

**2016 ANNUAL CCR UNIT INSPECTION REPORT  
LUMINANT BIG BROWN STEAM ELECTRIC STATION  
ASH DISPOSAL AREA II  
FREESTONE COUNTY, TEXAS**

January 13, 2017

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## 1.0 INTRODUCTION

Luminant Generation Company, LLC (Luminant) operates the Big Brown Steam Electric Station (BBSES) located approximately 10 miles northeast of Fairfield, Freestone County, Texas (see Figure 1). The BBSES consists of two coal/lignite-fired units with a combined operating capacity of approximately 1,150 megawatts. Coal Combustion Residuals (CCR) including fly ash, bottom ash and boiler slag are generated as part of BBSES unit operation. The CCRs are transported off-site for beneficial use by third-parties or are managed/disposed of by Luminant at the BBSES. Bottom ash is typically managed via mine placement in Area C of the nearby Luminant mine.

The CCR Rule (40 CFR 257 Subpart D - *Standards for the Receipt of Coal Combustion Residuals in Landfills and Surface Impoundments*) has been promulgated by EPA to regulate the management and disposal of CCRs as solid waste under Resource Conservation and Recovery Act (RCRA) Subtitle D. The final CCR Rule was published in the Federal Register on April 17, 2015. The effective date of the CCR Rule was October 19, 2015.

The CCR Rule establishes operating criteria for existing CCR surface impoundments and landfills, including annual inspection requirements for all CCR units to ensure that the design, construction, operation, and maintenance of the CCR units are consistent with recognized and generally accepted good engineering standards. Pastor, Behling & Wheeler, LLC (PBW) was retained by Luminant to perform the 2016 annual inspection of the CCR units at the BBSES. This report presents the findings of the 2016 annual inspection.

### 1.1 BBSES Units Subject to Annual CCR Inspection Requirements

The CCR Rule defines coal combustion residuals such as fly ash, bottom ash, boiler slag, flue gas desulfurization (FGD) materials (gypsum), and related solids generated from burning coal for the purpose of generating electricity by electric utilities and independent power producers. The annual inspection requirements of the CCR Rule apply to surface impoundments and landfills that dispose or otherwise engage in solid waste management of CCRs.

A site plan for the BBSES is shown on Figure 2. The following surface impoundments and landfills at the BBSES have been identified as CCR Units:

- North Bottom Ash Pond (NBAP) – surface impoundment;

- South Bottom Ash Pond (SBAP) – surface impoundment; and
- Ash Disposal Area II - landfill.

These CCR Units addressed in this report are described in greater detail below:

- Ash Disposal Area II. Ash Disposal Area II is located approximately 3,500 feet northeast of the BBSES power plant (PBW, 2016b). Ash Disposal Area II is the primary disposal facility for CCRs generated at the BBSES.

Ash Disposal Area II covers an area of approximately 240 acres and consists of ten active landfill cells (Cells 1 through 10) on the east side, one landfill cell that has been constructed but not yet used (Cell 11), and nine future landfill cells (Cells 12 through 20) on the west side. Cells 1 through 5 were constructed in sequence beginning in approximately 1987 and Cells 6 through 11 were constructed in sequence beginning in approximately 1992.

The landfill is constructed partially above and partially below grade and is surrounded by engineered earthen dikes that extend approximately 10 to 15 feet above the surrounding grade. Cells 1 through 11 have a 3-foot thick compacted clay liner.

As of 2016, the majority of the surface areas of Cells 1 through 8 have been covered with either a permanent clay cap or a temporary soil cap. The permanent clay cap covers an area of approximately 17.5 acres along the west side of the landfill and also a small portion of the north side of the landfill. The permanent clay cap consists of a minimum 3-foot thick compacted clay liner with a hydraulic conductivity of  $1 \times 10^{-7}$  cm/sec or less topped by a minimum 18" thick vegetative soil layer. The temporary soil cap covers an area of approximately 75 acres and varies in thickness from approximately 10 to 24 inches of sandy clay. Vegetation has been established on both of temporary and permanent cap areas.

