

**ANNUAL CCR UNIT INSPECTION REPORT  
LUMINANT – BIG BROWN STEAM ELECTRIC STATION  
NORTH AND SOUTH ASH PONDS & ASH DISPOSAL AREA II  
FREESTONE COUNTY, TEXAS**

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PBW Project No. 5170A

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## 1.0 INTRODUCTION

Luminant Power (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 reuse 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 impoundment are consistent with recognized and generally accepted good engineering standards. Pastor, Behling & Wheeler, LLC (PBW) was retained by Luminant to perform the 2015 annual inspection of the CCR units at the BBSES. This report presents the findings of the 2015 annual inspection.

### 1.1 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 annual CCR surface impoundment inspection must include the following:

- A review of available information regarding the status and condition of the CCR unit, including files available in the operating record, such as CCR unit design and construction information required by Sections 257.73(c)(1) and 257.74(c)(1), previous periodic structural stability assessments required under Sections 257.73(d) and 257.74(d), the results of inspections by the qualified person as required under Section 257.83(a), and the results of previous annual CCR inspections (where applicable).

- A visual inspection of the CCR unit to identify signs of distress or malfunction of the impoundment and appurtenant structures, and
- A visual inspection of any hydraulic structures underlying the base of the impoundment or passing through the dike of the impoundment for structural integrity and continued safe and reliable operation.

The qualified professional engineer must prepare a report following each inspection that addresses the following:

- Any changes in geometry of the impounding structure since previous annual inspection;
- The location and type of existing instrumentation and the maximum recorded readings of each instrument since the previous annual inspection;
- The approximate minimum, maximum, and present depth and elevation of the impounded water and CCR since the previous annual inspection;
- The storage capacity of the impounding structure at the time of the inspection;
- The approximate volume of the impounded water and CCR at the time of the inspection;
- Any appearances of actual or potential structural weakness of the impoundment, in addition to any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the impoundment and appurtenant structures; and
- Any other change(s) which may have affected the stability or operation of the impounding structure since the previous inspection.

## **1.2 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.

### **1.3 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.

The following surface impoundments and landfills at the BBSES have been identified as CCR Units subject to the annual CCR inspection requirements. Each of the listed surface impoundments is surrounded by earthen embankments (dikes) with heights of five feet or more and has a storage volume greater than 20 acre-feet.

- North Bottom Ash Pond (NBAP);
- South Bottom Ash Pond (SBAP); and
- Ash Disposal Area II.

These CCR Units are described in greater detail below:

- Bottom Ash Ponds. The NBAP and SBAP (collectively “Bottom Ash Ponds” or “BAPs”) are located approximately 1,500 feet northwest of the BBSES power plant (Figure 2). The BAPs are located approximately 1,000 feet from Fairfield Lake (normal pool elevation 310 feet above mean sea level (MSL)).

The BAPS receive recovered sluice water from bottom ash dewatering bins and other BBSES process wastewater sources. The ponds also act as a surge basin for various process water streams in the ash-water system. Decanted water at the opposite end of the pond from the slurry discharge pipeline is returned to the power plant for reuse in the bottom ash system. When sufficient bottom ash has accumulated in one pond, the bottom ash slurry is diverted to the other pond. Bottom ash in the inactive pond is then removed and taken to Ash Disposal Area II.

Each impoundment is approximately 1,400 feet long by 250 feet wide and covers an area of approximately eight acres. The impoundments are constructed partially above and partially below grade and are surrounded by engineered earthen embankments that extend approximately 14 to 21 feet above grade. The bottom of the BAPs is located at approximately 328 feet MSL and the crest elevation of the earthen embankments is 350 feet MSL. The NBAP and SBAP were

originally constructed in the late 1960s and were relined with a 3 foot thick clay liner in 1989-1990.

Recovered sluice water and process waters enter each pond through a series of above grade pipes on the east end. A 30-inch diameter subsurface decant water pipe exits the NBAP on the west end and a 42-inch subsurface decant water pipe exits the SBAP on the west end. These subsurface lines are connected to a below grade valve box immediately west of the SBAP. Piping from the valve box is connected to a low pressure ash water pump station located east of the SBAP.

- Ash Disposal Area II. Ash Disposal Area II is located approximately 3,500 feet northeast of the power plant (see Figure 2). Ash Disposal Area II is the primary disposal facility for CCRs generated at the BBSES. The unit covers an area of approximately 320 acres and consists of nine partially closed landfill cells (Cells 1-9), one active landfill cell (Cell 10), one landfill cell that has been constructed but has not yet received CCRs (Cell 11), and nine future landfill cells (Cells 12 through 20) on the western side. Ash Disposal Area II was registered with the TCEQ as a Class 2 non-hazardous industrial waste landfill in 1986 under SWR No. 30080 and began receiving CCRs in approximately 1989. The landfill registration was amended in 2009 to include future Cells 11 through 20.

The landfill is constructed partially above and partially below grade and is surrounded by engineered earthen embankments that extend approximately 10 to 15 feet above surrounding grade. Cells 1 through 11 were constructed with a 3 foot thick compacted clay liner. Cells 1 through 9 have been partially closed by placement of a 3 foot thick compacted clay cap with a vegetative cover layer. No subsurface penetrations of the perimeter embankments have been identified at Ash Disposal Area II.

