APPENDIX I

Water Quality Data Assurance Memorandum

Herrera Environmental Consultants, Inc.

Memorandum

To	Project File 10-04715-003
cc	Dylan Ahearn, Herrera Environmental Consultants
From	Gina Catarra, Herrera Environmental Consultants
Date	September 12, 2013
Subject	Data Quality Assurance Review of Filterra Bioretention System Water Quality Data

This memorandum presents a review of data quality for 51 water samples (including three field duplicates and two rinsate blank samples) collected from the inlet and outlet of a Filterra® Stormwater Bioretention Filtration System that is currently installed in the City of Bellingham, Washington, between September 2012 and June 2013. Aquatic Research Incorporated of Seattle, Washington analyzed the samples for:

- Total suspended solids (TSS) by Standard Method 2540D
- Total phosphorus (TP) by EPA method 365.1
- Hardness by Standard Method 2340B
- Orthophosphorus by EPA method 365.1
- Total and dissolved copper and zinc by EPA method 200.8
- Conductivity by EPA method 120.1
- pH by EPA method 150.1
- Turbidity by EPA method 180.1

Analytical Resources of Tukwila, Washington analyzed the samples for particle size distribution by ASTM 3977.

The laboratory's performance was reviewed in accordance with quality control (QC) criteria outlined in the *Filterra Bioretention System Phosphorus Treatment and Supplemental Peformance Monitoring Quality Assurance Project Plan* (QAPP) (Herrera 2012).

Quality control data summaries submitted by the laboratories were reviewed; raw data were not submitted by the laboratories. Data quality assurance worksheets summarizing the quality assurance and quality control (QA/QC) review were completed for each sampling event and are included as Attachment 1. Data qualifiers (flags) were added to the sample results in the laboratory reports. Data validation results are summarized below, followed by definitions of data qualifiers.

Custody, Preservation, Holding Times, and Completeness—Acceptable with Qualification

The samples were properly preserved and sample custody was maintained from sample collection to receipt at the laboratories. With the exceptions noted below, all samples were analyzed within the required holding times (Table 1). The laboratory reports were complete and contained results for all samples and tests requested on the chain-of-custody (COC) forms.

Table 1. Summary of sample collection requirements and reporting limits.

Parameter	Method Number [a]	Pre-Filtration Holding Time	Total Holding Time [b]	Laboratory Preservation	RL	Units
Total suspended solids	SM 2540D	NA	7 days	Cool ≤6°C	0.5	mg/L
Total phosphorus	EPA 365.1	NA	28 days	Cool ≤ 4°C, HCl to pH < 2	0.002	mg/L
Orthophosphorus	EPA 365.1	12 hours [c]	48 hours [f]	Cool ≤ 6°C	0.001	mg/L
Conductivity	EPA 120.1	NA	28 days	Cool ≤ 6°C	0.1	Umhos/cm
pH	EPA 150.1	NA	24 hours	Cool ≤ 6°C	0.1	std units
Turbidity	EPA 180.1	NA	48 hours	Cool ≤ 6°C	0.1	NTU
Hardness as $CaCO_3$	SM 2340C	NA	28 days	Cool ≤ 6°C, H_2SO_4 to pH < 2	2.0	mg/L
Copper, dissolved	EPA 200.8	12 hours [c]	6 months	Cool ≤ 6°C, HNO_3 to pH < 2	1	µg/L
Copper, total		NA			1	
Zinc, dissolved		12 hours [c]			5	
Zinc, total		NA			5	
PSD	ASTM 3977	NA	7 days	Cool ≤ 6°C	1.0	micron

[a] SM method numbers are from APHA et al. (1998); EPA method numbers are from U.S. EPA (1983, 1984). The 18th edition of *Standard Methods for the Examination of Water and Wastewater* (APHA et al. 1992) is the current legally adopted version in the *Code of Federal Regulations*.

[b] Holding time specified in U.S. EPA guidance (U.S. EPA 1983, 1984) or referenced in APHA et al. (1992) for equivalent method.

[c] U.S. EPA requires filtering for dissolved metals and orthophosphorus within 15 minutes of the collection of the last aliquot. This goal is exceedingly difficult to meet when conducting flow-weighted sampling. A more practical proxy goal for this study is 12 hours. Both goals will be reported with the data.

C = Celsius.
NA = not applicable.

The 48-hour holding time for orthophosphorus for samples collected on 2/22/2013, 3/01/2013, 3/14/2013 and 4/05/2013 was exceeded. Associated samples were qualified as estimated (J), as shown in Table 2.

The 24-hour holding time for pH and the 48 hour holding time for turbidity for samples collected on 3/14/2013 were exceeded. Associated samples were qualified as estimated (J), as shown in Table 2.

Table 2. Summary of sample results qualified due to holding time exceedance.

Sample ID	Sample Date	Parameter	Qualifier
FB-IN	2/22/2013	Orthophosphorus	J
FB-OUT	2/22/2013	Orthophosphorus	J
FB-IN	3/01/2013	Orthophosphorus	J
FB-OUT	3/01/2013	Orthophosphorus	J
QA-1	3/01/2013	Orthophosphorus	J
FB-IN	3/14/2013	Orthophosphorus	J
FB-OUT	3/14/2013	Orthophosphorus	J
FB-IN	3/14/2013	pH	J
FB-OUT	3/14/2013	pH	J
FB-IN	3/14/2013	Turbidity	J
FB-OUT	3/14/2013	Turbidity	J
FB-IN	4/05/2013	Orthophosphorus	J
FB-OUT	4/05/2013	Orthophosphorus	J

Laboratory Reporting Limits—Acceptable

The QAPP specified reporting limits are provided in Table 1. The laboratory reporting limits met the QAPP specified reporting limits for all analyses. No data were qualified based on laboratory reporting limits.

Blank Analysis—Acceptable

Method Blanks

Method blanks were analyzed at the required frequency. Method blanks did not contain levels of target analytes above the laboratory reporting limits.

Rinsate Blanks

A rinsate blank sample was collected from both FB-IN and FB-OUT and analyzed for TP, orthophosphorus, and total and dissolved metals in accordance with the QAPP. No results were detected above the reporting limits and no data were qualified.

Laboratory Control Sample Analysis—Acceptable

Laboratory control samples were analyzed at the required frequency. The percent recovery values for all sampling events met the laboratory criteria.

Matrix Spike Analysis—Acceptable

Matrix spike (MS) samples were analyzed at the required frequency. The percent recovery values for the MS analyses met the established control limits.

Laboratory Duplicate Analysis—Acceptable

Laboratory duplicates or laboratory control sample duplicates were analyzed at the required frequency. The relative percent difference (RPD) was calculated for each analyte where both duplicate values were greater than five times the reporting limit (RL). The difference between duplicate values was calculated if the detected compound concentration was less than five times the RL in either the sample or the field duplicate. A control limit of less than 20 percent RPD (25 percent for TSS) was established in the QAPP and a control limit of two times the RL was used to evaluate difference values. The relative percent difference (RPD) values met the control limits established by the QAPP, and all difference values were less than two times the RL.

Field Duplicates—Acceptable with Qualification

A total of three field duplicate samples were collected and analyzed for all analyses. With six exceptions, field duplicate precision met the QAPP specified criterion of less than 25 percent RPD. Table 3 summarizes the samples that were qualified as estimated (J) for field duplicate RPD exceedance. No other data associated with the sample batch were qualified due to field duplicate criteria exceedance because other quality control criteria were met.

