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ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 628053

2. To: (Receiving Organization) Distribution		3. From: (Originating Organization) 222-S Laboratory	4. Related EDT No.: N/A
5. Proj./Prog./Dept./Div.: K Basin, SFBWL/Waste Management/PPC/FDH		6. Design Authority/ Design Agent/Cog. Engr.: Franciska H. Steen	7. Purchase Order No.: N/A
8. Originator Remarks: This document is being released into the supporting document system for retrievability purposes.		9. Equip./Component No.: N/A	
		10. System/Bldg./Facility: K Basin	
11. Receiver Remarks: For release.		11A. Design Baseline Document? ☐ Yes ☒ No	
		12. Major Assm. Dwg. No.: N/A	
		13. Permit/Permit Application No.: N/A	
		14. Required Response Date: 12/03/99	

15. DATA TRANSMITTED					(F)	(G)	(H)	(I)
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	Approval Designator	Reason for Transmittal	Originator Disposition	Receiver Disposition
1	HNF-1686	N/A	0	K Basin Sandfilter Backwash Line Characterization Project, Analytical Results for Campaign 24	Q	2	1	1

16. KEY		
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K Basin Sandfilter Backwash Line Characterization Project, Analytical Results for Campaign 24

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U.S. Department of Energy Contract DE-AC06-96RL13200

EDT/ECN: EDT-628053 UC: 2070
Org Code: 31B00 Charge Code: 103429
B&R Code: EW 3120074 Total Pages: 15

Key Words: K Basin Sandfilter Backwash, Sandfilter, SBWL,
Characterization, Campaign 24, K Basin,

Abstract: N/A

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12/6/99
Release Approval Date

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HNF-1686 REV. 0

222-S LABORATORY

**K BASIN SANDFILTER BACKWASH LINE
CHARACTERIZATION PROJECT,
ANALYTICAL RESULTS FOR CAMPAIGN 24**

Project Coordinator: Franciska H. Steen

**Prepared for the U.S. Department of Energy
Office of Environmental Restoration
and Waste Management**

by

**222-S Laboratory
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222-S LABORATORY

**K BASIN SANDFILTER BACKWASH LINE
CHARACTERIZATION PROJECT,
ANALYTICAL RESULTS FOR CAMPAIGN 24**

Summary

Sample 203KWBMF was taken from the K West Sandfilter Backwash Pit on November 4, 1999 and received by 222-S Laboratory on November 4, 1999. Analyses were performed on sample 203KWBMF in accordance with *Letter of Instruction for K Basins Sandfilter Backwash Line Samples* (LOI) in support of the K Basin Sandfilter Backwash Line Characterization Project.

Appearance and Sample Handling

Sample 203KWBMF consisted of approximately 260 milliliters of clear liquid with a small amount of black solids on the bottom of the container. Table 1 summarizes appearance information and over-the-top (OTR) dose readings performed on the sample.

Table 1. Appearance and OTR for K W Basin Sandfilter Backwash Sample

Customer ID	Lab ID	Color	Clarity	Organic Layer	Solids	OTR (MREM/HR)
203KWBMF	S99K000030	None	Clear	None	Black	<0.5

Sample Preparation

There were no anomalies observed nor exceptions to the data precision and accuracy requirements stated in LOI for the digestion of the sample. The K Basin Sample Digestion Data Sheet (Table 2) compiles analytical results associated with the digestion process. Determination of Data Correction Digestion/Dilution Factors (Table 3) presents the data used to determine the digestion/dilution conversion factor and the final calculated value.

Attachment 1 (Sample Processing Scheme for K West Basin Sandfilter Backwash Line Sample (203KWBMF) illustrates the digestion process. Furthermore, this reference relates K West Basin identification numbers to their corresponding 222-S Laboratory Information Management System (LABCORE) sample numbers.