## 2.0 RECORDS REVIEW

In accordance with the requirements of 40 CFR Parts 257.83(b)(i) and 257.84(b)(i), Luminant provided PBW with the following information from the facility operating records for the CCR units at the BBSES:

- Fugitive Dust Control Plan (FDCP) for the CCR units,
- weekly qualified person inspection records for the CCR units,
- historical CCR unit design and construction documentation, and
- assessments of the structural stability of the CCR surface impoundments.

The 2015 annual inspection is the first annual inspection performed under the CCR Rule. As a result, no previous CCR annual inspections were available for review.

### 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 process. The FDCP was certified by a Registered Professional Engineer on October 5, 2015, and placed into the operating record on October 19, 2015. CCR within the BAPs is managed using wet handling systems, which virtually eliminates the generation of fugitive dust. However, the BBSES CCR FDCP does include the following dust control measures:

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

These dust controls shall be implemented during periodic removal of CCR solids from the BAPs. In addition, during loading of fly ash at BBSES the material is conditioned during the loading process to mitigate fugitive dust. Controls are also in-place at Ash Disposal Area II to comply with the FDCP during placement of CCR. 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

PBW reviewed weekly qualified person inspection forms for the BAPs and Ash Disposal Area II. Luminant initiated weekly CCR qualified person inspections at the BBSES during the week of October 12, 2015. Five weekly qualified person inspections were performed by Luminant prior to the annual inspection of the BAPs and Ash Disposal Area II.

Items identified for monitoring or action at each CCR Unit during the 2015 weekly qualified person inspections can be summarized as follows:

- NBAP and SBAP:
  - Monitor dry weather surface cracking observed on the upstream and downstream embankments (surface cracking subsequently disappeared following precipitation events);
  - Monitor/repair small animal burrows as needed; and
  - Monitor minor vehicle ruts on the crests of the embankments.
- Ash Disposal Area II:
  - Monitor and repair feral hog damage;
  - Monitor/repair interior slope erosion on face of Cell 11 embankment in northwest corner; and
  - Monitor/repair rutting of access road along north side.

The overall status of the BAPs and Ash Disposal Area II was reported as “satisfactory” during all weekly qualified person inspections. No conditions with the potential to result in structural weakness of the impoundment embankments or that could potentially disrupt the operation and safety of the impoundments were reported. Recommended action items were limited to routine maintenance of access roads, erosion and animal burrows that do not currently have the potential to result in structural weakness or disrupt the operation and safety of the impoundments and landfill.

## 2.3 CCR Unit Design and Construction Documentation

Luminant provided PBW with the following historical documents that included information concerning the design and construction of the BAPs and Ash Disposal Area II at the BBSES:

- CCR Rule Compliance Evaluation Report - BBSES (Pastor, Behling & Wheeler, LLC (PBW), August 6, 2015); and

- Critical Impoundment Inspection Report for BBSES (Pinnacle Technical Resources, Inc., July 9, 2014)

The 2015 PBW CCR report included a review of historical slope stability evaluations performed for the BAPs. A description of the design and construction characteristics for the BAPs and Ash Disposal Area II is presented in Section 1.3 of this annual report.

#### **2.4 CCR Surface Impoundment Structural Stability Assessment**

Section 4 of the 2015 PBW CCR report includes an assessment of historical structural stability analyses performed at the BAPs. As described in the report, a geotechnical and slope stability evaluation was performed in 2012 on the BAPs by Golder Associates. The Golder slope stability evaluation concluded that the critical embankment slope in the BAPs was stable under short-term and long-term conditions.

The 2015 PBW CCR report also referenced a dike assessment report prepared on behalf of EPA by Dewberry Consultants for the BAPs in 2014. The 2014 Dewberry report concluded that the BAP embankments were rated “satisfactory” for structural soundness.

### **3.0 CCR SURFACE IMPOUNDMENT FIELD INSPECTION**

The 2015 annual inspection of the BBSES CCR surface impoundments was performed on November 18, 2015. Patrick J. Behling, a registered professional engineer in the State of Texas, was accompanied by Luminant qualified persons during the inspection (Jeffery White, Joe Hubbert, Jacob Gonzales and Bennett Jones). The inspection consisted of a walking visual survey of the downstream embankments, the embankment crest, and upstream embankments of the BAPs to identify potential areas of concern (if present) that could affect structural integrity or disrupt operation of the impoundment. Since this was the initial annual CCR inspection for each unit, conditions at the surface impoundments were compared to the BBSES critical impoundment inspection performed on behalf of Luminant in 2014 (Pinnacle Technical Resources, 2014).

Figure 3 summarizes the field observations from the inspections of the BAPs. Photographs of the surface impoundments taken during the annual inspection are included as Appendix A. Figure 4 illustrates the location where photographs were taken during the inspection. The following sections summarize the results of the initial annual inspection, including specific observations related to the structural elements of the BAPs.

#### **3.1 Surface Impoundments – Downstream Embankments**

The downstream embankments of the BAPs were generally in good condition and no visual evidence of slope movement or misalignment was noted during the inspection. The embankments were well vegetated with grasses that had been mowed to a height sufficient for visual inspection of the embankment condition (approximately 6 inches high).

