D. B. Wilson Station CCR Landfill

Disposal of Coal Combustion Residuals (CCR) from Electric Utilities Final Rule
Run-on and Run-off Control System Plan

October 11, 2016
Revised: September 19, 2017
Revised: August 6, 2018
Revised: June 22, 2020

Revised: November 24, 2025

Prepared By:

ASSOCIATED ENGINEERS, INC.
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Project ID: 160030, 170137A, 170137B & 200108

Big Rivers Electric Corporation
Disposal of Coal Combustion Residuals (CCR) from Electric Utilities Final Rule
Run-on and Run-off Control System Plan

CCR Landfill Information

Name:	D.B. Wilson Station CCR Landfill
Operator:	D.B. Wilson Generating Station
Address:	5663 State Route 85 West Centertown, KY 42328

Qualified Professional Engineer

Name:	David A. Lamb
Company:	Associated Engineers, Inc.
Kentucky P.E. Number:	17822

Regulatory Applicability

As part of the § 257.81 for existing CCR landfill requirements, the owner or operator of an existing or new CCR landfill must design, construct, operate, and maintain a run-on and run-off control system plan as specified below. The owner or operator of the CCR unit must prepare the initial inflow design flood control system plan no later than October 17, 2016.

The owner or operator of an existing CCR landfill must design, construct, operate, and maintain:

(1) A run-on control system to prevent flow onto the active portion of the CCR unit during the peak discharge from a 24-hour, 25-year storm; and

(2) A run-off control system from the active portion of the CCR unit to collect and control at least the water volume resulting from a 24-hour, 25-year storm.

Run-off from the active portion of the CCR unit must be handled in accordance with the surface water requirements under § 257.3-3 (Part 257 - Criteria for Classification of Solid Waste Disposal Facilities and Practices Subpart A - Classification of Solid Waste Disposal Facilities and Practices Section 257.3-3 - Surface water):

Run-on and run-off control system plan:

(1) *Content of the plan.* The owner or operator must prepare initial and periodic run-on and run-off control system plans for the CCR unit. These plans must document how the run-

on and run-off control systems have been designed and constructed to meet the applicable requirements of this section. Each plan must be supported by appropriate engineering calculations. The owner or operator has completed the initial run-on and run-off control system plan when the plan has been placed in the facility's operating record.

(2) *Amendment of the plan*. The owner or operator may amend the written run-on and run-off control system plan at any time provided the revised plan is placed in the facility's operating record. The owner or operator must amend the written run-on and run- off control system plan whenever there is a change in conditions that would substantially affect the written plan in effect.

Description of Landfill

An aerial photo of the CCR unit is provided as Attachment A and an excerpt from U.S. Geological Survey (USGS) 7.5 minute Equality topographic quadrangle map showing the location of the CCR unit is provided as Attachment B.

The CCR unit is used for the placement of coal combustion residual material; currently fly ash, bottom ash and related material. The approximate total volume of CCR contained in the unit at the time of inspection is 4.9 million cubic yards. This volume was calculated from available flight derived pre-disposal baseline topography compared to October 2025 LIDAR derived topographic contours. The D.B. Wilson CCR landfill is raised above adjacent ground to a maximum elevation of approximately 546 feet AMSL. The original ground surface within the landfill footprint was irregular and the predominant features were the headwaters of Elk Creek and small stream valleys draining south. Other small tributaries drained west towards the Green River and north towards the Rough River.

Run-on and Run-off Control System Plan

The initial run-on and run-off control system plan documents that the run-on control system will prevent flow onto the active portion of the CCR unit during the peak discharge from a 24-hour/25-year storm; and that the run-off control system from the active portion of the CCR unit will collect and control at least the water volume resulting from a 24-hour/25-year storm.

Run-on Control Analysis

An evaluation of the D.B. Wilson CCR landfill configuration and topography resulted in the determination that because of the elevated position of active portions of the landfill, no significant run-on can occur and the only drainage onto active areas is storm water generated from direct precipitation; thus the CCR unit run-on system will prevent flow onto the active portion of the CCR unit during the peak discharge from the design storm event.

Run-off Control Analysis

Analysis of the D.B. Wilson CCR landfill drainage and sedimentation basin configurations and designs via SEDCAD modeling demonstrates that the design flood control system

adequately manages flow out of the CCR unit during and following the specified 24-hour/ 25-year storm event. SEDCAD by Civil Software Design, LLC is a widely recognized comprehensive hydrology and sedimentology package, useful for runoff and sediment control design calculations. The SEDCAD modeling results for the D.B. Wilson CCR landfill are attached to this report.

Leachate Control Analysis

Per Part 257.53 of the CCR rule, the definitions for run-on and run-off both include leachate. Big Rivers Electric Corporation manages leachate through a comprehensive plan. . In the event of leachate outbreaks, the leachate drainage would be routed to the leachate collection and treatment system and ultimately routed to properly permitted KPDES outfall 002; Additionally actions will be taken to mitigate the leachate drainage source by removing the impacted area and replacing the cover material with compacted clay and then covering the clay with new cover material and seeding and mulching the area. Specifically, Big Rivers implements the Leachate Management Standard Operating Procedures set forth in Attachment C.

In all instances, run-on or run-off water containing leachate would meet applicable KPDES effluent limits for permitted outfall prior to discharge. Therefore, any leachate drainage would comply with all applicable regulations prior to discharge.

The operating facility has verified that discharge from the D.B. Wilson CCR landfill is handled in accordance with the surface water requirements under § 257.3-3 (Part 257 - Criteria for Classification of Solid Waste Disposal Facilities and Practices Subpart A - Classification of Solid Waste Disposal Facilities and Practices Section 257.3-3 - Surface water).

Sources of Information

Geotechnical and other information provided by Associated Engineers, Inc.

