

TVA Shawnee Fossil Plant
Special Waste Landfill – Permit # SW07300041
May 2015 First Half of Year
Groundwater and Surface Water Monitoring Report

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KAS

XC:JKW

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
FRANKFORT OFFICE PARK
14 REILLY RD
FRANKFORT KY 40601
March 31, 1999

*James
dwr
cc: edms*

Joseph R. Bynum, Executive Vice President
Tennessee Valley Authority
1101 Market Street
Chattanooga, Tennessee 37402-2801

RE: Signature Authority for:
TVA Paradise Steam Plant (Drakesboro)
Permit No. 089-00012
Muhlenberg County

Tennessee Valley Authority Shawnee Fossil Plant
Permit No. 073-00041
McCracken County

Dear Mr. Bynum:

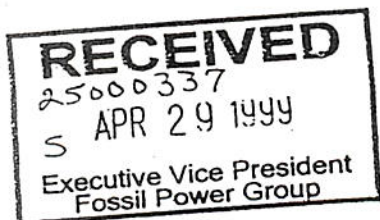
Thank you for notifying the cabinet of personnel changes in your organization. Due to this change, I have revised the listing of those positions which have signature authority for the above referenced landfills, in accordance with 401 KAR 47:160, Section 6.

This signature authority pertains to reports and applications that are required to be submitted to the Division of Waste Management. The positions authorized are:

<u>Position</u>	<u>Type of Authority (Permits and/or Reports)</u>
Plant Manager	Reports
Manager of Permitted Programs for Advanced Production Technology and Regulatory Integration	Reports



A copy of this letter must accompany any report submitted to the Division of Waste Management. The Division must be notified immediately upon any change in authority. Should you have any questions concerning the above, please contact me at (502) 564-6716, ext. 276.



Sincerely,

Mary Ann Goins

Mary Ann Goins, Admin. Spec., Pr.
Permit Administration Section
Solid Waste Branch
Division of Waste Management

c: Charlie Ritchie, Supervisor West Section
Carol Sole, Supervisor, Permit Administration Section

Paducah Regional Office
Madisonville Regional Office

JKW--5/3/99

cc: H. C. Kolb, Paradise

J. M. Loney, WT 8C-K



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ENERGY AND ENVIRONMENT CABINET

DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
200 FAIR OAKS LANE, 2ND FLOOR
FRANKFURT, KY 40601
TELEPHONE NUMBER (502) 564-6716

Groundwater and Surface Water Monitoring Sample Data Reporting Form

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statute (Kentucky Revised Statutes Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

1. Facility Name: Tennessee Valley Authority, Shawnee Fossil Plant

2. Activity: Special Waste Landfill

3. Agency Interest #: 3073

4. Permit #: 073-00041

5. Finds/Unit No.: KY4-640-006-686 /1

6. Quarter and Year: 2nd 2015

7. Check **one** of the following:

☐ Characterization ☐ Quarterly ☒ Semi-Annual ☐ Annual ☐ Assessment

8. Check applicable submittal: ☒ Groundwater ☐ Surface Water

FACILITY INFORMATION

9. Facility Name: Tennessee Valley Authority, Shawnee Fossil Plant

10. Facility Address: 7900 Metropolis Lake Road, Paducah, KY 42086-9450

11. County: McCracken **12.** Latitude: 37° 09' 15" **13.** Longitude: 88° 47' 25"

14. Sampling Date: 05/11/2015 - 05/14/2015

OWNER INFORMATION

15. Facility Owner: Tennessee Valley Authority **16.** Phone No.: (270) 575-8001

17. Contact Person: Holly Lawrence **18.** Phone No.: (270) 575-8024

19. Contact Person Title: Environmental Scientist

20. Mailing Address: 7900 Metropolis Lake Road, Paducah, KY 42086-9450

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

21. Company: Tennessee Valley Authority

22. Contact Person: Ronda L. Hooper **23.** Phone No.: (423) 751-6399

24. Mailing Address: TVA BR 4A-C, 1101 Market Street, Chattanooga, TN 37402

LABORATORY RECORD #1

25. Laboratory: Environmental Science Corporation **26.** Lab ID No.: TN-2006

27. Contact Person: Pam Langford **28.** Phone No.: (800) 767-5859

29. Mailing Address: 12065 Lebanon Rd., Mt. Juliet, TN 37122

LABORATORY RECORD #2

30. Laboratory: Southwest Research Institute **31.** Lab ID No.: KY-90010

32. Contact Person: Ms. Jackie Ranger **33.** Phone No.: (210) 522-3320

34. Mailing Address: 6220 Culebra Road, San Antonio, TX 78228

35. Certification statement: This certification clause shall be signed by the responsible person(s) described in 401 KAR 47:160, Section 6(1), and/or (2) and is required by 401 KAR 47:160, Section 6(4). This clause may be incorporated into a cover letter and attached to this submission. This clause shall accompany every report/application submitted to this office.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for such violations.


SIGNATURE


DATE

Jerry M. Kaler, Shawnee Fossil Plant Manager
NAME and TITLE - PLEASE PRINT

Table 1. Special Waste Landfill - Groundwater Monitoring Results - May 2015

Division of Waste Management
Solid Waste Branch
14 Reilly Road
Frankfort, KY 40601 (502) 564-6716

Permit Number: 073-00041
Facility: IVA - Shawnee Fossil Plant

FINDS/UNIT: KY4-640-006-686 / 1

GROUNDWATER SAMPLE ANALYSES

AKGWA NUMBER ¹ , Facility Well/Spring Number															8004-8123	8004-8123	8004-8123
Facility's Local Well or Spring Number (e.g. MW-1, etc.)															SHF-D27	SHF-D27	SHF-D30A
Sample Sequence # (For Official Use Only)																	
If sample is a Blank, specify Type (Field, Test, Method, or Equipment)																	
Sample Date and Time (Month/Day/Year hour:minutes)															5/13/2015 14:05	5/13/2015 14:05	5/13/2015 8:15
Duplicate ("Y" or "N") ²															N	N	N
Split ("Y" or "N") ³															N	N	N
Facility Sample ID Number (if applicable)																	
Laboratory Sample ID Number (if applicable)															574232	574232D	L765407-05
Date of Analysis (Month/Day/Year)															6/24/2015	6/24/2015	5/24/2015
Gradient with respect to monitored unit (Up, Down, Side)															Up	Up	Down
CASRN ⁴		SYSTEMATIC PARAMETER NAME	T D ⁵	UNITS OF MEAS.	METHOD	F L A G	DETECTED VALUE OR PQL ⁶	F L A G	DETECTED VALUE OR PQL ⁶	F L A G	DETECTED VALUE OR PQL ⁶	F L A G					
N/A		Alpha, total	T	pCi/L	EPA 900.0/7110B		-0.24		1.41		2.42		-1.69				
7429905		Aluminum, total	T	mg/L	EPA 6010B		0.17		0.05		0.05		<0.1				
7440382		Arsenic, total	T	mg/L	EPA 6020		<0.002		0.000682		0.000734		<0.002				
7440393		Barium, total	T	mg/L	EPA 6010B		0.091		0.17		0.17		0.03				
7440417		Beryllium, total	T	mg/L	EPA 6010B		<0.002		0.001		0.001		<0.002				
N/A		Beta, total	T	pCi/L	EPA 900.0		0.081		43.56		46.18		1.76				
71523		Bicarbonate Alkalinity as CaCO3		mg/L	SM 2320B		<20		122		137		85				
7440428		Boron, total	T	mg/L	EPA 6010B		1.4		0.035		0.035		3.6				
7440439		Cadmium, total	T	mg/L	EPA 6020		<0.001		0.00025		0.00025		<0.001				
7440702		Calcium, total	T	mg/L	EPA 6010B		28		30.8		30.7		66				
S0268		Carbon, total organic	T	mg/L	EPA 415.1/9060A		1.2		0.691		0.626		3.9				
16887006		Chloride, total	T	mg/L	EPA 9056		14		30.2		29.6		19				

¹ AKGWA # is 0000-0000 for any type of blank.

² Respond 'y' if the sample was a duplicate of another sample in this report.

³ Respond 'y' if the sample was split and analyzed by separate laboratories.

⁴ Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.

⁵ "T" = Total; "D" = Dissolved

⁶ "<" indicates a non-detect; do not use 'ND' or 'BDL'. Value then shown is Practical Quantitation Limit.

NS = No sample collected
J = Estimated value
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A = Average value
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AK GWA NUMBER ¹ , Facility Well/Spring Number													8004-8123	8004-8123
Facility's Local Well or Spring Number (e.g. MW-1, etc.)													SHF-D27	SHF-D30A
Sample Sequence # (For Official Use Only)														
If sample is a Blank, specify Type (Field, Test, Method, or Equipment)														
Sample Date and Time (Month/Day/Year hour:minutes)													5/13/2015 14:05	5/13/2015 8:15
Duplicate ("Y" or "N") ²													Y	N
Split ("Y" or "N") ³													N	N
Facility Sample ID Number (if applicable)														
Laboratory Sample ID Number (if applicable)													574232D	L 765407-05
Date of Analysis (Month/Day/Year)													6/24/2015	5/24/2015
Gradient with respect to monitored unit (Up, Down, Side)													Up	Down
CASRN ⁴	SYSTEMATIC PARAMETER NAME	T D ⁵	UNITS OF MEAS.	METHOD	DETECTED VALUE OR PQL ⁶	F L A G	DETECTED VALUE OR PQL ⁶	F L A G	DETECTED VALUE OR PQL ⁶	F L A G	DETECTED VALUE OR PQL ⁶	F L A G		
74404840	Cobalt, total	T	mg/L	EPA 6020	0.0049		<0.002		0.00025		<0.002			
S0130	Chemical Oxygen Demand		mg/L	SM 410.4/5220D	<10		<10		5.4		<10			
7440508	Copper, dissolved	D	mg/L	EPA 6010	<0.02		<0.02		0.000274		<0.02			
7782414	Fluoride, total	T	mg/L	EPA 9056	<0.1		<0.1		0.205		<0.1			
S0906	Static Water Level Elevation		ft	FIELD	313.42		322.83		318.01		301.02			
7439896	Iron, total	T	mg/L	EPA 6010B	13		1.2		0.107		<0.1			
7439921	Lead, total	T	mg/L	EPA 6020	0.0064		<0.002		0.00025		<0.002			
7439954	Magnesium, total	T	mg/L	EPA 6010B	3.9		16		12		20			
7439965	Manganese, total	T	mg/L	EPA 6010B	0.39		0.014		0.0025		1.7			
7439976	Mercury, total	T	mg/L	EPA 7470A	<0.0002		<0.0002		0.0001		<0.0002			
7439987	Molybdenum, total	T	mg/L	EPA 6010/6020	<0.005		<0.005		0.0025		<0.005			
7440020	Nickel, total	T	mg/L	EPA 6020	0.02		0.0031		0.00109		0.014			

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14 Reilly Road
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Permit Number: 073-00041