Surface conditions near the BAPs were generally wet due to heavy Fall rains. The site had experienced 21.8 inches in the thirty day period prior to the inspection (including 1.08 inches of rain the day before the inspection); consequently, several wet areas near the toe of the embankment slopes were noted. However, no active seepage was observed in these areas during the inspection. Potential seepage was also not identified as part of the previous weekly qualified person inspections. Recommended monitoring of wet areas will allow for identification of potential seepage during weekly inspections performed during seasonally dry periods. As indicated on Figure 3, the following areas were noted for future monitoring or repair:

- Monitor the small area of feral hog damage on the north embankment of the NBAP;

- Monitor the area of small animal burrows observed on the north embankment of the NBAP and repair with compacted clay fill or similar material if necessary; and
- Monitor the wet areas observed near the toe of the embankment slopes to allow for identification of potential seepage during weekly inspections performed during seasonally dry periods.

The below grade valve box located immediately west of the SBAP was also inspected during the annual inspection. No evidence of seepage or leakage around/through the subsurface piping running from the impoundments to the valve box was observed.

### **3.2 Surface Impoundments – Embankment Crest**

The majority of the embankment crest is improved with a crushed aggregate access road. The access roads are generally in good condition with limited areas of rutting observed on the crest of the south embankment of the SBAP. No visual evidence of slope failures or misalignments were noted on the crests of the embankments.

### **3.3 Surface Impoundments – Upstream Embankment**

The upstream embankments of the BAPs were generally in good condition and no visual evidence of slope failures or misalignments was noted on the upstream embankment of the BAPs; however, some areas of erosion of the interior slopes via either wave action or erosion from run-off were observed. As indicated on Figure 3, the following areas were noted for future monitoring or repair:

- Severe erosion was observed on the upstream embankment on the east side of the NBAP, near the ash slurry piping platform. A section of concrete near the platform had been undermined and the clay liner of the impoundment was visible in these areas. These areas should be repaired and provided with rock rip rap or other erosion control material.
- Minor areas of erosion were observed on the upstream embankment on the west side of both BAPs, near the piers. These areas should be monitored and rock rip rap or other erosion control material should be placed in these areas if the erosion becomes worse.

### 3.4 CCR Surface Impoundment Volumes

BBSES staff monitor fluid levels in the BAPs on a regular basis. At the time of the annual inspection, the level of fluid/CCR in both BAPs was approximately 347 feet MSL (approximately 3 feet below the crest of the perimeter embankments). Based on this elevation, the approximate volumes of impounded water and CCR at the time of the inspection were as follows:

- Impounded Water: 38,000,000 gallons per impoundment (76,000,000 gallons total)
- CCR Solids: 70,000 cubic yards per impoundment (140,000 cubic yards total)

It should be noted that no soundings or other quantitative measurements were used to estimate the current volume of CCR stored within the BAPs or the volume of water currently impounded.

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#### **4.0 CCR LANDFILL FIELD INSPECTION**

The 2015 annual inspection of Ash Disposal Area II was performed on November 18, 2015. Patrick J. Behling, 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 nine partially closed landfill cells (Cells 1-9), one active landfill cell (Cell 10), one landfill cell that has been constructed but not yet used (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, cap, and storm water control structures of Cells 10 and 11 and a driving survey of the former landfill cells. Figure 5 summarizes the field observations from the inspections of Ash Disposal Area II. Photographs of the landfill taken during the annual inspection are included as Appendix B. Figure 6 illustrates the location where photographs were taken during the inspection of the landfill. 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. This is the initial annual inspection; hence, the recently completed weekly inspections and this annual inspection will serve as the baseline inspection for Ash Disposal Area II.

##### **4.1 Perimeter Embankments**

The embankments surrounding Ash Disposal Area II were generally in fair/good condition. Consistent with previous critical impoundment inspections 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 perimeter embankments around the landfill were noted.

The embankments around the former cells (Cells 1 – 9) were mostly well vegetated and no visual evidence of slope failures or misalignments was noted in these areas. Rutting was observed on the access

road along the north side of the former cells. This area should continue to be monitored and repaired as necessary.

As indicated on Figure 5, the following areas were noted for future monitoring or repair on the embankments around Cells 10 and 11 (many of the identified repairs are already underway). It should be noted that most of the areas of erosion observed during the inspection were likely exacerbated by the heavy rainfall (21.8 inches) experienced during the month prior to the inspection:

- Severe 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. Cell 11 is enclosed with an earthen embankment and constructed with a clay liner and all observations indicated that the contact water was being contained in Cell 11. A minimum freeboard of approximately 2 feet was being maintained in Cell 11 at the time of the inspection.

The flow of contact water over the top of the interior embankment between the cells will accelerate the observed erosion, potentially to the degree that the stability of the interior embankment between the cells is compromised. 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.

- Severe 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.
- Severe 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.
- Feral hog damage was observed on the exterior/crest of the Cell 11 embankment, near the northwest corner. This area should be monitored and repaired as necessary.
- Minor erosion was observed along the interior slope face of the east and west embankments of Cell 11. These areas should continue to be monitored and repaired as necessary.
- Feral hog damage was observed on the exterior of the Cell 10 embankment along the south side. This area should be monitored and repaired as necessary.