During 2016, CCR placement occurred in the non-capped portions of Cells 1-8 and in Cells 9 and 10. Cells 10 and 11 were used for temporary contact water containment during 2016.

## **1.2 Annual CCR Surface Impoundment Inspection Requirements**

Section 257.83(b) of the CCR Rule specifies that annual inspections by a qualified professional engineer be performed for each CCR surface impoundment that: (1) has a dike height of five feet or more and a storage volume of 20 acre-feet or more; or (2) has a dike height of 20 feet or more. The NBAP and SBAP are surface impoundments surrounded by earthen embankments (dikes) with heights of five feet or more and the BAPs have a storage volume greater than 20 acre-feet. As a result, the BAPs are subject to the annual inspection requirements of Section 257.83(b) of the CCR Rule. The first annual CCR inspection for the BAPs was performed in 2015 (PBW, 2016a).

In accordance with Section 257.83(b), a 2016 annual CCR inspection would ordinarily be required for the BAPs; however, CCR Rule Section 257.83(b)(4)(ii) states the following regarding annual inspection requirements for surface impoundments:

*(ii) In any calendar year in which both the periodic inspection by a qualified professional engineer and the quinquennial (occurring every five years) structural stability assessment by a qualified professional engineer required by Sections 257.73(d) and 257.74(d) are required to be completed, **the annual inspection is not required**, provided the structural stability assessment is completed during the calendar year...*

A five-year structural stability assessment was performed for the NBAP and SBAP during 2016 by Golder Associates as required under CCR Rule Section 257.73(d) (Golder, 2016). Since the five-year structural stability assessment was performed for the NBAP and SBAP during 2016, a 2016 annual inspection is **not** required for the NBAP and SBAP under CCR Rule Section 257.83(b)(4)(ii). The next annual inspection of the BAPs will be performed in 2017.

### **1.3 Annual CCR Landfill Inspection Requirements**

Section 257.84(b) of the CCR Rule specifies that annual inspections be performed for CCR landfills by a qualified professional engineer. The annual CCR landfill inspection must include a review of available information regarding the status and condition of the CCR landfill including files available in the operating record, such as the results of inspections by the qualified person as required under Section 257.84(a), and the results of previous annual CCR inspections (where applicable) and visual inspection of the CCR landfill to identify signs of distress or malfunction of the landfill. The qualified professional engineer must prepare a report following each inspection that addresses the following:

- Any changes in geometry of the structure since the previous annual inspection;
- The approximate volume of CCR in the landfill at the time of the inspection;
- Any appearances of an actual or potential structural weakness of the CCR unit, in addition to any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the CCR unit; and
- Any other change(s) which may have affected the stability or operation of the CCR unit since the previous annual inspection.

Ash Disposal Area II is classified as an Existing CCR Landfill under the CCR Rule and is therefore subject to the annual inspection requirements of Section 257.84(b). The first annual CCR inspection for Ash Disposal Area II was performed in 2015 (PBW, 2016a).

## **2.0 RECORDS REVIEW**

In accordance with the requirements of 40 CFR Part 257.84(b)(i), PBW reviewed the following information from the facility operating records for Ash Disposal Area II at the BBSES:

- Fugitive Dust Control Plan (FDCP),
- Weekly qualified person inspection records,
- Historical CCR unit design and construction documentation, and
- 2015 Annual CCR Inspection Report.

### **2.1 CCR Fugitive Dust Control Plan**

The CCR FDCP for the BBSES dated October 2015 was reviewed by PBW as part of the annual CCR inspection (Luminant, 2015). The FDCP was certified by a Registered Professional Engineer on October 5, 2015, and placed into the operating record on October 19, 2015. The BBSES CCR FDCP includes the following dust control measures:

- Water spray or fogging systems;
- Compaction;
- Vegetative cover; and
- Reduced vehicle speeds.

Controls are in-place at Ash Disposal Area II to comply with the FDCP during placement of CCR. In addition, during loading of fly ash at the BBSES power plant, the material is conditioned during the loading process to mitigate fugitive dust. The FDCP includes provisions to amend the plan as necessary, and the plan includes a log for citizen complaints. No citizen complaints were recorded with the FDCP at the time of the annual inspection.