HNF-1686, REV. 0

Sample 203KWBMF was entered into the LABCORE as a solid sample. In order to satisfy the LABCORE upload of the raw data, a digest factor of 1g/L was used to convert the units for the results from uCi/L to uCi/g. Therefore, the uCi/g data results are equal to the uCi/L data results. The uCi/L results were converted to uCi/mL on Tables 5, 6 and 7. The volume and weight correction factors were also applied in order to correct the data results to the original sample.

Analytical Results

The data summary tables included in this report compile analytical results associated with each sample. Results are reported as activity of the digestate (S99K000030). These results were corrected for volume and weight of the entire sample. Analytical results for the digestate are presented in Tables 4A, 4B and 4C. Analytical results corrected to the original sample volume are presented in Tables 5, 6 and 7. These tables present an estimated quantification limit (EQL) for each analysis. An EQL is equivalent to a practical quantification limit (as required by LOI) and is calculated as the method detection limit multiplied by any dilution factor and by a factor of ten.

Plutonium (238 Pu and 239/240Pu)

There were no anomalies observed during sample analysis. The detection limit was much less than the customer specified detection limit of 4.2 $\mu\text{Ci/L}$. No Pu238 was detected in the sample duplicate (the result was a less than value). Therefore, the mean results for both the corrected and uncorrected data (see tables 4A and 5) could not be calculated and were determined to be less than the detection limit. The preparation blank did not show contamination. Standard recovery, precision and accuracy were all within acceptable limits.

Uranium (U)

A Relative Percent Difference of 27.498 was reported for S99K000030. The results were near the detection limit which decreased the precision of the analysis. No reanalysis was performed. The detection limit was much less than the customer specified detection limit of 23 mg/L. The preparation blank did not show contamination. Standard recovery and accuracy were all within acceptable limits.

HNF-1686, REV. 0

Procedures

Table 8 lists the analytical procedures used for performing sample analyses.

Table 8. Analytical Procedures

Analysis	Preparation Procedure	Analysis Procedure
Pu 238 and Pu239/240	LA-505-162 Rev. C-0	*LA-953-104 Rev. B-2
U	LA-505-162 Rev. C-0	LA-925-009 Rev. D-1

* LOI requires Pu239 to be analyzed by LA-943-128. However, this procedure was taken out of service and an equivalent procedure was used LA-953-104.

References

DeFigh-Price, C., October 1996, *Letter of Instruction for K Basins Sandfilter Backwash Line Samples*, Revision 3, Internal Memorandum 2A100-96.018.

Markel, L.P., 1999, *222-S Laboratory Quality Assurance Plan*, HNF-SD-CP-QAPP-016, Rev. 3C, Waste Management Federal Services of Hanford, Inc., Richland, WA 99352.

Table 2. Sample Digestion Data Sheet (LA-505-162, Revision C-2)

Step	Labcore Name	Parameter Description	Units	Datum
9.1.2.1		Labcore Sample Number	n/a	S99K000030
9.1.2.2	ESTVOL01	Estimated total volume of sample	mL	260.8
9.1.2.3	DOSE-02	Dose rate window closed	mR/hr	<0.5
9.1.2.3	WODOSE02	Dose rate window open	mrad/hr	<0.5
9.1.4	GROSSWT1	Gross weight of sample bottle and contents	grams	300.698
9.1.7	TAREWT01	Tare weight of PTFE drying/digesting vessel	grams	168.181
9.2.5	TAREWT02	Tare weight of empty dried sample bottle	grams	31.452
9.2.8	REFBLWT	Weight of bottle refilled to initial liquid level	grams	291.740
9.2.10	DRYWT-01	Gross weight of drying vessel, 1st drying	grams	168.195
9.2.12	DRYWT-02	Gross weight of drying vessel, 2nd drying	grams	168.195
9.2.13.1	AVENETWT	Average of net weight of dried sludge	grams	0.014
9.2.14	DRYWT-03	Gross weight of drying vessel, 3rd drying	grams	n/a
9.2.15	NETWT-01	Net weight of dried sludge	grams	0.014
9.2.16.2	TAREWT03	Tare weight of bottle for sludge storage	grams	0.0000
9.2.16.4	GROSSWT2	Gross weight of excess dry sludge + storage container	grams	0.0000
9.2.16.5	NETWT-02	Net weight of excess dried sludge	grams	0.0000
9.2.16.6	GROSSWT3	Gross weight of remaining dried sludge to be digested plus drying vessel	grams	168.195
9.2.16.7	NETWT-03	Net weight of remaining dried sludge to be digested	grams	0.014
9.2.17	NETWT-04	Net weight of dried sludge to be digested	grams	0.014
9.2.31.3	VOLDIG01	Volume of diluted digestate (same as volume of volumetric flask)	mL	100
9.2.31.5	KDIG-01	Digestion Factor		0.3707
9.2.36	GROSSWT4	Gross weight of dry digesting vessel plus residue	grams	168.195
9.2.36	APPEAR02	Appearance of dried residue	n/a	Dissolved
9.2.37	CHILD-01	LABCORE number of digestate	n/a	n/a