#### **4.2 Landfill Cap**

The capped/closed portions of the closed cells appear to be adequately vegetated with limited areas of erosion. Feral hog damage was observed in several areas of the closed cells. These areas should be monitored and repaired as necessary.

#### **4.3 Active CCR Placement Areas**

CCRs are currently being placed in Cell 10. Cell 11 has been constructed and is available for CCR placement once the capacity of Cell 10 becomes exhausted and the water is removed from Cell 11. Approximately 39,665 tons of CCRs were placed in Ash Disposal Area II during 2015.

#### **4.4 Surface Water Controls**

Storm water is diverted off of the capped portions of the former cells to adjacent surface water ditches. Contact water from Cell 10 remains in the cell (and was observed to be flowing into Cell 11 as described above). It is recommended that the embankment between Cells 10 and 11 be repaired and the contact water level in Cell 10 be lowered to prevent flow into Cell 11, with appropriate freeboard.

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## 5.0 SUMMARY OF FINDINGS

The findings of the 2015 annual inspection of the CCR Units at the BBSSES 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.

### 5.1 Visual Observation of Embankment Alignments

- Bottom Ash Ponds. Consistent with previous structural integrity evaluations, critical impoundment inspections 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 surface impoundment embankments were noted.
- Ash Disposal Area II. Consistent with previous critical impoundment inspections 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.

### 5.2 Surface Impoundments – Visual Observations of Structural Integrity

No conditions were observed during the annual inspection that indicates an actual or potential structural weakness of the BAPs is present. No changes in geometry of the structure were noted with respect to conditions documented in the 2014 critical impoundment inspection report (Pinnacle, 2014). 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 the annual inspection suggest that no changes that may affect the stability or operation of the impounding structure have been observed.

### 5.3 Landfill – Visual Observations of Structural Integrity

No conditions were observed during the annual inspection that indicates 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 the annual inspection suggest that changes that may affect the stability or operation of the landfill have not been observed.

Severe 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. The flow of contact water over the top of the interior embankment between the cells will accelerate the observed erosion, potentially to the degree that the stability of the interior embankment between the cells is compromised. 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.

#### **5.4 CCR Unit Volumes at Time of Inspection**

- Bottom Ash Ponds
  - Impounded Water: 38,000,000 gallons per impoundment (76,000,000 gallons total)
  - CCR Solids: 70,000 cubic yards per impoundment (140,000 cubic yards total)
- Ash Disposal Area II
  - Approximately 39,665 tons of CCRs were placed in Ash Disposal Area II during 2015.

## 6.0 RECOMMENDATIONS

The following recommendations are based on the results of the 2015 annual CCR inspection of the BAPs and Ash Disposal Area II:

- Severe erosion was observed on the upstream embankment on the east side of the NBAP, near the ash slurry piping platform. A section of concrete near the platform had been undermined and the clay liner of the impoundment was visible in these areas. These areas should be repaired and provided with rock rip rap or other erosion control material.
- Severe 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.
- Severe 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.
- Severe 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.
- Luminant should continue to monitor the other areas of concern listed in Sections 3.0 and 4.0 of this report.
- This annual inspection report should be completed by filing the report in the operating record of the respective CCR units no later than January 19, 2016.
- The 2016 annual inspection of the BAPs and Ash Disposal Area II should be performed in November/December 2016 unless otherwise required by the CCR rule.