Table 3. Summary of samples qualified due to field duplicate criteria exceedances.

Sample Date	Parameter	Sample ID	Duplicate ID	RPD (%)	Qualifier
3/01/2013	TSS	FB-IN	QA-1	64	J
3/01/2013	Total copper	FB-IN	QA-1	26	J
3/01/2013	Total zinc	FB-IN	QA-1	86	J
3/06/2013	TSS	FB-IN	QA-2	29	J
3/06/2013	Orthophosphorus	FB-IN	QA-2	40	J
3/06/2013	PSD	FB-IN	QA-2	43	J

Data Quality Assessment Summary

In general, the data quality for all parameters was found to be acceptable based on holding time, reporting limit, method blank, control standard, matrix spike, laboratory duplicate, and field duplicate criteria. Nine orthophosphorus, two pH, and two turbidity results were qualified as estimated (J) due to holding time exceedances. In addition, two TSS, one total copper, one total zinc, one orthophosphorus, and one PSD result were qualified as estimated (J) due to field duplicate precision exceedances.

Usability of the data is based on the guidance documents previously noted. Upon consideration of the information presented here, the data are acceptable as qualified.

Definition of Data Qualifiers

The following data qualifier definitions are taken from *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (U.S. EPA 2002).

U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

J The associated value is an estimated quantity.

UJ The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

R The data are unusable. (Note: analyte may or may not be present.)

References

APHA et al. 1992. Standard Methods for the Examination of Water and Wastewater. 18th edition. Edited by A.E. Greenberg, American Public Health Association (APHA); A.D. Eaton, American Water Works Association (AWWA); and L.S. Clesceri, Water Environment Federation (WEF).

APHA et al. 1998. Standard Methods for the Examination of Water and Wastewater. 20th edition. Edited by A.E. Greenberg, American Public Health Association (APHA); A.D. Eaton, American Water Works Association (AWWA); and L.S. Clesceri, Water Environment Federation (WEF).

Herrera. 2012. Filterra Bioretention System Phosphorus Treatment and Supplemental Basic and Enhanced Treatment Performance Monitoring Quality Assurance Project Plan. Prepared for Amercast by Herrera Environmental Consultants, Inc., Seattle, Washington. June 7, 2012.

U.S. EPA. 1983. Methods for Chemical Analysis of Water and Wastes. EPA-600/4-79-020. U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory. Cincinnati, Ohio.

U.S. EPA. 1984. Guidelines Establishing Test Procedures for the Analysis of Pollutants under the Clean Water Act; Final Rule and Interim Final Rule. U.S. Environmental Protection Agency. 40 CFR Part 136. October 26, 1984.

U.S. EPA. 2002. Contract laboratory program national functional guidelines for inorganic data review. U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, D.C. (EPA-540/R-01/008).

ATTACHMENT A

Data Quality Assurance Worksheets

Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 8/26/2013 Page ____ of ____

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP, hardness, Total and Dissolved copper and zinc, PSD (ARI)

Checked: initials

Sample Date/Sample ID: 9/18/2012 / FB-IN, FB-OUT (Rinsate samples)

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
TSS	SM2540D	NA	**NA**	**NA**	**≤7**	0.5 MG/L	NA	**NA**	NA	**±10**	NA	**≤ 25**	NS	**≤25**	OK	NOT ANALYZED
TP	EPA 365.1	NA	**NA**	**2**	**≤28**	<0.002 / 0.002 MG/L	FB-OUT 102	**±25**	103	**±10**	FB-OUT NC	**≤ 20**	NS	**≤ 25**	OK	NONE
SRP	EPA 365.1	<12	**≤12**	**1**	**≤2**	<0.001 / 0.001 MG/L	Batch 95	**±25**	97	**±10**	Batch 0	**≤ 20**	NS	**≤ 25**	OK	NONE
HARDNESS	SM2340B	NA	**NA**	**NA**	**≤180**	0.1 MG/L	NA	**±25**	NA	**±10**	NA	**≤ 20**	NS	**≤ 25**	OK	NOT ANALYZED
TOT. CU AND ZN	EPA 200.8	NA	**NA**	**7**	**≤180**	1-5 UG/L	Batch 98,112	**±25**	98,104	**±10**	Batch NC	**≤ 20**	NS	**≤ 25**	OK	NONE
DISS. CU AND ZN	EPA 200.8	<12	**≤12**	**13**	**≤180**	1-5 UG/L	FB-IN 96,104	**±25**	98,96	**±10**	FB-IN NC	**≤ 20**	NS	**≤ 25**	OK	NONE
PSD	ASTM 3977	NA	**NA**	**NA**	**≤7**	NA / 1 MICRON	NA	**NA**	NA	**NA**	NA	**NA**	NS	**NA**	OK	NOT ANALYZED

[1] If the sample or duplicate value is less than five times the reporting limit, the difference is calculated rather than the relative percent difference (RPD). The QA goal is a difference <2 times the detection limit instead of the number indicated in the goal column.

NA – not applicable or not available NC – not calculable due to one or more values below the detection limit NS – field duplicate not sampled.

Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page ____ of ____

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP, hardness, Total and Dissolved copper and zinc, PSD (ARI)

Checked: initials _____

Sample Date/Sample ID: 01/09/2013 / FB-IN, FB-OUT

date _____

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
TSS	SM2540D	NA	**NA**	1	**≤7**	<0.50 0.5 MG/L	NA	**NA**	94	**±10**	Batch 9	**≤ 25**	NS	**≤25**	OK	NONE
TP	EPA 365.1	NA	**NA**	6	**≤28**	<0.002 0.002 MG/L	Batch 104	**±25**	98	**±10**	Batch 0	**≤ 20**	NS	**≤ 25**	OK	NONE
SRP	EPA 365.1	<12	**≤12**	1	**≤2**	<0.001 0.001 MG/L	Batch 100	**±25**	100	**±10**	Batch 0	**≤ 20**	NS	**≤ 25**	OK	NONE
HARDNESS	SM2340B	NA	**NA**	12	**≤180**	<2.00 2 MG/L	FB-OUT 97	**±25**	95	**±10**	FB-OUT 1	**≤ 20**	NS	**≤ 25**	OK	NONE
TOT. CU AND ZN	EPA 200.8	NA	**NA**	5	**≤180**	<1,5 1-5 UG/L	FB-OUT 110,120	**±25**	104,94	**±10**	FB-OUT 13,NC	**≤ 20**	NS	**≤ 25**	OK	NONE
DISS. CU AND ZN	EPA 200.8	<12	**≤12**	1	**≤180**	<1,5 1-5 UG/L	Batch 112,98	**±25**	95,102	**±10**	Batch 2,15	**≤ 20**	NS	**≤ 25**	OK	NONE
PSD	ASTM 3977	NA	**NA**	3	**≤180**	NA 1 MICRON	NA	**NA**	NA	**NA**	NA	**NA**	NS	**NA**	OK	NONE

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Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page 1 of 1

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP, hardness, Total and Dissolved copper and zinc, PSD (ARI)

