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1.0 INTRODUCTION

Federal Regulation Title 40, Part 257.81 requires the owner or operator of an existing or new CCR landfill or any lateral expansion of an existing CCR landfill to comply with the following:

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.
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.
3. Run-off from the active portion of the CCR unit must be handled in accordance with the surface water requirements under §257.3-3.
4. Prepare initial and periodic run-on and run-off control system plans for the CCR unit according to the following timeframes:
   a. For existing CCR landfills, the owner or operator of the CCR unit must prepare the initial run-on and run-off control system plan no later than October 17, 2016.
   b. The owner or operator of the CCR unit must prepare periodic run-on and run-off control system plans every five (5) years.
5. Obtain a certification from a qualified professional engineer stating that the initial and periodic run-on and run-off control system plans meet the requirements of this section.
6. Comply with the recordkeeping requirements specified in §257.105(g), the notification requirements specified in §257.106(g), and the internet requirements specified in §257.107(g).

This Run-on and Run-off Control System Plan (initial plan document dated October 2016) presents the regulatory-required materials as noted above. It is prepared for the existing landfill at AEP’s H.W. Pirkey Power Plant in Hallsville, Texas. The landfill operation has installed and is maintaining the planned storm water control measures discussed in this plan. Attached Figure 1 – Overall Landfill Exhibit illustrates the landfill complex showing the storm water drainage systems as of October 2016.

2.0 RUN-ON CONTROLS

The purpose of run-on controls is to prevent the flow of water onto the active portion of the landfill during the peak discharge from a 24-hour, 25-year storm. The controls may be permanent or temporary, and their function may also change over time as landfill development proceeds. Controls must consider site conditions outside of the landfill footprint as well as site conditions within the landfill footprint.

2.1 Run-On Controls Outside the Landfill Footprint

2.1.1 Stormwater Perimeter Ditches

Perimeter drainage ditches around the active landfill provide controls to handle run-on from outside the active landfill footprint. The perimeter ditches define the limits of the active landfill ash disposal area/footprint. The perimeter ditches direct stormwater around the landfill pond to the south, and stormwater enters an unnamed tributary that flows 0.8 mile to Hatley Creek.

The perimeter ditches were designed to adequately handle the peak flow from a 25-year, 24-hour storm event. The design calculations are provided in Figure 5. Locations of the perimeter collection and diversion channels are also shown on Figure 1 – Overall Landfill Exhibit.
2.2 Run-On Controls Inside the Landfill Footprint

Run-on controls inside the landfill footprint are in place to ensure that stormwater from closed landfill cells do not enter the active landfill footprint.

2.2.1 Landfill Phasing and Construction Practices

The landfill at H.W. Pirkey Power Plant is broken into multiple cells, which are named based on the year they were constructed. Currently the active landfill cells are the 2012 Cell and 2015 Cell, and all other landfill cells have been capped and covered and are now closed. The closed landfill cells are graded to divert stormwater away from the active landfill cell, and into a storm sewer system with letdowns to capture water from the benches of the cell as well. See the figures in the appendix for the landfill configuration.

2.2.1.1 Phase 1 Active Filling - 2012 Cell

Phase 1 active filling occurs in the 2012 Landfill Cell. Prior to the construction of the 2015 cell, the road along the west end of the cell served as a stormwater diversion berm. All capped and covered cells adjacent to the 2012 Landfill Cell to the north and east are graded to divert water away from the active cell and into stormwater perimeter ditches that bypass the landfill pond. Run-on controls within the landfill footprint consist of an underdrain system. However, this underdrain system discharges into the landfill pond instead of bypassing the pond. Run-off controls consist of a perimeter HDPE lined ditch on the south and west sides of the landfill cell. Also, a leachate collection system serves to collect leachate from the cell and carries water to the perimeter lined ditches. All stormwater and leachate that enters the perimeter ditches discharges into the landfill pond.

2.2.1.2 Phase 2 Active Filling - 2015 Cell

Phase 2 active filling will occur in the 2015 Landfill Cell. Currently, the 2015 Cell has been constructed, so it is considered active; however there is no active filling in the 2015 Cell. Active filling will commence once the 2012 Cell is at capacity. Once the 2012 Cell is closed, it will slope away from the active landfill to a stormwater system that carries water to a perimeter ditch that bypasses the landfill pond. Run-on controls within the landfill footprint consist of an underdrain system that is discharged into a ditch that bypasses the landfill pond. Run-off controls consist of a perimeter HDPE lined ditch on the south and west sides of the landfill cell. Also, a leachate collection system serves to collect leachate from the cell and carries water to the perimeter lined ditch. All stormwater and leachate that enters the perimeter ditch discharges into the landfill pond.