## 7.0 REFERENCES

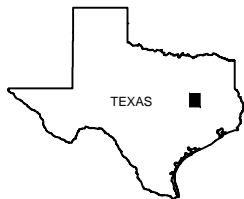
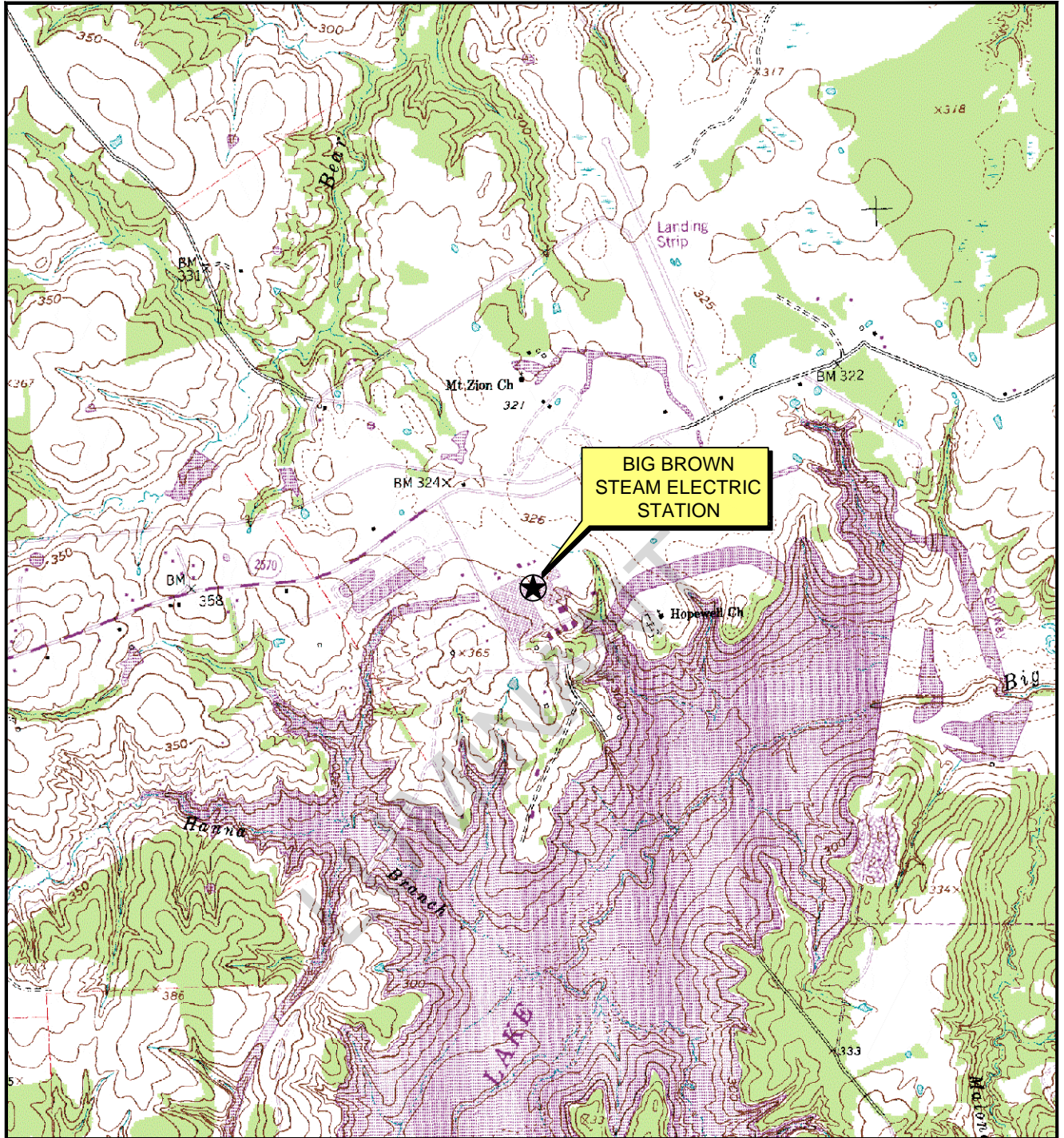
Pastor, Behling & Wheeler, LLC (PBW), 2015. *CCR Rule Compliance Evaluation Report - BBSES*, August 6.

Pinnacle Technical Resources, Inc., 2014. Critical Impoundment Inspection Report for *Big Brown Steam Electric Station*. July 9.

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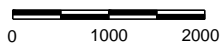
**FIGURES**



QUADRANGLE LOCATION



Scale in Feet



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

Figure 1

**SITE LOCATION MAP**

PROJECT: 5170A

BY: ADJ

REVISIONS

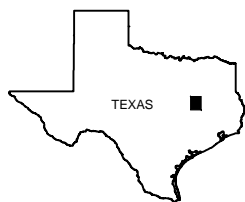
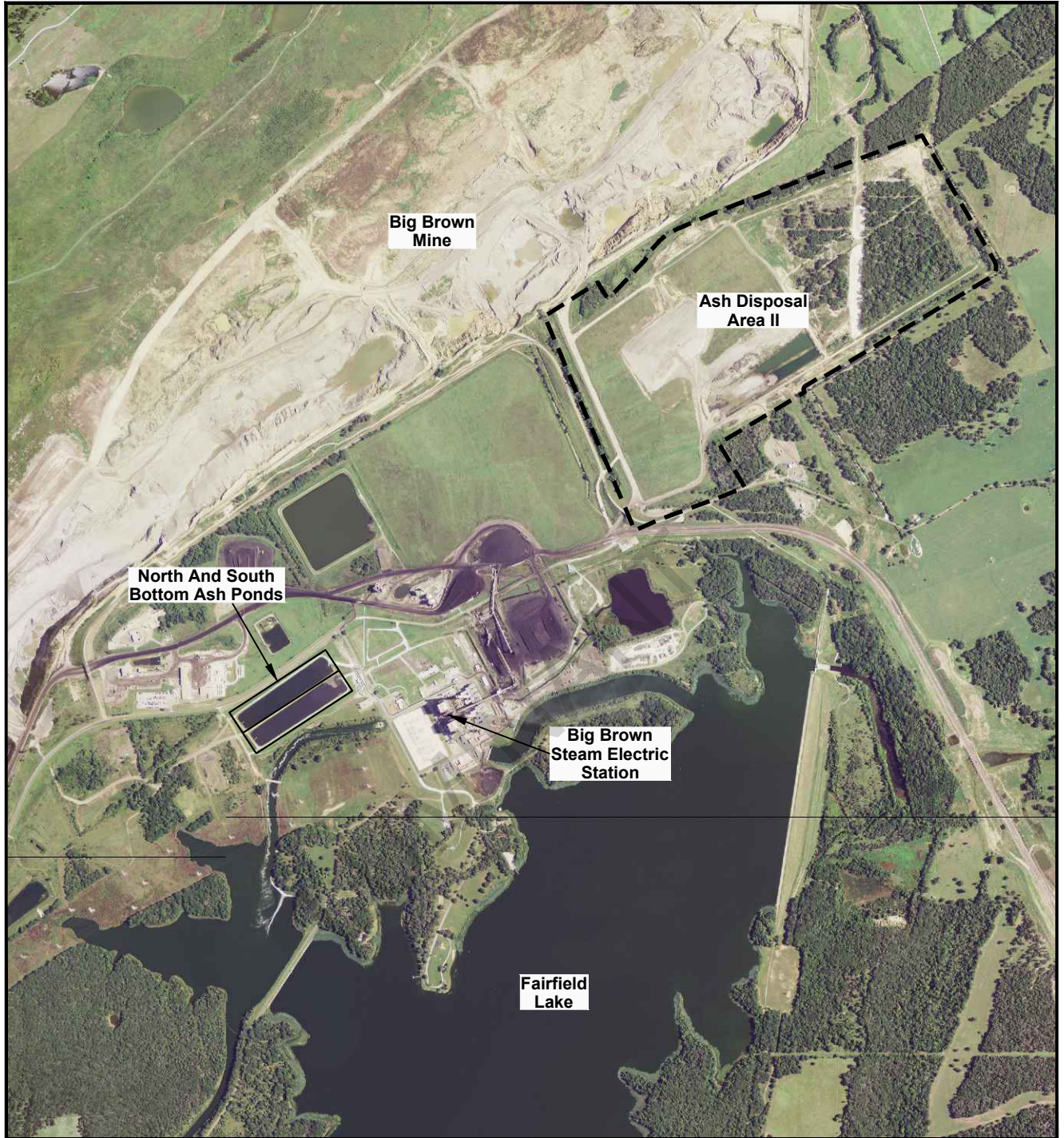
DATE: DEC., 2015