Checked: initials

Sample Date/Sample ID: 01/23/2013 / FB-IN, FB-OUT

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
TSS	SM2540D	NA	**NA**	6	**≤7**	<0.50 0.5 MG/L	NA	**NA**	93	**±10**	Batch 0	**≤ 25**	NS	**≤25**	OK	NONE
TP	EPA 365.1	NA	**NA**	6	**≤28**	<0.002 0.002 MG/L	Batch 102	**±25**	103	**±10**	Batch 0	**≤ 20**	NS	**≤ 25**	OK	NONE
SRP	EPA 365.1	<12	**≤12**	2	**≤2**	<0.001 0.001 MG/L	Batch 105	**±25**	100	**±10**	Batch 0	**≤ 20**	NS	**≤ 25**	OK	NONE
HARDNESS	SM2340B	NA	**NA**	12	**≤180**	<2.00 2 MG/L	Batch 96	**±25**	96	**±10**	Batch 1.4	**≤ 20**	NS	**≤ 25**	OK	NONE
TOT. CU AND ZN	EPA 200.8	NA	**NA**	6	**≤180**	<1,5 1-5 UG/L	Batch 98,100	**±25**	95,92	**±10**	Batch 4,NC	**≤ 20**	NS	**≤ 25**	OK	NONE
DISS. CU AND ZN	EPA 200.8	<12	**≤12**	6	**≤180**	<1,5 1-5 UG/L	FB-OUT 93,96	**±25**	95,92	**±10**	FB-OUT 2,NC	**≤ 20**	NS	**≤ 25**	OK	NONE
PSD	ASTM 3977	NA	**NA**	6	**≤7**	NA 1 MICRON	NA	**NA**	NA	**NA**	NA	**NA**	NS	**NA**	OK	NONE

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Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page 1 of 1

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP, hardness, Total and Dissolved copper and zinc, PSD (ARI)

Checked: initials

Sample Date/Sample ID: 01/24/2013 / FB-IN, FB-OUT

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
TSS	SM2540D	NA	**NA**	5	**≤7**	<0.50 0.5 MG/L	NA	**NA**	93	**±10**	Batch 0	**≤ 25**	NS	**≤25**	OK	NONE
TP	EPA 365.1	NA	**NA**	5	**≤28**	<0.002 0.002 MG/L	Batch 102	**±25**	103	**±10**	Batch 0	**≤ 20**	NS	**≤ 25**	OK	NONE
SRP	EPA 365.1	<12	**≤12**	1	**≤2**	<0.001 0.001 MG/L	Batch 105	**±25**	100	**±10**	Batch 0	**≤ 20**	NS	**≤ 25**	OK	NONE
HARDNESS	SM2340B	NA	**NA**	11	**≤180**	<2.00 2 MG/L	Batch 96	**±25**	96	**±10**	Batch 1.4	**≤ 20**	NS	**≤ 25**	OK	NONE
TOT. CU AND ZN	EPA 200.8	NA	**NA**	5	**≤180**	<1,5 1-5 UG/L	FB-OUT 98,100	**±25**	95,92	**±10**	FB-OUT 4,NC	**≤ 20**	NS	**≤ 25**	OK	NONE
DISS. CU AND ZN	EPA 200.8	<12	**≤12**	5	**≤180**	<1,5 1-5 UG/L	FB-OUT 94,102	**±25**	95,92	**±10**	FB-OUT 0,NC	**≤ 20**	NS	**≤ 25**	OK	NONE
PSD	ASTM 3977	NA	**NA**	NA	**≤7**	NA 1 MICRON	NA	**NA**	NA	**NA**	NA	**NA**	NS	**NA**	OK	NOT ANALYZED

[1] If the sample or duplicate value is less than five times the reporting limit, the difference is calculated rather than the relative percent difference (RPD). The QA goal is a difference <2 times the detection limit instead of the number indicated in the goal column.

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Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page 1 of 1

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP, hardness, Total and Dissolved copper and zinc, PSD (ARI)

Checked: initials

Sample Date/Sample ID: 01/26/2013 / FB-IN, FB-OUT

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
TSS	SM2540D	NA	**NA**	5	**≤7**	<0.50 0.5 MG/L	NA	**NA**	94	**±10**	Batch 7	**≤ 25**	NS	**≤25**	OK	NONE
TP	EPA 365.1	NA	**NA**	3	**≤28**	<0.002 0.002 MG/L	FB-OUT 102	**±25**	103	**±10**	FB-OUT 0	**≤ 20**	NS	**≤ 25**	OK	NONE
SRP	EPA 365.1	<12	**≤12**	2	**≤2**	<0.001 0.001 MG/L	FB-OUT 95	**±25**	103	**±10**	FB-OUT 0	**≤ 20**	NS	**≤ 25**	OK	NONE
HARDNESS	SM2340B	NA	**NA**	9	**≤180**	<2.00 2 MG/L	Batch 96	**±25**	96	**±10**	Batch 1.4	**≤ 20**	NS	**≤ 25**	OK	NONE
TOT. CU AND ZN	EPA 200.8	NA	**NA**	3	**≤180**	<1,5 1-5 UG/L	Batch 98,100	**±25**	95,92	**±10**	Batch 4.1,NC	**≤ 20**	NS	**≤ 25**	OK	NONE
DISS. CU AND ZN	EPA 200.8	<12	**≤12**	3	**≤180**	<1,5 1-5 UG/L	Batch 93,96	**±25**	95,92	**±10**	Batch 1.7,NC	**≤ 20**	NS	**≤ 25**	OK	NONE
PSD	ASTM 3977	NA	**NA**	NA	**≤7**	NA 1 MICRON	NA	**NA**	NA	**NA**	NA	**NA**	NS	**NA**	OK	NOT ANALYZED

[1] If the sample or duplicate value is less than five times the reporting limit, the difference is calculated rather than the relative percent difference (RPD). The QA goal is a difference <2 times the detection limit instead of the number indicated in the goal column.

NA – not applicable or not available NC – not calculable due to one or more values below the detection limit NS – field duplicate not sampled.

Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page 1 of 1

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP, hardness, Total and Dissolved copper and zinc, PSD (ARI)

Checked: initials

Sample Date/Sample ID: 01/28/2013 / FB-IN, FB-OUT

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
TSS	SM2540D	NA	**NA**	3	**≤7**	<0.50 0.5 MG/L	NA	**NA**	94	**±10**	Batch 7	**≤ 25**	NS	**≤25**	OK	NONE
TP	EPA 365.1	NA	**NA**	1	**≤28**	<0.002 0.002 MG/L	Batch 102	**±25**	103	**±10**	Batch 0	**≤ 20**	NS	**≤ 25**	OK	NONE
SRP	EPA 365.1	<12	**≤12**	1	**≤2**	<0.001 0.001 MG/L	Batch 102	**±25**	107	**±10**	Batch 6.1	**≤ 20**	NS	**≤ 25**	OK	NONE
HARDNESS	SM2340B	NA	**NA**	7	**≤180**	<2.00 2 MG/L	Batch 96	**±25**	96	**±10**	Batch 1.4	**≤ 20**	NS	**≤ 25**	OK	NONE
TOT. CU AND ZN	EPA 200.8	NA	**NA**	11	**≤180**	<1,5 1-5 UG/L	FB-OUT 93,102	**±25**	97,92	**±10**	FB-OUT 4.3,NC	**≤ 20**	NS	**≤ 25**	OK	NONE
DISS. CU AND ZN	EPA 200.8	<12	**≤12**	2	**≤180**	<1,5 1-5 UG/L	Batch 115,116	**±25**	104,102	**±10**	Batch 0.6,NC	**≤ 20**	NS	**≤ 25**	OK	NONE
PSD	ASTM 3977	NA	**NA**	NA	**≤7**	NA 1 MICRON	NA	**NA**	NA	**NA**	NA	**NA**	NS	**NA**	OK	NOT ANALYZED

[1] If the sample or duplicate value is less than five times the reporting limit, the difference is calculated rather than the relative percent difference (RPD). The QA goal is a difference <2 times the detection limit instead of the number indicated in the goal column.

