

2015 Initial Landfill Inspection Report

Northeastern Units 3&4 Ash Landfill
Oologah, Oklahoma
NHIW Landfill Permit No. 3566010

December 2015
Project No. 35157169



**PUBLIC SERVICE
COMPANY OF
OKLAHOMA**SM

A unit of American Electric Power

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PROFESSIONAL ENGINEER'S CERTIFICATION

The following Sections contain information, studies, findings, data, and observations compiled by Terracon Consultants, Inc. (Terracon) for Public Service Company of Oklahoma (PSO) Northeastern Power Station Units 3 & 4. This report documents findings for the Northeastern Ash Landfill, an existing non-hazardous industrial solid waste (NHIW) landfill located in Rogers County, Oklahoma. Public Service Company of Oklahoma is a unit of American Electric Power.

This document is intended to comply with *CCR Rule Section 257.84 Inspection requirements for CCR landfills*. The information that comprises this Initial Inspection Report was prepared under the direction of F. Owen Carpenter, a licensed professional engineer in the State of Oklahoma.

As required by *Oklahoma Title 59 O.S. Supp. 2010- Section 475*, Terracon Consultants, Inc. is authorized by the Oklahoma State Board of Professional Engineers and Land Surveyors to provide engineering services in the State of Oklahoma. In testimony thereof, **Certificate Number 4531** was issued under seal of the Board on March 24, 2004. The current certification expiration date is June 30, 2017.

"I certify that, to the best of my knowledge, the information contained herein is accurate and verifiable."

F. Owen Carpenter, P.E., P.G.
Oklahoma Professional Engineer No. 23514

December 11, 2015
Date



Expires 31-OCT-17

1.0 INTRODUCTION

Public Service Company of Oklahoma (PSO) owns and operates the Northeastern Ash Landfill, an existing non-hazardous industrial solid waste (NHIW) disposal facility located near Oologah, Oklahoma. The landfill currently operates under ODEQ Permit No. 3566010 and is permitted to dispose of coal combustion residuals. The PSO Northeastern Power Station is located at the junction of U.S. Highway 169 and Oklahoma Highway 88 approximately 1 mile south of Oologah, Rogers County, Oklahoma. A site location map showing the general location of the landfill is presented in **FIGURE 1** in **APPENDIX A**.

Mr. Owen Carpenter, P.E., and Mr. Quin Baber, P.G. performed the initial inspection of the ash landfill at the Northeastern Power Station. Mr. Dan Outlaw, the lead construction supervisor for AEP for the on-going intermediate liner installation at the landfill was notified but did not accompany the Terracon personnel on the site walk-through. This report is a summary of the inspection and an assessment of the general condition of the facility.

The initial inspection was conducted on October 27, 2015 during the morning hours. Weather conditions were cloudy during the inspection with temperature ranging from approximately 54 degrees to 62 degrees Fahrenheit. Precedent rainfall totaled approximately 0.32 inches during the seven days leading up to the inspection date (Tulsa Station).

FIGURE 2 in **APPENDIX A** provides a plan view Google Earth aerial photographic image of the subject landfill and areas observed during the initial inspection. Photographic log approximate location and viewing directions are depicted on the figure using directional arrows. The existing landfilled wastes were placed within a mined/quarried area adjacent to the Verdigris River near the southern boundary of the Northeastern Plant property ownership. Portions of the upper limestone rock appear to have been removed, primarily within the western portion of the landfill. A dike structure defining the south edge of the disposal facility was built as a part of initial plant construction. This dike would be built to an elevation of 610 feet MSL having a crest width of 10 to 12 feet and 3:1 side slopes. The dike acted as a barrier between the disposal area and the Verdigris River. An additional construction event raised the dike to the current crest elevations of greater than 630 feet MSL, with a crest width of about 25 feet. Side-slopes of the dike, running down to the river basin, have an overall slope on the order of 30 degrees from horizontal and consist of red-brown clay with limestone gravel mixed with varying amounts of ash material and larger rock. Limestone with some thin shale beds, followed by shale, underlies the constructed dike. The facility previously installed a slurry wall and grout curtain on the southeast side of the landfill within the constructed dike.