CHECKED: PJB

**PASTOR, BEHLING & WHEELER, LLC**  
 CONSULTING ENGINEERS AND SCIENTISTS

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

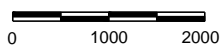




PHOTOGRAPH LOCATION



Scale in Feet



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

Figure 2

**SITE VICINITY MAP**

PROJECT: 5170A

BY: ADJ

REVISIONS

DATE: DEC., 2015

CHECKED: PJB

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SOURCE:  
 Imagery from www.tnris.gov, Young, aerial photographs, 2012.





SMALL ANIMAL BURROWS  
THROUGHOUT THIS AREA

SEVERE EROSION ON  
UPSTREAM EMBANKMENT  
CLAY LINER EXPOSED

FERAL HOG  
DAMAGE

FM 2570

NORTH BOTTOM ASH POND

ASH SLURRY INLET  
PIPING PLATFORMS

SOUTH BOTTOM ASH POND

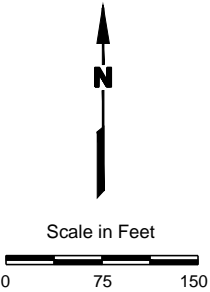
ACCESS  
ROAD RUTS

PIERS

MINOR EROSION  
ON UPSTREAM  
EMBANKMENT

VALVE BOX

PLANT COOLING  
WATER CHANNEL



SOURCE:  
Imagery from www.tris.gov, Young, aerial photographs, 2012.

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

Figure 3  
**ANNUAL INSPECTION FINDINGS  
SUMMARY MAP NORTH AND  
SOUTH BOTTOM ASH PONDS**

PROJECT: 5170A	BY: ADJ	REVISIONS
DATE: DEC., 2015	CHECKED: PJB	

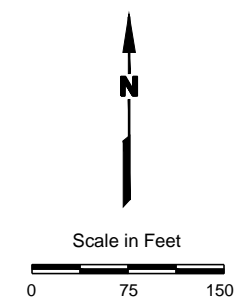
**PASTOR, BEHLING & WHEELER, LLC**  
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**EXPLANATION**

📍 Photograph Location and Direction



SOURCE:  
Imagery from www.tnris.gov, Young, aerial photographs, 2012.

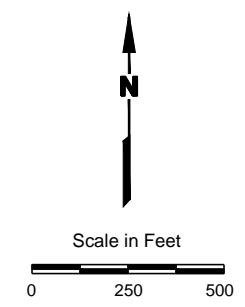
**BIG BROWN STEAM ELECTRIC STATION  
FAIRFIELD, TEXAS**

Figure 4  
**ANNUAL INSPECTION  
PHOTOGRAPH LOG NORTH AND  
SOUTH BOTTOM ASH PONDS**

PROJECT: 5170A	BY: ADJ	REVISIONS
DATE: DEC., 2015	CHECKED: PJB	

**PASTOR, BEHLING & WHEELER, LLC**  
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SOURCE:  
Imagery from Google Maps dated 11/17/2014.