### **2.2 Weekly Qualified Person Inspection Records**

Weekly inspections of CCR Units by a qualified person are required under Section 257.84(a) of the CCR Rule. Weekly CCR qualified person inspections of Ash Disposal Area II were performed throughout 2016. PBW reviewed the weekly qualified person inspection forms for Ash Disposal Area II prepared from January 2016 through the date of the annual inspection by PBW.

Items identified for monitoring or action at Ash Disposal Area II during the 2016 weekly qualified person inspections can be summarized as follows:

- Monitor/repair feral hog damage;
- Monitor/repair interior slope erosion on face of Cell 11 embankment;
- Monitor/repair erosion along access road along north side; and
- Monitor/repair erosion on capped area in north part of landfill.

No conditions with the potential to result in structural weakness of the landfill embankments or that could potentially disrupt the operation and safety of the landfill were reported.

### 2.3 CCR Unit Design and Construction Documentation

PBW reviewed the following document that included information concerning the design and construction of Ash Disposal Area II:

- CCR Closure Plan - Big Brown Steam Electric Station Ash Disposal Area II, Freestone County, Texas. October (PBW, 2016b)

A description of the design and construction characteristics for Ash Disposal Area II is presented in Section 1.1 of this annual report.

### 2.4 2015 Annual CCR Inspection Report

PBW reviewed the 2015 Annual CCR Inspection Report for the BBSES (PBW, 2016a). The recommendations from the 2015 Annual CCR Inspection Report regarding Ash Disposal Area II and the status of activities to address the recommendations at the time of the 2016 Annual CCR Inspection can be summarized as follows:

Recommendation from 2015 Annual CCR Inspection	Status at Time of 2016 Annual CCR Inspection
Significant erosion was observed in the earthen embankment separating Cell 10 from Cell 11 and ash contact water from Cell 10 was observed to be flowing into Cell 11. It is recommended that the embankment be repaired and the contact water level in Cell 10 be lowered to prevent flow into Cell 11, with appropriate freeboard.	The embankment between Cell 10 and Cell 11 was repaired/raised during 2016 and no evidence of contact water flowing from Cell 10 into Cell 11 was observed.
Significant erosion was observed on the interior slope face of the Cell 11 embankment in the northwest corner. The clay liner of the landfill cell was visible in these areas. These areas should be repaired and provided with rock rip rap or other erosion control material.	The interior slope face of the Cell 11 embankment in the northwest corner was repaired during 2016. Area is monitored as part of weekly inspections.



<b>Recommendation from 2015 Annual CCR Inspection</b>	<b>Status at Time of 2016 Annual CCR Inspection</b>
Significant erosion was observed in several areas on the interior slope face of the Cell 10 embankment, along the south side. These areas should be repaired and provided with rock rip rap or other erosion control material.	The interior slope face of the Cell 10 embankment along the south side was repaired during 2016. Area is monitored as part of weekly inspections.
Luminant should continue to monitor the other areas of concern listed in Sections 3.0 and 4.0 of the report.	These areas are monitored as part of weekly qualified person inspections.

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### **3.0 CCR LANDFILL FIELD INSPECTION**

The 2016 annual inspection of Ash Disposal Area II was performed on November 15, 2016. Patrick J. Behling, PE, a registered professional engineer in the State of Texas, was accompanied by Luminant qualified persons during the inspection (Jeffery White, Joe Hubbert).

Ash Disposal Area II consists of eight partially closed landfill cells (Cells 1-8), two active landfill cells (Cells 9 and 10), one landfill cell that has been constructed but not yet used for CCR placement (Cell 11), and nine future landfill cells (Cells 12 through 20) on the western side. The inspection consisted of a walking visual survey of the embankments, CCR placement areas, and storm water/contact water control in Cells 10 and 11 and a driving survey of the partially capped landfill cells. Figure 3 summarizes the field observations from the inspection of Ash Disposal Area II. Photographs of the landfill taken during the annual inspection are included as Appendix A and Figure 4 illustrates the location where the photographs were taken. The following sections present the results of the annual inspection, including specific observations related to the structural elements of Ash Disposal Area II.