2.0 GENERAL INFORMATION

Structure or Unit: Northeastern Ash Landfill, including separation dike along Verdigris River

Owner: Public Service Company of Oklahoma

Type of Dike: Earthen Fill

Date of Construction: Initial Construction 1979

OWRB Hazard Classification: Low

LOCATION

County: Rogers County

General Location: One mile south of Oologah, OK

Stream and Basin: Verdigris River

SIZE

Dike Crest Elevation: 630 (approximate)

Height: 28 feet average above bedrock

In-place Waste: 1.380 million cubic yards (approximate)

3.0 SUMMARY OF VISUAL OBSERVATIONS

The summary of the visual observations presented herein uses terms to describe the general appearance or condition of an observed item, activity or structure. Their meaning is understood as follows:

CONDITION OF LANDFILL OR DIKE COMPONENT

Good: A condition or activity that is generally better or slightly better than what is minimally expected or anticipated from a design or maintenance point of view.

Fair or Acceptable: A condition or activity that generally meets what is minimally expected or anticipated from a design or maintenance point of view.

Poor: A condition or activity that is generally below what is minimally expected or anticipated from a design or maintenance point of view.

SEVERITY OF DEFICIENCY

Minor: A reference to an observed deficiency (e.g., erosion, seepage, vegetation, etc..) where the current maintenance condition is below what is normal or desired, but which is not currently causing concern from a structural safety or stability point of view.

Significant: A reference to an observed deficiency (e.g. erosion, seepage, vegetation, etc.) where the current maintenance program has neglected to improve the condition. Usually these conditions have been identified in previous inspections, but have not been corrected.

Excessive: A reference to an observed deficiency (e.g., erosion, seepage, vegetation, etc.) where the current maintenance condition is above or worse than what is normal or desired, and which may have affected the ability of the observer to properly evaluate the structure or particular area being observed or which may be a concern from a structural safety or stability point of view.

INSPECTION OBSERVATIONS –

See FIGURE 2: Landfill Inspection Location Plan

The initial inspection included observation of: Instability signatures, including areas of erosion, sloughing, scarps, saturated areas, changes in vegetation, misalignment, obvious settlement, sinkholes, cracking, etc.; insufficient vegetation; stormwater management features including ditches, swales, benches, etc.; CCR containment features; leachate management system, including precipitate buildup, damaged pipes, etc.; and, landfill liner system, leachate collection system, berms, etc.. The landfill currently has an estimated 1.380 million cubic yards of waste in place as of the date of the recent pre-construction topographic survey dated December 2014. The as-built landfill conditions, as of the date of the original conditions survey prior to construction, beginning in January 2015, are shown on the attached Sheet 3 existing conditions construction drawing (**Construction Drawing No. 34-30200-15-0**) that is included in **APPENDIX A**. The landfill and associated land features were observed, beginning at the Photo 1 location shown on **FIGURE 2** and advancing counterclockwise around the landfill perimeter. Referenced photos are included in **APPENDIX B**.

Areas Under Construction

1. Every area of the existing landfill, including the waste disposal area, the constructed and lined leachate impoundment, and stormwater collection area (Basin C) has undergone construction during calendar year 2015 and therefore is in large part in a denuded state. The construction area will be re-vegetated or will remain covered with protective geosynthetic materials or protective cover upon project completion, in accordance with the project construction specifications. (Photo 27)
2. No comment is made during this initial inspection regarding Instability signatures, insufficient vegetation, or damaged pipes, etc., as the areas under construction may require additional construction and/or re-working/finishing and are subject to oversight by construction quality assurance personnel.
3. It was noted that there is an area of wetting at the toe of slope of the landfill perimeter berm in the vicinity of the coal car unloading building. (Photos 78, 80 and 83) This area will be monitored during future inspections following the completion of construction at the landfill.