Engineering design drawings and other information provided by Big Rivers Electric Corporation

United States Geological Survey U.S. Geological Survey (USGS) 7.5 minute Equality topographic quadrangle map

Professional Engineer Certification [Per 40 CFR § 257.81]
D.B. Wilson CCR Landfill Run-on and Run-off Control System Plan

I hereby certify that myself or an agent under my review has prepared this Run-on and Run-regulate the disposal of coal combustion residuals (CCR) as solid waste under subtitle D of the Resource Conservation and Recovery Act (RCRA), attest that this Plan has been prepared in accordance with good engineering practices and meets the intent of 40 CFR Part 257.81. To the best of my knowledge and belief, the information contained in this Plan is true, complete, and accurate.

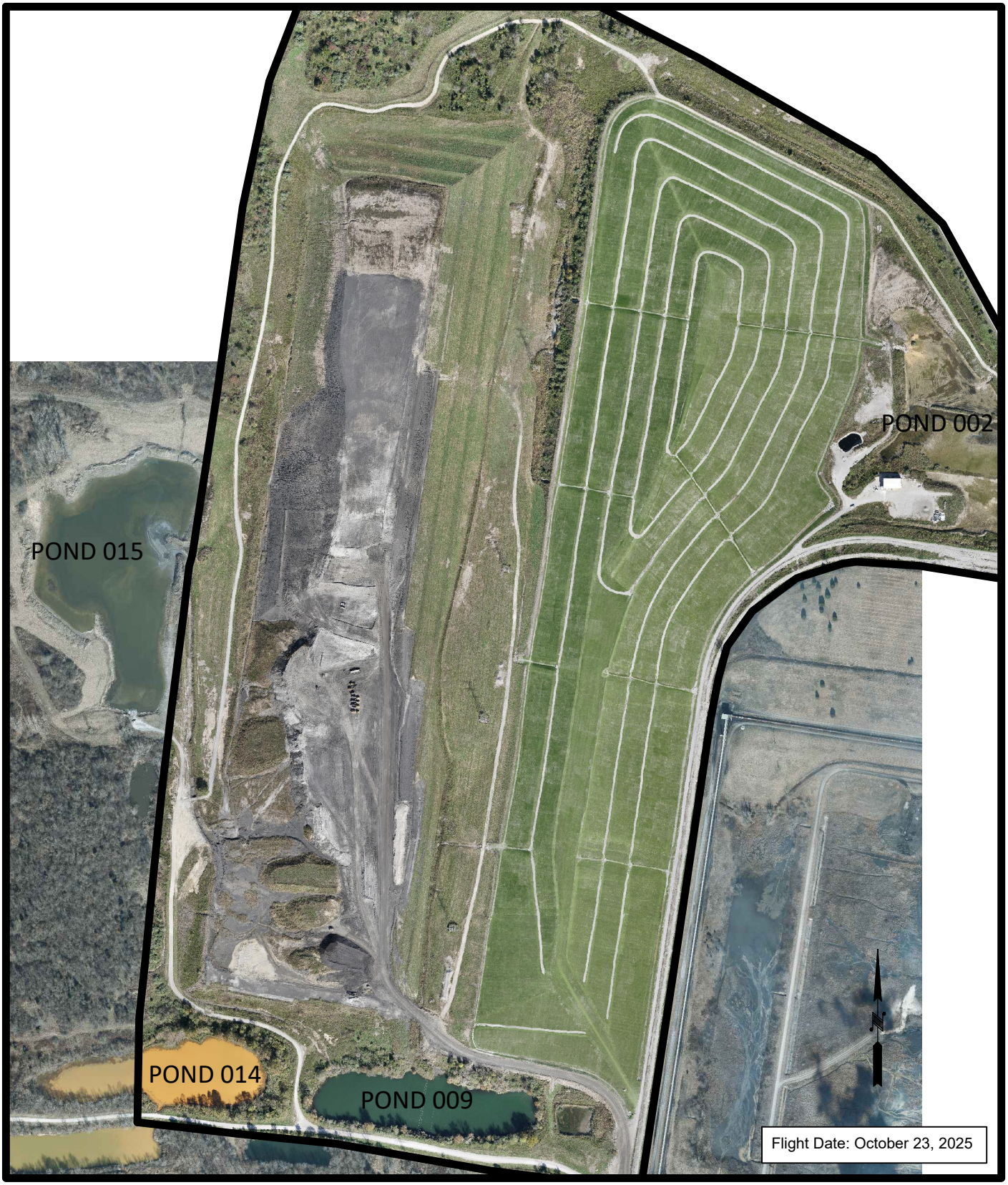
David A. Lamb P.E.

State of Kentucky License No. 17822

Date: November 24, 2025

STATE OF KENTUCKY
DAVID A. LAMB 17822
LICENSED PROFESSIONAL ENGINEER

David A. Lamb, PE
Digitally signed by David A. Lamb, PE
Date: 2025.11.24 14:05:40 -06'00'



BIG RIVERS ELECTRIC CORPORATION

DB Wilson CCR Landfill

Attachment A - 2025 Annual Inspection Aerial Photo

Job Number:	25-0130
Date:	11/24/2025
Scale:	1" = 600'
Drawn By:	A.E.I.

Revisions:

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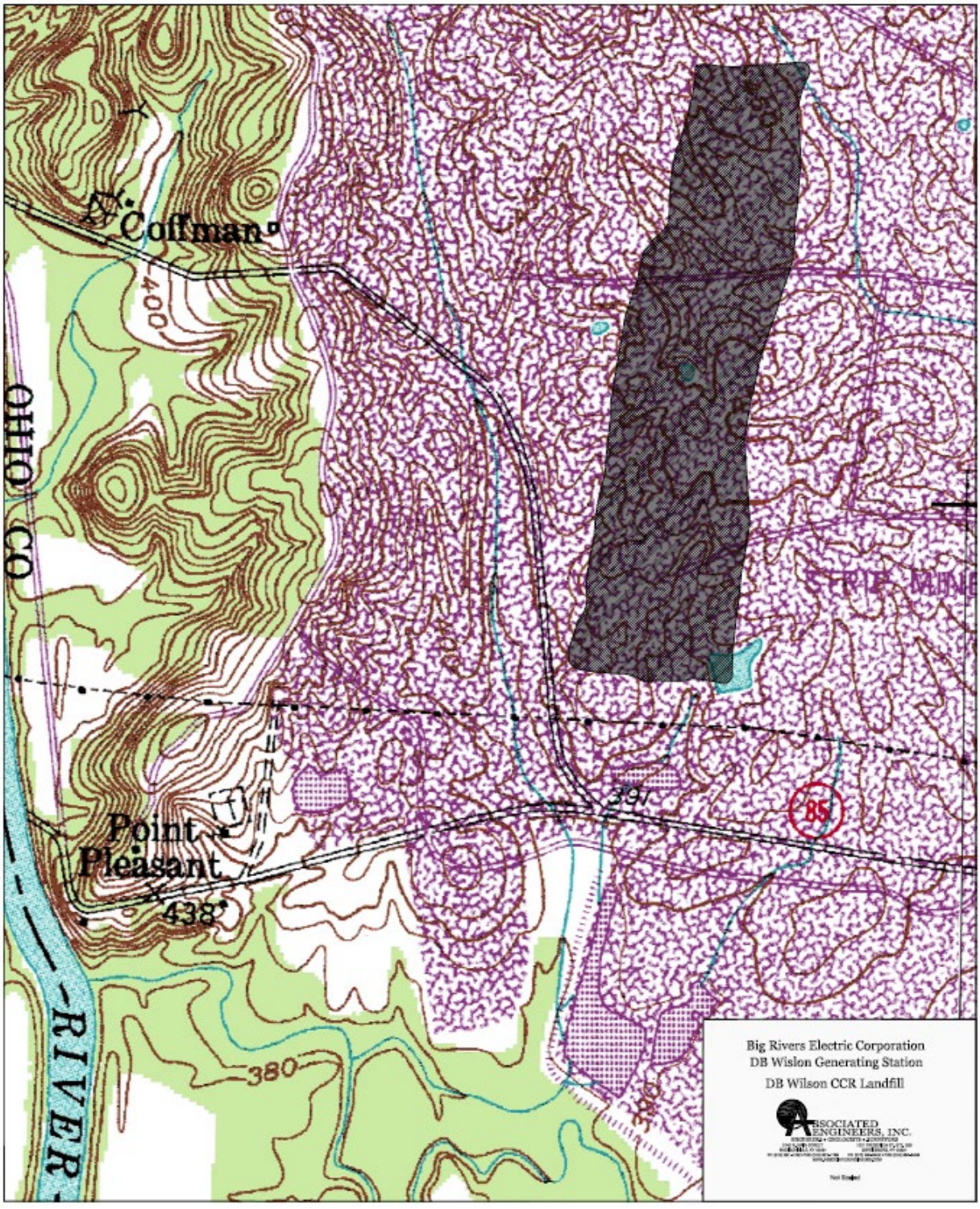
Attachment A - Aerial Photo of the D.B. Wilson CCR Landfill



Attachment B - Topographic Map showing the D.B. Wilson CCR Landfill

Attachment C - Leachate Management Standard Operating Procedures

Subject: Surface Seep and Leachate Outbreaks Repair

To ensure compliance with 40 CFR 257 Subpart D and 401 KAR Chapters 45 and 46, the following procedure will be utilized for identification and repair of seeps and leachate outbreaks at CCR landfills. For purposes of this SOP, a leachate outbreak is wastewater/seepage flowing directly from the covered CCR that has passed through or emerged from solid waste and contains soluble, suspended or miscible materials removed from such wastes. Seeps are flows that emerge from the ground immediately below the actual waste disposal area and that may contain leachate that is mixed with water from saturated soils or surface water infiltration.

- An inspection by a qualified person will be conducted once per week to identify any seeps and leachate outbreaks at CCR landfills and CCR surface impoundments. The inspection will include the entire perimeter of both Phase I and Phase II as weather conditions allow at the time of the inspection. The weather conditions at the time of the inspection must be documented on the inspection form.
- Identified seeps and leachate outbreaks must be located and documented by Global Positioning Satellite (GPS) and digital photography.
- Identified seeps and leachate outbreaks must be quantified as to the amount of standing or flowing water in gallons per minute. Measurements or estimates of the impacted area in square feet must be included. Other information relevant to remediation of the outbreak or seep shall be included on the BREC inspection form.
- All information fields on the BREC inspection form shall be completed.
- Categorize the seep or leachate outbreak into one of three categories:
    - Category 1 – Leachate/seep flow is contained within a drainage ditch and pond system that flows to a KPDES permitted outfall and the outbreak or seep is readily repairable by removing the impacted area and replacing the cover dirt with compacted clay, seeded and mulched, when the soil conditions are not too wet to preclude typical construction activities or the ambient temperature is not too low to preclude typical construction activities. For purposes of this determination, readily repairable is an outbreak or seep that can reasonably be believed to be remediated by removing the impacted area and replacing the cover with compacted clay. This determination requires the judgment of the inspector based upon the size, flow, and any repeat history of the outbreak or seep. For any area where there is no visible flow and no rutting/erosion of the soil from prior flow(s),but only saturated soil, then such an area will not be identified as a seep/leachate outbreak but will be identified and recorded as “saturated soil” in the log and monitored during subsequent weekly inspections.
    - Category 2 – Leachate/seep is contained within a drainage ditch and pond system that flows to a KPDES permitted outfall but requires further investigation and evaluation prior to any attempt at remediation or if initial remediation efforts prove to be unsuccessful.
    - Category 3 – Leachate/seep is not contained within the KPDES permitted ditch and pond system. Any areas identified must be routed to the KPDES permitted ditch