NA – not applicable or not available NC – not calculable due to one or more values below the detection limit NS – field duplicate not sampled.

Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page 1 of 1

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP, hardness, Total and Dissolved copper and zinc, PSD (ARI)

Checked: initials

Sample Date/Sample ID: 01/30/2013 / FB-IN, FB-OUT

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
TSS	SM2540D	NA	**NA**	2	**≤7**	<0.50 0.5 MG/L	NA	**NA**	92	**±10**	Batch 8	**≤ 25**	NS	**≤25**	OK	NONE
TP	EPA 365.1	NA	**NA**	12	**≤28**	<0.002 0.002 MG/L	Batch 102	**±25**	101	**±10**	Batch 0	**≤ 20**	NS	**≤ 25**	OK	NONE
SRP	EPA 365.1	<12	**≤12**	<1	**≤2**	<0.001 0.001 MG/L	Batch 98	**±25**	101	**±10**	Batch 4.0	**≤ 20**	NS	**≤ 25**	OK	NONE
HARDNESS	SM2340B	NA	**NA**	5	**≤180**	<2.00 2 MG/L	FB-OUT 96	**±25**	96	**±10**	FB-OUT 1.4	**≤ 20**	NS	**≤ 25**	OK	NONE
TOT. CU AND ZN	EPA 200.8	NA	**NA**	9	**≤180**	<1,5 1-5 UG/L	Batch 93,102	**±25**	97,92	**±10**	Batch 4.3,NC	**≤ 20**	NS	**≤ 25**	OK	NONE
DISS. CU AND ZN	EPA 200.8	<12	**≤12**	12	**≤180**	<1,5 1-5 UG/L	FB-OUT 98,106	**±25**	96,92	**±10**	FB-OUT 4.4,NC	**≤ 20**	NS	**≤ 25**	OK	NONE
PSD	ASTM 3977	NA	**NA**	NA	**≤7**	NA 1 MICRON	NA	**NA**	NA	**NA**	NA	**NA**	NS	**NA**	OK	NOT ANALYZED

[1] If the sample or duplicate value is less than five times the reporting limit, the difference is calculated rather than the relative percent difference (RPD). The QA goal is a difference <2 times the detection limit instead of the number indicated in the goal column.

NA – not applicable or not available NC – not calculable due to one or more values below the detection limit NS – field duplicate not sampled.

Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page 1 of 1

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP, hardness, Total and Dissolved copper and zinc, PSD (ARI)

Checked: initials

Sample Date/Sample ID: 02/22/2013 / FB-IN, FB-OUT

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
TSS	SM2540D	NA	**NA**	5	**≤7**	<0.50 0.5 MG/L	NA	**NA**	95	**±10**	Batch 1.9	**≤ 25**	NS	**≤25**	OK	NONE
TP	EPA 365.1	NA	**NA**	3	**≤28**	<0.002 0.002 MG/L	Batch 96	**±25**	101	**±10**	Batch 3.5	**≤ 20**	NS	**≤ 25**	OK	NONE
SRP	EPA 365.1	<12	**≤12**	3	**≤2**	<0.001 0.001 MG/L	Batch 100	**±25**	100	**±10**	Batch 0	**≤ 20**	NS	**≤ 25**	OK	FLAG SAMPLES "J" DUE TO HOLDING TIME.
HARDNESS	SM2340B	NA	**NA**	10	**≤180**	<2.00 2 MG/L	Batch 101	**±25**	96	**±10**	Batch NC	**≤ 20**	NS	**≤ 25**	OK	NONE
TOT. CU AND ZN	EPA 200.8	NA	**NA**	4	**≤180**	<1,5 1-5 UG/L	Batch 95,92	**±25**	109,106	**±10**	Batch 7.6,6.1	**≤ 20**	NS	**≤ 25**	OK	NONE
DISS. CU AND ZN	EPA 200.8	<12	**≤12**	3	**≤180**	<1,5 1-5 UG/L	Batch 103,116	**±25**	108,106	**±10**	Batch NC,NC	**≤ 20**	NS	**≤ 25**	OK	NONE
PSD	ASTM 3977	NA	**NA**	NA	**≤7**	NA 1 MICRON	NA	**NA**	NA	**NA**	NA	**NA**	NS	**NA**	OK	NOT ANALYZED

[1] If the sample or duplicate value is less than five times the reporting limit, the difference is calculated rather than the relative percent difference (RPD). The QA goal is a difference <2 times the detection limit instead of the number indicated in the goal column.

NA – not applicable or not available NC – not calculable due to one or more values below the detection limit NS – field duplicate not sampled.

Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page 1 of 1

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP, hardness, Total and Dissolved copper and zinc, PSD (ARI)

Checked: initials

Sample Date/Sample ID: 02/25/2013 / FB-IN, FB-OUT

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
TSS	SM2540D	NA	**NA**	4	**≤7**	<0.50 0.5 MG/L	NA	**NA**	95	**±10**	Batch 0	**≤ 25**	NS	**≤25**	OK	NONE
TP	EPA 365.1	NA	**NA**	4	**≤28**	<0.002 0.002 MG/L	Batch 100	**±25**	101	**±10**	Batch 0	**≤ 20**	NS	**≤ 25**	OK	NONE
SRP	EPA 365.1	<12	**≤12**	2	**≤2**	<0.001 0.001 MG/L	Batch 100	**±25**	100	**±10**	Batch 0	**≤ 20**	NS	**≤ 25**	OK	NONE
HARDNESS	SM2340B	NA	**NA**	7	**≤180**	<2.00 2 MG/L	Batch 101	**±25**	96	**±10**	Batch NC	**≤ 20**	NS	**≤ 25**	OK	NONE
TOT. CU AND ZN	EPA 200.8	NA	**NA**	4	**≤180**	<1,5 1-5 UG/L	FB-OUT 118,112	**±25**	104,108	**±10**	FB-OUT 9.8,NC	**≤ 20**	NS	**≤ 25**	OK	NONE
DISS. CU AND ZN	EPA 200.8	<12	**≤12**	2	**≤180**	<1,5 1-5 UG/L	FB-OUT 114,110	**±25**	108,106	**±10**	FB-OUT 4.9,NC	**≤ 20**	NS	**≤ 25**	OK	NONE
PSD	ASTM 3977	NA	**NA**	4	**≤7**	NA 1 MICRON	NA	**NA**	NA	**NA**	NA	**NA**	NS	**NA**	OK	NONE

[1] If the sample or duplicate value is less than five times the reporting limit, the difference is calculated rather than the relative percent difference (RPD). The QA goal is a difference <2 times the detection limit instead of the number indicated in the goal column.

NA – not applicable or not available NC – not calculable due to one or more values below the detection limit NS – field duplicate not sampled.

Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page 1 of 1

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP, hardness, Total and Dissolved copper and zinc, PSD (ARI)

Checked: initials

Sample Date/Sample ID: 03/01/2013 / FB-IN, FB-OUT, QA-1 (Field duplicate)

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
TSS	SM2540D	NA	**NA**	3	**≤7**	<0.50 0.5 MG/L	NA	**NA**	94	**±10**	Batch 9.5	**≤ 25**	64	**≤25**	OK	"J" FLAG FB-IN AND QA-1 DUE TO FIELD DUPLICATE
TP	EPA 365.1	NA	**NA**	<1	**≤28**	<0.002 0.002 MG/L	Batch 101	**±25**	98	**±10**	Batch 0.8	**≤ 20**	0	**≤ 25**	OK	NONE
SRP	EPA 365.1	<12	**≤12**	3	**≤2**	<0.001 0.001 MG/L	QA-1 99	**±25**	100	**±10**	QA-1 1.4	**≤ 20**	15	**≤ 25**	OK	"J" FLAG DUE TO HOLDING TIME
HARDNESS	SM2340B	NA	**NA**	3	**≤180**	<2.00 2 MG/L	Batch 101	**±25**	96	**±10**	Batch NC	**≤ 20**	1.2	**≤ 25**	OK	NONE
TOT. CU AND ZN	EPA 200.8	NA	**NA**	4	**≤180**	<1,5 1-5 UG/L	QA-1 97,88	**±25**	105,106	**±10**	QA-1 0, 9.5	**≤ 20**	26,86	**≤ 25**	OK	"J" FLAG FB-IN AND QA-1 DUE TO FIELD DUPLICATE
DISS. CU AND ZN	EPA 200.8	<12	**≤12**	3	**≤180**	<1,5 1-5 UG/L	QA-1 110,118	**±25**	108,106	**±10**	QA-1 16,NC	**≤ 20**	0,NC	**≤ 25**	OK	NONE
PSD	ASTM 3977	NA	**NA**	NA	**≤7**	NA 1 MICRON	NA	**NA**	NA	**NA**	NA	**NA**	NS	**NA**	OK	NOT ANALYZED

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NA – not applicable or not available NC – not calculable due to one or more values below the detection limit NS – field duplicate not sampled.

Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page 1 of 1

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP, hardness, Total and Dissolved copper and zinc, PSD (ARI)

Checked: initials

Sample Date/Sample ID: 03/06/2013 / FB-IN, FB-OUT, QA-2 (Field duplicate)

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
TSS	SM2540D	NA	**NA**	5	**≤7**	<0.50 0.5 MG/L	NA	**NA**	97	**±10**	Batch 9.5	**≤ 25**	29	**≤25**	OK	"J" FLAG FB-IN AND QA-2 DUE TO FIELD DUPLICATE
TP	EPA 365.1	NA	**NA**	5	**≤28**	<0.002 0.002 MG/L	QA-2 100	**±25**	100	**±10**	QA-2 10	**≤ 20**	10	**≤ 25**	OK	NONE
SRP	EPA 365.1	<12	**≤12**	2	**≤2**	<0.001 0.001 MG/L	Batch 100	**±25**	100	**±10**	Batch 0	**≤ 20**	40	**≤ 25**	OK	"J" FLAG FB-IN AND QA-2 DUE TO FIELD DUPLICATE
HARDNESS	SM2340B	NA	**NA**	14	**≤180**	<2.00 2 MG/L	Batch 93	**±25**	98	**±10**	Batch 3.6	**≤ 20**	0	**≤ 25**	OK	NONE
TOT. CU AND ZN	EPA 200.8	NA	**NA**	5	**≤180**	<1,5 1-5 UG/L	QA-2 102,104	**±25**	110,106	**±10**	QA-2 5.7,0	**≤ 20**	DIFF=0.00 16, NC	**≤ 25**	OK	NONE
DISS. CU AND ZN	EPA 200.8	<12	**≤12**	5	**≤180**	<1,5 1-5 UG/L	Batch 92,100	**±25**	109,106	**±10**	Batch 0,NC	**≤ 20**	DIFF=0.00 15, NC	**≤ 25**	OK	NONE
PSD	ASTM 3977	NA	**NA**	6	**≤7**	NA 1 MICRON	NA	**NA**	NA	**NA**	NA	**NA**	43	**NA**	OK	"J" FLAG FB-IN AND QA-2 DUE TO FIELD DUPLICATE

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NA – not applicable or not available NC – not calculable due to one or more values below the detection limit NS – field duplicate not sampled.

Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page 1 of 1

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP, hardness, Total and Dissolved copper and zinc, PSD (ARI)

Checked: initials

Sample Date/Sample ID: 03/13/2013 / FB-IN, FB-OUT

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
TSS	SM2540D	NA	**NA**	6	**≤7**	<0.50 0.5 MG/L	NA	**NA**	95	**±10**	Batch 5.4	**≤ 25**	NS	**≤25**	OK	NONE
TP	EPA 365.1	NA	**NA**	6	**≤28**	<0.002 0.002 MG/L	Batch 104	**±25**	106	**±10**	Batch 3.9	**≤ 20**	NS	**≤ 25**	OK	NONE
SRP	EPA 365.1	<12	**≤12**	<1	**≤2**	<0.001 0.001 MG/L	Batch 100	**±25**	100	**±10**	Batch NC	**≤ 20**	NS	**≤ 25**	OK	NONE
HARDNESS	SM2340B	NA	**NA**	14	**≤180**	<2.00 2 MG/L	Batch 95	**±25**	94	**±10**	Batch 2.2	**≤ 20**	NS	**≤ 25**	OK	NONE
TOT. CU AND ZN	EPA 200.8	NA	**NA**	5	**≤180**	<1,5 1-5 UG/L	Batch 82,88	**±25**	108,106	**±10**	Batch 10,8.7	**≤ 20**	NS	**≤ 25**	OK	NONE
DISS. CU AND ZN	EPA 200.8	<12	**≤12**	5	**≤180**	<1,5 1-5 UG/L	Batch 87,94	**±25**	108,106	**±10**	Batch NC,NC	**≤ 20**	NS	**≤ 25**	OK	NONE
PSD	ASTM 3977	NA	**NA**	NA	**≤7**	NA 1 MICRON	NA	**NA**	NA	**NA**	NA	**NA**	NS	**NA**	OK	NOT ANALYZED

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NA – not applicable or not available NC – not calculable due to one or more values below the detection limit NS – field duplicate not sampled.

Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page 1 of 2

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP, hardness, conductivity, pH, turbidity, Total and Dissolved copper and zinc

Checked: initials

Sample Date/Sample ID: 03/14/2013 / FB-IN, FB-OUT

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
TSS	SM2540D	NA	**NA**	7	**≤7**	<0.50 0.5 MG/L	NA	**NA**	97	**±10**	Batch 11	**≤ 25**	NS	**≤25**	OK	NONE
TP	EPA 365.1	NA	**NA**	5	**≤28**	<0.002 0.002 MG/L	Batch 104	**±25**	106	**±10**	Batch 3.9	**≤ 20**	NS	**≤ 25**	OK	NONE
SRP	EPA 365.1	<12	**≤12**	4	**≤2**	<0.001 0.001 MG/L	Batch 105	**±25**	91	**±10**	Batch 0	**≤ 20**	NS	**≤ 25**	OK	"J" FLAG DUE TO HOLDING TIME
HARDNESS	SM2340B	NA	**NA**	13	**≤180**	<2.00	Batch 94	**±25**	94	**±10**	Batch 2.2	**≤ 20**	NS	**≤ 25**	OK	NONE
TOT. CU AND ZN	EPA 200.8	NA	**NA**	6	**≤180**	<1,5 1-5 UG/L	Batch 82,94	**±25**	106,94	**±10**	Batch 7.1, NC	**≤ 20**	NS	**≤ 25**	OK	NONE
DISS. CU AND ZN	EPA 200.8	<12	**≤12**	6	**≤180**	<1,5 1-5 UG/L	Batch 97,94	**±25**	106,106	**±10**	Batch 13,4.0	**≤ 20**	NS	**≤ 25**	OK	NONE
PSD	ASTM 3977	NA	**NA**	NA	**≤7**	NA 1 MICRON	NA	**NA**	NA	**NA**	NA	**NA**	NS	**NA**	OK	NOT ANALYZED