The inspection requirements for CCR landfills include a review of the design, construction, operation and maintenance of the landfill in order to determine if the CCR unit meets generally accepted good engineering practice. The primary objective of the visual inspection of Ash Disposal Area II was to identify any evidence of actual or potential structural weakness of the CCR unit, including conditions that are disrupting or have the potential to disrupt the operation and safety of the CCR unit. Landfill conditions observed during the 2016 inspection were compared to conditions reported from the 2015 inspection to identify changes in geometry of the structure.

#### **3.1 Perimeter Embankments**

The embankments surrounding Ash Disposal Area II were generally in fair/good condition. Consistent with the weekly qualified person inspections performed during 2016, no evidence of slope movements or misalignments that have potential to affect the structural integrity of the perimeter embankments around the landfill were noted.

The embankments around the partially capped cells (Cells 1-8) were mostly well vegetated and no visual evidence of slope failures or misalignments was noted in these areas.

As indicated on Figure 3, the following areas were noted for future monitoring or repair on the embankments around Cells 10 and 11:

- Significant erosion was observed in several areas on the interior slope face of the Cell 10 embankment, along the south side. These areas should be repaired and provided with rock rip rap or other erosion control material.
- Minor erosion was observed along the interior slope face of the north, east and west embankments of Cell 11. These areas should continue to be monitored and repaired as necessary.

### **3.2 Landfill Cap**

The capped portions of Cells 1-8 appear to be adequately vegetated with limited areas of erosion. Small areas of feral hog damage and minor surficial erosion were observed along the north side of capped Cells 1-8. These areas should be monitored and repaired as necessary.

Two soil borrow piles were observed on top of the capped areas of Cells 1-8: one near the northeast corner and one near the southwest corner. The borrow piles have been vegetated to control erosion and no significant evidence of erosion was observed in these areas.

### **3.3 Active CCR Placement Areas**

During 2016, CCR placement occurred in the non-capped portions of Cells 1-8 and in Cells 9 and 10. Cell 11 is available for CCR placement once the capacity of the other cells becomes exhausted.

Approximately 39,665 tons of CCRs were placed in Ash Disposal Area II during 2015 and approximately 23,741 tons of CCRs were placed in the landfill from January through October, 2016.

### **3.4 Storm Water and Contact Water Controls**

Storm water is diverted off of the capped portions of Cells 1-8 to adjacent surface water ditches. Contact water from the active areas of the landfill is temporarily contained in Cells 10 and 11 and is allowed to evaporate, is pumped to the BBSSES power plant for consumptive use, or is sprayed on the active portions of the landfill for dust control. No evidence of problems associated with the storm water and contact water controls at Ash Disposal Area II were observed during the inspection.

### **3.5 Comparison to 2015 Annual CCR Inspection Findings**

The findings of the 2016 Annual CCR Inspection of Ash Disposal Area II compare to the findings/recommendations from the 2015 Annual CCR Inspection Report as follows:

- No changes in geometry of the landfill since the previous annual inspection were observed;
- No other changes which could affect the stability or operation of the landfill since the previous annual inspection were observed; and
- The recommendations presented in the 2015 Annual CCR Inspection Report have all been addressed by Luminant (See Section 2.4 of this report).

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#### **4.0 SUMMARY OF FINDINGS**

The findings of the 2016 annual inspection of the Ash Disposal Area II at the BBSES are summarized herein. Luminant qualified persons responsible for the weekly inspections accompanied PBW during the annual inspection to ensure that observed conditions did not represent a change in geometry since previous inspection or have the potential to disrupt operation and safety of the CCR units.

##### **4.1 Visual Observation of Embankment Alignments – Ash Disposal Area II**

Consistent with the previous annual CCR inspection performed on behalf of Luminant, and recently completed weekly inspections, no evidence of slope movements or misalignments that have potential to affect the structural integrity of the landfill were noted.