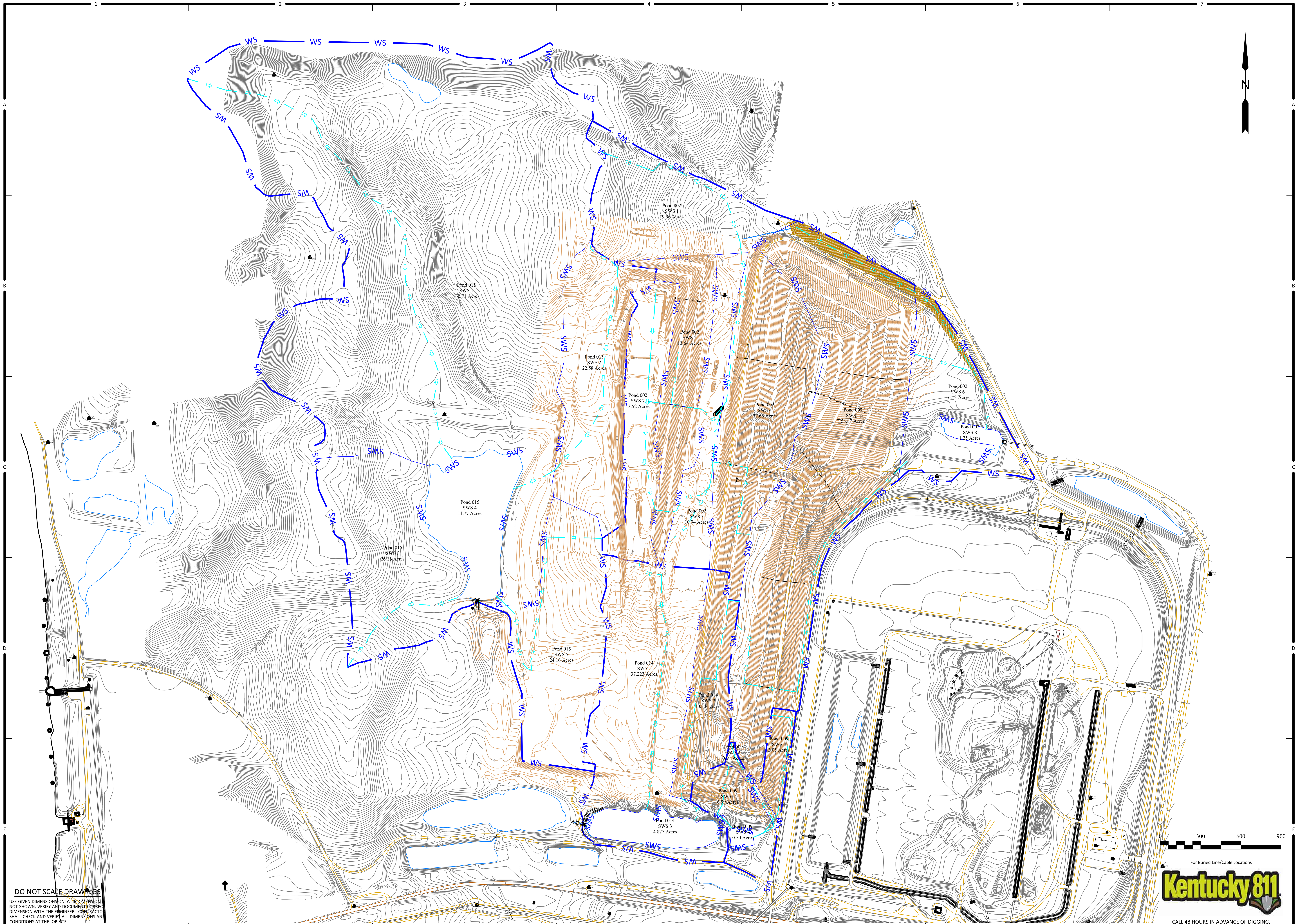
and pond system. Actions must begin immediately to prevent a discharge to a water of the United States by remediating the outbreak or seep.

- Steps to take if a Category 1 seep/leachate outbreak reappears:
    - If a Category 1 seep/leachate outbreak reappears more than 30 days after a previous repair and the flow from the seep/leachate outbreak has been reduced or the extent of the impact is reduced from the initial identification of the seep/leachate outbreak, then Big Rivers may classify the reappearance of the seep/leachate outbreak as a Category 1 seep/leachate outbreak and commence repairs per the Agreed Order (excavate, compact, seed, and mulch.)
    - For any area where there is no visible flow but only saturated soil, then such an area will not be identified as a seep/leachate outbreak but will be identified and recorded as "saturated soil" in the log and monitored during subsequent weekly inspections.
    - Seeps/leachate outbreaks that reappear less than 30 days after a repair or that reappear at a later date with increased flow or impact area will be classified as a Category 2.
- Collect water samples for constituents listed in Table 1. A water sample will only be collected for analysis when a sufficient amount of water is flowing on the surface to collect a sample without disturbing the underlying soil. Samples will be collected once for each categorization unless there are visual changes such as color in the leachate. Seep/leachate water samples will be collected once when identified as a Category 1 and again if reclassified as a Category 2. The analysis will be performed by a laboratory certified in the State of Kentucky. The analysis must contain the chain of custody, complete analysis with QA/QC results. Results will be maintained in the Landfill operating log on-site.
- Place categorized information in the Landfill operating log.
- Corrective actions for readily repairable seeps and leachate outbreaks must begin as soon as reasonably feasible with consideration given to inclement weather patterns and soil moisture conditions.
- Remediation areas outside the KPDES permitted ditch and pond system must include the installation of sedimentation controls as found in the Storm water Pollution Prevention Plan/Best Management Plan guidance document published by the Kentucky Division of Water. Water samples shall be taken for impacted areas outside the KPDES permitted ditch and pond system and analyzed for the following total metals: Table 1.
- Cover soil and/or special waste removed during the remediation process must be placed in an active area of a CCR landfill or reused during the remediation of the unit if practicable.
- Replacement soil must be compacted, seeded and mulched.
- Environmental Services shall evaluate and determine remediation plans for a seep/leachate outbreak that is deemed not readily repairable (Category 2) based upon flow and landfill conditions. Until remediation occurs, seep/leachate flow shall be visually monitored, conveyed to a KPDES permitted outfall, and treated as necessary to ensure compliance with KPDES discharge limits and applicable water quality standards in the receiving stream. Remediation activities required for a Category 2 outbreak will be sent to the Division of Waste Management, 300 Sower Boulevard, Frankfort, Kentucky 40601 within five (5) business days of finalizing the report.

