

Prepared for:  
**Gavin Power, LLC**

# Residual Waste Landfill

## Location Restriction Report

James M. Gavin Power Plant

17 October 2018

Project No.: 0469558

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## Signature Page

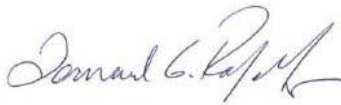
October 2018

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## Location Restriction Report

ERM Project No. 0469558

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Leonard Rafalko  
*Partner, ERM*

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Joseph Robb  
*Project Manager, ERM*

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### Environmental Resources Management

One Beacon Street, 5<sup>th</sup> Floor

Boston, MA 02108

T: (617) 646-7800

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### **Acronyms and Abbreviations**

CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
ERM	Environmental Resources Management
FS	Factors of Safety
Gavin	Gavin Power, LLC
OEPA	Ohio Environmental Protection Agency
PTI	Permit to Install
RWL	Residual Waste Landfill

## Certification

I hereby certify that I or an agent under my review has prepared this Location Restriction Report for the Residual Waste Landfill in accordance with 40 CFR 257.60 through 257.64. To the best of my knowledge, the information contained in this Report is true, complete, and accurate.



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James Hemme, P.E.

*State of Ohio License No: 72851*

*Principal Consultant, ERM*

## 1. INTRODUCTION

The General James M. Gavin Power Plant (the “Plant”) is a coal-fired generating station located in Gallia County in Cheshire, Ohio, along the Ohio River. The Plant includes the Residual Waste Landfill (RWL), which is used to manage coal combustion residuals (CCR) generated by the Plant. As such, the RWL is subject to regulation under Title 40, Code of Federal Regulations, Part 257 (40 CFR Part 257) (also known as the CCR Rule). The location of the RWL is shown on Figure 1-1.

The existing RWL facility was initially permitted in 1994 and received a new permit in 2014 from the Ohio Environmental Protection Agency (OEPA) to expand horizontally and vertically (Permit to Install [PTI] #06-08447). The RWL is permitted to accept and dispose of CCR material as a Class 3 Landfill.

Approximately 98 percent of this material is Flue Gas Desulfurization by-product (consisting of scrubber cake, fly ash, and lime) and 2 percent is other materials (bottom ash, fly ash, lime ball mill rejects, coal pulverizer rejects, and bottom ash pond sediments) approved by OEPA for disposal in the RWL. The RWL is considered an existing CCR landfill under the CCR Rule.

This report was produced by Environmental Resource Management, Inc. (ERM) to evaluate the unstable area location restriction (40 CFR 257.64) for the RWL. This report covers the portions of the landfill for which construction had commenced prior to 19 October 2015, as shown on Figure 1-1. The other location restrictions imposed by the CCR Rule (placement above the uppermost aquifer, wetlands, fault areas, and seismic impact zones) are not required for existing CCR landfills.

## 2. LOCATION RESTRICTIONS

### 2.1 Documentation Reviewed

ERM has relied primarily on reports and information prepared by others to evaluate compliance with the CCR Rule location restrictions, and in particular has relied upon the following sources:

- *Permit to Install Narrative Report, Volume III, Design Calculations*, (American Electric Power 1993)
- *Stability and Settlement Analysis Report, Final Permit to Install Application, Expansion of the Gavin Plan Residual Waste Landfill* (Geosyntec and American Electric Power (AEP) 2012)
- *2017 Annual Inspection Report, Residual Waste Landfill, Gavin Power Plant, Cheshire Ohio* (ERM 2018)

### 2.2 Unstable Areas (40 CFR 257.64)

The CCR Rule provides the following definition for an “unstable area” (40 CFR 257.53):

*Unstable area means a location that is susceptible to natural or human induced events or forces capable of impairing the integrity, including structural components of some or all of the CCR unit that are responsible for preventing releases from such unit. Unstable areas can include poor foundation conditions, areas susceptible to mass movements, and karst terrains.*

The CCR Rule requires that CCR units not be located in an unstable area unless the owner or operator demonstrates that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted (40 CFR 257.64(a)). This evaluation of unstable areas addresses the definitional requirements noted above and specifically considers the following factors from 40 CFR 257.64(b):

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

The evaluation of Unstable Areas for the RWL is provided in the following subsections.