##### **4.2 Visual Observations of Structural Integrity – Ash Disposal Area II**

No conditions were observed during the 2016 annual inspection that indicate an actual or potential structural weakness of the perimeter embankments surrounding Ash Disposal Area II. In addition, conditions observed during the annual inspection indicate that a disruption or the potential for disruption of the operation and safety of the CCR unit is not currently anticipated. A review of weekly inspections completed to date by Luminant and the completion of this annual inspection did not identify any changes that may affect the stability or operation of the landfill.

##### **4.3 CCR Unit Volume at Time of Inspection – Ash Disposal Area II**

During 2016, CCR placement occurred in the non-capped portions of Cells 1-8 and in Cells 9 and 10. Approximately 39,665 tons of CCRs were placed in Ash Disposal Area II during 2015 and approximately 23,741 tons of CCRs were placed in the landfill from January through October, 2016.

## 5.0 RECOMMENDATIONS

The following recommendations are based on the results of the 2016 annual CCR inspection of Ash Disposal Area II:

- Significant erosion was observed in several areas on the interior slope face of the Cell 10 embankment, along the south side. These areas should be repaired and provided with rock rip rap or other erosion control material as necessary.
- Minor erosion was observed along the interior slope face of the north, east and west embankments of Cell 11. These areas should continue to be monitored and repaired as necessary.
- The capped portions of Cells 1-8 appear to be adequately vegetated with limited areas of erosion. Small areas of feral hog damage and minor surficial erosion were observed along the north side of capped Cells 1-8. These areas should be monitored and repaired as necessary.
- This annual inspection report should be completed by filing the report in the operating record of the BBSSES no later than January 18, 2017.
- The 2017 annual inspection of the BAPs and Ash Disposal Area II should be performed in November/December 2017.

## 6.0 REFERENCES

Golder Associates (Golder), 2016. Structural Stability Assessment Report – Big Brown Steam Electric Station, October.

Luminant, 2015. CCR Fugitive Dust Control Plan – Big Brown Steam Electric Station, October 5.

Pastor, Behling & Wheeler, LLC (PBW), 2016a. 2015 Annual CCR Unit Inspection Report - Big Brown Steam Electric Station North and South Ash Ponds & Ash Disposal Area II, January 14.