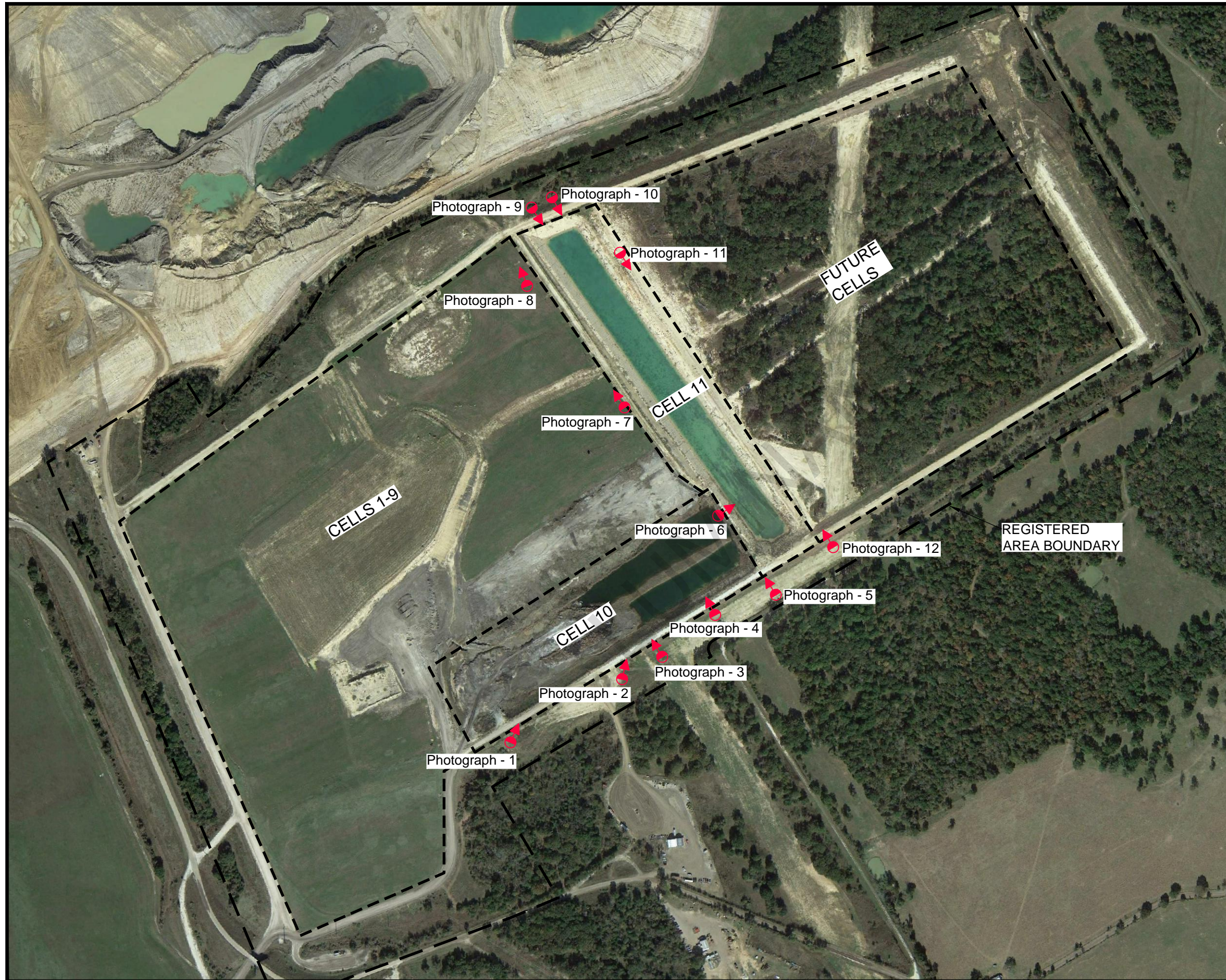
**BIG BROWN STEAM ELECTRIC STATION**  
FAIRFIELD, TEXAS

Figure 5  
**ANNUAL INSPECTION FINDINGS**  
**SUMMARY MAP**  
**ASH DISPOSAL AREA II**

PROJECT: 5170A	BY: ADJ	REVISIONS
DATE: DEC., 2015	CHECKED: PJB	

**PASTOR, BEHLING & WHEELER, LLC**  
CONSULTING ENGINEERS AND SCIENTISTS





**EXPLANATION**

📍➔ Photograph Location and Direction



Scale in Feet  
0 250 500

SOURCE:  
Imagery from Google Maps dated 11/17/2014.

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

Figure 6

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

PROJECT: 5170A	BY: ADJ	REVISIONS
DATE: DEC., 2015	CHECKED: PJB	

**PASTOR, BEHLING & WHEELER, LLC**  
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**APPENDIX A**

**PHOTOGRAPHS – NORTH AND SOUTH BOTTOM ASH PONDS**

LUMINANT



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 1</b> – (View SW) CCR Unit Signs – NBAP and SBAP	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Bottom Ash Pond Annual Inspection	DATE 11/18/2015



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 2</b> – (View N) Ash slurry inlet piping platform - NBAP	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Bottom Ash Pond Annual Inspection	DATE 11/18/2015



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 3</b> – (View W) View along crest of south embankment of SBAP. Note rutting on left.	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Bottom Ash Pond Annual Inspection	DATE 11/18/2015



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 4</b> – (View W) View along crest at corner of south and west embankment of SBAP. Pier on right.	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Bottom Ash Pond Annual Inspection	DATE 11/18/2015