#### 2.2.1 Evaluation of On-Site or Local Soil Conditions that May Result in Significant Differential Settling

To evaluate on-site or local soil conditions that may result in significant differential settling at the RWL, ERM reviewed the geotechnical stability evaluations in the original 1993 PTI Application (AEP 1993), and the PTI Application for the Expansion of the RWL (AEP and Geosyntec 2012).

The relevant analysis in the 1993 PTI Application included the following:

- Characterization of the stratigraphy and consolidation properties of the foundation soils;
- Calculation of the estimated settlements at selected locations; and
- An evaluation of the effects of the estimated settlements on the performance of the landfill.

The primary concerns associated with consolidation of the foundation soils were settlement effects on the integrity of the landfill liner, and the performance of the leachate collection system. The analysis showed that localized differential settlements were not anticipated to occur. Calculations confirmed that total and

differential settlements due to consolidation of foundation soils would not adversely affect the overall performance of the compacted soil liner or the synthetic liner, and the resulting total and differential deformations would not impede the gravity flow of the leachate drainage system.

The 2012 PTI Application contained a Stability and Settlement Analysis Report that included consideration of the following:

- Hydrostatic uplift;
- Static and seismic stability;
- Liquefaction analyses;
- Settlement analyses; and
- An unstable areas assessment.

The primary conclusions of the Stability and Settlement Analysis Report related to differential settling included the following:

- **Hydrostatic uplift**—Analyses were performed to evaluate potential hydrostatic uplift (i.e., upward pressure from groundwater on the landfill). Stability is achieved through inclusion of the use of an underdrain system that has been designed and integrated where necessary to manage hydrostatic uplift by intercepting any groundwater rise that would pressurize the liner system.
- **Static and Seismic Slope Stability**—Analyses were performed to evaluate the static and seismic slope stability factors of safety (FS) for shallow and deep potential slip surfaces (interim and final slopes). The analysis concluded the landfill design configuration (for the vertical and lateral expansion) is stable with respect to static and seismic slope stability. With one exception, the calculated FS values were all above the minimum required FS values of 1.5 for static and 1.0 for seismic for shallow and deep-seated rotational and translational failure surfaces. The calculated FS values for static, saturated shallow failure surfaces were all above the minimum required FS value of 1.1. In one case, an analysis considering that the entire landfill was placed under undrained conditions (i.e., instantaneous application of the full applied load of the landfill) did not result in an acceptable FS value. The scenario was re-evaluated assuming a staged construction approach, and minimum required FS values for static and seismic conditions were calculated for multiple waste elevations (the staged construction will allow for dissipation of pore pressures during construction). This staged construction approach has been implemented to provide for the necessary pore pressure dissipation.
- **Liquefaction**—The potential for liquefaction was evaluated through consideration of soil physical properties derived from geotechnical laboratory and field studies. The report concluded the natural soils at the Site (including residual clayey soils and fill soils) are predominantly low- to medium-plasticity clays with moisture contents below the liquid limit of the soil. Based on the analysis conducted, and the low seismicity in the region of Ohio where the Plant is located, widespread liquefaction hazards within the natural soil materials near the RWL are not anticipated.
- **Settlement Analysis**—This analysis evaluated total settlements occurring in compressible soil layers under the combined loading of fill soils, Flue Gas Desulfurization waste fill, and final cover soils. The evaluation demonstrated the strain on the existing landfill liners to be within acceptable limits and the existing leachate lines will maintain positive grades for gravity drainage.
- **Unstable Area Assessment**—Portions of this evaluation are summarized in Sections 2.2.2 and 2.2.3 of this report.



Thus, an evaluation of on-site and local soil conditions at the RWL does not indicate the potential for significant differential settling.