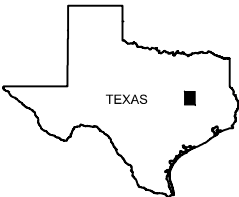
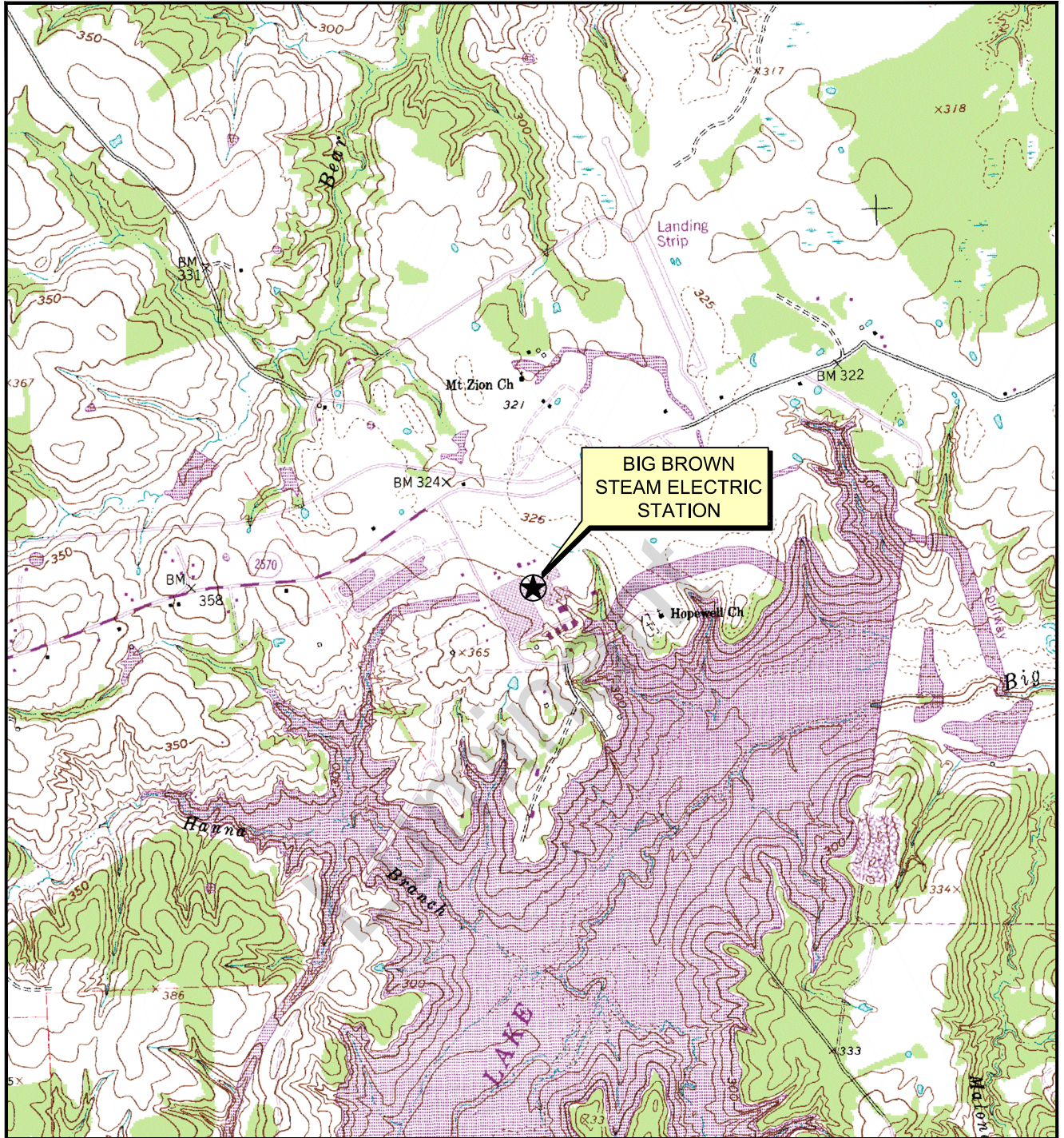
PBW, 2016b. CCR Closure Plan - Big Brown Steam Electric Station Ash Disposal Area II, Freestone County, Texas. October

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**FIGURES**

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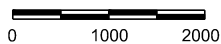