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Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page 2 of 2

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP, hardness, conductivity, pH, turbidity, Total and Dissolved copper and zinc

Checked: initials

Sample Date/Sample ID: 03/14/2013 / FB-IN, FB-OUT

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
COND	EPA 120.1	NA	**NA**	11	**≤28**	NA 0.1 UMHOS/CM	NA	**NA**	100	**±10**	Batch 0.5	**≤ 20**	NS	**≤25**	OK	NONE
PH	EPA 150.1	NA	**NA**	2	**≤1**	NA 0.1 STD UNITS	NA	**NA**	NA	**NA**	NA	**NA**	NS	**≤ 25**	OK	"J" FLAG DUE TO HOLDING TIME
TURBIDITY	EPA 180.1	NA	**NA**	3	**≤2**	NA 0.1 NTU	NA	**NA**	96	**±10**	Batch 3.9	**≤ 20**	NS	**≤ 25**	OK	"J" FLAG DUE TO HOLDING TIME

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Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page 1 of 2

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP, hardness, conductivity, pH, turbidity, Total and Dissolved copper and zinc

Checked: initials

Sample Date/Sample ID: 03/16/2013 / FB-IN, FB-OUT

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
TSS	SM2540D	NA	**NA**	5	**≤7**	<0.50 0.5 MG/L	NA	**NA**	97	**±10**	Batch 11	**≤ 25**	NS	**≤25**	OK	NONE
TP	EPA 365.1	NA	**NA**	3	**≤28**	<0.002 0.002 MG/L	FB-OUT 104	**±25**	106	**±10**	FB-OUT 3.9	**≤ 20**	NS	**≤ 25**	OK	NONE
SRP	EPA 365.1	<12	**≤12**	2	**≤2**	<0.001 0.001 MG/L	FB-OUT 105	**±25**	91	**±10**	FB-OUT 0	**≤ 20**	NS	**≤ 25**	OK	NONE
HARDNESS	SM2340B	NA	**NA**	11	**≤180**	<2.00	FB-OUT 94	**±25**	94	**±10**	FB-OUT 2.2	**≤ 20**	NS	**≤ 25**	OK	NONE
TOT. CU AND ZN	EPA 200.8	NA	**NA**	4	**≤180**	<1,5 1-5 UG/L	Batch 82,94	**±25**	106,106	**±10**	Batch 7.1, NC	**≤ 20**	NS	**≤ 25**	OK	NONE
DISS. CU AND ZN	EPA 200.8	<12	**≤12**	4	**≤180**	<1,5 1-5 UG/L	Batch 97,94	**±25**	106,106	**±10**	Batch 13,4.0	**≤ 20**	NS	**≤ 25**	OK	NONE
PSD	ASTM 3977	NA	**NA**	NA	**≤7**	NA 1 MICRON	NA	**NA**	NA	**NA**	NA	**NA**	NS	**NA**	OK	NOT ANALYZED

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NA – not applicable or not available NC – not calculable due to one or more values below the detection limit NS – field duplicate not sampled.

Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page 2 of 2

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP, hardness, conductivity, pH, turbidity, Total and Dissolved copper and zinc

Checked: initials

Sample Date/Sample ID: 03/16/2013 / FB-IN, FB-OUT

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
COND	EPA 120.1	NA	**NA**	9	**≤28**	NA 0.1 UMHOS/CM	NA	**NA**	100	**±10**	Batch 0.5	**≤ 20**	NS	**≤25**	OK	NONE
PH	EPA 150.1	NA	**NA**	1	**≤1**	NA 0.1 STD UNITS	NA	**NA**	NA	**NA**	NA	**NA**	NS	**≤ 25**	OK	NONE
TURBIDITY	EPA 180.1	NA	**NA**	1	**≤2**	NA 0.1 NTU	NA	**NA**	96	**±10**	FB-OUT 3.9	**≤ 20**	NS	**≤ 25**	OK	NONE

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Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page 1 of 2

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP, hardness, conductivity, pH, turbidity, Total and Dissolved copper and zinc

Checked: initials

Sample Date/Sample ID: 03/20/2013 / FB-IN, FB-OUT

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
TSS	SM2540D	NA	**NA**	6	**≤7**	<0.50 0.5 MG/L	NA	**NA**	95	**±10**	FB-OUT 9.9	**≤ 25**	NS	**≤25**	OK	NONE
TP	EPA 365.1	NA	**NA**	2	**≤28**	<0.002 0.002 MG/L	Batch 98	**±25**	103	**±10**	Batch 6.2	**≤ 20**	NS	**≤ 25**	OK	NONE
SRP	EPA 365.1	<12	**≤12**	2	**≤2**	<0.001 0.001 MG/L	FB-OUT 105	**±25**	100	**±10**	FB-OUT 13	**≤ 20**	NS	**≤ 25**	OK	NONE
HARDNESS	SM2340B	NA	**NA**	9	**≤180**	<2.00	Batch 96	**±25**	99	**±10**	Batch 0.8	**≤ 20**	NS	**≤ 25**	OK	NONE
TOT. CU AND ZN	EPA 200.8	NA	**NA**	6	**≤180**	<1,5 1-5 UG/L	Batch 89,88	**±25**	105,98	**±10**	Batch 4.1,0	**≤ 20**	NS	**≤ 25**	OK	NONE
DISS. CU AND ZN	EPA 200.8	<12	**≤12**	2	**≤180**	<1,5 1-5 UG/L	FB-OUT 97,108	**±25**	105,104	**±10**	FB-OUT 0,NC	**≤ 20**	NS	**≤ 25**	OK	NONE
PSD	ASTM 3977	NA	**NA**	NA	**≤7**	NA 1 MICRON	NA	**NA**	NA	**NA**	NA	**NA**	NS	**NA**	OK	NOT ANALYZED

[1] If the sample or duplicate value is less than five times the reporting limit, the difference is calculated rather than the relative percent difference (RPD). The QA goal is a difference <2 times the detection limit instead of the number indicated in the goal column.

NA – not applicable or not available NC – not calculable due to one or more values below the detection limit NS – field duplicate not sampled.

Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page 2 of 2

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP, hardness, conductivity, pH, turbidity, Total and Dissolved copper and zinc

Checked: initials

Sample Date/Sample ID: 03/20/2013 / FB-IN, FB-OUT

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
COND	EPA 120.1	NA	**NA**	5	**≤28**	NA 0.1 UMHOS/CM	NA	**NA**	100	**±10**	FB-OUT 0.5	**≤ 20**	NS	**≤25**	OK	NONE
PH	EPA 150.1	NA	**NA**	1	**≤1**	NA 0.1 STD UNITS	NA	**NA**	NA	**NA**	NA	**NA**	NS	**≤ 25**	OK	NONE
TURBIDITY	EPA 180.1	NA	**NA**	2	**≤2**	NA 0.1 NTU	NA	**NA**	98	**±10**	Batch 2.4	**≤ 20**	NS	**≤ 25**	OK	NONE

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NA – not applicable or not available NC – not calculable due to one or more values below the detection limit NS – field duplicate not sampled.

Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page 1 of 1

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP, hardness, Total and Dissolved copper and zinc

Checked: initials

Sample Date/Sample ID: 04/05/2013 / FB-IN, FB-OUT

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
TSS	SM2540D	NA	**NA**	7	**≤7**	<0.50 0.5 MG/L	NA	**NA**	96	**±10**	Batch 11	**≤ 25**	NS	**≤25**	OK	NONE
TP	EPA 365.1	NA	**NA**	6	**≤28**	<0.002 0.002 MG/L	Batch 104	**±25**	100	**±10**	Batch 5.4	**≤ 20**	NS	**≤ 25**	OK	NONE
SRP	EPA 365.1	<12	**≤12**	3	**≤2**	<0.001 0.001 MG/L	Batch 105	**±25**	97	**±10**	Batch 0	**≤ 20**	NS	**≤ 25**	OK	"J" FLAG RESULTS DUE TO HOLDING TIME.
HARDNESS	SM2340B	NA	**NA**	12	**≤180**	<2.00 2 MG/L	Batch 92	**±25**	94	**±10**	Batch 2.1	**≤ 20**	NS	**≤ 25**	OK	NONE
TOT. CU AND ZN	EPA 200.8	NA	**NA**	5	**≤180**	<1,5 1-5 UG/L	Batch 85,86	**±25**	107,104	**±10**	Batch 2.9,1.3	**≤ 20**	NS	**≤ 25**	OK	NONE
DISS. CU AND ZN	EPA 200.8	<12	**≤12**	5	**≤180**	<1,5 1-5 UG/L	Batch 97,104	**±25**	107,104	**±10**	Batch 2.2,0	**≤ 20**	NS	**≤ 25**	OK	NONE
PSD	ASTM 3977	NA	**NA**	NA	**≤7**	NA 1 MICRON	NA	**NA**	NA	**NA**	NA	**NA**	NS	**NA**	OK	NOT ANALYZED

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Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page 1 of 1

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP, hardness, Total and Dissolved copper and zinc

Checked: initials

Sample Date/Sample ID: 04/06/2013 / FB-IN, FB-OUT

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
TSS	SM2540D	NA	**NA**	6	**≤7**	<0.50 0.5 MG/L	NA	**NA**	96	**±10**	Batch 11	**≤ 25**	NS	**≤25**	OK	NONE
TP	EPA 365.1	NA	**NA**	5	**≤28**	<0.002 0.002 MG/L	Batch 104	**±25**	100	**±10**	Batch 5.4	**≤ 20**	NS	**≤ 25**	OK	NONE
SRP	EPA 365.1	<12	**≤12**	2	**≤2**	<0.001 0.001 MG/L	FB-OUT 105	**±25**	97	**±10**	FB-OUT 0	**≤ 20**	NS	**≤ 25**	OK	NONE
HARDNESS	SM2340B	NA	**NA**	11	**≤180**	<2.00 2 MG/L	Batch 92	**±25**	94	**±10**	Batch 2.1	**≤ 20**	NS	**≤ 25**	OK	NONE
TOT. CU AND ZN	EPA 200.8	NA	**NA**	4	**≤180**	<1,5 1-5 UG/L	Batch 85,86	**±25**	107,104	**±10**	Batch 2.9,1.3	**≤ 20**	NS	**≤ 25**	OK	NONE
DISS. CU AND ZN	EPA 200.8	<12	**≤12**	4	**≤180**	<1,5 1-5 UG/L	Batch 97,104	**±25**	107,104	**±10**	Batch 2.2,0	**≤ 20**	NS	**≤ 25**	OK	NONE
PSD	ASTM 3977	NA	**NA**	NA	**≤7**	NA 1 MICRON	NA	**NA**	NA	**NA**	NA	**NA**	NS	**NA**	OK	NOT ANALYZED

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Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page 1 of 1

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP, hardness, Total and Dissolved copper and zinc

Checked: initials

Sample Date/Sample ID: 04/10/2013 / FB-IN, FB-OUT

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
TSS	SM2540D	NA	NA	7	≤7	<0.50 0.5 MG/L	NA	NA	94	±10	Batch 0	≤ 25	NS	≤25	OK	NONE
TP	EPA 365.1	NA	NA	1	≤28	<0.002 0.002 MG/L	Batch 104	±25	100	±10	Batch 5.4	≤ 20	NS	≤ 25	OK	NONE
SRP	EPA 365.1	<12	≤12	2	≤2	<0.001 0.001 MG/L	Batch 95	±25	98	±10	Batch 0	≤ 20	NS	≤ 25	OK	NONE
HARDNESS	SM2340B	NA	NA	7	≤180	<2.00 2 MG/L	FB-OUT 92	±25	94	±10	FB-OUT 2.2	≤ 20	NS	≤ 25	OK	NONE
TOT. CU AND ZN	EPA 200.8	NA	NA	5	≤180	<1,5 1-5 UG/L	FB-IN 103,120	±25	107,106	±10	FB-IN 13,NC	≤ 20	NS	≤ 25	OK	NONE
DISS. CU AND ZN	EPA 200.8	<12	≤12	5	≤180	<1,5 1-5 UG/L	FB-OUT 108,116	±25	107,106	±10	FB-OUT 8.3,NC	≤ 20	NS	≤ 25	OK	NONE
PSD	ASTM 3977	NA	NA	NA	≤7	NA 1 MICRON	NA	NA	NA	NA	NA	NA	NS	NA	OK	NOT ANALYZED

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Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page 1 of 1

Laboratory/Parameters: Aquatic Research / TSS, TP

Checked: initials

Sample Date/Sample ID: 05/12/2013 / FB-IN, FB-OUT

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
TSS	SM2540D	NA	**NA**	5	**≤7**	<0.50 0.5 MG/L	NA	**NA**	97	**±10**	Batch 2.2	**≤ 25**	NS	**≤25**	OK	NONE
TP	EPA 365.1	NA	**NA**	3	**≤28**	<0.002 0.002 MG/L	Batch 102	**±25**	101	**±10**	Batch 5.4	**≤ 20**	NS	**≤ 25**	OK	NONE
SRP	EPA 365.1	NA	**≤12**	NA	**≤2**	<0.001 0.001 MG/L	NA	**±25**	NA	**±10**	NA	**≤ 20**	NS	**≤ 25**	OK	NOT ANALYZED
HARDNESS	SM2340B	NA	**NA**	NA	**≤180**	<2.00 2 MG/L	NA	**±25**	NA	**±10**	NA	**≤ 20**	NS	**≤ 25**	OK	NOT ANALYZED
TOT. CU AND ZN	EPA 200.8	NA	**NA**	NA	**≤180**	<1,5 1-5 UG/L	NA	**±25**	NA	**±10**	NA	**≤ 20**	NS	**≤ 25**	OK	NOT ANALYZED
DISS. CU AND ZN	EPA 200.8	NA	**≤12**	NA	**≤180**	<1,5 1-5 UG/L	NA	**±25**	NA	**±10**	NA	**≤ 20**	NS	**≤ 25**	OK	NOT ANALYZED
PSD	ASTM 3977	NA	**NA**	NA	**≤7**	NA 1 MICRON	NA	**NA**	NA	**NA**	NA	**NA**	NS	**NA**	OK	NOT ANALYZED

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Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page 1 of 1