### 2.2.2 *On-Site or Local Geologic or Geomorphologic Features*

The Unstable Areas Assessment presented in the Stability and Settlement Analysis Report that was included in the PTI Application for the Expansion of the RWL provided the following information about on-site and local geologic or geomorphologic features:

- **Presence of Karst Terrain**—According to the Ohio Department of Natural Resources, Gallia County, Ohio is not an area known to contain karst features. There are no observed or reported karst features evident in the vicinity of the RWL.
- **Areas Susceptible to Mass Movement**—The Site is located in an area identified by Ohio Department of Natural Resources as having a potential for slope failures due to the presence of “red beds” (consolidated mudstones) of the Conemaugh and Monongahela rock groups (GeoFacts No. 8 1995). However, evaluations presented in the 2012 PTI explicitly incorporated presumptive geotechnical properties (e.g., shear strength) for the red bed formations under the RWL. With this consideration, the factors of safety for slope stability are adequate. In addition, no major instabilities have been observed at the RWL since its construction in 1994.
- **Areas Susceptible to Coastal and River Erosion**—The Site is located above the 100-year flood plain and is not located in an area that is anticipated to be subject to coastal or river erosion.

Thus, an evaluation of on-site or local geologic or geomorphological features at the RWL does not indicate that the RWL is located in an unstable area.

### 2.2.3 *On-Site or Local Human-Made Features or Events (Both Surface and Subsurface)*

Geotechnical site investigations were performed to identify conditions at the RWL which could potentially cause a significant amount of post-construction differential settlement, or downslope movement of soil, rock, and/or debris under the influence of gravity, unless improved. These evaluations, which were presented in the original 1993 PTI Application (AEP 1993), and the PTI Application for the Expansion of the RWL (AEP and Geosyntec 2012) were certified by a qualified professional engineer and are summarized in Section 2.2.1 of this report.

The potential presence of underground mining was addressed in the 2012 PTI Application for the Expansion of the RWL. Pomeroy coal was historically mined near the Gavin Plant. Although a public records search disclosed no maps of underground mining of coal within the footprint of the RWL or its lateral expansion, undocumented mine structures could exist. To ensure suitable foundation conditions for the landfill, the 2012 PTI application called for engineering measures to be implemented during the excavation phase in areas where the Pomeroy coal is anticipated to exist beneath the lateral expansion footprint of the RWL.

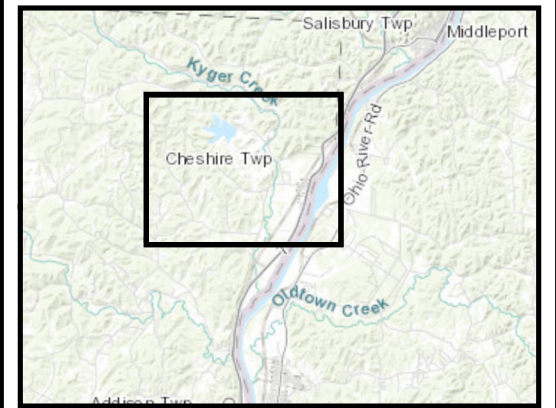
The 2017 Annual Engineering Inspection Report for the RWL also concluded that the landfill is in satisfactory operating condition and the lateral expansion is being completed in a satisfactory manner (ERM 2018).

Thus, an evaluation of on-site or local human-made features or events (both surface and subsurface) does not indicate that the RWL is located in an unstable area.

### 3. CONCLUSIONS

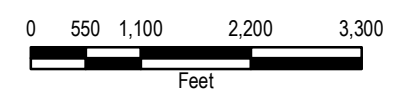
Based on ERM's analysis of information from geotechnical studies performed by Geosyntec and AEP and previous permit applications, the RWL is not located in an "unstable area" and thus meets the requirements of 40 CFR 257.64.