**Table 4A. Analytical Results for Digestates
K Basin Sand Filter Backwash Line
Campaign 24**

Digestate Results Not Corrected for Digestion Factors or Dilution Factors

**Pu-238 by TRU-SPEC Resin
LA-953-104**

SAMPLE IDENTIFICATION			SAMPLE RESULTS			QUALITY CONTROL DATA					
Customer Sample Number	Laboratory Sample Number	Campaign Number	Sample Result uCi/L	Duplicate Result uCi/L	Mean Result uCi/L	Standard % Recovery	Preparation Blank uCi/L	Precision of Duplicate RPD	Accuracy of Spike % Recovery	Detection Limit uCi/L	Counting Error, Relative %
203KWBMF	S99K000030	24	<3.79E-03	<3.67E-03	<3.79E-03	N/A	<3.59E-03	N/A	N/A	3.79E-03	11.6

Table 4B. Analytical Results for Digestates
K Basin Sand Filter Backwash Line
Campaign 24

Digestate Results Not Corrected for Digestion Factors or Dilution Factors

Pu-239/240 by TRU-SPEC Resin
LA-953-104

LA-553-104

SAMPLE IDENTIFICATION			SAMPLE RESULTS			QUALITY CONTROL DATA					
Customer Sample Number	Laboratory Sample Number	Campaign Number	Sample Result uCi/L	Duplicate Result uCi/L	Mean Result uCi/L	Standard % Recovery	Preparation Blank uCi/L	Precision of Duplicate RPD	Accuracy of Spike % Recovery	Detection Limit uCi/L	Counting Error, Relative %
203KWBMF	S99K000030	24	3.97E-03	3.82E-03	3.90E-03	101.6	<3.59E-03	3.851	95.3	3.79E-03	6.6

**Table 4C. Analytical Results for Digestates
K Basin Sand Filter Backwash Line
Campaign 24**

Digestate Results Not Corrected for Digestion Factors or Dilution Factors

Uranium by Phosphorescence
LA-925-009

SAMPLE IDENTIFICATION			SAMPLE RESULTS			QUALITY CONTROL DATA					
Customer Sample Number	Laboratory Sample Number	Campaign Number	Sample Result ug/L	Duplicate Result ug/L	Mean Result ug/L	Standard % Recovery	Preparation Blank ug/L	Precision of Duplicate RPD	Accuracy of Spike % Recovery	Detection Limit ug/L	Relative Percent Uncertainty
203KWBMF	S99K000030	24	6.83E-03	8.48E-03	7.66E-03	103.4	4.63E-03	27.5	104.8	2.15E-04	2.6

Table 3. Determination of Data Correction Digestion/Dilution Factors
K Basin Sand Filter Backwash Line
Campaign 24

Column 1 Customer Sample Number	Column 2 Labore Parent Sample Number	Column 3 Sample Bottle Refilled Weight grams	Column 4 Bottle Tare Weight grams	Column 5 Density Factor	Column 6 Initial Sample Volume (converted by density) milliliters	Column 7 Weight of Digested Sludge grams	Column 8 Volume of Digestate (Vol flask volume) milliliters	Column 9 * Digestion Factor Volume (mL) and weight (g) 3.834E-01
203KWBMF	S99K000030	291.740	31.452	0.998	260.810	0.0140	100.0	

Column 3. Derived from step 9.2.8 of LA-505-162, Rev. C-2.