Perimeter Dike - Southwest perimeter of landfill and along the Verdigris River

1. The landfill perimeter dike begins to reach a height of greater than five feet in the vicinity of groundwater monitoring well MW-5 (near Photo 6), and then wraps around the southernmost corner of the landfill after which it runs the full length of the landfill and Basin C along the Verdigris River (to near Photo 62). See also **FIGURE 2**. The upper slope appeared to be approximately 4:1 and the lower slope appeared to be about 1:1. (Photos 21 and 22). This transitioned to a roughly 1:1 slope all the way up to the perimeter road elevation near Photo 40. A flatter slope was noted in the vicinity of Photo 41 and appeared to be about a 2:1 slope. Occasional, local wetting at the interface between the upper fill and the underlying rock outcrop “shelves” has been noted historically. A slurry wall and grout-curtain system has been installed through the dike along the Verdigris River side of the dike. Up-gradient and down-gradient piezometers have been installed to measure the effectiveness of the slurry wall/grout curtain system and to monitor water levels.
2. The outside slope of the dike was in stable condition, with no notable signs of instability. No saturated conditions were observed within the fill area above the rock outcrops of the native formation “shelves” upon which it typically rests. No saturated conditions were observed at the fill/shelf interface. Saturated areas or seepage areas emanating from the lower in-place rock shelves in the Verdigris River stream area were not documented for the purposes of this inspection.
3. The outer bank (downslope from the perimeter road at the top of the dike) was heavily wooded with trees and brush and leaf-fall. (Photos 22 and 30) Observation of small-scale pre-movement cracking, sloughing and/or saturated conditions may be obscured by the heavy ground cover. However, none was noted.

Stormwater Management System

1. The landfill intermediate liner design includes a perimeter berm that will prevent run-on of stormwater into the fill area during operations and will convey stormwater outside the perimeter berm to the stormwater collection basin – Basin C. (Photo 35)
2. Stormwater conveyances are presently in an interim stage during construction. However, at this time no blockages of stormwater flow, erosion, or deterioration are noted.
3. Occasional minor occurrences of pooling water within the GM lined perimeter ditch were noted. Trampolining of GM was noted within the perimeter ditch (Photo 26). However, these occurrences do not inhibit general run-off of stormwater into basin C.

CCR Containment Features

1. Every area of the existing landfill, including the waste disposal area, the constructed and lined leachate impoundment, and stormwater collection area (Basin C) has undergone construction during calendar year 2015 and is therefore in an interim state prior to State acceptance at the time of the inspection.
2. No damage to the GM liner, berms, LCS piping, etc. was noted during the inspection. Defects observed during construction and CQA oversight have been patched and tested for integrity as part of the on-going construction project. No appreciable precipitate/scale buildup or damage was noted for visible portions of the leachate collection system. The pipes are to be cleaned out after placement of the protective cover, after placement of the first lift of waste, and once a year thereafter in accordance with the facility operating plan.

4.0 CONCLUSIONS

Based on our visual inspection, it is concluded that the perimeter dike impounding the ash landfill was generally in good condition at the time of inspection with no signs of distress that would indicate possible instability, excessive settlement, misalignment, sloughing, or cracking of the dike. The stormwater conveyances are still in an interim condition within the construction sequence, but those that have been constructed are in good condition with no blockages or deterioration. The CCR containment features are still in an interim condition within the construction sequence, but those that have been constructed are in good condition with no damage noted to completed elements of the system.