2.2.1.3 Phase 3 Active Filling - 2019 Cell

Phase 3 active filling will occur in the 2019 Landfill Cell. The 2019 Cell is currently in the design phase, however the overall concept of the cell has been finalized. Active filling will commence once the 2015 Cell is at capacity. Once the 2015 Cell is closed, it will slope away from the active landfill to a storm water letdown system that carries water to a perimeter ditch that bypasses the landfill pond. Run-on controls within the landfill footprint consist of an underdrain system that will discharge into a ditch that bypasses the landfill pond. Run-off controls consist of a perimeter HDPE lined ditch on the south and west sides of the landfill cell. Also, a leachate collection system will serve to collect leachate from the cell and carry water to the perimeter lined ditch. All stormwater and leachate that enters the perimeter ditch will discharge into the landfill pond.
2.2.2 Underdrain System

Underneath the HDPE lined landfill cells, an underdrain system was installed to convey groundwater to perimeter ditches. The underdrain systems consist of perforated HDPE pipes that are wrapped in SB57 rock, and then wrapped in filter fabric. The pipe systems are in a drainage layer that directs groundwater to the pipe systems.

3.0 RUN-OFF CONTROLS

The run-off control system prevents flow (contact water) from leaving the active portion of the landfill during the peak discharge from a 24-hour, 25-year storm. Run-off control consists of the following aspects:

- Perimeter ditches
- Leachate collection system
- Landfill Pond
- Ash filling operation

Stormwater from the active landfill travels to the landfill pond via perimeter ditches, or through the leachate collection system. The leachate collection system is similar to the underdrain system, but differs in that it is located in a drainage layer above the HDPE liner of the cell, and conveys leachate from the active landfill cell to the landfill pond. Chimney drains in the 2015 Cell are utilized to capture stormwater from the top of the active landfill cell, and these chimney drains tie directly into the leachate system. Ash filling operation is managed such that contact water is directed to the chimney drains. The run-off control features are presented on the attached figures in the appendix. The following further describes the run-off control components.

3.1 Perimeter ditches

Perimeter ditches are constructed around the active-phase filling areas. These ditches serve to convey stormwater from the active landfill to the landfill pond. All ditches were designed to adequately convey the water volume resulting from a 24 hour, 25 year storm event. The leachate collection system and ash filling operation use the ditches as part of their control systems as described below. The design calculations for the perimeter ditches are provided on Figure 5.

3.2 Leachate Collection System

The leachate collection system consists of 2-ft-thick minimum drainage layer over the landfill composite liner system and a network of perforated collection pipes. The composite liner system is sloped to promote drainage to the leachate collection pipe network, and the leachate collection pipe network discharges into the perimeter ditches. The leachate collection pipe network spacing is a function of the base grade liner slope, drainage layer permeability, and flow distance to collection pipes. The Hydraulic Evaluation of Landfill Performance (HELP) model was used in evaluating the pipe spacing with respect to contact water percolation to the leachate collection drainage layer, the minimum liner slope and a selected pipe spacing or flow distance to a collection pipe.

Design of the chimney drains considered a 25-year, 24-hour storm event and a drainage area of approximately 4 acres. This resulted in a controlled discharge of storm water in to the chimney drain and down to the leachate collection pipes.
3.3 Landfill Pond
All stormwater from the active landfill discharges into the landfill pond. The landfill pond was designed for the 25 year, 24-hour storm. However, the current landfill pond is serving as a total containment pond, meaning that stormwater that is collected in the pond is not treated and released downstream. Instead, water from the pond is pumped to the plant for evaporation. Also, an evaporator system is locally utilized in the pond. In case of emergencies, the pond does have a pipe discharge system that can be opened, as well as an emergency spillway.

3.4 Ash Filling Operation
The ash filling operation must be performed in a manner to provide run-off control within the disposal cell such that the contact surface water reaches the leachate collection system. This involves grading the placed ash in a controlled manner to direct contact surface water flow toward the chimney drain structures in the interior portions of the disposal area. Ash grading must be directed away from the outboard slopes. Stormwater on the outboard slopes makes its way toward the perimeter ditches and into the landfill pond.

4.0 PLAN REVIEW AND CHANGES IN FACILITY OPERATION
Landfill Owner and/or Operator will review and evaluate this Plan every five (5) years from initial plan preparation and when there are changes in the facility design, construction, operation, or maintenance that materially affect the facility’s potential for run-on and run-off control. Amendments to the Plan made to address changes of this nature are referred to as technical or major amendments, and must be certified by a P.E. Non-technical amendments can be performed by the facility owner and/or operator.