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP

Checked: initials

Sample Date/Sample ID: 05/22/2013 / FB-IN, FB-OUT

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
TSS	SM2540D	NA	NA	6	≤7	<0.50 0.5 MG/L	NA	NA	96	±10	Batch 4.0	≤ 25	NS	≤25	OK	NONE
TP	EPA 365.1	NA	NA	2	≤28	<0.002 0.002 MG/L	Batch 100	±25	101	±10	Batch 0	≤ 20	NS	≤ 25	OK	NONE
SRP	EPA 365.1	<12	≤12	2	≤2	<0.001 0.001 MG/L	Batch 100	±25	103	±10	Batch 7.4	≤ 20	NS	≤ 25	OK	NONE
HARDNESS	SM2340B	NA	NA	NA	≤180	<2.00 2 MG/L	NA	±25	NA	±10	NA	≤ 20	NS	≤ 25	OK	NOT ANALYZED
TOT. CU AND ZN	EPA 200.8	NA	NA	NA	≤180	<1,5 1-5 UG/L	NA	±25	NA	±10	NA	≤ 20	NS	≤ 25	OK	NOT ANALYZED
DISS. CU AND ZN	EPA 200.8	NA	≤12	NA	≤180	<1,5 1-5 UG/L	NA	±25	NA	±10	NA	≤ 20	NS	≤ 25	OK	NOT ANALYZED
PSD	ASTM 3977	NA	NA	NA	≤7	NA 1 MICRON	NA	NA	NA	NA	NA	NA	NS	NA	OK	NOT ANALYZED

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Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page 1 of 1

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP

Checked: initials

Sample Date/Sample ID: 05/22/2013 / FB-IN, FB-OUT

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
TSS	SM2540D	NA	**NA**	6	**≤7**	<0.50 0.5 MG/L	NA	**NA**	96	**±10**	Batch 4.0	**≤ 25**	NS	**≤25**	OK	NONE
TP	EPA 365.1	NA	**NA**	12	**≤28**	<0.002 0.002 MG/L	Batch 98	**±25**	102	**±10**	Batch 0	**≤ 20**	NS	**≤ 25**	OK	NONE
SRP	EPA 365.1	<12	**≤12**	2	**≤2**	<0.001 0.001 MG/L	FB-OUT 100	**±25**	103	**±10**	FB-OUT 7.4	**≤ 20**	NS	**≤ 25**	OK	NONE
HARDNESS	SM2340B	NA	**NA**	NA	**≤180**	<2.00 2 MG/L	NA	**±25**	NA	**±10**	NA	**≤ 20**	NS	**≤ 25**	OK	NOT ANALYZED
TOT. CU AND ZN	EPA 200.8	NA	**NA**	NA	**≤180**	<1,5 1-5 UG/L	NA	**±25**	NA	**±10**	NA	**≤ 20**	NS	**≤ 25**	OK	NOT ANALYZED
DISS. CU AND ZN	EPA 200.8	NA	**≤12**	NA	**≤180**	<1,5 1-5 UG/L	NA	**±25**	NA	**±10**	NA	**≤ 20**	NS	**≤ 25**	OK	NOT ANALYZED
PSD	ASTM 3977	NA	**NA**	NA	**≤7**	NA 1 MICRON	NA	**NA**	NA	**NA**	NA	**NA**	NS	**NA**	OK	NOT ANALYZED

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Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page 1 of 1

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP, dissolved copper and zinc

Checked: initials

Sample Date/Sample ID: 06/12/2013 / FB-IN, FB-OUT, FB-QA-3, FB-IN-B, FB-OUT-B

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
TSS	SM2540D	NA	**NA**	7	**≤7**	<0.50 0.5 MG/L	NA	**NA**	98	**±10**	FB-QA-3 3.4	**≤ 25**	3.4	**≤25**	OK	NONE
TP	EPA 365.1	NA	**NA**	12	**≤28**	<0.002 0.002 MG/L	FB-OUT-B 102	**±25**	100	**±10**	FB-OUT-B NC	**≤ 20**	2.4	**≤ 25**	OK	NONE
SRP	EPA 365.1	<12	**≤12**	2	**≤2**	<0.001 0.001 MG/L	FB-OUT-B 105	**±25**	100	**±10**	FB-OUT-B NC	**≤ 20**	DIFF = 0.001	**≤ 25**	OK	NONE
HARDNESS	SM2340B	NA	**NA**	NA	**≤180**	<2.00 2 MG/L	NA	**±25**	NA	**±10**	NA	**≤ 20**	NS	**≤ 25**	OK	NOT ANALYZED
TOT. CU AND ZN	EPA 200.8	NA	**NA**	NA	**≤180**	<1,5 1-5 UG/L	NA	**±25**	NA	**±10**	NA	**≤ 20**	NS	**≤ 25**	OK	NOT ANALYZED
DISS. CU AND ZN	EPA 200.8	<12	**≤12**	8	**≤180**	<1,5 1-5 UG/L	Batch 100,108	**±25**	97,94	**±10**	Batch 4.2,NC	**≤ 20**	NS	**≤ 25**	OK	NONE
PSD	ASTM 3977	NA	**NA**	NA	**≤7**	NA 1 MICRON	NA	**NA**	NA	**NA**	NA	**NA**	NS	**NA**	OK	NOT ANALYZED

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Data Quality Assurance Worksheet

By G. Catarra

Project Name/No./Client: Filterra Bioretention System Phosphorus Treatment/ 10-04715-000/ Filterra

Date 08/27/13 Page 1 of 1

Laboratory/Parameters: Aquatic Research / TSS, TP, SRP

Checked: initials

Sample Date/Sample ID: 06/20/2013 / FB-IN, FB-OUT

date

Parameter	Completeness/ Methodology	Pre-preservation Holding Times (hours)		Total Holding Times (days)		Method Blanks Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Field Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal	Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal[1]	Reported	Goal[1]		
TSS	SM2540D	NA	**NA**	5	**≤7**	<0.50 0.5 MG/L	NA	**NA**	95	**±10**	Batch 11	**≤ 25**	NS	**≤25**	OK	NONE
TP	EPA 365.1	NA	**NA**	2	**≤28**	<0.002 0.002 MG/L	Batch 106	**±25**	100	**±10**	Batch 0	**≤ 20**	NS	**≤ 25**	OK	NONE
SRP	EPA 365.1	<12	**≤12**	1	**≤2**	<0.001 0.001 MG/L	FB-OUT 100	**±25**	100	**±10**	FB-OUT 0	**≤ 20**	NS	**≤ 25**	OK	NONE
HARDNESS	SM2340B	NA	**NA**	NA	**≤180**	<2.00 2 MG/L	NA	**±25**	NA	**±10**	NA	**≤ 20**	NS	**≤ 25**	OK	NOT ANALYZED
TOT. CU AND ZN	EPA 200.8	NA	**NA**	NA	**≤180**	<1,5 1-5 UG/L	NA	**±25**	NA	**±10**	NA	**≤ 20**	NS	**≤ 25**	OK	NOT ANALYZED
DISS. CU AND ZN	EPA 200.8	NA	**≤12**	NA	**≤180**	<1,5 1-5 UG/L	NA	**±25**	NA	**±10**	NA	**≤ 20**	NS	**≤ 25**	OK	NOT ANALYZED
PSD	ASTM 3977	NA	**NA**	NA	**≤7**	NA 1 MICRON	NA	**NA**	NA	**NA**	NA	**NA**	NS	**NA**	OK	NOT ANALYZED

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