5.0 RECOMMENDATIONS

Remedial Activities

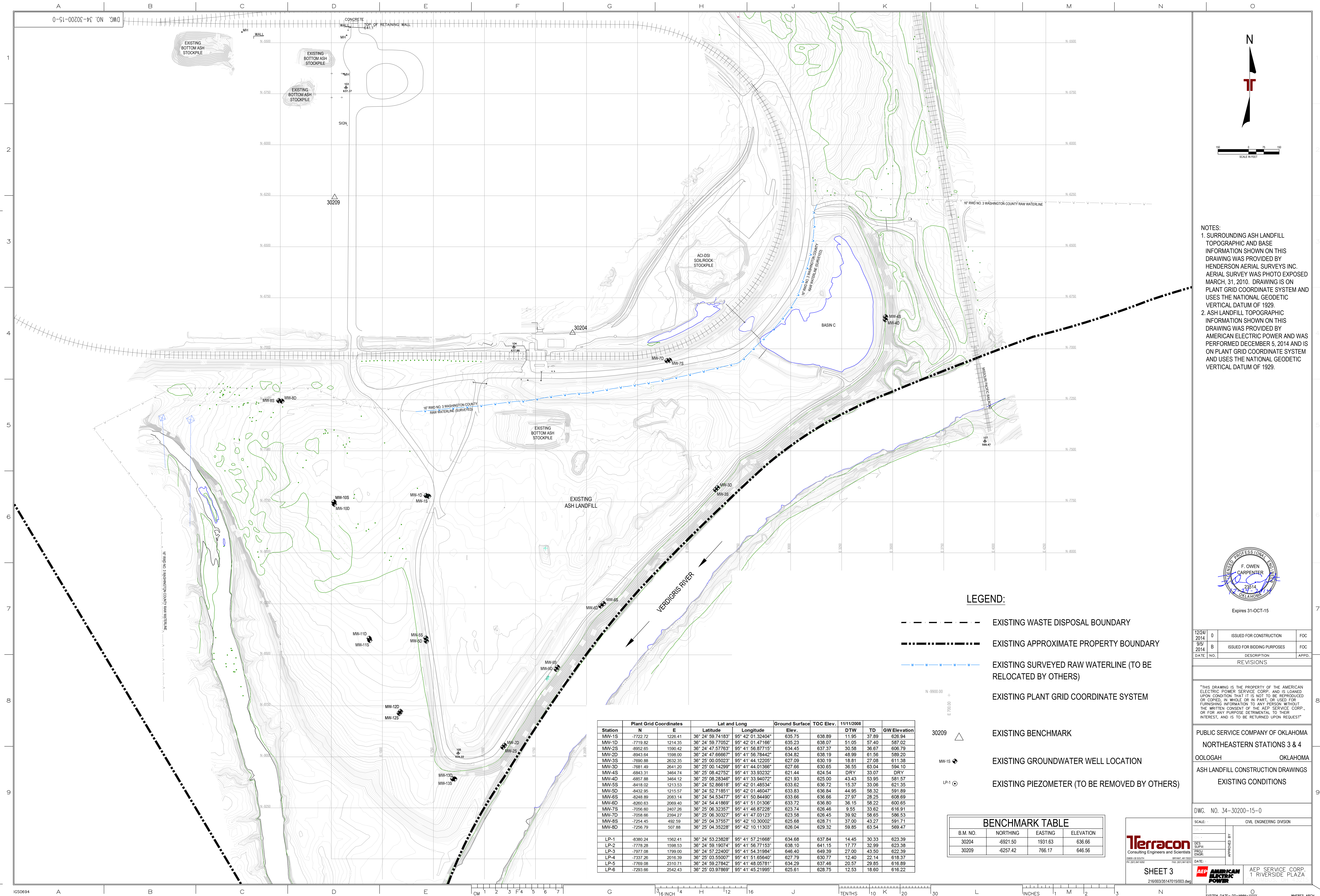
- No remedial activities are recommended at this time. A final construction walk-through is anticipated at the conclusion of landfill construction activities and remedial activities may be recommended at that time.

General Maintenance and Monitoring Activities

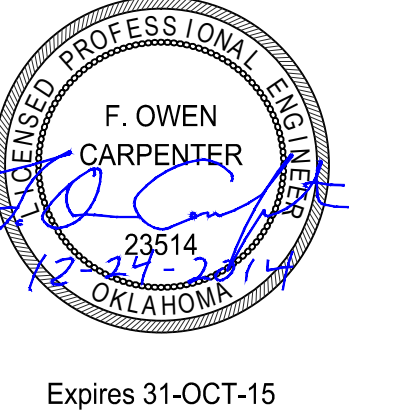
- Continue formal inspections, monitoring and maintenance as required by the CCR and ODEQ Solid Waste Management rules.
- Continue to monitor water levels in piezometers still in place in the slurry wall area to determine if excess pore water pressure is building in the outside slope of the perimeter dike.
- Monitor wet areas historically noted in the dike/bedrock interface within the Verdigris River stream area.
- Monitor wet areas at the toe of slope of the landfill perimeter berm in the area of the coal car unloading building.