Column 4. Derived from step 9.2.5 of LA-505-162, Rev. C-2.

Column 5. Density of reagent grade water at room temperature.

Column 6. Calculation: (column 3 - column 4) ÷ column 5.

Column 7. Derived from step 9.2.17 of LA-505-162, Rev. C-2.

Column 8. Derived from step 9.2.31.3 of LA-505-162, Rev. C-2.

Column 9. Calculation: (column 8 ÷ column 6). Digestion factor to correct to total volume and weight of solids in original sample.

Note: Since all solids were digested, Column 7 is both the weight of solids digested and the original weight of the dried solids. Thus, the ratio is 1.

Table 5. Analytical Results Corrected to Original Sample Volume: Pu-238 by TRU-SPEC Resin
K Basin Sand Filter Backwash Line
Campaign 24
Data are Corrected for Digestion Factors and Dilution Factors

Pu-238 by TRU-SPEC Resin
LA-953-104

SAMPLE IDENTIFICATION				SAMPLE RESULTS					QUALITY CONTROL DATA							
Customer Sample Number	Laboratory Sample Number	Campaign Number	Conversion Factor to uCi/mL	Digestate Sample Result uCi/L	Final Sample Result uCi/mL	Digestate Duplicate Result uCi/L	Final Duplicate Result uCi/mL	Digestate Mean Result uCi/L	Final Mean Result uCi/mL	Digestate Preparation Blank uCi/L	Final Preparation Blank uCi/mL	Precision of Duplicate RPD	Digestate Detection Limit uCi/L	Final Detection Limit uCi/mL	Estimated Quantitation Limit uCi/mL	Relative Percent Counting Error
203KWBMF	S99K000030	24	3.834E-01	<3.79E-03	<1.45E-06	<3.67E-03	<1.41E-06	<3.79E-03	<1.45E-06	<3.59E-03	<3.59E-06	N/A	3.79E-03	1.45E-06	1.45E-05	11.6

Notes: The detection limit and relative percent counting error are based on the sample results.

"Final" refers to the result as it pertains to the original sample volume, calculated by multiplying the digestate results by the conversion factor and dividing this number by 1000 to convert uCi/L to uCi/mL.

Table 6. Analytical Results Corrected to Original Sample Volume: Pu-239/240 by TRU-SPEC Resin
K Basin Sand Filter Backwash Line
Campaign 24
Data are Corrected for Digestion Factors and Dilution Factors

Pu-239/240 by TRU-SPEC Resin
LA-963-104

SAMPLE IDENTIFICATION			SAMPLE RESULTS								QUALITY CONTROL DATA							
Customer Sample Number	Laboratory Sample Number	Campaign Number	Conversion Factor to uCi/mL	Digestate Sample Result uCi/L	Final Sample Result uCi/mL	Digestate Duplicate Result uCi/L	Final Duplicate Result uCi/mL	Digestate Mean Result uCi/L	Final Mean Result uCi/mL	Standard % Recovery	Digestate Preparation Blank uCi/L	Final Preparation Blank uCi/mL	Precision of Duplicate RPD	Accuracy of Spike % Recovery	Digestate Detection Limit uCi/L	Final Detection Limit uCi/mL	Estimated Quantitation Limit uCi/mL	Relative Percent Counting Error
203KWBWF	S99K000030	24	3.834E-01	3.97E-03	1.52E-06	3.83E-03	1.47E-06	3.90E-03	1.50E-06	101.6	<3.59E-03	<3.59E-06	3.861	96.3	3.79E-03	1.45E-06	1.45E-05	6.8

Notes: The detection limit and relative percent counting error are based on the sample results.