Facility: TVA - Shawnee Fossil Plant

FINDS/UNIT: KY4-640-006-686 / 1

GROUNDWATER SAMPLE ANALYSES

AKGWA NUMBER ¹ , Facility Well/Spring Number	8002-8124	8004-9951				8004-8123		8004-8123
Facility's Local Well or Spring Number (e.g. MW-1, etc.)	SHF-D11	SHF-D11B	SHF-D19	SHF-D27		SHF-D27	SHF-D27	SHF-D30A
Sample Sequence # (For Official Use Only)								
If sample is a Blank, specify Type (Field, Test, Method, or Equipment)								
Sample Date and Time (Month/Day/Year hour:minutes)	5/13/2015 10:15	5/13/2015 11:25	5/14/2015 10:25	5/13/2015 14:05		5/13/2015 14:05		5/13/2015 8:15
Duplicate ("Y" or "N") ²	N	N	N	N		Y		N
Split ("Y" or "N") ³	N	N	N	N		N		N
Facility Sample ID Number (if applicable)								
Laboratory Sample ID Number (if applicable)	L 765407-02	L 765407-03	L 765407-04	574232		574232D		L 765407-05
Date of Analysis (Month/Day/Year)	5/27/2015	5/27/2015	5/27/2015	6/24/2015		6/24/2015		5/24/2015
Gradient with respect to monitored unit (Up, Down, Side)	Down	Down	Up	Up		Up	Up	Down
CASRN ⁴	T D ⁵	UNITSO F MEAS.	METHOD	F L A G	DETECTED VALUE OR PQL ⁶	F L A G	DETECTED VALUE OR PQL ⁶	F L A G
S0296	pH (field)	sd	FELD		4.9		6	
7440097	Potassium, total	T	EPA 6010B		1.8		<1	
7782492	Selenium, total	T	EPA 6020		<0.002		0.0031	
7440235	Sodium, total	T	EPA 6010B		11		85	
S0266	Total Dissolved Solids	T	SM 2540C		170		460	
S0145	Specific Conductance		FELD		146		678	
7440246	Strontium, total	T	EPA 6010B		0.057		0.061	
14808798	Sulfate, total	T	EPA 9056		32		200	
S0907	Temperature		FELD		16.5		16.1	
7440280	Thallium, total	T	EPA 6010/6020		<0.002		<0.002	
7440291	Thorium, total	T	EPA 6020		0.002		0	
7440326	Titanium, total	T	EPA 6010/6020		0.17		<0.05	

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Division of Waste Management
Solid Waste Branch
14 Reilly Road
Frankfort, KY 40601 (502) 564-6716

Permit Number: 073-00041
Facility: IVA - Shawnee Fossil Plant

FINDS/UNIT: KY4-640-006-686 / 1

GROUNDWATER SAMPLE ANALYSES

AKGWA NUMBER ¹ , Facility Well/Spring Number													
Facility's Local Well or Spring Number (e.g. MW-1, etc.)													
Sample Sequence # (For Official Use Only)													
If sample is a Blank, specify Type (Field, Test, Method, or Equipment)													
Sample Date and Time (Month/Day/Year hour:minutes)													
Duplicate ("Y" or "N") ²													
Split ("Y" or "N") ³													
Facility Sample ID Number (if applicable)													
Laboratory Sample ID Number (if applicable)													
Date of Analysis (Month/Day/Year)													
Gradient with respect to monitored unit (Up, Down, Side)													
CASRN ⁴	SYSTEMATIC PARAMETER NAME	T D ⁵	UNITS OF MEAS.	METHOD	DETECTED VALUE OR PQL ⁶	F L A G	DETECTED VALUE OR PQL ⁶	F L A G	DETECTED VALUE OR PQL ⁶	F L A G	DETECTED VALUE OR PQL ⁶	F L A G	
N/A	Alpha, total	T	pCi/L	EPA 900.0/7110B	-0.877		-0.668		0.725		1.65		1.2
7429905	Aluminum, total	T	mg/L	EPA 6010B	<0.1		<0.1		<0.1		<1		<0.1
7440382	Arsenic, total	T	mg/L	EPA 6020	<0.002		<0.002		<0.002		<0.002		<0.002
7440393	Barium, total	T	mg/L	EPA 6010B	0.056		0.027		0.028		0.063		0.031
7440417	Beryllium, total	T	mg/L	EPA 6010B	<0.002		<0.002		<0.002		<0.02		<0.002
N/A	Beta, total	T	pCi/L	EPA 900.0	2.4		4.9		3.45		3.11		2.47
71523	Bicarbonate Alkalinity as CaCO3		mg/L	SM 2320B	88		36		<20		<20		120
7440428	Boron, total	T	mg/L	EPA 6010B	3.5		2		5.1		7.6		4.8
7440439	Cadmium, total	T	mg/L	EPA 6020	<0.001		<0.001		<0.001		<0.001		0.0013
7440702	Calcium, total	T	mg/L	EPA 6010B	57		19		33		290		120
S0268	Carbon, total organic	T	mg/L	EPA 415.1/9060A	1.8		1.4		1.4		13		3.3
16887006	Chloride, total	T	mg/L	EPA 9056	20		20		18		7.8		14

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AKGWA NUMBER ¹ , Facility Well/Spring Number												
Facility's Local Well or Spring Number (e.g. MW-1, etc.)												
Sample Sequence # (For Official Use Only)												
If sample is a Blank, specify Type (Field, Test, Method, or Equipment)												
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Duplicate ("Y" or "N") ²												
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Date of Analysis (Month/Day/Year)												
Gradient with respect to monitored unit (Up, Down, Side)												
CASRN ⁴	SYSTEMATIC PARAMETER NAME	T D ⁵	UNITS OF MEAS.	METHOD	DETECTED VALUE OR PQL ⁶	F L A G	DETECTED VALUE OR PQL ⁶	F L A G	DETECTED VALUE OR PQL ⁶	F L A G	DETECTED VALUE OR PQL ⁶	F L A G
7440484	Cobalt, total	T	mg/L	EPA 6020	0.0025		<0.002		<0.002		<0.002	
S0130	Chemical Oxygen Demand		mg/L	SM 410.4/5220D	<10		<10		<10		110	
7440508	Copper, dissolved	D	mg/L	EPA 6010	<0.02		<0.02		<0.02		<0.02	
7782414	Fluoride, total	T	mg/L	EPA 9056	0.1		0.12		<0.1		<0.1	
S0906	Static Water Level Elevation		ft	FIELD	299.38		312.37		313.29		321.10	
7439896	Iron, total	T	mg/L	EPA 6010B	2.4		9		<0.1		160	
7439921	Lead, total	T	mg/L	EPA 6020	<0.002		<0.002		<0.002		<0.002	
7439954	Magnesium, total	T	mg/L	EPA 6010B	9		4.5		<1		19	
7439965	Manganese, total	T	mg/L	EPA 6010B	3.8		0.96		0.35		67	
7439976	Mercury, total	T	mg/L	EPA 7470A	<0.0002		<0.0002		<0.0002		<0.0002	
7439987	Molybdenum, total	T	mg/L	EPA 6010/6020	<0.005		<0.005		0.49		<0.005	
7440020	Nickel, total	T	mg/L	EPA 6020	0.0022		<0.002		<0.002		<0.002	

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CASRN ⁴	SYSTEMATIC PARAMETER NAME	T D ⁵	UNITS OF MEAS.	METHOD	DETECTED VALUE OR PQL ⁶	F L A G	DETECTED VALUE OR PQL ⁶	F L A G	DETECTED VALUE OR PQL ⁶	F L A G	DETECTED VALUE OR PQL ⁶	F L A G	DETECTED VALUE OR PQL ⁶	F L A G
S0296	pH (field)		std	FIELD	6.1		6.1		5.6		6.3		6	
7440097	Potassium, total	T	mg/L	EPA 6010B	2.3		1.1		4.8		<10		1.6	
7782492	Selenium, total	T	mg/L	EPA 6020	<0.002		<0.002		<0.002		<0.002		<0.002	
7440235	Sodium, total	T	mg/L	EPA 6010B	18		13		12		16		16	
S0266	Total Dissolved Solids	T	mg/L	SM 2540C	310		180		240		1600		630	
S0145	Specific Conductance		umhos/cm	FIELD	460		253		304		1877		771	
7440246	Strontium, total	T	mg/L	EPA 6010B	0.17		0.065		0.13		0.76		0.34	
14808798	Sulfate, total	T	mg/L	EPA 9056	120		60		100		1100		300	
S0907	Temperature		deg-F	FIELD	17.5		18.7		22.7		20.0		18.7	
7440280	Thallium, total	T	mg/L	EPA 6010/6020	<0.002		<0.002		<0.002		<0.002		<0.002	
7440291	Thorium, total	T	mg/L	EPA 6020	<0.000383		<0.000383		<0.000383		<0.000383		<0.000383	
7440326	Titanium, total	T	mg/L	EPA 6010/6020	<0.05		<0.05		<0.05		<0.5		<0.05	

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D = Concentration from analysis of a secondary dilution factor

Table 1. Special Waste Landfill - Groundwater Monitoring Results - May 2015

Division of Waste Management

Permit Number: 073-00041

Solid Waste Branch

14 Reilly Road

Facility: TVA - Shawnee Fossil Plant

Frankfort, KY 40601 (502) 564-6716

FINDS/UNIT: KY4-640-006-686 / 1

GROUNDWATER SAMPLE ANALYSES

[illegible]

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Division of Waste Management

Solid Waste Branch

14 Reilly Road

Frankfort, KY 40601 (502) 564-6716

Permit Number: 073-00041

Facility: IVA - Shawnee Fossil Plant

FINDS/UNIT: KY4-640-006-686 / 1

GROUNDWATER SAMPLE ANALYSES

AKGWA NUMBER ¹ , Facility Well/Spring Number	8004-9957	8004-9960	8004-9960	8004-6405	0000-0000
Facility's Local Well or Spring Number (e.g. MW-1, etc.)	SHF-D76A	SHF-D77	SHF-D8A	SHF-D8A	SHF-FIELD BLANK
Sample Sequence # (For Official Use Only)					
If sample is a Blank, specify Type (Field, Test, Method, or Equipment)					
Sample Date and Time (Month/Day/Year hour:minutes)	5/12/2015 9:30	5/14/2015 7:50	5/12/2015 8:25	5/12/2015 8:25	5/13/2015 14:05
Duplicate ("Y" or "N") ²	N	N	N	Y	N
Split ("Y" or "N") ³	N	N	N	N	N
Facility Sample ID Number (if applicable)					
Laboratory Sample ID Number (if applicable)	L 765407-12	L 765407-13	L 765407-01	L 765407-14	L 765407-15
Date of Analysis (Month/Day/Year)	5/27/2015	5/26/2015	5/26/2015	5/26/2015	5/26/2015
Gradient with respect to monitored unit (Up, Down, Side)	Down	Up	Down	Down	
CASRN ⁴					
N/A	Alpha, total	DETECTED VALUE OR PQL ⁶	DETECTED VALUE OR PQL ⁶	DETECTED VALUE OR PQL ⁶	DETECTED VALUE OR PQL ⁶
7429905	Aluminum, total	-3.43	-0.188	1.47	-1.35
7440382	Arsenic, total	0.14	<0.1	<0.1	<0.1
7440393	Barium, total	<0.002	<0.002	<0.002	<0.002
7440417	Beryllium, total	0.03	0.053	0.12	<0.005
N/A	Beta, total	<0.002	<0.002	<0.002	<0.002
71523	Bicarbonate Alkalinity as CaCO3	9.32	1.69	5.17	4.12
7440428	Boron, total	<20	130	35	<20
7440439	Cadmium, total	22	<0.2	<0.2	<0.2
7440702	Calcium, total	<0.001	<0.001	<0.001	<0.001
S0268	Carbon, total organic	490	33	13	<1
16887006	Chloride, total	5.2	13	1.2	<1
		4.8	200	34	<1