Pastor, Behling & Wheeler  PROJECT NO. 5170A	DESCRIPTION	<b>Photograph 5</b> – Minor erosion of upstream embankment at west end of SBAP.	
	SITE NAME	Big Brown Steam Electric Station – Bottom Ash Pond Annual Inspection	DATE 11/18/2015



Pastor, Behling & Wheeler  PROJECT NO. 5170A	DESCRIPTION	<b>Photograph 6</b> – Minor erosion along upstream embankment at west end of NBAP. Pier in background.	
	SITE NAME	Big Brown Steam Electric Station – Bottom Ash Pond Annual Inspection	DATE 11/18/2015



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 7</b> – (View NE) Crest of interior embankment between NBAP and SBAP.	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Bottom Ash Pond Annual Inspection	DATE 11/18/2015



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 8</b> – Pier at west end of NBAP.	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Bottom Ash Pond Annual Inspection	DATE 11/18/2015





Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 9</b> – (View E) View along crest at corner of north and east embankment of NBAP. Ash slurry inlet piping platform in background.	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Bottom Ash Pond Annual Inspection	DATE 11/18/2015



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 10</b> – Severe erosion of upstream embankment at east end of NBAP.	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Bottom Ash Pond Annual Inspection	DATE 11/18/2015



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 11</b> – (View SW) View along crest of south embankment of SBAP.	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Bottom Ash Pond Annual Inspection	DATE 11/18/2015



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 12</b> – Below grade valve box at west end of SBAP.	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Bottom Ash Pond Annual Inspection	DATE 11/18/2015



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 13</b> – (View NE) View along crest of north embankment of NBAP.	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Bottom Ash Pond Annual Inspection	DATE 11/18/2015



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 14</b> – (View SW) View along crest of north embankment of NBAP.	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Bottom Ash Pond Annual Inspection	DATE 11/18/2015





Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 15</b> – (View SW) View along toe of north embankment of NBAP.	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Bottom Ash Pond Annual Inspection	DATE 11/18/2015



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 16</b> – (View SW) View along toe of north embankment of NBAP.	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Bottom Ash Pond Annual Inspection	DATE 11/18/2015



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 17</b> – (View NE) View along toe of south embankment of SBAP.	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Bottom Ash Pond Annual Inspection	DATE 11/18/2015



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 18</b> – (View NE) View along toe of south embankment of SBAP.	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Bottom Ash Pond Annual Inspection	DATE 11/18/2015



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 19</b> – (View SW) View along toe of south embankment of SBAP.	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Bottom Ash Pond Annual Inspection	DATE 11/18/2015



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 20</b> – (View N) View along toe of east embankment of SBAP.	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Bottom Ash Pond Annual Inspection	DATE 11/18/2015

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





Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 1</b> – (View NE) Southeast corner of Cell 10 (active CCR placement area)	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Ash Disposal Area II Annual Inspection	DATE 11/18/2015



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 2</b> – (View NE) View along crest of south embankment of Cell 10	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Ash Disposal Area II Annual Inspection	DATE 11/18/2015





Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 3</b> – Severe erosion of interior slope face of south embankment of Cell 10.	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Ash Disposal Area II Annual Inspection	DATE 11/18/2015



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 4</b> – Severe erosion of interior slope face of south embankment of Cell 10.	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Ash Disposal Area II Annual Inspection	DATE 11/18/2015



Pastor, Behling & Wheeler  PROJECT NO. 5170A	DESCRIPTION	<b>Photograph 5</b> – (View NW) View along embankment separating Cell 10 (left) from Cell 11 (right) from southwest corner.	
	SITE NAME	Big Brown Steam Electric Station – Ash Disposal Area II Annual Inspection	DATE 11/18/2015



Pastor, Behling & Wheeler  PROJECT NO. 5170A	DESCRIPTION	<b>Photograph 6</b> – Severe erosion of crest of embankment separating Cell 10 and Cell 11. Contact water flowing from Cell 10 to Cell 11.	
	SITE NAME	Big Brown Steam Electric Station – Ash Disposal Area II Annual Inspection	DATE 11/18/2015





Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 7</b> – (View NW) Crest of embankment between former Cells 1-9 and Cell 11. Cell 11 on right.	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Ash Disposal Area II Annual Inspection	DATE 11/18/2015



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 8</b> – (View NW) View along crest of embankment between former Cells 1-9 and Cell 11 at northwest corner. Cell 11 on right.	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Ash Disposal Area II Annual Inspection	DATE 11/18/2015



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 9</b> – Severe erosion of interior slope face of embankment of Cell 11 in northwest corner.	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Ash Disposal Area II Annual Inspection	DATE 11/18/2015



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 10</b> – Severe erosion of interior slope face of embankment of Cell 11 in northwest corner.	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Ash Disposal Area II Annual Inspection	DATE 11/18/2015





Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 11</b> – (View SE) View along crest of north embankment of Cell 11. Note minor erosion and rutting. Cell 11 on right.	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Ash Disposal Area II Annual Inspection	DATE 11/18/2015



Pastor, Behling & Wheeler	DESCRIPTION	<b>Photograph 12</b> – (View NW) View along crest of north embankment of Cell 11 from southeast corner. Cell 11 on left.	
PROJECT NO. 5170A	SITE NAME	Big Brown Steam Electric Station – Ash Disposal Area II Annual Inspection	DATE 11/18/2015