- Category 3 seeps displaying a visual flow will be reported to the Kentucky Division of Water – Surface Water Permits Branch in Frankfort, Kentucky and the Madisonville Field Office consistent with the Section 2.12 reporting provisions of the KPDES permit for leachate/seep outbreaks. Category 3 seeps with a visual flow will also be reported to the Kentucky Division of Waste Management – Field Operations Branch in Frankfort, Kentucky and the Madisonville Field Office. Reporting of the seeps shall occur as soon as feasible after discovery of such a seep, but no later than ten (10) days after discovery. Environmental Services shall evaluate and determine remediation plans for a Category 3 seep that is deemed not readily repairable based upon flow and landfill conditions.
- These protocols shall be followed at CCR units subject to the federal CCR Rule and 401 KAR Chapter 46 as well as those inactive units that remain subject to 401 KAR Chapter 45.

- Table 1
    - From 40 CFR 257 App. III
        - Boron
        - Calcium
        - Chloride
        - Fluoride
        - pH
        - Sulfate
        - Total Dissolved Solids
    - From 40 CFR 257 App. IV
        - Antimony
        - Arsenic
        - Barium
        - Beryllium
        - Cadmium
        - Chromium
        - Cobalt
        - Fluoride
        - Lead
        - Lithium
        - Mercury
        - Molybdenum
        - Selenium
        - Thallium
        - Radium 226 and 228 combined
    - From 401 KAR 45:160
        - *Chemical Oxygen Demand
        - *Total Organic Carbon
        - *Specific Conductance
        - *Copper
        - *Nickel
        - *Zinc

- *Iron
- *Sodium
- *Magnesium
- *Potassium
- *Bicarbonate
- *Carbonate



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JOB NO.	16-0029
DRAWN BY	M.T.L.
CHECKED BY	D.A.L.
DATE	10/11/2016

BIG RIVERS ELECTRIC CORPORATION
CCR RULE RUN ON/RUN OFF ANALYSIS
D.B. WILSON STATION CCR LANDFILL

WATERSHED MAP

FIGURE

1

Big Rivers Electric Corporation
D.B. Wilson Station
Centertown, Kentucky

Stormwater Evaluation

Wilson Landfill

Pond 002

25 Year - 24 Hour Event

AEI Project #16-0030

Matthew T. Lile

Associated Engineers, Inc.
2740 N. Main St.
Madisonville, KY 42431

Phone: (270) 821-7732
Email: mlile@associatedengineers.com

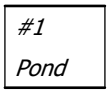
General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	25 yr - 24 hr
Rainfall Depth:	5.870 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	Pond 002



Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	In	161.970	161.970	331.31	46.58
	Out			241.61	46.58

Structure Detail:

Structure #1 (Pond)

Pond 002

Pond Inputs:

Initial Pool Elev:	405.50 ft
Initial Pool:	12.61 ac-ft

Broad-crested Weir

Weir Width (ft)	Spillway Elev (ft)
20.40	405.50

Pond Results:

Peak Elevation:	407.95 ft
Dewater Time:	0.94 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
401.30	1.250	0.000	0.000	
401.31	1.264	0.013	0.000	
401.50	1.530	0.278	0.000	
401.60	1.660	0.437	0.000	
401.90	2.080	0.997	0.000	
402.00	2.230	1.212	0.000	
402.20	2.350	1.670	0.000	
402.50	2.536	2.403	0.000	
402.80	2.729	3.192	0.000	
403.10	2.929	4.041	0.000	
403.40	3.136	4.950	0.000	
403.70	3.349	5.923	0.000	
404.00	3.570	6.961	0.000	
404.30	3.647	8.043	0.000	
404.60	3.726	9.149	0.000	
404.90	3.805	10.279	0.000	
405.20	3.885	11.432	0.000	

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
405.50	3.965	12.609	0.000		Spillway #1
405.80	4.046	13.811	10.347	13.75	
406.00	4.100	14.626	22.265	4.85	
406.10	4.129	15.037	29.268	1.00	
406.40	4.215	16.289	53.768	1.25	
406.70	4.302	17.566	82.784	0.55	
407.00	4.390	18.870	115.692	0.35	
407.30	4.479	20.200	152.080	0.25	
407.60	4.569	21.557	191.645	0.20	
407.90	4.660	22.942	234.143	0.20	
407.95	4.675	23.178	241.613	0.10	Peak Stage
408.00	4.690	23.409	248.930		
408.20	4.888	24.367	279.393		
408.50	5.193	25.879	327.227		
408.75	5.454	27.210	368.971		
408.80	5.507	27.484	377.516		
408.99	5.710	28.549	410.585		
409.00	5.720	28.606	412.353		

Detailed Discharge Table

Elevation (ft)	Broad-crested Weir (cfs)	Combined Total Discharge (cfs)
401.30	0.000	0.000
401.31	0.000	0.000
401.50	0.000	0.000
401.60	0.000	0.000
401.90	0.000	0.000
402.00	0.000	0.000
402.20	0.000	0.000
402.50	0.000	0.000
402.80	0.000	0.000
403.10	0.000	0.000
403.40	0.000	0.000
403.70	0.000	0.000
404.00	0.000	0.000
404.30	0.000	0.000
404.60	0.000	0.000
404.90	0.000	0.000

Elevation (ft)	Broad-crested Weir (cfs)	Combined Total Discharge (cfs)
405.20	0.000	0.000
405.50	0.000	0.000
405.80	10.347	10.347
406.00	22.265	22.265
406.10	29.268	29.268
406.40	53.768	53.768
406.70	82.784	82.784
407.00	115.692	115.692
407.30	152.080	152.080
407.60	191.645	191.645
407.90	234.143	234.143
408.00	248.930	248.930
408.20	279.393	279.393
408.50	327.227	327.227
408.75	368.971	368.971
408.80	377.516	377.516
408.99	410.585	410.585
409.00	412.353	412.353