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Table 1. Special Waste Landfill - Groundwater Monitoring Results - May 2015

Division of Waste Management
Solid Waste Branch
14 Reilly Road
Frankfort, KY 40601 (502) 564-6716

Permit Number: 073-00041

Facility: IVA - Shawnee Fossil Plant

FINDS/UNIT: KY4-640-006-686 / 1

GROUNDWATER SAMPLE ANALYSES

AKGWA NUMBER ¹ , Facility Well/Spring Number	8004-9957	8004-9960	8004-9960	8004-6405	0000-0000
Facility's Local Well or Spring Number (e.g. MW-1, etc.)	SHF-D76A	SHF-D77	SHF-D8A	SHF-D8A	SHF-FIELD BLANK
Sample Sequence # (For Official Use Only)					
If sample is a Blank, specify Type (Field, Test, Method, or Equipment)					
Sample Date and Time (Month/Day/Year hour:minutes)	5/12/2015 9:30	5/14/2015 7:50	5/12/2015 8:25	5/12/2015 8:25	5/13/2015 14:05
Duplicate ("Y" or "N") ²	N	N	N	Y	N
Split ("Y" or "N") ³	N	N	N	N	N
Facility Sample ID Number (if applicable)					
Laboratory Sample ID Number (if applicable)	L 765407-12	L 765407-13	L 765407-01	L 765407-14	L 765407-15
Date of Analysis (Month/Day/Year)	5/27/2015	5/26/2015	5/26/2015	5/26/2015	5/26/2015
Gradient with respect to monitored unit (Up, Down, Side)	Down	Up	Down	Down	
CASRN ⁴					
7440484	Cobalt, total	DETECTED VALUE OR PQL ⁶	DETECTED VALUE OR PQL ⁶	DETECTED VALUE OR PQL ⁶	DETECTED VALUE OR PQL ⁶
S0130	Chemical Oxygen Demand	46	0.037	0.0034	<0.002
7440508	Copper, dissolved	<0.02	12	<10	<10
7782414	Fluoride, total	<0.1	<0.02	<0.02	<0.02
S0906	Static Water Level Elevation	319.98	<0.1	<0.1	<0.1
7439896	Iron, total	4.8	304.99	319.03	NS
7439921	Lead, total	<0.002	4.8	<0.1	<0.1
7439954	Magnesium, total	1.3	<0.002	<0.002	<0.002
7439965	Manganese, total	4	15	3.2	<1
7439976	Mercury, total	<0.0002	1.2	1.7	<0.01
7439987	Molybdenum, total	0.051	<0.0002	<0.0002	<0.0002
7440020	Nickel, total	0.011	<0.005	<0.005	<0.005

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Table 1. Special Waste Landfill - Groundwater Monitoring Results - May 2015

Division of Waste Management
Solid Waste Branch
14 Reilly Road
Frankfort, KY 40601 (502) 564-6716

Permit Number: 073-00041
Facility: IVA - Shawnee Fossil Plant

FINDS/UNIT: KY4-640-006-686 / 1

GROUNDWATER SAMPLE ANALYSES

AKGWA NUMBER ¹ , Facility Well/Spring Number	8004-9957	8004-9960	8004-9960	8004-6405	0000-0000
Facility's Local Well or Spring Number (e.g. MW-1, etc.)	SHF-D76A	SHF-D77	SHF-D8A	SHF-D8A	SHF-FIELD BLANK
Sample Sequence # (For Official Use Only)					
If sample is a Blank, specify Type (Field, Test, Method, or Equipment)					
Sample Date and Time (Month/Day/Year hour:minutes)	5/12/2015 9:30	5/14/2015 7:50	5/12/2015 8:25	5/12/2015 8:25	5/13/2015 14:05
Duplicate ("Y" or "N") ²	N	N	N	Y	N
Split ("Y" or "N") ³	N	N	N	N	N
Facility Sample ID Number (if applicable)					
Laboratory Sample ID Number (if applicable)	L 765407-12	L 765407-13	L 765407-01	L 765407-14	L 765407-15
Date of Analysis (Month/Day/Year)	5/27/2015	5/26/2015	5/26/2015	5/26/2015	5/26/2015
Gradient with respect to monitored unit (Up, Down, Side)	Down	Up	Down	Down	
CASRN ⁴					
S0296	pH (field)	DETECTED VALUE OR PQL ⁶	F L A G	DETECTED VALUE OR PQL ⁶	F L A G
7440097	Potassium, total	6.3		5.4	NS
7782492	Selenium, total	17		4	<1
7440235	Sodium, total	<0.002		<0.002	<0.002
S0266	Total Dissolved Solids	17		24	<1
S0145	Specific Conductance	2000		160	<10
7440246	Strontium, total	2278		237	NS
14808798	Sulfate, total	0.92		0.083	<0.01
S0907	Temperature	1300		14	<5
7440280	Thallium, total	19.9		15.6	NS
7440291	Thorium, total	<0.002		<0.002	<0.002
7440326	Titanium, total	<0.000383		<0.000383	<0.000383
		<0.05		<0.05	<0.05

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Division of Waste Management

Solid Waste Branch

14 Reilly Road

Frankfort, KY 40601 (502) 564-6716

Permit Number: 073-00041

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FINDS/UNIT: KY4-640-006-686 / 1

GROUNDWATER SAMPLE ANALYSES

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INTRODUCTION

The Shawnee Special Waste Landfill was originally permitted in October 1993. The landfill was placed into Groundwater Assessment by the Kentucky Division of Waste Management (KDWM) in a letter dated February 17, 2011. This followed characterization and confirmation sampling in 2010, which indicated exceedances of background groundwater statistics and Maximum Contaminant Levels (MCLs). Now, beyond the drought conditions that occurred in 2010 and improved sampling techniques such as micropurging, there were no MCL exceedances for this sampling event. Therefore, the groundwater sampling results meet drinking water standards for required parameters. This report contains the first half of year groundwater assessment monitoring results for samples collected by TVA staff from May 11 through 14, 2015. Sample analyses were performed by ESC Lab Sciences and Southwest Research Institute (SRI). Groundwater monitoring, sample analysis and reporting were performed in accordance with 401 KAR 45:160 and the approved facility Construction/Operation Permit, the most recent dated June 20, 2014.

GROUNDWATER SAMPLING AND ANALYSIS

Unfiltered groundwater samples were collected by M.W. Starks (TVA) at background monitoring wells D19, D27 and D77, and at downgradient (compliance) wells D8A, D11, D11B, D30A, D30B, D33A, D74A, D74B, D75A, D75B, and D76A. A quality control (QC) duplicate sample was obtained from well D-8A. A field blank was collected while sampling well D-27. In addition, a duplicate sample was obtained from well D-27, as required for SRI laboratory QC. Sample collection, handling, and quality control were performed in accordance with Sections 4.1 through 4.4 of the Groundwater Monitoring Plan presented in Attachment 44 of the 2007 permit modification.

Samples were analyzed for all groundwater assessment parameters specified in the Groundwater Assessment Plan approved on April 19, 2013. Analytical results are summarized on KDWM data forms in Table 1. Groundwater samples from well D27 (which historically has contained trichloroethene and radiological contaminants flowing from off-site sources) were analyzed by SRI. Groundwater samples from all other monitoring wells were analyzed by ESC. All holding times were met.

EVALUATION OF GROUNDWATER MONITORING DATA

Comparison of the May 2015 monitoring data to Kentucky Department of Environmental Protection (KDEP) MCLs indicates there were no MCL exceedances for this sampling event (see Table 2). Additionally, statistical analysis of the groundwater monitoring data was performed for permit-required parameters using prediction intervals applied on an interwell basis (Gibbons, 1994). A description of the method, rationale for its selection, and specifics regarding application to the facility groundwater detection monitoring program (originally presented in the June 2010 monitoring report) is summarized below.

Separate statistical evaluations were performed on monitoring data for wells completed in each of the three shallow aquifers present beneath the landfill site. These aquifers include the upper Regional Groundwater Aquifer (RGA), the Upper Continental Deposits (UCD), and alluvial deposits of the Ohio River and local tributaries. Monitoring wells associated with each aquifer are identified in Table 3. Either parametric or nonparametric prediction interval methods were applied depending on normality of background constituent data. For all constituents except pH, one-sided upper prediction limits (UPLs) derived from n background measurements and having a $(1-\alpha)$ probability of including the next k measurements at compliance wells were computed for each constituent using the methods of Gibbons (1994, pp. 8-76), where α is the Type 1 (false-positive) error level and k is equal to the number of constituents times the number of compliance wells. Evaluation of pH data were performed using a two-sided prediction interval having a lower prediction limit (LPL) and an UPL. Future sample constituent measurements from compliance wells associated with each aquifer were compared to background prediction limits derived from available monitoring data for the same aquifer. If a new measurement was outside of background prediction interval, the method allows one verification resample from each monitoring well having a statistical exception. The resample is analyzed only for the exceeded constituent(s). Should the resample result also fall outside of background prediction interval, the exception is deemed statistically significant; otherwise, the original exception is considered insignificant.

