# CCR Landfill Location Restrictions: Unstable Areas

**Twin Oaks Power Station**
**13065 Plant Road**
**Bremond, Texas 76629**

**October 12, 2018**

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# 1.0 Introduction

The following report is intended to fulfill the requirements of Coal Combustion Residual Rule 40 CFR §257.64 (Location Restrictions: Unstable Areas) for the existing Twin Oaks Power (TOP) Utility Landfill located near Bremond, Texas. Section 40 CFR §257.64 requires that an owner or operator of an existing CCR landfill demonstrate that they meet the specific criteria for Unstable Areas, as defined in 40 CFR §257.53 (Definitions) and as discussed in the 40 CFR Part 257 Preamble.

# 2.0 Location Restrictions: Unstable Areas

In accordance with 40 CFR §257.64, an existing CCR landfill or any existing lateral expansion of a CCR unit must not be located in an unstable area, unless the owner or operator can demonstrate that recognized and generally accepted good engineering practices have been incorporated into the design of the landfill and to ensure that the integrity of the structural components of the landfill will not be disrupted. The owner and operator should consider the following:

- Onsite or local soil conditions that may result in significant differential settling;
- Onsite or local geologic or geomorphologic features; and
- Onsite or local human-made features or events (both surface and subsurface).

As provided in 40 CFR §257.53 (Definitions), *unstable area* means a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity of some or all of the structural components responsible for preventing releases from a CCR unit (i.e. existing landfill). Unstable areas can include poor foundation conditions, areas susceptible to mass movements and karst terrains. *Structural Components*, per 40 CFR §257.53 (Definitions), mean liners, leachate collection and removal systems (if applicable), final covers, run-on and run-off systems, inflow design flood control systems and any other component used in the construction and operation of the CCR unit that is necessary to ensure the integrity of the unit, and the contents of the unit, are not released into the environment.

## 2.1 Unstable Areas – Geotechnical Investigation

In October 2017, a geotechnical investigation was issued that characterized and evaluated subsurface conditions and provided stability data for the existing CCR landfill. As part of this investigation, boreholes were drilled and sampled adjacent to and around the periphery of the existing CCR landfill.

The findings and subsurface information from the referenced investigation demonstrate that no natural or manmade unstable areas, including areas that have poor foundation soils, areas susceptible to mass movements and karst terrains, are present at the site.

### 2.1.1 Field and Laboratory Testing

The subsurface exploration of the existing landfill consisted of advancing a total of 10 borings located adjacent to and around the periphery of the existing CCR landfill. Each

boring was completed to an approximate termination depth of 60 feet, below existing grades.

**Drilling Methods.** Field operations were performed in general accordance with ASTM procedures or similar accepted practices. Soil borings were drilled using a track mounted Geoprobe drilling rig equipped with a rotary head and continuous augers. The use of mud rotary or rotary wash was not necessary.

**Soil Sampling.** Sample intervals were semi-continuous in the upper 10 feet of each boring and five (5) foot intervals thereafter, unless otherwise directed by the onsite geotechnical engineer. Split-spoon (Standard Penetration Test, SPT) or disturbed samples were collected in general accordance with ASTM Standard Method D 1586. Relatively undisturbed soil samples were collected using tube samplers in general accordance with ASTM D 1587 and extruded in the field. The collected samples were subsequently examined and selected for laboratory testing by a geotechnical engineer.

**Laboratory Testing.** An extensive laboratory-testing program was performed on selected samples obtained from the exploratory borings. Laboratory testing included Atterberg Limit Determination (ASTM D4318), Moisture Content (ASTM D2216), Particle Size Analysis with Hydrometer (ASTM D422), Percentage Passing No. 200 Sieve (ASTM D1140), Consolidated Undrained (CU) Triaxial Compression (ASTM D4767), Unconsolidated Undrained (UU) Triaxial Compression (ASTM D2850), One-Dimensional Consolidation of Soils (ASTM D2435), Direct Shear (ASTM D3080), and Moisture-Density of Soil Cement Mixtures (ASTM D558). Detailed laboratory test data are presented in the referenced geotechnical report.