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	19.960	0.080	0.270	0.308	77.000	M	68.71	5.593
	2	13.640	0.078	0.832	0.270	79.000	M	48.91	4.047
	3	10.940	0.135	0.687	0.277	91.000	F	44.35	4.242
	4	27.660	0.053	0.907	0.267	79.000	M	99.17	8.207
	5	58.870	0.376	0.457	0.233	79.000	M	121.86	13.917
	6	16.130	0.096	0.000	0.000	79.000	M	57.83	4.786
	7	13.520	0.247	0.487	0.325	91.000	F	51.19	5.185
	8	1.250	0.000	0.000	0.000	99.000	F	5.62	0.599
	Σ	**161.970**						**331.31**	**46.577**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	3. Short grass pasture	11.08	46.00	415.00	2.660	0.043
		8. Large gullies, diversions, and low flowing streams	5.81	57.00	981.00	7.230	0.037
#1	**1**	**Time of Concentration:**					**0.080**
#1	2	6. Grassed waterway	1.01	4.00	396.00	1.500	0.073
		7. Paved area and small upland gullies	28.19	64.00	227.00	10.680	0.005
#1	**2**	**Time of Concentration:**					**0.078**
#1	3	5. Nearly bare and untilled, and alluvial valley fans	4.40	22.00	500.00	2.090	0.066
		8. Large gullies, diversions, and low flowing streams	0.66	4.00	606.00	2.430	0.069
#1	**3**	**Time of Concentration:**					**0.135**
#1	4	3. Short grass pasture	22.22	22.00	99.00	3.770	0.007
		8. Large gullies, diversions, and low flowing streams	1.40	7.00	500.00	3.540	0.039
		7. Paved area and small upland gullies	21.46	56.00	261.00	9.320	0.007
#1	**4**	**Time of Concentration:**					**0.053**
#1	5	3. Short grass pasture	0.21	1.00	474.00	0.360	0.365
		7. Paved area and small upland gullies	22.52	91.00	404.00	9.550	0.011
#1	**5**	**Time of Concentration:**					**0.376**
#1	6	3. Short grass pasture	4.64	20.00	431.00	1.720	0.069
		8. Large gullies, diversions, and low flowing streams	2.56	12.00	469.00	4.790	0.027

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	**6**	**Time of Concentration:**					**0.096**
#1	7	5. Nearly bare and untilled, and alluvial valley fans	14.00	14.00	100.00	3.740	0.007
		5. Nearly bare and untilled, and alluvial valley fans	0.50	2.00	400.00	0.700	0.158
		8. Large gullies, diversions, and low flowing streams	5.71	10.00	175.00	7.170	0.006
		8. Large gullies, diversions, and low flowing streams	1.42	14.00	984.04	3.570	0.076
#1	**7**	**Time of Concentration:**					**0.247**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	7. Paved area and small upland gullies	1.00	4.00	400.00	2.010	0.055
		8. Large gullies, diversions, and low flowing streams	0.90	20.00	2,213.00	2.850	0.215
#1	**1**	**Muskingum K:**					**0.270**
#1	2	8. Large gullies, diversions, and low flowing streams	0.06	1.00	1,540.00	0.760	0.562
		7. Paved area and small upland gullies	1.00	4.00	400.00	2.010	0.055
		8. Large gullies, diversions, and low flowing streams	0.90	20.00	2,213.00	2.850	0.215
#1	**2**	**Muskingum K:**					**0.832**
#1	3	8. Large gullies, diversions, and low flowing streams	0.08	1.00	1,264.00	0.840	0.417
		7. Paved area and small upland gullies	1.00	4.00	400.00	2.010	0.055
		8. Large gullies, diversions, and low flowing streams	0.90	20.00	2,213.00	2.850	0.215
#1	**3**	**Muskingum K:**					**0.687**
#1	4	8. Large gullies, diversions, and low flowing streams	0.06	1.00	1,675.00	0.730	0.637
		7. Paved area and small upland gullies	1.00	4.00	400.00	2.010	0.055
		8. Large gullies, diversions, and low flowing streams	0.90	20.00	2,213.00	2.850	0.215
#1	**4**	**Muskingum K:**					**0.907**
#1	5	8. Large gullies, diversions, and low flowing streams	0.25	6.00	2,437.00	1.480	0.457
#1	**5**	**Muskingum K:**					**0.457**
#1	7	7. Paved area and small upland gullies	22.03	26.00	118.00	9.440	0.003
		8. Large gullies, diversions, and low flowing streams	5.35	20.00	374.00	6.930	0.014

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	0.75	14.00	1,867.00	2.590	0.200
		7. Paved area and small upland gullies	1.00	4.00	400.00	2.010	0.055
		8. Large gullies, diversions, and low flowing streams	0.90	20.00	2,213.00	2.850	0.215
#1	**7**	**Muskingum K:**					**0.487**

Big Rivers Electric Corporation
D.B. Wilson Station
Centertown, Kentucky

Stormwater Evaluation

Wilson Landfill

Ponds 009, 014, & 015

25 Year - 24 Hour Event

AEI Project #16-0030

Matthew T. Lile

Associated Engineers, Inc.
2740 N. Main St.
Madisonville, KY 42431

Phone: (270) 821-7732
Email: mlile@associatedengineers.com

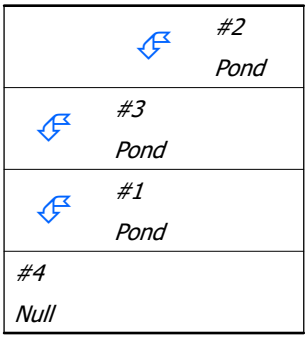
General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	25 yr - 24 hr
Rainfall Depth:	5.870 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	#4	0.000	0.000	Pond 015
Pond	#2	==>	#3	0.000	0.000	Pond 009
Pond	#3	==>	#4	0.000	0.000	Pond 014
Null	#4	==>	End	0.000	0.000	Combined Discharge



Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#2	In	11.450	11.450	42.06	3.57
	Out			41.55	3.57
#3	In	52.440	63.890	260.07	23.94
	Out			13.84	9.50
#1	In	247.380	247.380	633.06	66.65
	Out			24.72	29.79
#4		0.000	311.270	36.63	39.29

Structure Detail:

Structure #2 (Pond)

Pond 009

Pond Inputs:

Initial Pool Elev:	402.00 ft
Initial Pool:	4.71 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
402.00	14.00	4.60:1	11.80:1	160.00

Pond Results:

Peak Elevation:	402.10 ft
Dewater Time:	0.50 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
396.00	0.500	0.000	0.000		
397.00	0.605	0.552	0.000		
398.00	0.720	1.213	0.000		
399.00	0.798	1.972	0.000		
400.00	0.880	2.811	0.000		
401.00	0.949	3.725	0.000		
402.00	1.020	4.709	0.000		Spillway #1
402.10	1.050	4.820	41.551	12.10	Peak Stage
403.00	1.132	5.785	402.900		
404.00	1.250	6.975	1,334.105		

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
396.00	0.000	0.000
397.00	0.000	0.000
398.00	0.000	0.000
399.00	0.000	0.000
400.00	0.000	0.000
401.00	0.000	0.000
402.00	0.000	0.000
403.00	402.900	402.900
404.00	1,334.105	1,334.105

Structure #3 (Pond)

Pond 014

Pond Inputs:

Initial Pool Elev:	388.30 ft
Initial Pool:	20.79 ac-ft

Broad-crested Weir

Weir Width (ft)	Spillway Elev (ft)
10.00	391.00

Pond Results:

Peak Elevation:	391.45 ft
Dewater Time:	1.04 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
384.00	4.620	0.000	0.000	
385.00	4.730	4.675	0.000	
386.00	4.820	9.450	0.000	
387.00	4.880	14.300	0.000	
388.00	5.057	19.268	0.000	
388.30	5.111	20.793	0.000	
389.00	5.237	24.415	0.000	
390.00	5.420	29.743	0.000	

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
391.00	5.544	35.225	0.000		Spillway #1
391.45	5.601	37.738	13.835	24.95	Peak Stage
392.00	5.670	40.832	30.870		

Detailed Discharge Table

Elevation (ft)	Broad-crested Weir (cfs)	Combined Total Discharge (cfs)
384.00	0.000	0.000
385.00	0.000	0.000
386.00	0.000	0.000
387.00	0.000	0.000
388.00	0.000	0.000
388.30	0.000	0.000
389.00	0.000	0.000
390.00	0.000	0.000
391.00	0.000	0.000
392.00	30.870	30.870

Structure #1 (Pond)

Pond 015

Pond Inputs:

Initial Pool Elev:	414.30 ft
Initial Pool:	4.27 ac-ft

Broad-crested Weir

Weir Width (ft)	Spillway Elev (ft)
10.00	417.00

Pond Results:

Peak Elevation:	417.86 ft
Dewater Time:	2.16 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
413.90	10.500	0.000	0.000		
414.00	10.600	1.055	0.000		
414.10	10.677	2.119	0.000		
414.20	10.754	3.191	0.000		
414.30	10.831	4.270	0.000		
414.40	10.908	5.357	0.000		
414.50	10.986	6.451	0.000		
414.60	11.063	7.554	0.000		
414.70	11.141	8.664	0.000		
414.80	11.220	9.782	0.000		
414.90	11.298	10.908	0.000		
415.00	11.377	12.042	0.000		
415.10	11.624	13.192	0.000		
415.20	11.873	14.367	0.000		
415.30	12.125	15.566	0.000		
415.40	12.380	16.792	0.000		
415.50	12.637	18.043	0.000		
415.60	12.898	19.319	0.000		
415.70	13.160	20.622	0.000		
415.80	13.425	21.951	0.000		
415.90	13.693	23.307	0.000		
416.00	13.964	24.690	0.000		
416.10	14.150	26.096	0.000		
416.20	14.338	27.520	0.000		
416.30	14.527	28.963	0.000		
416.40	14.717	30.426	0.000		
416.50	14.908	31.907	0.000		
416.60	15.099	33.407	0.000		
416.70	15.291	34.927	0.000		
416.80	15.483	36.465	0.000		
416.90	15.678	38.023	0.000		
417.00	15.873	39.601	0.000		Spillway #1
417.10	16.068	41.198	0.976	19.80*	
417.20	16.265	42.815	2.761	11.35	
417.30	16.463	44.451	5.072	5.25	
417.40	16.662	46.107	7.809	3.15	
417.50	16.862	47.784	10.914	2.20	
417.60	17.061	49.480	14.347	1.60	
417.70	17.260	51.196	18.080	2.15	
417.80	17.461	52.932	22.088	3.35	
417.86	17.587	54.016	24.724	2.95	Peak Stage

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
417.90	17.664	54.688	26.357	
418.00	17.867	56.465	30.870	

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Broad-crested Weir (cfs)	Combined Total Discharge (cfs)
413.90	0.000	0.000
414.00	0.000	0.000
414.10	0.000	0.000
414.20	0.000	0.000
414.30	0.000	0.000
414.40	0.000	0.000
414.50	0.000	0.000
414.60	0.000	0.000
414.70	0.000	0.000
414.80	0.000	0.000
414.90	0.000	0.000
415.00	0.000	0.000
415.10	0.000	0.000
415.20	0.000	0.000
415.30	0.000	0.000
415.40	0.000	0.000
415.50	0.000	0.000
415.60	0.000	0.000
415.70	0.000	0.000
415.80	0.000	0.000
415.90	0.000	0.000
416.00	0.000	0.000
416.10	0.000	0.000
416.20	0.000	0.000
416.30	0.000	0.000
416.40	0.000	0.000
416.50	0.000	0.000
416.60	0.000	0.000
416.70	0.000	0.000
416.80	0.000	0.000
416.90	0.000	0.000