A site-wide Type 1 error rate of 0.05 is maintained in application of the parametric form of the prediction interval. The corresponding individual sample constituent error rates for comparisons

Constituent	Units	Method	SHF-D11	SHF-D11B	SHF-D19	SHF-D27	SHF-D27	SHF-D30A	SHF-D30B	SHF-D33A	SHF-D74A	KDEP MCL
Alpha, total	pCi/L	EPA 900.0/7110B	6.64	-0.24	1.35	1.41	2.42	-1.69	-0.877	-0.03	-0.668	15
Aluminum, total	mg/L	EPA 6010B	9.9	0.17	0.28	0.05	0.05	<0.1	<0.1	<0.1	<0.1	
Arsenic, total	mg/L	EPA 6020	0.0026	<0.002	<0.002	0.000682	0.000734	<0.002	<0.002	0.0066	<0.002	0.01
Barium, total	mg/L	EPA 6010B	0.19	0.091	0.037	0.17	0.17	0.03	0.056	0.054	0.027	2.0
Beryllium, total	mg/L	EPA 6010B	<0.002	<0.002	<0.002	0.001	0.001	<0.002	<0.002	<0.002	<0.002	
Beta, total	pCi/L	EPA 900.0	3.87	0.081	0.844	43.56	46.18	1.76	2.4	2.94	4.9	50
Bicarbonate Alkalinity as CaCO3	mg/L	SM 2320B	<20	<20	110	122	137	85	88	<20	36	
Boron, total	mg/L	EPA 6010B	<0.2	1.4	<0.2	0.035	0.035	3.6	3.5	2.4	2	
Cadmium, total	mg/L	EPA 6020	<0.001	<0.001	<0.001	0.00025	0.00025	<0.001	<0.001	<0.001	<0.001	0.005
Calcium, total	mg/L	EPA 6010B	12	28	40	30.8	30.7	66	57	21	19	
Carbon, total organic	mg/L	EPA 415.1/9060A	1.7	1.2	3.3	0.691	0.626	3.9	1.8	<1	1.4	
Chloride, total	mg/L	EPA 9056	14	14	18	30.2	29.6	19	20	20	20	
Cobalt, total	mg/L	EPA 6020	0.0049	0.0048	<0.002	0.00025	0.00025	<0.002	0.0025	<0.002	<0.002	
COD, Low Level	mg/L	SM 410.4/5220D	<10	<10	<10	5.4	5.4	<10	<10	<10	<10	
Copper, dissolved	mg/L	EPA 6010	<0.02	<0.02	<0.02	0.00027	0.000274	<0.02	<0.02	<0.02	<0.02	1.3
Fluoride, total	mg/L	EPA 9056	<0.1	<0.1	<0.1	0.193	0.205	<0.1	0.1	0.12	0.36	4.0
Iron, total	mg/L	EPA 6010B	13	2	1.2	0.127	0.107	<0.1	2.4	9	<0.1	
Lead, total	mg/L	EPA 6020	0.0064	<0.002	<0.002	0.00025	0.00025	<0.002	<0.002	<0.002	<0.002	0.05
Magnesium, total	mg/L	EPA 6010B	3.9	10	16	12	12	20	9	4.5	<1	
Manganese, total	mg/L	EPA 6010B	0.39	1.4	0.014	0.0025	0.0025	1.7	3.8	0.96	0.35	
Groundwater Surface Elevation Above Sea Level	ft	FIELD	313.42	313.52	322.83	318.01	318.01	301.02	299.38	312.37	313.29	
Mercury, total	mg/L	EPA 7470A	<0.0002	<0.0002	<0.0002	0.0001	0.0001	<0.0002	<0.0002	<0.0002	<0.0002	0.002
Molybdenum, total	mg/L	EPA 6010/6020	<0.005	<0.005	<0.005	0.0025	0.0025	<0.005	<0.005	<0.005	0.49	
Nickel, total	mg/L	EPA 6020	0.02	0.024	0.0031	0.00144	0.00109	0.014	0.0022	<0.002	<0.002	
pH (field)	pH	FIELD	4.9	5.2	6	6.1	6.10	5.7	6.1	6.1	6.9	
Potassium, total	mg/L	EPA 6010B	1.8	2.1	<1	1.47	1.45	<1	2.3	1.1	6.1	
Selenium, total	mg/L	EPA 6020	<0.002	<0.002	0.0031	0.00286	0.00308	<0.002	<0.002	<0.002	<0.002	0.05
Sodium, total	mg/L	EPA 6010B	11	13	85	41.3	40.9	17	18	13	12	
Solids, Total Dissolved (dried at 180C)	mg/L	SM 2540C	170	260	460	253	254	450	310	180	110	
Specific conductance @ 25C (field)	umhos/cm	FIELD	146	298	678	418	418.00	540	460	253	186	
Strontium, total	mg/L	EPA 6010B	0.057	0.082	0.061	0.101	0.1	0.17	0.17	0.065	0.13	
Sulfate, total	mg/L	EPA 9056	32	130	200	34.3	33.4	180	120	60	20	
Temperature, Fahrenheit	degrees F	FIELD	16.50	17.10	16.10	18.00	18.00	16.10	17.50	18.70	22.30	
Thallium, total	mg/L	EPA 6010/6020	<0.002	<0.002	<0.002	0.00025	0.00025	<0.002	<0.002	<0.002	<0.002	
Thorium, total	mg/L	EPA 200.8/6020	0.002	<0.000383	0	0	0	<0.000383	<0.000383	<0.000383	<0.000383	
Titanium, total	mg/L	EPA 6010/6020	0.17	<0.05	<0.05	0.0025	0.0025	<0.05	<0.05	<0.05	<0.05	
Uranium, total	mg/L	EPA 200.8/6020	0.00487	<0.000067	0.00024	0.000479	0.000476	<0.000067	<0.000067	<0.000067	0.000073	
Vanadium, total	mg/L	EPA 6010/6020	0.0098	<0.005	<0.005	0.001	0.001	<0.005	<0.005	<0.005	<0.005	
Zinc, total	mg/L	EPA 6020	0.064	0.19	<0.025	0.00552	0.00592	<0.025	<0.025	<0.025	<0.025	
Turbidity, field	NTU	FIELD	161	3.8	22.3	0.2	0.2	0	2.9	49.4	0	

Constituent	Units	Method	SHF-D74B	SHF-D75A	SHF-D75B	SHF-D76A	SHF-D77	SHF-D8A	SHF-D8A	SHF-FIELD BLANK	KDEP MCL
Alpha, total	pCi/L	EPA 900.0/7110B	0.725	1.65	1.24	-3.43	-0.188	2.15	1.47	-1.35	15
Aluminum, total	mg/L	EPA 6010B	<0.1	<1	<0.1	0.14	<0.1	<0.1	<0.1	<0.1	
Arsenic, total	mg/L	EPA 6020	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.01
Barium, total	mg/L	EPA 6010B	0.028	0.063	0.031	0.03	0.053	0.12	0.12	<0.005	2.0
Beryllium, total	mg/L	EPA 6010B	<0.002	<0.02	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Beta, total	pCi/L	EPA 900.0	3.45	3.11	2.47	9.32	1.69	2.47	5.17	4.12	50
Bicarbonate Alkalinity as CaCO3	mg/L	SM 2320B	<20	<20	120	<20	130	33	35	<20	
Boron, total	mg/L	EPA 6010B	5.1	7.6	4.8	22	<0.2	0.2	<0.2	<0.2	
Cadmium, total	mg/L	EPA 6020	<0.001	<0.001	0.0013	<0.001	<0.001	<0.001	<0.001	<0.001	0.005
Calcium, total	mg/L	EPA 6010B	33	290	120	490	33	13	13	<1	
Carbon, total organic	mg/L	EPA 415.1/9060A	1.4	13	3.3	5.2	13	1.8	1.2	<1	
Chloride, total	mg/L	EPA 9056	18	7.8	14	4.8	200	35	34	<1	
Cobalt, total	mg/L	EPA 6020	<0.002	<0.002	0.003	0.021	0.037	0.0034	0.004	<0.002	
COD, Low Level	mg/L	SM 410.4/5220D	<10	110	<10	46	12	<10	32	<10	
Copper, dissolved	mg/L	EPA 6010	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	1.3
Fluoride, total	mg/L	EPA 9056	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	4.0
Iron, total	mg/L	EPA 6010B	<0.1	160	0.1	4.8	4.8	<0.1	<0.1	<0.1	
Lead, total	mg/L	EPA 6020	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.05
Magnesium, total	mg/L	EPA 6010B	3.9	19	25	1.3	15	3.2	3.3	<1	
Manganese, total	mg/L	EPA 6010B	0.85	67	5	4	1.2	1.7	1.7	<0.01	
Groundwater Surface Elevation Above Sea Level	ft	FIELD	308.99	321.10	326.31	319.98	304.99	319.03	319.03	NS	
Mercury, total	mg/L	EPA 7470A	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.002
Molybdenum, total	mg/L	EPA 6010/6020	<0.005	<0.005	<0.005	0.051	<0.005	<0.005	<0.005	<0.005	
Nickel, total	mg/L	EPA 6020	0.011	<0.002	0.012	0.011	0.025	0.0036	0.0042	<0.002	
pH (field)	pH	FIELD	5.6	6.3	6	6.3	5.5	5.40	5.4	NS	
Potassium, total	mg/L	EPA 6010B	4.8	<10	1.6	17	1	4	4	<1	
Selenium, total	mg/L	EPA 6020	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.05
Sodium, total	mg/L	EPA 6010B	12	16	16	17	180	24	24	<1	
Solids, Total Dissolved (dried at 180C)	mg/L	SM 2540C	240	1600	630	2000	650	160	140	<10	
Specific conductance @ 25C (field)	umhos/cm	FIELD	304	1877	771	2278	1431	237	237	NS	
Strontium, total	mg/L	EPA 6010B	0.13	0.76	0.34	0.92	0.14	0.083	0.082	<0.01	
Sulfate, total	mg/L	EPA 9056	100	1100	300	1300	190	14	14	<5	
Temperature, Fahrenheit	degrees F	FIELD	22.70	20.00	18.70	19.90	15.80	15.6	15.6	NS	
Thallium, total	mg/L	EPA 6010/6020	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Thorium, total	mg/L	EPA 200.8/6020	<0.000383	<0.000383	<0.000383	<0.000383	<0.000383	<0.000383	<0.000383	<0.000383	
Titanium, total	mg/L	EPA 6010/6020	<0.05	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Uranium, total	mg/L	EPA 200.8/6020	<0.000067	<0.000067	0.000108	<0.000067	<0.000067	<0.000067	<0.000067	<0.000067	
Vanadium, total	mg/L	EPA 6010/6020	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Zinc, total	mg/L	EPA 6020	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	
Turbidity, field	NTU	FIELD	0	34.7	0	30.1	1.7	0.00	0	NS	

Table 3. Aquifer-Specific Groundwater Monitoring Networks

Aquifer	Well	Installation Date	Location Relative to Landfill
Upper RGA	D27	Apr-1988	Background
	D8A	Sep-1987	Downgradient (Little Bayou side)
	D11B	Jun-2008	Downgradient (Ohio River side)
	D30B	Jun-2008	Downgradient (Ohio River side)
	D74B	Jun-2008	Downgradient (Ohio River side)
	D75B	Jun-2008	Downgradient (Little Bayou side)
UCD	D19	Apr-1988	Background
	D75A	Jun-2008	Downgradient (Little Bayou side)
	D76A	Jun-2008	Downgradient (Little Bayou side)
Alluvium	D77	Jun-2008	Background
	D11	Mar-1988	Downgradient (Ohio River side)
	D30A	Jun-2008	Downgradient (Ohio River side)
	D33A	Jun-2008	Downgradient (Ohio River side)
	D74A	Jun-2008	Downgradient (Ohio River side)

are computed and reported based on the number of compliance locations, constituents, and verification resamples using the methodology presented in the American Society for Testing and Materials (ASTM) D6312-98 (ASTM, 1998). For nonparametric prediction interval testing, the confidence level is based on n , k , and the number of resamples. Constituent prediction limits are updated with new sample measurements added to the pool of background data for each aquifer. Statistical analysis of monitoring data are performed using MANAGES groundwater data management and evaluation software (EPRI, 2013).