QUADRANGLE LOCATION



Scale in Feet



**BIG BROWN STEAM ELECTRIC STATION**  
 FAIRFIELD, TEXAS

Figure 1

**SITE LOCATION MAP**

PROJECT: 5255

BY: ADJ

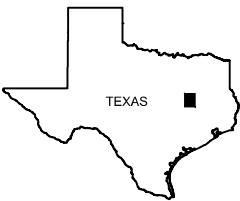
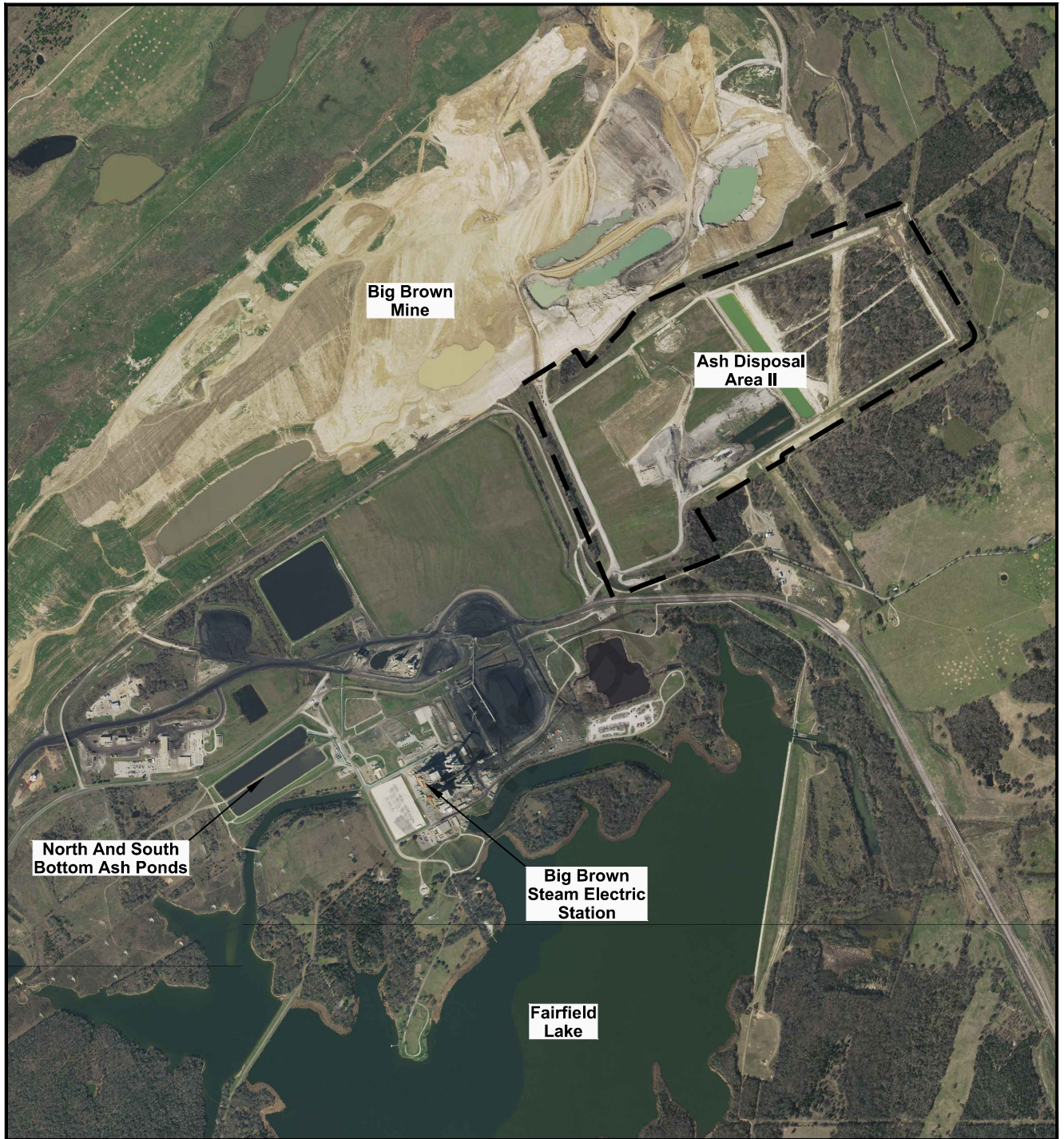
REVISIONS

DATE: DEC., 2016

CHECKED: PJB

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 CONSULTING ENGINEERS AND SCIENTISTS

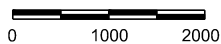
SOURCE:  
 Base map from www.tnris.gov, Young, TX 7.5 min. USGS quadrangle dated 1961,  
 revised 1982.



PHOTOGRAPH LOCATION



Scale in Feet



**LUMINANT GENERATION COMPANY, LLC**  
**BIG BROWN STEAM ELECTRIC STATION**

Figure 2

**SITE VICINITY MAP**

PROJECT: 5255

BY: ADJ

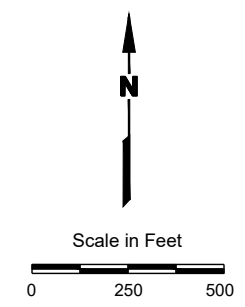
REVISIONS

DATE: DEC., 2016

CHECKED: RBL/PJB

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SOURCE:  
 Imagery from www.tnris.gov, Young, aerial photographs, 2015.



SOURCE:  
Imagery from www.tnris.gov, Young, aerial photographs, 2015.