## **FIGURES**



**Legend**

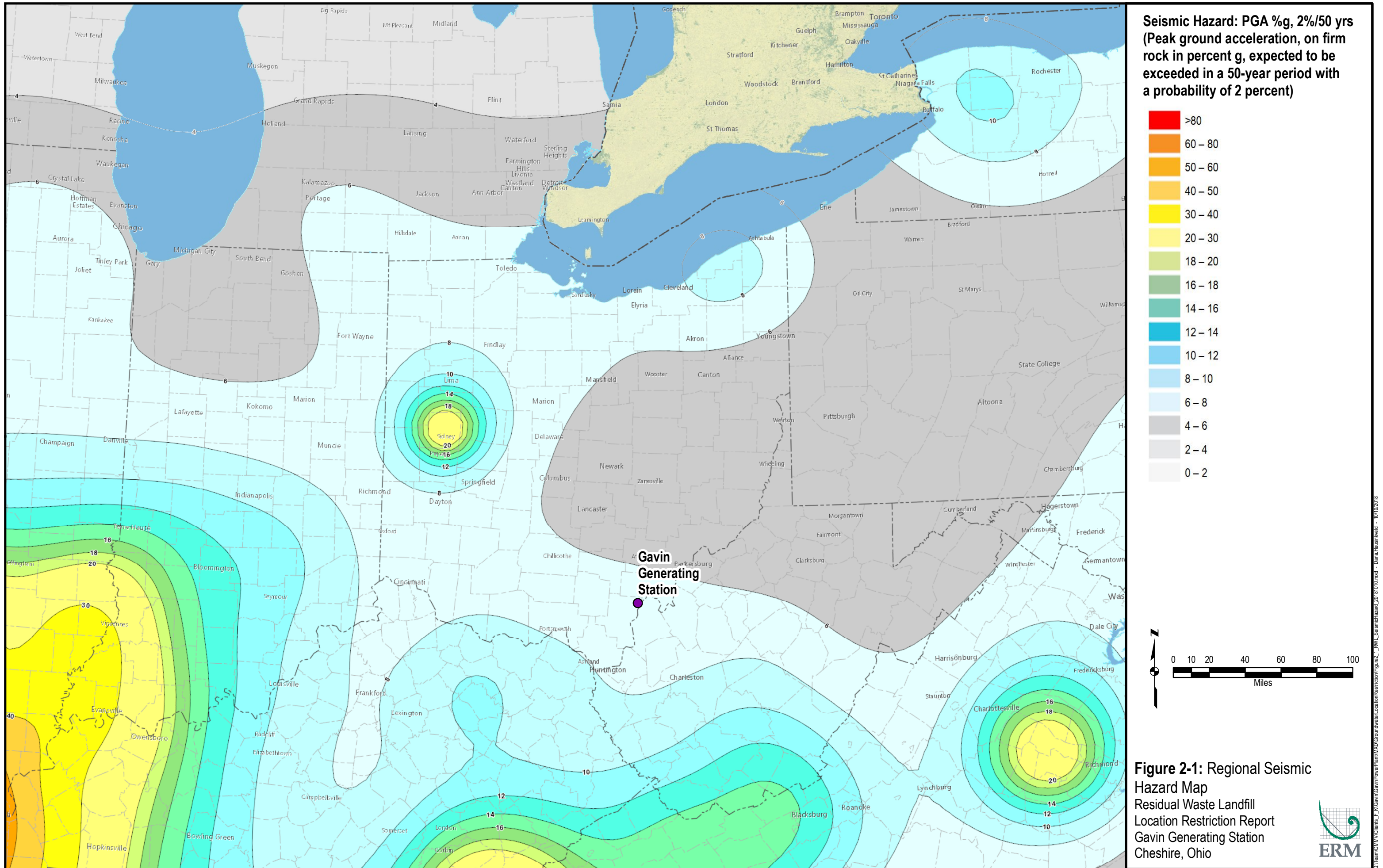
- Approximate Extent of Existing CCR Landfill
- Permitted Limit of Waste



**Figure 1-1: Site Layout and CCR Unit Location**  
 Residual Waste Landfill  
 Location Restriction Report  
 Gavin Generating Station  
 Cheshire, Ohio



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**ERM's Boston Office**

One Beacon Street, 5<sup>th</sup> Floor

Boston, MA 02108

T: (617) 646-7800

[www.erm.com](http://www.erm.com)