### 2.1.2 Subsurface Soil Conditions

The generalized subsurface profile encountered in these borings consists of coarse-grained (sandy) soils and fine-grained (clayey) soils extending to an approximate depth of 30 to 40 feet. The majority of soils encountered below 40 feet consist of very dense silty sands and poorly graded sands, with fine-grained or clayey soils near the termination depth. Lignitic material was encountered in four (4) borings at an approximate depth of 25 to 30 feet and 40 to 45 feet.

Based on the findings of the referenced geotechnical investigation, the area is not conducive to downslope movement of soil, rock, or debris under the influence of gravity. In

addition, the immediate area around the landfill does not include anthropogenic activities that could induce instability.

### 2.1.3 Onsite Surface Conditions

The majority of the area surrounding the landfill is relatively flat with minor elevation changes, and generally consists of maintained vegetated areas. These areas drain potential surface run-on water away from the landfill via overland flow, then to unnamed tributaries and then to Bee Branch Creek located to the east of the existing landfill.

### 2.1.4 Geology

Based on geologic mapping provided by United States Geologic Survey (USGS), this site is located in the Calvert Bluff and Simsboro Formation (Ecb and Esb). The Simsboro Formation is generally characterized by mostly sand, some mudstone, clay and mudstone conglomerate. Based on the geologic mapping provided by the USGS, the existing landfill is not located in an area prone to karst, or other potentially unstable, geologic conditions.

### 2.1.5 Groundwater

Groundwater level measurements were made during drilling activities and upon completion of drilling (if practical). Based on these observations at the time of drilling, groundwater levels ranged between 13 to 53 feet below existing grade.

Groundwater levels may fluctuate with climatic and seasonal variations, land-use or drainage pattern changes, and accurate determination of static groundwater levels is typically made with standpipe piezometers. The installation of piezometers to evaluate long-term groundwater conditions and subsequent monitoring was not included in the referenced geotechnical investigation.

## 2.2 Settlement and Subgrade Deformation

A settlement analysis of landfill foundations soils were performed to evaluate the estimated amount of total and differential settlement upon achieving the final proposed height of the landfill, assuming an ash unit weight of 100 pounds per cubic foot ($lbs/ft^3$). The stress increase imposed on the underlying soils is dependent on the geometry and placement of landfill materials. The landfill geometry evaluated in the referenced report is similar to that provided in other CCR demonstration reports.

Based on the proposed disposal geometry and subsequent maximum stress of applied CCR material on foundation soil, results in an estimated slope gradient (from landfill edge to

approximate landfill center) of 0.0025 (0.25%) or differential settlement on the order of approximately one (1) inch (vertical) per 35 feet (horizontal). These estimated movements are considered minimal and are not expected to hinder the proper operation and stability of the underlying clay liner, structural components, or operation of the landfill.

Based on the collected subsurface information and the estimated settlement of existing soils under final disposal height, the underlying soils appear stable and suitable for the CCR landfill and do not indicate unstable conditions.

## 2.3 Local Manmade Features or Events

There are no known local manmade features or events that would classify the CCR landfill site as an unstable area. In accordance with the Rule definitions and criteria, such features or events would include mining, cut and fill activities during construction, excessive drawdown of groundwater, and construction over an old/existing landfill.

## 2.4 Location Restriction Compliance Assessment

Based on the information provided by the referenced geotechnical investigation, and as provided and defined in this section, the existing CCR landfill is not situated in an unstable area and is, therefore, in compliance with the requirements of the location restriction for unstable areas, as defined by 40 CFR §257.64.

## 3.0 Location Restriction: Unstable Area Certification

By means of this certification, (i) this document has been prepared, and reviewed in accordance with good engineering practice, (ii) it is my professional opinion that the evaluation referenced herein was prepared consistent with the minimum requirements of 40 CFR §257.64, (iii) I or my agent has visited and examined the facility, (iv) this certification is not and shall not be interpreted or construed as a guarantee, warranty or legal opinion, and (v), it is my professional opinion that this report and referenced material meets the requirements of 40 CFR §257.64.

By: _____

John J. Tayntor, P.E.

Dated: October 12, 2018


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