"Final" refers to the result as it pertains to the original sample volume, calculated by multiplying the digestate results by the conversion factor and dividing this number by 1000 to convert uCi/L to uCi/mL.

HNF-1686 REV. 0

Table 7. Analytical Results Corrected to Original Sample Volume: Uranium by Phosphorescence
K Basin Sand Filter Backwash Line
Campaign 24
Data are Corrected for Digestion Factors and Dilution Factors

Uranium by Phosphorescence
LA-928-008

SAMPLE IDENTIFICATION				SAMPLE RESULTS										QUALITY CONTROL DATA						
Customer Sample Number	Laboratory Sample Number	Campaign Number	Conversion Factor	Digestate Sample Result ug/L	Final Sample Result ug/mL	Digestate Duplicate Result ug/L	Final Duplicate Result ug/mL	Digestate Mean Result ug/L	Final Mean Result ug/mL	Standard % Recovery	Digestate Preparation Blank ug/L	Final Preparation Blank ug/mL	Precision of Duplicate RPD	Accuracy of Spike % Recovery	Digestate Detection Limit ug/L	Final Detection Limit ug/mL	Estimated Quantitation Limit uCi/mL	Relative Percent Uncertainty		
203KWBMF	S99K000030	24	3.834E-01	6.83E-03	2.62E-06	8.48E-03	3.25E-06	7.66E-03	2.93E-06	103.4	4.63E-03	4.63E-06	27.5	104.8	2.15E-04	8.24E-08	8.24E-07	2.6		

Notes: The detection limit and relative percent uncertainty are based on the sample results.

"Final" refers to the result as it pertains to the original sample volume, calculated by multiplying the digestate results by the conversion factor and dividing by 1000 to convert uCi/L to uCi/mL.

Attachment 1. Sample Processing Scheme for K Basin SFBWL Sludge per LA-505-162

HNF-1686 REV. 0

9.1.2.1 Laboref: 9997000000

Original Sample
Steps 9.1.1
9.1.4
9.1.2.2 Estimated Vol in ml: 250
9.1.2.3 Dose Rate, v/o in ml/hr: <0.05
9.1.2.3 Dose Rate, v/o in ml/hr: <0.05
9.1.4 Gross wt in grams: 300.033

Quantitative Transfer of Sludge with wash water

Step 9.1.7
9.1.7 Tare wt in grams: 100.101

Step 9.1.8

Heat to dryness

Steps 9.2.1
9.2.3
9.2.9
9.2.10

9.2.10 Gross wt in grams: 100.105

Dry for 2 hrs
2nd & 3rd dryings

Steps 9.2.11
9.2.15

9.2.12 Gross wt in grams: 100.106
9.2.13.1 Average net wt in grams: 0.014
9.2.14 Gross wt in grams: n/a
9.2.15 Net wt in grams: n/a

Split excess dried sludge

Amount <10g

Step 9.2.17

9.2.16.9 Gross wt in grams: n/a
9.2.16.7 Net wt in grams: n/a
9.2.17 Net wt in grams: n/a

Digest, Cool & Settle

Steps 9.2.18
9.2.22

Empty Bottle

Make mark at the water level

Steps 9.2.4
9.2.5

9.2.5 Tare wt in grams: 31.458

Steps 9.2.6
9.2.8

9.2.8 Gross wt in grams: 201.740

Amount exceeding 10g

Step 9.2.16

9.2.16.2 Tare wt in grams: n/a
9.2.16.4 Gross wt in grams: n/a
9.2.16.5 Net wt in grams: n/a

Sample Processing Scheme for K Basin SFBWL Sludge per LA-505-182, continued

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