Technical and administrative amendments to the Plan will be documented on the Plan Review Log. Owner/Operator will make the necessary revisions to the Plan as soon as possible, but no later than six months after the change occurs. The Plan must be implemented as soon as possible following a technical amendment, but no later than six months from the date of the amendment. The Designated Person is responsible for initiating and coordinating revisions to the SPCC Plan.

Scheduled reviews and Plan amendments will be recorded in the Plan Review Log provided in Appendix 2. The log will be completed even if no amendment is made to the Plan as a result of the review.

5.0 PROFESSIONAL ENGINEER CERTIFICATION
This original Plan, and all subsequent reviews and amended plans, must obtain certification from a qualified PE stating that the initial and subsequent run-on and run-off control system plans meet the requirements of 40 CFR 257. This certification in no way relieves the owner or operator of the facility of his/her duty to fully implement this Plan. The Professional Engineer Certification page is provided in Appendix C.
APPENDIX A:
Figures and Calculations
Figure 1: Overall Landfill Exhibit

Figure 2: Phase 1 Active Ash Filling Sequence

Figure 3: Phase 2 Active Ash Filling Sequence

Figure 4: Phase 3 Active Ash Filling Sequence

Figure 5: Hydrology Exhibit Figure

Associated Calculations
FIGURE 2
PHASE 1 - 2012 CELL
UNDERDRAIN SYSTEM (2.2.2)

LANDFILL POND (3.3)

STORMWATER PERIMETER DITCHES (2.1.1)

CONCEPTUAL PERIMETER HDPE LINED DITCH (3.1)

LEACHATE COLLECTION SYSTEM (3.2)

EXISTING CONTOURS SHOWN ARE A COMBINATION OF ACTUAL CONTOURS AND PROJECTED CONTOURS AT THE TIME OF PHASE 3

PHASE 3 - 2019 CELL
Run-on Stormwater Perimeter Ditch #1

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Time interval = 1 min
Drainage area = 17.400 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 8.30 in
Storm duration = 24 hrs

Peak discharge = 95.43 cfs
Time to peak = 12.12 hrs
Hyd. volume = 328,116 cuft
Curve number = 74
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type III
Shape factor = 484
Run-on Stormwater Perimeter Ditch

Trapezoidal

- Bottom Width (ft) = 12.00
- Side Slopes (z:1) = 3.00, 3.00
- Total Depth (ft) = 3.00
- Invert Elev (ft) = 100.00
- Slope (%) = 0.25
- N-Value = 0.030

Highlighted

- Depth (ft) = 3.00
- Q (cfs) = 250.54
- Area (sqft) = 63.00
- Velocity (ft/s) = 3.98
- Wetted Perim (ft) = 30.97
- Crit Depth, Yc (ft) = 2.01
- Top Width (ft) = 30.00
- EGL (ft) = 3.25

Calculations

- Compute by: Known Depth
- Known Depth (ft) = 3.00

Elev (ft) vs. Depth (ft)

Section

Reach (ft)
Run-off Perimeter Ditch #1

Hydrograph type = SCS Runoff  Peak discharge = 286.99 cfs
Storm frequency = 25 yrs  Time to peak = 12.10 hrs
Time interval = 1 min  Hyd. volume = 1,054,783 cuft
Drainage area = 40.920 ac  Curve number = 90
Basin Slope = 0.0 %  Hydraulic length = 0 ft
Tc method = User  Time of conc. (Tc) = 10.00 min
Total precip. = 8.30 in  Distribution = Type III
Storm duration = 24 hrs  Shape factor = 484
Run-off Perimeter Ditch #1

**Trapezoidal**
- Bottom Width (ft) = 12.00
- Side Slopes (z:1) = 3.00, 3.00
- Total Depth (ft) = 4.00
- Invert Elev (ft) = 100.00
- Slope (%) = 0.74
- N-Value = 0.012

**Highlighted**
- Depth (ft) = 4.00
- Q (cfs) = 1,921
- Area (sqft) = 96.00
- Velocity (ft/s) = 20.01
- Wetted Perim (ft) = 37.30
- Crit Depth, Yc (ft) = 4.00
- Top Width (ft) = 36.00
- EGL (ft) = 10.23

**Calculations**
- Compute by: Known Depth
- Known Depth (ft) = 4.00

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### Section

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**Reach (ft)**
Run-off Perimeter Ditch #2

Hydrograph type = SCS Runoff  
Peak discharge = 41.38 cfs
Storm frequency = 25 yrs  
Time to peak = 12.10 hrs
Time interval = 1 min  
Hyd. volume = 152,083 cuft
Drainage area = 5.900 ac  
Curve number = 90
Basin Slope = 0.0 %  
Hydraulic length = 0 ft
Tc method = User  
Time of conc. (Tc) = 10.00 min
Total precip. = 8.30 in  
Distribution = Type III
Storm duration = 24 hrs  
Shape factor = 484

