TB-12-062420	MW-5, MW-10, MW-13	NA		NA		ND		ND		ND		ND			ND		
TB-13-062520	MW-1, MW-6 MW-7, MW-8, MW-9, MW-15, MW-16	NA		NA		ND		ND		ND		ND			ND		

Notes

NA	Not Analyzed
ND	Not/None Detected
J	Analyte concentration is an estimated value
(J)	Analyte concentration is an estimated value - qualifier assigned by data validator
(U)	NotDetected - qualifier assigned by data validator