Statistical results for the May 2015 groundwater monitoring data are summarized in Table 4. Computed background testing limits and other supporting information pertaining to statistical analysis of constituent data for UCD, RGA, and alluvial well samples are provided in Appendices A, B and C, respectively. Statistical exceedances for wells in the UCD were shown for boron, COD, specific conductance, sulfate, total dissolved solids, and total organic carbon (Table 4). RGA data exceptions are also shown in Table 4. Exceedances were shown for boron, pH, specific conductance, sulfate, and total dissolved solids (Table 4). COD was also in an exceedance for the Well D-8A duplicate, but not the well itself. This makes the COD UPL suspect, as all other parameters closely align with the well results. The alluvial aquifer, showed exceedances for boron, molybdenum, and pH (Table 4).

Statistical findings indicate the likelihood of coal-combustion by-product effects on groundwater beneath and downgradient of the Special Waste Landfill. However, current groundwater quality in the landfill locality does not exceed KDEP MCLs for drinking water (Table 2). No confirmation sampling was recommended following this monitoring event because statistical exceptions were similar to those observed since September 2010. While the water beneath and downgradient of the landfill meet drinking water standards, groundwater beneath the SHF reservation is restricted from use due to the Department of Energy Water Policy Boundary, which includes the entire SHF reservation.

GROUNDWATER POTENTIOMETRIC SURFACE MAPS

Groundwater level elevations measured in monitoring wells on May 11, 2015, prior to sampling are included in Table 1. These measurements were used in preparing groundwater

PARAMETER	UNITS	UCD AQUIFER				REGIONAL GRAVEL AQUIFER							ALLUVIAL AQUIFER				
		UPL (D19)	D75A	D76A		UPL (D27)	D11B	D30B	D74B	D75B	D8A	D8A- DUP	UPL (D77)	D11	D30A	D33A	D74A
Boron, total	mg/L	0.20	7.6	22		0.20	1.4	3.5	5.1	4.8	0.2	<0.2	0.41	<0.2	3.6	2.4	2
Carbon, total organic	mg/L	4.75	13	5.2		2.00	1.2	1.8	1.4	3.3	1.8	1.2	12.33	1.7	3.9	<1	1.4
Chloride, total	mg/L	25.528	7.8	4.8		36.7	14	20	18	14	35	34	222.0	14	19	20	20
COD, Low Level	mg/L	44.0	110	46		20.0	<10	<10	<10	<10	<10	32	48.0	<10	<10	<10	<10
Molybdenum, total	mg/L	0.020	<0.005	0.051		0.0050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.020	<0.005	<0.005	<0.005	0.49
pH (field) ¹	std	5.8-6.9	6.3	6.3		5.87-6.54	5.2	6.1	5.6	6	5.4	5.4	5.4-6.3	4.9	5.7	6.1	6.9
Specific conductance (field)	umhos/cm	1704	1877	2278		506	298	460	304	771	237	237	1448	146	540	253	186
Sulfate, total	mg/L	200	1100	1300		45.7	130	120	100	300	14	14	226	32	180	60	20
Total Dissolved Solids	mg/L	474.098	1600	2000		319	260	310	240	630	160	140	737	170	450	180	110
Vanadium, total	mg/L	0.010	<0.005	<0.005		0.010	<0.0025	<0.005	<0.005	<0.005	<0.005	<0.005	0.010	0.0098	<0.005	<0.005	<0.005

¹ pH data are compared to LPL and UPL.

Data values shown in **red** denote UPL or LPL exceptions.

NS = no sample; well did not recover enough after purging to provide adequate volume for sampling.

potentiometric maps for the RGA aquifer presented on Figure 2. The essentially linear array of monitoring wells completed in the alluvial and UCD aquifers precludes development of meaningful potentiometric surfaces for the formations; consequently, measured groundwater elevations are posted beside each well on Figures 1 and 3, respectively. The inferred direction of groundwater movement in the three shallow aquifers beneath the site is generally toward the Ohio River.

CONCLUSIONS

The May 2015 groundwater assessment monitoring results demonstrate no MCL exceedances.

Statistical exceedances for wells in the UCD were shown for boron, COD, specific conductance, sulfate, total dissolved solids, and total organic carbon. RGA statistical exceedances were shown for boron, pH, specific conductance, sulfate, and total dissolved solids. COD was also in an exceedance for the Well D-8A duplicate, but not the well itself. This makes the COD UPL suspect, as all other parameters closely align with the well results. The alluvial aquifer, showed exceedances for boron, molybdenum, and pH. While statistical findings indicate potential coal-combustion by-product effects on groundwater beneath and downgradient of the Special Waste Landfill, local groundwater quality down gradient of the landfill does not exceed KDEP MCLs for drinking water, and has an existing restriction on its use due by the DOE water policy boundary.

CONTACT FOR FURTHER INFORMATION

Report preparation was performed by Ronda L. Hooper, an Ash and Groundwater Specialist with Waste Permits, Compliance, and Monitoring. Any questions regarding this groundwater monitoring report should be directed to her in TVA's Chattanooga office at (423) 751-6399.

Figure 1. UCD Groundwater Potentiometric Levels on May 11, 2015



Figure 2. RGA Groundwater Potentiometric Surface on May 11, 2015

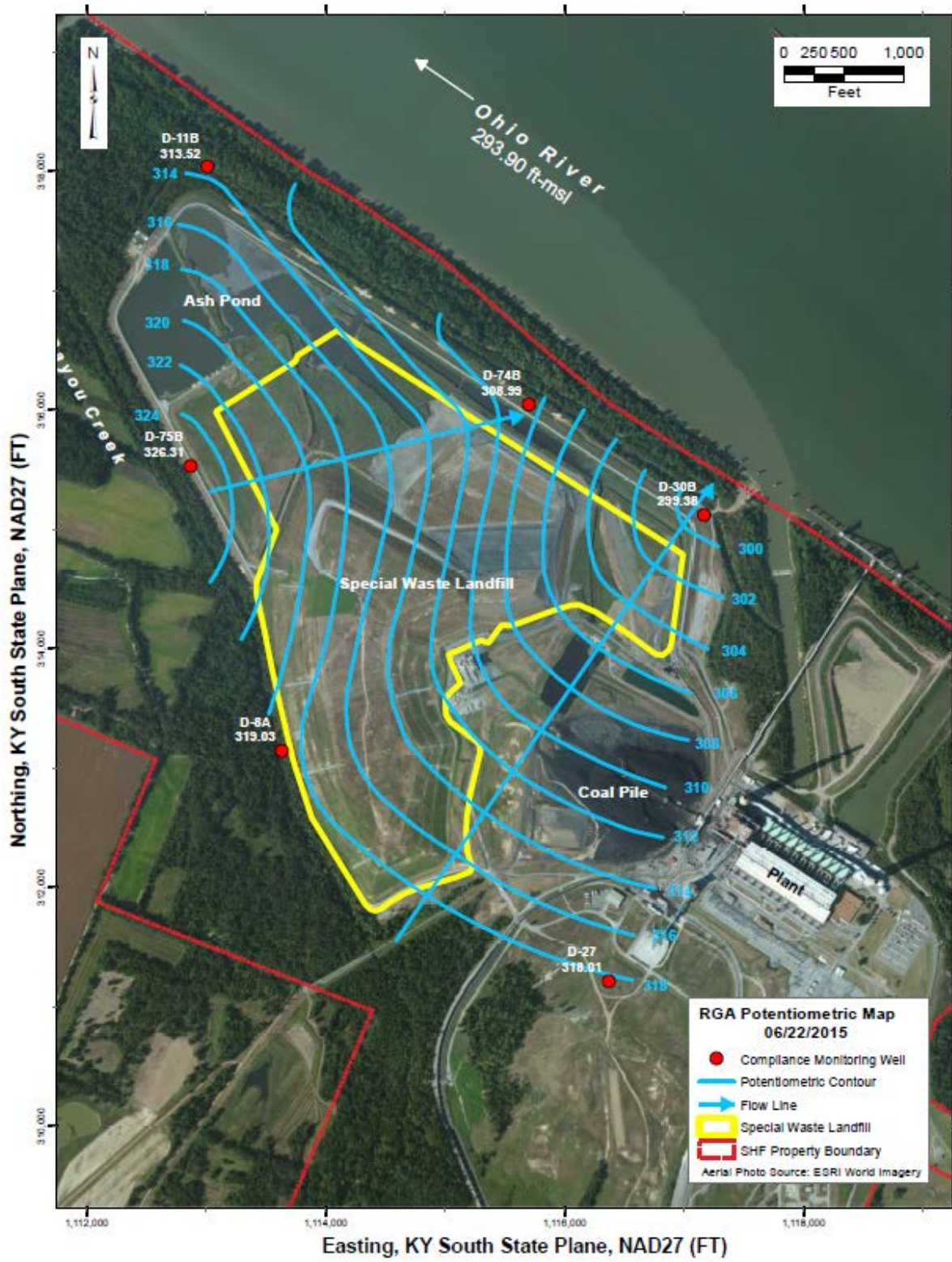


Figure 3. Alluvial Aquifer Groundwater Potentiometric Levels on May 11, 2015



REFERENCES

- ASTM, 1998, Standard Guide for Developing Appropriate Statistical Approaches for Groundwater Detection Monitoring Programs, ASTM D 6312-98.
- Gibbons, R.D., 1994, Statistical Methods for Groundwater Monitoring, John Wiley & Sons, Inc.
- EPRI, 2013, “MANAGES (version 3.4b), Groundwater Data Management and Evaluation Software”, EPRI product # 1012581, Palo Alto, CA.