Run-off Perimeter Ditch #2

Hyd. No. 3 -- 25 Year

Q (cfs)

Run-off Perimeter Ditch #2

Hyd. No. 3 -- 25 Year

Q (cfs)

Time (hrs)
**Run-off Perimeter Ditch #2**

**Trapezoidal**

- Bottom Width (ft) = 12.00
- Side Slopes (z:1) = 3.00, 3.00
- Total Depth (ft) = 4.00
- Invert Elev (ft) = 100.00
- Slope (%) = 1.11
- N-Value = 0.012

**Highlighted**

- Depth (ft) = 4.00
- Q (cfs) = 2,353
- Area (sqft) = 96.00
- Velocity (ft/s) = 24.51
- Wetted Perim (ft) = 37.30
- Crit Depth, Yc (ft) = 4.00
- Top Width (ft) = 36.00
- EGL (ft) = 13.34

**Calculations**

- Compute by: Known Depth
- Known Depth (ft) = 4.00
Run-off Perimeter Ditch #3

Hydrograph type = SCS Runoff  Peak discharge = 76.10 cfs
Storm frequency = 25 yrs  Time to peak = 12.10 hrs
Time interval = 1 min  Hyd. volume = 279,677 cuft
Drainage area = 10.850 ac  Curve number = 90
Basin Slope = 0.0 %  Hydraulic length = 0 ft
Tc method = User  Time of conc. (Tc) = 10.00 min
Total precip. = 8.30 in  Distribution = Type III
Storm duration = 24 hrs  Shape factor = 484

Run-off Perimeter Ditch #3
Hyd. No. 4 -- 25 Year

Q (cfs)

0.00 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00

Time (hrs)

0.00 2.00 4.00 6.00 8.00 10.00 12.00 14.00 16.00 18.00 20.00 22.00 24.00 26.00

Hyd No. 4
Run-off Perimeter Ditch #3

Trapezoidal
- Bottom Width (ft) = 35.00
- Side Slopes (z:1) = 6.00, 6.00
- Total Depth (ft) = 2.00
- Invert Elev (ft) = 100.00
- Slope (%) = 3.00
- N-Value = 0.020

Calculations
- Compute by: Known Depth
- Known Depth (ft) = 2.00

Highlighted
- Depth (ft) = 2.00
- Q (cfs) = 1,644
- Area (sqft) = 94.00
- Velocity (ft/s) = 17.49
- Wetted Perim (ft) = 59.33
- Crit Depth, Yc (ft) = 2.00
- Top Width (ft) = 59.00
- EGL (ft) = 6.76

Elev (ft)  | Section  | Depth (ft) |
-----------|----------|------------|
103.00     |          | 3.00       |
102.50     |          | 2.50       |
102.00     |          | 2.00       |
101.50     |          | 1.50       |
101.00     |          | 1.00       |
100.50     |          | 0.50       |
100.00     |          | 0.00       |
99.50      |          | -0.50      |

Reach (ft)
APPENDIX B: Run-On and Run-Off Plan Review Log
Plan Review and Changes in Facility Configuration

Scheduled reviews and Plan amendments shall be recorded in the Plan Review Log below. This log must be completed even if no amendment is made to the Plan as a result of the review.

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APPENDIX C:
Professional Engineer Certification
Professional Engineer Certification

The Run-on Run-off System Control Plan for the H.W. Pirkey Power Plant Landfill was prepared by Akron Consulting, LLC (TBPE Firm #14014). This Certification/Statement of Professional Opinion is limited to the information available to Akron at the time the Plan was written. On the basis of and subject to the foregoing, it is my professional opinion as a Professional Engineer licensed in the State of Texas, that the Plan has been prepared in accordance with good and accepted engineering practices as exercised by other engineers practicing in the same discipline(s), under similar circumstances and at the time and in the same locale. It is my professional opinion that the Plan was prepared consistent with the requirements of the United States Environmental Protection Agency’s “Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments,” published in the Federal Register on April 17, 2015 with an effective date of October 19, 2015 and meets the requirements of Part 257.81.

The use of the words “certification” and/or “certify” in this document shall be interpreted and construed as a Statement of Professional Opinion, and is not and shall not be interpreted or construed as a guarantee, warranty or legal opinion. This certification in no way relieves the Owner or Operator of the facility of his/her duty to fully implement this Plan.

Engineer: Landon Cole Allen
Registration Number: 119170
State: Texas
Date: 10/14/2016

P.E. certification is required for the original Plan and Plan reviews and amendments.

AKRON CONSULTING, LLC
431 N. CENTER ST.
LONGVIEW, TX 75601
TBPE Firm Reg. # 14014
(C) 903-236-9744
(f) 903-236-9745
www.akron-consulting.com