Appendix A

Figures



NOTES:
1. SURROUNDING ASH LANDFILL TOPOGRAPHIC AND BASE INFORMATION SHOWN ON THIS DRAWING WAS PROVIDED BY HENDERSON AERIAL SURVEYS INC. AERIAL SURVEY WAS PHOTO EXPOSED MARCH 31, 2010. DRAWING IS ON PLANT GRID COORDINATE SYSTEM AND USES THE NATIONAL GEODETIC VERTICAL DATUM OF 1929.
2. ASH LANDFILL TOPOGRAPHIC INFORMATION SHOWN ON THIS DRAWING WAS PROVIDED BY AMERICAN ELECTRIC POWER AND WAS PERFORMED DECEMBER 5, 2014 AND IS ON PLANT GRID COORDINATE SYSTEM AND USES THE NATIONAL GEODETIC VERTICAL DATUM OF 1929.



12/24/2014	0	ISSUED FOR CONSTRUCTION	FOC
05/14/2014	B	ISSUED FOR BIDDING PURPOSES	FOC
DATE	NO.	DESCRIPTION	APPRO.
REVISIONS			
THIS DRAWING IS THE PROPERTY OF THE AMERICAN ELECTRIC POWER SERVICE CORP. AND IS LOANED UPON CONDITION THAT IT IS NOT TO BE REPRODUCED OR COPIED, IN WHOLE OR IN PART, OR USED FOR FURNISHING INFORMATION TO ANY PERSON WITHOUT THE WRITTEN CONSENT OF THE AEP SERVICE CORP. OR FOR ANY PURPOSE DETRIMENTAL TO THEIR INTEREST, AND IS TO BE RETURNED UPON REQUEST.			
PUBLIC SERVICE COMPANY OF OKLAHOMA NORTHEASTERN STATIONS 3 & 4 Oologah, Oklahoma ASH LANDFILL CONSTRUCTION DRAWINGS EXISTING CONDITIONS			

DWG. NO. 34-30200-15-0	
SCALE:	CIVIL ENGINEERING DIVISION
DESIGNED BY:	APPROVED BY:
DRAWN BY:	DATE:
CHECKED BY:	DATE:
IN CHARGE:	DATE:

Terracon
Consulting Engineers and Scientists
216/003/35147015/003.dwg

SHEET 3
AEP SERVICE CORP.
11 RIVERSIDE PLAZA

BENCHMARK TABLE			
B.M. NO.	NORTHING	EASTING	ELEVATION
30204	-6921.50	1931.63	636.66
30209	-6257.42	766.17	646.56



Plant Grid Coordinates		Lat and Long		Ground Surface		TOC Elev.		11/11/2008	
Station	N	E	Latitude	Longitude	Elev.			DTW	TD
MW-1S	-7722.72	1226.41	36° 24' 59.74163"	95° 42' 01.32404"	635.75	638.89	11.95	37.89	626.84
MW-1D	-7719.82	1214.35	36° 24' 59.77052"	95° 42' 01.47166"	636.23	638.07	51.05	57.40	587.02
MW-2S	-8862.65	1590.42	36° 24' 47.57763"	95° 41' 56.87715"	634.45	637.37	30.58	36.67	606.79
MW-2D	-8943.64	1588.00	36° 24' 47.66667"	95° 41' 56.78442"	634.82	638.19	48.99	61.56	599.20
MW-3S	-7690.88	2632.35	36° 25' 00.05023"	95° 41' 44.12205"	627.09	630.19	18.61	27.08	611.38
MW-3D	-7691.49	2641.20	36° 25' 00.14299"	95° 41' 44.01366"	627.66	630.65	36.55	63.04	594.10
MW-4S	-6843.31	3464.74	36° 25' 08.42752"	95° 41' 33.93232"	621.44	624.54	DRY	33.07	DRY
MW-4D	-6857.88	3464.12	36° 25' 08.28346"	95° 41' 33.94072"	621.93	625.00	43.43	53.95	581.57
MW-5S	-6418.02	1213.33	36° 24' 52.86618"	95° 42' 01.48531"	633.62	636.72	15.37	33.06	621.25
MW-5D	-8432.95	1215.57	36° 24' 52.71851"	95° 42' 01.46047"	633.83	636.84	44.95	58.32	591.89
MW-6S	-8248.89	2083.14	36° 24' 54.53477"	95° 41' 50.84490"	633.66	636.66	27.97	28.25	608.69
MW-6D	-8260.63	2069.40	36° 24' 54.41869"	95° 41' 51.01306"	633.72	636.80	36.15	58.22	600.65
MW-7S	-7056.60	2407.36	36° 25' 06.32357"	95° 41' 46.87228"	623.74	628.46	9.55	33.62	616.91
MW-7D	-7059.68	2394.27	36° 25' 06.30327"	95° 41' 47.03123"	623.58	628.45	39.92	58.65	586.53
MW-8S	-7254.45	492.59	36° 25' 04.37557"	95° 42' 10.30002"	625.68	628.71	37.00	43.27	591.71
MW-8D	-7256.79	507.88	36° 25' 04.35228"	95° 42' 10.11303"	626.04	629.32	59.85	63.54	569.47
LP-1	-8380.24	1562.41	36° 24' 53.23826"	95° 41' 57.21668"	634.68	637.84	14.45	30.33	623.39
LP-2	-7778.28	1598.53	36° 24' 59.19074"	95° 41' 56.77153"	638.10	641.15	17.77	32.99	623.38
LP-3	-7977.08	1799.00	36° 24' 57.22400"	95° 41' 54.31894"	646.40	649.39	27.00	43.50	622.39
LP-4	-7537.26	2016.39	36° 25' 03.55007"	95° 41' 51.65640"	627.79	630.77	12.40	22.14	616.37
LP-5	-7769.08	2310.71	36° 24' 59.27842"	95° 41' 48.05781"	634.29	637.46	20.57	29.85	616.89
LP-6	-7293.66	2542.43	36° 25' 03.97869"	95° 41' 45.21995"	625.61	628.75	12.53	18.60	616.22




Appendix B


Inspection Photographs



**NE 3 & 4 Ash Landfill Initial Inspection
Conducted October 27, 2015**




**Project involved a perimeter walk-through of the landfill beginning in the vicinity of Photo 1 and advancing counterclockwise
Photos taken October 27, 2015.**


Text			
Photograph ID #	Description	Comments	Photo
1	Looking southeast at west ramp onto constructed perimeter berm	Begin counterclockwise walk-down of the entire landfill boundary and the Basin C boundary	
6	Looking at perimeter embankment – MW-5 area	No vegetative distress noted along this southwest embankment (emb) area. Emb appears flatter than 3:1	

21	Looking downslope toward Verdigris River	Upper slope estimated at approximately 4:1			
22	Looking downslope toward Verdigris River	Lower slope estimated at approximately 1:1			
26	Looking southwest along perimeter stormwater ditch				

27	Looking north along unfinished portion of LCS system in temporary weir vicinity				
30	Looking north along the perimeter road toward MW-6	Note presence of heavy groundcover downslope to the right of the photo			
35	Looking north from the top of the perimeter berm	Note temporary weir in the foreground and stormwater conveyance ditch to the right			

40	Looking downslope toward the Verdigris River approximately half way between MW-6 and MW-3	Steep slope at around 1:1 extends up to perimeter road on top of dike			
41	Looking south at downward slope of perimeter dike	Note repelling rope in picture			

62	Looking south at perimeter dike below Basin C from the access road leading to wastewater mixing structure				
78	Looking west at standing water upstream from the leachate impoundment area in the north ditch				
80	Looking southwest at the toe of the landfill perimeter berm	Note saturated condition			

83	Looking north down the landfill perimeter berm toward the coal unloading building	Note flow of water from the coal unloading building area south toward the landfill berm toe	
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