ENERGY AND ENVIRONMENT CABINET

DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
200 FAIR OAKS LANE, 2ND FLOOR
FRANKFURT, KY 40601
TELEPHONE NUMBER (502) 564-6716

Groundwater and Surface Water Monitoring Sample Data Reporting Form

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statute (Kentucky Revised Statutes Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

1. Facility Name: Tennessee Valley Authority, Shawnee Fossil Plant

2. Activity: Special Waste Landfill

3. Agency Interest #: 3073

4. Permit #: 073-00041

5. Finds/Unit No.: KY4-640-006-686 /1

6. Quarter and Year: 3rd 2015

7. Check **one** of the following:

☐ Characterization ☐ Quarterly ☒ Semi-Annual ☐ Annual ☐ Assessment

8. Check applicable submittal: ☐ Groundwater ☒ Surface Water

FACILITY INFORMATION

9. Facility Name: Tennessee Valley Authority, Shawnee Fossil Plant

10. Facility Address: 7900 Metropolis Lake Road, Paducah, KY 42086-9450

11. County: McCracken **12.** Latitude: 37° 09' 15" **13.** Longitude: 88° 47' 25"

14. Sampling Date: 05/11/2015 to 05/14/2015

OWNER INFORMATION

15. Facility Owner: Tennessee Valley Authority **16.** Phone No.: (270) 575-8001

17. Contact Person: Holly Lawrence **18.** Phone No.: (270) 575-8024

19. Contact Person Title: Environmental Scientist

20. Mailing Address: Highway 996, Paducah, KY 42001

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

21. Company: Tennessee Valley Authority

22. Contact Person: Ronda L. Hooper **23.** Phone No.: (423) 751-6399

24. Mailing Address: TVA BR 4A-C, 1101 Market Street, Chattanooga, TN 37402

LABORATORY RECORD #1

25. Laboratory: Environmental Science Corporation **26.** Lab ID No.: TN-2006

27. Contact Person: Pam Langford **28.** Phone No.: (800) 767-5859

29. Mailing Address: 12065 Lebanon Rd., Mt. Juliet, TN 37122

LABORATORY RECORD #2

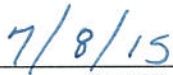
30. Laboratory: Southwest Research Institute **31.** Lab ID No.: KY-90010

32. Contact Person: Ms. Jackie Ranger **33.** Phone No.: (210) 522-3320

34. Mailing Address: 6220 Culebra Road, San Antonio, TX 78228

35. Certification statement: This certification clause shall be signed by the responsible person(s) described in 401 KAR 47:160, Section 6(1), and/or (2) and is required by 401 KAR 47:160, Section 6(4). This clause may be incorporated into a cover letter and attached to this submission. This clause shall accompany every report/application submitted to this office.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for such violations.

 _____ SIGNATURE	 _____ DATE
---	--

Jerry M. Kaler, Shawnee Fossil Plant Manager
NAME and TITLE - PLEASE PRINT

Table 1. Special Waste Landfill - Surface Water Monitoring Results - June 2014

Division of Waste Management
Solid Waste Branch
14 Reilly Road
Frankfort, KY 40601 (502) 564-6716

Permit Number: 073-00041

Facility: TVA - Shawnee Fossil Plant

FINDS/UNIT: KY4-640-006-686 / 1

SURFACE WATER SAMPLE ANALYSES

AKGWA NUMBER ¹ , Facility Well/Spring Number				MNPT0002	MNPT0002	MNPT0003	MNPT0004	MNPT0005
Facility's Local Well or Spring Number (e.g. MW-1, etc.)				SW-A	SW-A	SW-B	SW-C	SW-D
Sample Sequence # (For Official Use Only)								
If sample is a Blank, specify Type (Field, Test, Method, or Equipment)								
Sample Date and Time (Month/Day/Year hour:minutes)				5/13/15 11:10	5/13/15 11:10	5/13/15 10:35	5/13/15 11:50	5/13/15 12:15
Duplicate ("Y" or "N") ²				N	Y	N	N	N
Split ("Y" or "N") ³				N	N	N	N	N
Facility Sample ID Number (if applicable)								
Laboratory Sample ID Number (if applicable)				L765432-01	L765432-05	L765432-02	L765432-03	L765432-04
Date of Analysis (Month/Day/Year)				5/20/15-6/8/15	5/20/15-6/8/15	5/21/15-6/8/15	5/20/15-6/8/15	5/20/15-6/8/15
Gradient with respect to monitored unit (Up, Down, Side)				Up	Down	Up	Up	Down
CASRN ⁴	SYSTEMATIC PARAMETER NAME ⁵	UNITS OF MEAS.	METHOD	DETECTED VALUE OR PQL ⁶	DETECTED VALUE OR PQL ⁶	DETECTED VALUE OR PQL ⁶	DETECTED VALUE OR PQL ⁶	DETECTED VALUE OR PQL ⁶
7440428	Boron, total	T mg/L	EPA 6010B	<200	<200	<200	<200	<200
7440702	Calcium, total	T mg/L	EPA 6010B	40	40	42.00	26	41
16887006	Chloride, total	T mg/L	EPA 9056	15	15	21.00	23	26
S0296	pH (field)	std	field	7.3	7.3	6.80	7.5	7.6
10053	Solids, Total Suspended	T mg/L	SM 2540D	25	28	120.00	11	23
14808798	Sulfate, total	T mg/L	EPA 9056	38	38	39.00	18	38

¹ AKGWA # is 0000-0000 for any type of blank.

² Respond 'Y' if the sample was a duplicate of another sample in this report.

³ Respond 'Y' if the sample was split and analyzed by separate laboratories.

⁴ Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.

⁵ "T" = Total; "D" = Dissolved

⁶ "<" indicates a non-detect; do not use 'ND' or 'BDL'. Value then shown is Practical Quantitation Limit.

J = Estimated value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

INTRODUCTION

This report is to comply with the permit requirements for the TVA Shawnee Fossil Plant Special Waste Landfill, Permit No. SW07300041 dated June 20, 2014. Specifically, it addresses required surface water monitoring in accordance 401 KAR 45:160 and the approved Surface Water Monitoring Plan. Attachment 43 of the 2007 permit modification of the Special Waste Landfill Permit contains the Surface Water Monitoring Plan. This is the report of the first half of the year, semiannual surface water monitoring data collected May 13, 2015 from designated monitoring sites on the Ohio River and Little Bayou Creek (LBC). Samples were collected from the four locations (SW-A to SW-D) shown in Figure 1. The Ohio River field conditions created a turbid sample from location SW-B (87.2 NTU). Samples were analyzed by ESC Lab Sciences, Mt. Juliet, Tennessee. Sample collection, analysis and reporting were performed by TVA staff in accordance with 401 KAR 45:160 and the approved Surface Water Monitoring Plan.

SURFACE WATER SAMPLING AND ANALYSIS

Unfiltered grab samples were collected by M.W. Starks at SW-A, SW-B, SW-C, and SW-D surface water monitoring stations on LBC and the Ohio River. The stations were field determined and in the general vicinity of the longitude and latitude coordinates of the monitoring points designated in Figure 1. Bill McDonough with KDWM confirmed the field-determined locations of the monitoring points as appropriate. Monitoring stations SW-A and SW-B are positioned at upstream and downstream locations on the Ohio River relative to the Special Waste Landfill; whereas, stations SW-C and SW-D are located at upstream and downstream sites on LBC. Field duplicate samples were collected at station SW-A. Sample collection, handling and quality control were performed as specified in the Surface Water Monitoring Plan (Attachment 43) of the Facility Permit Application, and in accordance with *EPA Region 4 Operating Procedure: Surface Water Sampling, SESDPROC-201-R1, November 1, 2007*. Water samples were received by ESC on May 15, 2015 and analytical results were reported on May 26, 2015.

Ohio River and LBC water samples were analyzed for the six parameters specified in the most recent Facility Permit dated June 20, 2014, using the analytical methods listed in Table 2 of Attachment 43 of the 2007 permit modification. Analytical results are summarized in the KDWM data form on Table 1. All analytical testing was conducted within recommended sample holding times.

Upstream-downstream data comparisons for LBC indicate mixed results. There was a slightly higher concentration of calcium, chloride and sulfate at downstream station SW-D than at upstream station SW-C, but SW-D had double the level of total suspended solids (TSS). The high TSS could have influenced some of the results. Boron was non-detectable at both locations, and pH was approximately the same.

The downstream data for the river, SW-B showed very little change from the upstream sampling point SW-A, with the exception of a slight increase in chloride, and the TSS was several times higher at the downstream Ohio River sampling point (SW-B).

CONTACT FOR FURTHER INFORMATION

The surface water monitoring report was prepared by Ronda Hooper, an Ash and Groundwater Specialist with Waste Permits, Compliance, and Monitoring. Any questions regarding this report should be directed to her in Chattanooga at (423) 751-6399.

