Unstable Area Demonstration
40 CFR 257.64
Sunflower Electric Power Corporation
Holcomb Common Facilities, LLC

Prepared for:

Sunflower Electric Power Corporation
A Touchstone Energy® Cooperative

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Table of Contents

Certification

This Unstable Areas Evaluation fulfills the minimum requirements of 40 CFR §257.64. This certification is based upon review of the design and operational information and/or data made available by Holcomb Facilities about the CCR Unit.

ALLIED ENVIRONMENTAL CONSULTANTS, INC.

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1.0 INTRODUCTION

1.1 PURPOSE OF REPORT

This report addresses the unstable areas evaluation requirements in the Federal Coal Combustion Residuals (CCR) Rule specified in Title 40 of the Code of Federal Regulations (CFR), Section (§) 257.64. Allied Environmental Consultants (AEC) submits this report on the behalf of Holcomb Common Facilities, LLC for the Industrial CCR Landfill located near Holcomb Kansas. As detailed in 40 CFR §257.64, it must be demonstrated that the CCR unit is not located in an unstable area, or if located in an unstable area that the Site's structural components have been designed to ensure the integrity of the CCR unit will not be disrupted.

1.2 CCR RULE REQUIRMENTS FOR UNSTABLE AREAS

In accordance with 40 CFR 257.64(a), "CCR units must not be located in unstable areas unless the owner or operator demonstrates" that "recognized and generally accepted engineering practices have been incorporated into the design of the unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted." Per regulation, unstable areas are defined as a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity of the CCR unit. 40 CFR 257.64 requires the evaluation of the presence of natural unstable features such as poor foundation conditions, areas susceptible to mass movement (i.e. landslides, avalanches, debris slides and flows, block sliding, rock fall), and karst terrain. If present, a demonstration of the prescribed engineering practices to overcome the instability is required.

When determining if an area is unstable, the owner/operator must consider the following factors, at a minimum:

1. On-site or local soil conditions that may result in significant differential settling;
2. On-site or local geologic or geomorphic features; and
3. On-site or local human-made features or events (both surface and subsurface).

Per the preamble to 40 CFR 257 (pages 21367-21368), a site investigation should identify any potential thick layers of soil that are soft and compressible which could cause a significant amount of post-construction differential settlement of foundation soils, adjacent embankments, and slopes. In addition, examination should identify soil conditions or subsurface conditions that are conducive to downslope movement of soil, rock, or debris under the influence of gravity.

1.3 REFERENCED DOCUMENTATION

This report references the December 29, 2006 Holcomb Common Facilities Industrial Landfill Engineering Report, prepared by GAI Consultants which is Volume 3 of the Permit Modification Package submitted to the Kansas Department of Health and Environment, hereafter referred to as Volume 3 Report. The Report was submitted to include all the pertinent information regarding the Landfill Design and includes a detailed geotechnical investigation regarding site stability that considers the above minimum factors.

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2.0 UNSTABLE AREA DETERMINIATION

In accordance with the 40 CFR 257 preamble (page 21368) owners or operators of CCR units a stability assessment should evaluate the following:

1. the adequacy of the subsurface exploration program;
2. the liquefaction potential of the embankment, slopes and foundation soils;
3. the expected behavior of the embankment slopes and foundation soils when they are subjected to seismic activity;
4. the potential for seepage induced failure; and
5. the potential for differential settlement.

Previous investigations and analyses have been reported in the Volume 3 Report that include these elements which are summarized below.

2.1 SOIL CONDITIONS

As discussed in the Volume 3 Report, the site contains approximately 3 to 29 feet of loose to medium dense eolian soils (i.e., wind-blown or wind-derived) comprised chiefly of sands and silts underlain by alluvial sands and gravels with alluvial clay and silt layers. Investigations presented in the Volume 3 Report concluded that the eolian soils have relatively low densities and are stable at their normally low natural moisture content and may tend to compress when wetted. The alluvial sands were reported as capable of supporting moderate to high loads.

For the landfill design slopes, a static factor of safety of 4.62 and a seismic factor of safety of 2.61 were calculated for the 15 percent slope and a static factor of safety of 2.38 and seismic factor of safety of 1.73 were calculated for the 33 percent slope. In addition, the estimated settlement was in the range of 2 to 3 inches based on a 100-foot fill height limiting effects of any potential differential settlement.

2.2 GEOLOGIC AND GEOMORPHIC FEATURES

As defined in the Volume 3 Report and based on review of available literature there are no geologic or geomorphic features that would cause instability at the site. The most referenced geologic condition for instability, karst terrain, is not recorded to be present in the CCR unit's area in Finney County[1].

According to the 2014 U.S. Geological Survey National Seismic Hazard Maps, the site is located in an area that has no expected peak acceleration with a 2% probability of exceedance in 50 years. This indicates that there is little to no risk from seismic-induced failure. Liquefaction risk, typically a result of water saturation and earthquake movement in loose granular soils, is also extremely low due to the limited earthquake risk, and depth to saturated soils.

[1] Kansas Geological Survey, Bulletin 162, and Bulletin 55.

2.3 HUMAN MADE FEATURES OR EVENTS

There are no known anthropogenic sources that may cause unstable areas. Drawdown of the regional aquifer is occurring; however, the depth to the aquifer (180+ feet below ground surface) precludes any effect on the landfill foundation soils. Likewise, cut and fill slopes in the area are only associated with the landfill and its appurtenances which are designed and constructed with safety side slopes of a maximum of 3H:1V to preclude mass movement.

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3.0 DESIGN CONSIDERATIONS

Based on the findings above, the potential instability issues at the site are related to wetting of the surficial eolian sands. This risk is minimized by rapid moisture infiltration into the soils, deep aquifer and thereby no intercept with surface soils, and low annual rainfall. Even so, Volume 3 and design documents for the site provide for the following design considerations:

- Remove eolian sands beneath the evaporation basin, backfill with alluvial sands;
- Construct base of landfill with sand/fly-ash mixture pad and positive drainage;
- Construct toe ditches with sand/fly-ash mixture with specified minimum slopes; and
- Maintain all slopes at a maximum of 3H:1V (33%).

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4.0 LIMITATIONS OF THE REPORT

This report has been prepared on behalf of and for the exclusive use of our client and the property or site listed herein. Conclusions stated in this report refer only to the site and for the period of time when work was performed. AEC represents that the data have been reviewed, and that this document has been prepared in accordance with professional principles and practices generally and currently accepted at the time and in the locality where services were rendered. This representation is in lieu of all warranties either expressed or implied. AEC requests to be notified in the event the client or interested third parties use this report in a manner that differs from the stated purpose.

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