Elevation (ft)	Broad-crested Weir (cfs)	Combined Total Discharge (cfs)
417.00	0.000	0.000
417.10	0.976	0.976
417.20	2.761	2.761
417.30	5.072	5.072
417.40	7.809	7.809
417.50	10.914	10.914
417.60	14.347	14.347
417.70	18.080	18.080
417.80	22.088	22.088
417.90	26.357	26.357
418.00	30.870	30.870

Structure #4 (Null)

Combined Discharge

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#2	1	3.050	0.090	0.022	0.323	79.000	M	10.94	0.905
	2	0.910	0.022	0.006	0.408	89.000	F	3.82	0.349
	3	6.990	0.028	0.000	0.000	79.000	M	25.06	2.074
	4	0.500	0.000	0.000	0.000	99.000	F	2.25	0.239
	Σ	**11.450**						**42.06**	**3.567**
#3	1	37.220	0.105	0.000	0.000	91.000	F	159.52	14.970
	2	10.340	0.101	0.007	0.422	79.000	M	37.07	3.068
	3	4.880	0.000	0.000	0.000	99.000	F	21.94	2.337
	Σ	**63.890**						**260.07**	**23.943**
#1	1	162.710	0.248	0.000	0.000	77.000	M	357.47	36.672
	2	22.580	0.105	0.013	0.402	91.000	F	96.77	9.082
	3	26.160	0.181	0.000	0.000	77.000	M	61.73	5.935
	4	11.770	0.000	0.000	0.000	99.000	F	52.91	5.637
	5	24.160	0.182	0.010	0.314	91.000	F	96.84	9.323
	Σ	**247.380**						**633.06**	**66.648**
#4	**Σ**	**311.270**						**36.63**	**39.288**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	3. Short grass pasture	10.00	30.00	300.00	2.520	0.033
		8. Large gullies, diversions, and low flowing streams	9.11	69.00	757.00	9.050	0.023
		8. Large gullies, diversions, and low flowing streams	1.82	51.00	2,805.12	4.040	0.192
#1	**1**	**Time of Concentration:**					**0.248**
#1	2	5. Nearly bare and untilled, and alluvial valley fans	9.52	26.00	273.00	3.080	0.024
		8. Large gullies, diversions, and low flowing streams	3.52	58.00	1,647.02	5.620	0.081
#1	**2**	**Time of Concentration:**					**0.105**
#1	3	1. Forest with heavy ground litter	5.00	15.00	300.00	0.560	0.148
		8. Large gullies, diversions, and low flowing streams	4.16	31.00	746.03	6.110	0.033
#1	**3**	**Time of Concentration:**					**0.181**
#1	5	5. Nearly bare and untilled, and alluvial valley fans	6.80	28.00	412.00	2.600	0.044

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	1.09	17.00	1,559.06	3.130	0.138
#1	**5**	**Time of Concentration:**					**0.182**
#2	1	3. Short grass pasture	27.22	43.00	158.00	4.170	0.010
		8. Large gullies, diversions, and low flowing streams	0.69	5.00	724.00	2.490	0.080
#2	**1**	**Time of Concentration:**					**0.090**
#2	2	5. Nearly bare and untilled, and alluvial valley fans	17.92	19.00	106.00	4.230	0.006
		8. Large gullies, diversions, and low flowing streams	11.65	70.00	601.00	10.230	0.016
#2	**2**	**Time of Concentration:**					**0.022**
#2	3	3. Short grass pasture	25.26	74.00	293.00	4.020	0.020
		8. Large gullies, diversions, and low flowing streams	5.13	4.00	78.00	6.790	0.003
		8. Large gullies, diversions, and low flowing streams	6.29	10.00	159.00	7.520	0.005
#2	**3**	**Time of Concentration:**					**0.028**
#3	1	5. Nearly bare and untilled, and alluvial valley fans	6.78	16.00	236.00	2.600	0.025
		8. Large gullies, diversions, and low flowing streams	4.01	70.00	1,747.00	6.000	0.080
#3	**1**	**Time of Concentration:**					**0.105**
#3	2	3. Short grass pasture	29.63	24.00	81.00	4.350	0.005
		8. Large gullies, diversions, and low flowing streams	1.00	6.00	600.00	3.000	0.055
		7. Paved area and small upland gullies	27.52	30.00	109.00	10.560	0.002
		8. Large gullies, diversions, and low flowing streams	4.57	42.00	919.00	6.410	0.039
#3	**2**	**Time of Concentration:**					**0.101**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	6. Grassed waterway	3.82	13.00	340.00	2.930	0.032
#1	**1**	**Muskingum K:**					**0.000**
#1	2	8. Large gullies, diversions, and low flowing streams	5.34	18.00	337.00	6.930	0.013
#1	**2**	**Muskingum K:**					**0.013**
#1	4	6. Grassed waterway	4.12	63.00	1,530.00	3.040	0.139
#1	**4**	**Muskingum K:**					**0.000**
#1	5	8. Large gullies, diversions, and low flowing streams	0.91	1.00	110.00	2.860	0.010
#1	**5**	**Muskingum K:**					**0.010**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	1	7. Paved area and small upland gullies	2.25	4.00	178.00	3.010	0.016
		8. Large gullies, diversions, and low flowing streams	1.23	1.00	81.00	3.330	0.006
#2	**1**	**Muskingum K:**					**0.022**
#2	2	8. Large gullies, diversions, and low flowing streams	6.32	11.00	174.00	7.540	0.006
#2	**2**	**Muskingum K:**					**0.006**
#3	2	8. Large gullies, diversions, and low flowing streams	9.28	22.00	237.00	9.140	0.007
#3	**2**	**Muskingum K:**					**0.007**