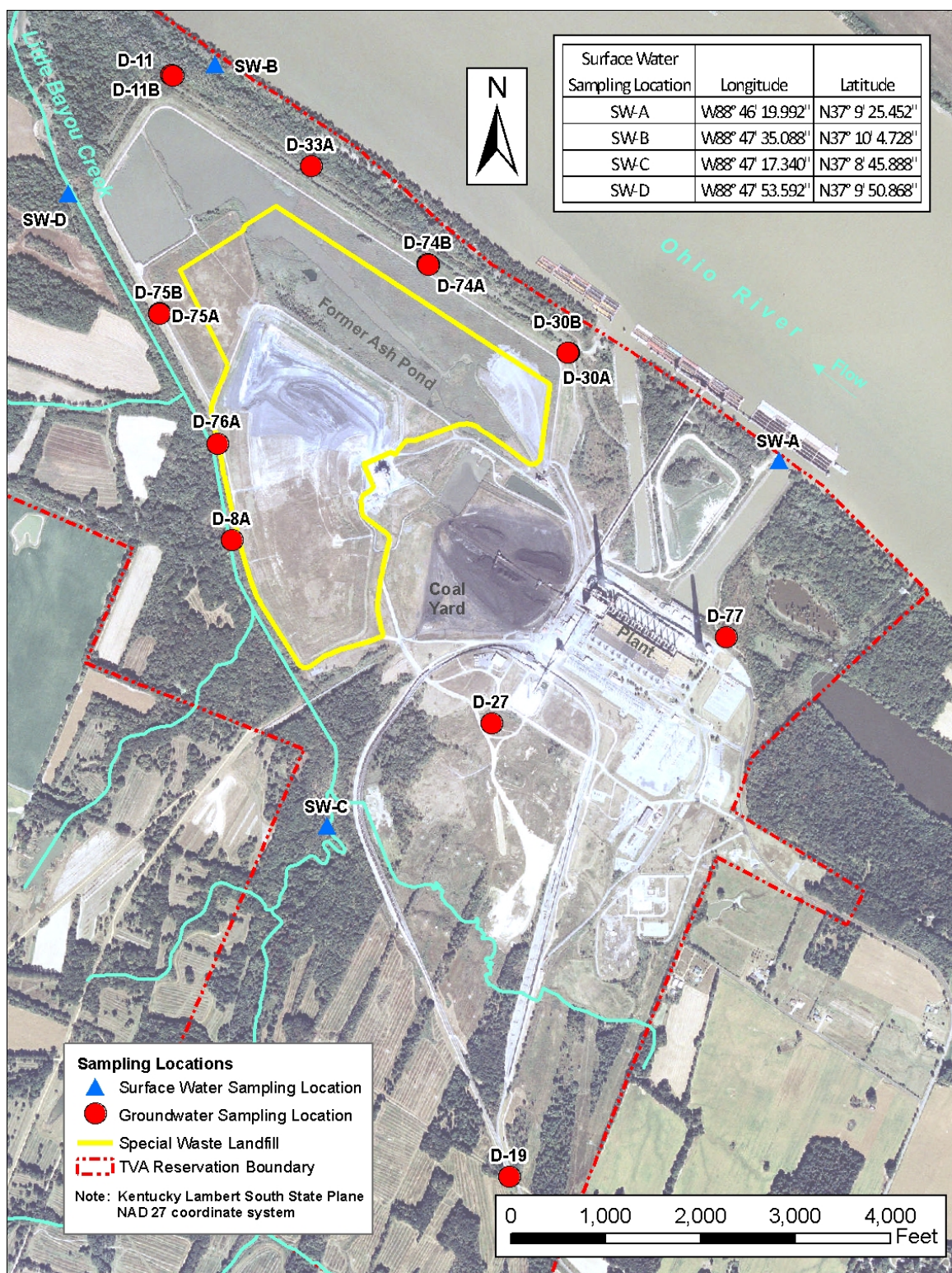


Figure 1. Shawnee Fossil Plant Surface Water Sampling Locations

APPENDIX A

PREDICTION LIMIT STATISTICAL RESULTS FOR UCD AQUIFER MONITORING WELL DATA

Shawnee

Statistical Analysis Procedure

Background Date Range: 11/01/2006 to 05/14/2015 Background Locations: SHF-D19		Number of Future Observations: 20.00	
Compliance Date Range: 05/11/2015 to 05/14/2015 Compliance Locations: SHF-D75A,SHF-D76A			
Comparison Method if all Background Results are Non-Detect: Statistical Test for Parametric Background Data Distributions: Statistical Test for Cases with High Percentage of Non-Detect Background Data: Statistical Test for Cases with High Percentage of Non-Detect Background Data: Statistical Test for Non-Parametric Background Data Distributions:		STmdl = Last MDL STpar = Parametric Prediction Interval on Background STlow1 = Non-Parametric Prediction Interval on Background (ND Frequency > 55%) STlow2 = Non-Parametric Prediction Interval on Background (ND Frequency > 90%) STnon = Non-Parametric Prediction Interval on Background	
Background Comparison:		Interwell	
Number of Verification Samples:		1	
Default Type 1 Individual Comparison Error Level (False Positive Rate) for tests other than Prediction Interval		0.05	
Type 1 Individual Comparison Error Level (False Positive Rate) for Prediction Interval		Calculate based on number of locations, parameters, and number of verification resamples, assumes site-wide Error Level of 0.05, using the approach of ASTM (1998).	
Non-Detect Processing (Parametric Tests):		<=55% using MDL * 1.0 >55% using MDL * 1.0	
Non-Detect Processing (All Other):		<=55% using MDL * 1.0 >55% using MDL * 1.0	

Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
SHF-D75A	Boron, total, ug/L	05/12/2015	20	100.00	No/No	STmdl	N/A	200.000		7,600.000	Yes	
SHF-D75A	Carbon, total organic, mg/L	05/12/2015	20	0.00	No/No	STnon	99.14	4.750		13.000	Yes	
SHF-D75A	Chloride, total, mg/L	05/12/2015	20	0.00	Yes/Yes	STpar	94.94	25.528		7.800	No	
SHF-D75A	COD, Low Level, mg/L	05/12/2015	20	70.00	No/No	STlow1	99.14	44.000		110.000	Yes	
SHF-D75A	Molybdenum, total, ug/L	05/12/2015	20	90.00	No/No	STlow1	99.14	20.000		<5.000	No	
SHF-D75A	pH (field), pH	05/12/2015	21	0.00	No/No	STnon	99.22	6.900	5.800	6.300	No	
SHF-D75A	Specific Cond. (Field), umhos/cm	05/12/2015	21	0.00	No/No	STnon	99.22	1,704.000		1,877.000	Yes	
SHF-D75A	Sulfate, total, mg/L	05/12/2015	20	0.00	No/No	STnon	99.14	200.000		1,100.000	Yes	
SHF-D75A	TDS - 180C, mg/L	05/12/2015	20	0.00	Yes/Yes	STpar	94.94	474.098		1,600.000	Yes	
SHF-D75A	Vanadium, total, ug/L	05/12/2015	20	80.00	No/No	STlow1	99.14	10.000		<5.000	No	

MANAGES

Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
SHF-D76A	Boron, total, ug/L	05/12/2015	20	100.00	No/No	STmdl	N/A	200.000		22,000.000	Yes	
SHF-D76A	Carbon, total organic, mg/L	05/12/2015	20	0.00	No/No	STnon	99.14	4.750		5.200	Yes	
SHF-D76A	Chloride, total, mg/L	05/12/2015	20	0.00	Yes/Yes	STpar	94.94	25.528		4.800	No	
SHF-D76A	COD, Low Level, mg/L	05/12/2015	20	70.00	No/No	STlow1	99.14	44.000		46.000	Yes	
SHF-D76A	Molybdenum, total, ug/L	05/12/2015	20	90.00	No/No	STlow1	99.14	20.000		51.000	Yes	
SHF-D76A	pH (field), pH	05/12/2015	21	0.00	No/No	STnon	99.22	6.900	5.800	6.300	No	
SHF-D76A	Specific Cond. (Field), umhos/cm	05/12/2015	21	0.00	No/No	STnon	99.22	1,704.000		2,278.000	Yes	
SHF-D76A	Sulfate, total, mg/L	05/12/2015	20	0.00	No/No	STnon	99.14	200.000		1,300.000	Yes	
SHF-D76A	TDS - 180C, mg/L	05/12/2015	20	0.00	Yes/Yes	STpar	94.94	474.098		2,000.000	Yes	
SHF-D76A	Vanadium, total, ug/L	05/12/2015	20	80.00	No/No	STlow1	99.14	10.000		<5.000	No	

MANAGES

APPENDIX B

PREDICTION LIMIT STATISTICAL RESULTS FOR RGA MONITORING WELL DATA

Shawnee

Statistical Analysis Procedure

Background Date Range: 11/01/2006 to 05/14/2015
Background Locations: SHF-D27

Compliance Date Range: 05/11/2015 to 05/14/2015
Compliance Locations: SHF-D11B, SHF-D30B, SHF-D74B, SHF-D75B, SHF-D8A

Comparison Method if all Background Results are Non-Detect: STmdl = Last MDL
Statistical Test for Parametric Background Data Distributions: STpar = Parametric Prediction Interval on Background
Statistical Test for Cases with High Percentage of Non-Detect Background Data: STlow1 = Non-Parametric Prediction Interval on Background (ND Frequency > 55%)
Statistical Test for Cases with High Percentage of Non-Detect Background Data: STlow2 = Non-Parametric Prediction Interval on Background (ND Frequency > 90%)
Statistical Test for Non-Parametric Background Data Distributions: STnon = Non-Parametric Prediction Interval on Background

Background Comparison: Interwell

Number of Verification Samples: 1
Default Type 1 Individual Comparison Error Level (False Positive Rate) for tests other than Prediction Interval: 0.05

Non-Detect Processing (Parametric Tests):
<=55% using MDL * 1.0
>55% using MDL * 1.0

Non-Detect Processing (All Other):
<=55% using MDL * 1.0
>55% using MDL * 1.0

Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
SHF-D11B	Boron, total, ug/L	05/13/2015	20	90.00	No/No	STlow1	97.93	200.000		1,400.000	Yes	
SHF-D11B	Carbon, total organic, mg/L	05/13/2015	24	75.00	No/No	STlow1	98.51	2.000		1.200	No	
SHF-D11B	Chloride, total, mg/L	05/13/2015	24	0.00	Yes/Yes	STpar	96.80	36.707		14.000	No	
SHF-D11B	COD, Low Level, mg/L	05/13/2015	24	79.17	No/No	STlow1	98.51	20.000		<10.000	No	
SHF-D11B	Molybdenum, total, ug/L	05/13/2015	20	95.00	No/No	STlow1	97.93	5.000		<5.000	No	
SHF-D11B	pH (field), pH	05/12/2015	24	0.00	Yes/Yes	STpar	96.80	6.544	5.872	5.200	Yes	
SHF-D11B	Specific Cond. (Field), umhos/cm	05/12/2015	24	0.00	Yes/Yes	STpar	96.80	505.719		298.000	No	
SHF-D11B	Sulfate, total, mg/L	05/13/2015	24	0.00	Yes/Yes	STpar	96.80	45.713		130.000	Yes	
SHF-D11B	TDS - 180C, mg/L	05/13/2015	24	0.00	Yes/Yes	STpar	96.80	319.208		260.000	No	
SHF-D11B	Vanadium, total, ug/L	05/13/2015	20	85.00	No/No	STlow1	97.93	10.000		<5.000	No	

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Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
SHF-D30B	Boron, total, ug/L	05/13/2015	20	90.00	No/No	STlow1	97.93	200.000		3,500.000	Yes	
SHF-D30B	Carbon, total organic, mg/L	05/13/2015	24	75.00	No/No	STlow1	98.51	2.000		1.800	No	
SHF-D30B	Chloride, total, mg/L	05/13/2015	24	0.00	Yes/Yes	STpar	96.80	36.707		20.000	No	
SHF-D30B	COD, Low Level, mg/L	05/13/2015	24	79.17	No/No	STlow1	98.51	20.000		<10.000	No	
SHF-D30B	Molybdenum, total, ug/L	05/13/2015	20	95.00	No/No	STlow1	97.93	5.000		<5.000	No	
SHF-D30B	pH (field), pH	05/12/2015	24	0.00	Yes/Yes	STpar	96.80	6.544	5.872	6.100	No	
SHF-D30B	Specific Cond. (Field), umhos/cm	05/12/2015	24	0.00	Yes/Yes	STpar	96.80	505.719		460.000	No	
SHF-D30B	Sulfate, total, mg/L	05/13/2015	24	0.00	Yes/Yes	STpar	96.80	45.713		120.000	Yes	
SHF-D30B	TDS - 180C, mg/L	05/13/2015	24	0.00	Yes/Yes	STpar	96.80	319.208		310.000	No	
SHF-D30B	Vanadium, total, ug/L	05/13/2015	20	85.00	No/No	STlow1	97.93	10.000		<5.000	No	

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Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
SHF-D74B	Boron, total, ug/L	05/12/2015	20	90.00	No/No	STlow1	97.93	200.000		5,100.000	Yes	
SHF-D74B	Carbon, total organic, mg/L	05/12/2015	24	75.00	No/No	STlow1	98.51	2.000		1.400	No	
SHF-D74B	Chloride, total, mg/L	05/12/2015	24	0.00	Yes/Yes	STpar	96.80	36.707		18.000	No	
SHF-D74B	COD, Low Level, mg/L	05/12/2015	24	79.17	No/No	STlow1	98.51	20.000		<10.000	No	
SHF-D74B	Molybdenum, total, ug/L	05/12/2015	20	95.00	No/No	STlow1	97.93	5.000		<5.000	No	
SHF-D74B	pH (field), pH	05/12/2015	24	0.00	Yes/Yes	STpar	96.80	6.544	5.872	5.600	Yes	
SHF-D74B	Specific Cond. (Field), umhos/cm	05/12/2015	24	0.00	Yes/Yes	STpar	96.80	505.719		304.000	No	
SHF-D74B	Sulfate, total, mg/L	05/12/2015	24	0.00	Yes/Yes	STpar	96.80	45.713		100.000	Yes	
SHF-D74B	TDS - 180C, mg/L	05/12/2015	24	0.00	Yes/Yes	STpar	96.80	319.208		240.000	No	
SHF-D74B	Vanadium, total, ug/L	05/12/2015	20	85.00	No/No	STlow1	97.93	10.000		<5.000	No	