**BIG BROWN STEAM ELECTRIC STATION  
FAIRFIELD, TEXAS**

Figure 3  
**ANNUAL INSPECTION FINDINGS  
SUMMARY MAP  
ASH DISPOSAL AREA II**

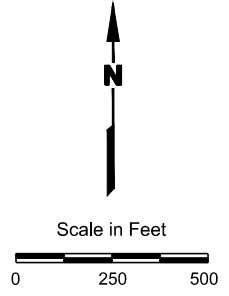
PROJECT: 5255	BY: ADJ	REVISIONS
DATE: DEC., 2016	CHECKED: PJB	

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**EXPLANATION**

📍➔ Photograph Location and Direction



SOURCE:  
Imagery from www.tnris.gov, Young, aerial photographs, 2015.

**BIG BROWN STEAM ELECTRIC STATION**  
FAIRFIELD, TEXAS

Figure 4  
**ANNUAL INSPECTION  
PHOTOGRAPH LOG  
ASH DISPOSAL AREA II**

PROJECT: 5255	BY: ADJ	REVISIONS
DATE: DEC., 2016	CHECKED: PJB	

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CONSULTING ENGINEERS AND SCIENTISTS

**APPENDIX A**  
**PHOTOGRAPHS – ASH DISPOSAL AREA II**

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Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 1</b> – (View NW) Southwest corner Cell 11, along repaired dike between Cells 10 and 11. Cell 10 on left, Cell 11 on right.	
PROJECT NO. 5255	SITE NAME	Big Brown Steam Electric Station – Ash Disposal Area II Annual Inspection	DATE 11/15/2016



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 2</b> – (View NW) View along west dike of Cell 11	
PROJECT NO. 5255	SITE NAME	Big Brown Steam Electric Station – Ash Disposal Area II Annual Inspection	DATE 11/15/2016



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 3</b> – (View E) View along north dike of Cell 11. Area of minor erosion on left.	
PROJECT NO. 5255	SITE NAME	Big Brown Steam Electric Station – Ash Disposal Area II Annual Inspection	DATE 11/15/2016



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 4</b> – (View W) View along north dike of Cell 11. Minor erosion along west dike of Cell 11 in background.	
PROJECT NO. 5255	SITE NAME	Big Brown Steam Electric Station – Ash Disposal Area II Annual Inspection	DATE 11/15/2016



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 5</b> – (View SE) View along top of east dike of Cell 11. Repaired/raised access road in foreground.	
PROJECT NO. 5255	SITE NAME	Big Brown Steam Electric Station – Ash Disposal Area II Annual Inspection	DATE 11/15/2016



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 6</b> – Minor erosion along east bank of Cell 11.	
PROJECT NO. 5255	SITE NAME	Big Brown Steam Electric Station – Ash Disposal Area II Annual Inspection	DATE 11/15/2016





Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 7</b> – (View W) View along south dike of Cell 11. Minor erosion on west dike of Cell 11 in background.	
PROJECT NO. 5255	SITE NAME	Big Brown Steam Electric Station – Ash Disposal Area II Annual Inspection	DATE 11/15/2016



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 8</b> – (View NW) View along east dike of Cell 11.	
PROJECT NO. 5255	SITE NAME	Big Brown Steam Electric Station – Ash Disposal Area II Annual Inspection	DATE 11/15/2016



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 9</b> – (View E) View along south dike of Cell 10. Active ash placement area.	
PROJECT NO. 5255	SITE NAME	Big Brown Steam Electric Station – Ash Disposal Area II Annual Inspection	DATE 11/15/2016



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 10</b> – (View W) View along south dike of Cell 10. Active ash placement area. Typical area of significant erosion in foreground (partially obscured by vegetation)	
PROJECT NO. 5255	SITE NAME	Big Brown Steam Electric Station – Ash Disposal Area II Annual Inspection	DATE 11/15/2016



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 11</b> – (View N) Minor erosion of capped area.	
PROJECT NO. 5255	SITE NAME	Big Brown Steam Electric Station – Ash Disposal Area II Annual Inspection	DATE 11/15/2016



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 12</b> – (View E) Cells 9 and 10. Active ash placement area.	
PROJECT NO. 5255	SITE NAME	Big Brown Steam Electric Station – Ash Disposal Area II Annual Inspection	DATE 11/15/2016