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Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
SHF-D75B	Boron, total, ug/L	05/12/2015	20	90.00	No/No	STlow1	97.93	200.000		4,800.000	Yes	
SHF-D75B	Carbon, total organic, mg/L	05/12/2015	24	75.00	No/No	STlow1	98.51	2.000		3.300	Yes	
SHF-D75B	Chloride, total, mg/L	05/12/2015	24	0.00	Yes/Yes	STpar	96.80	36.707		14.000	No	
SHF-D75B	COD, Low Level, mg/L	05/12/2015	24	79.17	No/No	STlow1	98.51	20.000		<10.000	No	
SHF-D75B	Molybdenum, total, ug/L	05/12/2015	20	95.00	No/No	STlow1	97.93	5.000		<5.000	No	
SHF-D75B	pH (field), pH	05/12/2015	24	0.00	Yes/Yes	STpar	96.80	6.544	5.872	6.000	No	
SHF-D75B	Specific Cond. (Field), umhos/cm	05/12/2015	24	0.00	Yes/Yes	STpar	96.80	505.719		771.000	Yes	
SHF-D75B	Sulfate, total, mg/L	05/12/2015	24	0.00	Yes/Yes	STpar	96.80	45.713		300.000	Yes	
SHF-D75B	TDS - 180C, mg/L	05/12/2015	24	0.00	Yes/Yes	STpar	96.80	319.208		630.000	Yes	
SHF-D75B	Vanadium, total, ug/L	05/12/2015	20	85.00	No/No	STlow1	97.93	10.000		<5.000	No	

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Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
SHF-D8A	Boron, total, ug/L	05/12/2015	20	90.00	No/No	STlow1	97.93	200.000		200.000	No	
		05/12/2015	20	90.00	No/No		97.93	200.000		<200.000	No	
SHF-D8A	Carbon, total organic, mg/L	05/12/2015	24	75.00	No/No	STlow1	98.51	2.000		1.800	No	
		05/12/2015	24	75.00	No/No		98.51	2.000		1.200	No	
SHF-D8A	Chloride, total, mg/L	05/12/2015	24	0.00	Yes/Yes	STpar	96.80	36.707		35.000	No	
		05/12/2015	24	0.00	Yes/Yes		96.80	36.707		34.000	No	
SHF-D8A	COD, Low Level, mg/L	05/12/2015	24	79.17	No/No	STlow1	98.51	20.000		<10.000	No	
		05/12/2015	24	79.17	No/No		98.51	20.000		32.000	Yes	
SHF-D8A	Molybdenum, total, ug/L	05/12/2015	20	95.00	No/No	STlow1	97.93	5.000		<5.000	No	
		05/12/2015	20	95.00	No/No		97.93	5.000		<5.000	No	
SHF-D8A	pH (field), pH	05/12/2015	24	0.00	Yes/Yes	STpar	96.80	6.544	5.872	5.400	Yes	
SHF-D8A	Specific Cond. (Field), umhos/cm	05/12/2015	24	0.00	Yes/Yes	STpar	96.80	505.719		237.000	No	
SHF-D8A	Sulfate, total, mg/L	05/12/2015	24	0.00	Yes/Yes	STpar	96.80	45.713		14.000	No	
		05/12/2015	24	0.00	Yes/Yes		96.80	45.713		14.000	No	

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Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
SHF-D8A	TDS - 180C, mg/L	05/12/2015	24	0.00	Yes/Yes	STpar	96.80	319,208		160,000	No	No
		05/12/2015	24	0.00	Yes/Yes		96.80	319,208		140,000	No	No
SHF-D8A	Vanadium, total, ug/L	05/12/2015	20	85.00	No/No	STlow1	97.93	10,000		<5,000	No	No
		05/12/2015	20	85.00	No/No		97.93	10,000		<5,000	No	No

APPENDIX C

PREDICTION LIMIT STATISTICAL RESULTS FOR ALLUVIAL AQUIFER MONITORING WELL DATA

Shawnee
Statistical Analysis Procedure

Background Date Range: 11/01/2006 to 05/14/2015

Background Locations: SHF-D77

Compliance Date Range: 05/11/2015 to 05/14/2015

Compliance Locations: SHF-D11, SHF-D30A, SHF-D33A, SHF-D74A

Comparison Method if all Background Results are Non-Detect:

Statistical Test for Parametric Background Data Distributions:

Statistical Test for Cases with High Percentage of Non-Detect Background Data:

Statistical Test for Cases with High Percentage of Non-Detect Background Data:

Statistical Test for Non-Parametric Background Data Distributions:

STmdl = Last MDL

STpar = Parametric Prediction Interval on Background

STlow1 = Non-Parametric Prediction Interval on Background (ND Frequency > 55%)

STlow2 = Non-Parametric Prediction Interval on Background (ND Frequency > 90%)

STnon = Non-Parametric Prediction Interval on Background

Background Comparison:

Interwell

Number of Verification Samples:

1

Default Type 1 Individual Comparison Error Level

(False Positive Rate) for tests other than Prediction Interval

0.05

Non-Detect Processing (Parametric Tests):

<=55% using MDL * 1.0

>55% using MDL * 1.0

Non-Detect Processing (All Other):

<=55% using MDL * 1.0

>55% using MDL * 1.0

Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
SHF-D11	Boron, total, ug/L	05/13/2015	20	75.00	Yes/No	STlow1	98.32	410.000		<200.000	No	
SHF-D11	Carbon, total organic, mg/L	05/13/2015	20	5.00	No/Yes	STpar	96.42	12.331		1.700	No	
SHF-D11	Chloride, total, mg/L	05/13/2015	20	0.00	No/No	SThon	98.32	222.000		14.000	No	
SHF-D11	COD, Low Level, mg/L	05/13/2015	20	60.00	No/No	STlow1	98.32	48.000		<10.000	No	
SHF-D11	Molybdenum, total, ug/L	05/13/2015	20	90.00	No/No	STlow1	98.32	20.000		<5.000	No	
SHF-D11	pH (field), pH	05/12/2015	21	0.00	No/No	SThon	98.47	6.300	5.400	4.900	Yes	
SHF-D11	Specific Cond. (Field), umhos/cm	05/12/2015	21	0.00	No/No	SThon	98.47	1,448.000		146.000	No	
SHF-D11	Sulfate, total, mg/L	05/13/2015	20	0.00	No/No	SThon	98.32	226.000		32.000	No	
SHF-D11	TDS - 180C, mg/L	05/13/2015	20	0.00	No/Yes	STpar	96.42	737.764		170.000	No	
SHF-D11	Vanadium, total, ug/L	05/13/2015	20	95.00	No/No	STlow1	98.32	10.000		9.800	No	

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Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
SHF-D30A	Boron, total, ug/L	05/13/2015	20	75.00	Yes/No	STlow1	98.32	410.000		3,600.000	Yes	
SHF-D30A	Carbon, total organic, mg/L	05/13/2015	20	5.00	No/Yes	STpar	96.42	12.331		3.900	No	
SHF-D30A	Chloride, total, mg/L	05/13/2015	20	0.00	No/No	SThon	98.32	222.000		19.000	No	
SHF-D30A	COD, Low Level, mg/L	05/13/2015	20	60.00	No/No	STlow1	98.32	48.000		<10.000	No	
SHF-D30A	Molybdenum, total, ug/L	05/13/2015	20	90.00	No/No	STlow1	98.32	20.000		<5.000	No	
SHF-D30A	pH (field), pH	05/12/2015	21	0.00	No/No	SThon	98.47	6.300	5.400	5.700	No	
SHF-D30A	Specific Cond. (Field), umhos/cm	05/12/2015	21	0.00	No/No	SThon	98.47	1,448.000		540.000	No	
SHF-D30A	Sulfate, total, mg/L	05/13/2015	20	0.00	No/No	SThon	98.32	226.000		180.000	No	
SHF-D30A	TDS - 180C, mg/L	05/13/2015	20	0.00	No/Yes	STpar	96.42	737.764		450.000	No	
SHF-D30A	Vanadium, total, ug/L	05/13/2015	20	95.00	No/No	STlow1	98.32	10.000		<5.000	No	

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Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
SHF-D33A	Boron, total, ug/L	05/13/2015	20	75.00	Yes/No	STlow1	98.32	410.000		2,400.000	Yes	
SHF-D33A	Carbon, total organic, mg/L	05/13/2015	20	5.00	No/Yes	STpar	96.42	12.331		<1.000	No	
SHF-D33A	Chloride, total, mg/L	05/13/2015	20	0.00	No/No	SThon	98.32	222.000		20.000	No	
SHF-D33A	COD, Low Level, mg/L	05/13/2015	20	60.00	No/No	STlow1	98.32	48.000		<10.000	No	
SHF-D33A	Molybdenum, total, ug/L	05/13/2015	20	90.00	No/No	STlow1	98.32	20.000		<5.000	No	
SHF-D33A	pH (field), pH	05/12/2015	21	0.00	No/No	SThon	98.47	6.300	5.400	6.100	No	
SHF-D33A	Specific Cond. (Field), umhos/cm	05/12/2015	21	0.00	No/No	SThon	98.47	1,448.000		253.000	No	
SHF-D33A	Sulfate, total, mg/L	05/13/2015	20	0.00	No/No	SThon	98.32	226.000		60.000	No	
SHF-D33A	TDS - 180C, mg/L	05/13/2015	20	0.00	No/Yes	STpar	96.42	737.764		180.000	No	
SHF-D33A	Vanadium, total, ug/L	05/13/2015	20	95.00	No/No	STlow1	98.32	10.000		<5.000	No	

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Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
SHF-D74A	Boron, total, ug/L	05/12/2015	20	75.00	Yes/No	STlow1	98.32	410.000		2,000.000	Yes	
SHF-D74A	Carbon, total organic, mg/L	05/12/2015	20	5.00	No/Yes	STpar	96.42	12.331		1.400	No	
SHF-D74A	Chloride, total, mg/L	05/12/2015	20	0.00	No/No	SThon	98.32	222.000		20.000	No	
SHF-D74A	COD, Low Level, mg/L	05/12/2015	20	60.00	No/No	STlow1	98.32	48.000		<10.000	No	
SHF-D74A	Molybdenum, total, ug/L	05/12/2015	20	90.00	No/No	STlow1	98.32	20.000		490.000	Yes	
SHF-D74A	pH (field), pH	05/12/2015	21	0.00	No/No	SThon	98.47	6.300	5.400	6.900	Yes	
SHF-D74A	Specific Cond. (Field), umhos/cm	05/12/2015	21	0.00	No/No	SThon	98.47	1,448.000		186.000	No	
SHF-D74A	Sulfate, total, mg/L	05/12/2015	20	0.00	No/No	SThon	98.32	226.000		20.000	No	
SHF-D74A	TDS - 180C, mg/L	05/12/2015	20	0.00	No/Yes	STpar	96.42	737.764		110.000	No	
SHF-D74A	Vanadium, total, ug/L	05/12/2015	20	95.00	No/No	STlow1	98.32	10.000		<5.000	No	

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