

**CORRECTIVE MEASURES STATUS REPORT
BBSS COAL ASH RECLAMATION SITE**

**Submitted by
Constellation Power Source Generation, Inc.**

**To
Maryland Department of the Environment**

October 16, 2007

CORRECTIVE MEASURES STATUS REPORT

1. Introduction

This Corrective Measures Status Report is presented in compliance with paragraph 31 of the Consent Decree between Maryland Department of the Environment (MDE), Constellation Power Source Generation, and BBSS, Inc., effective date October 1, 2007.

Paragraph 31 of the Consent Decree states the following:

31. Within fifteen (15) days of the signing of this Consent Decree by the Department, Defendants shall submit to the Department a summary status report of the initial Corrective Measures ("Corrective Measures Status Report") that already have been performed or in progress. The Corrective Measures Status Report shall include:

(a) a brief status update addressing the following activities responsive to Waugh Chapel groundwater issues:

- i. Re-sampling private wells.*
- ii. Continued provision of alternate water supplies.*
- iii. Status of ongoing preparation to provide county water supply to appropriate locations, including Summerfield Road residents.*
- iv. Update on study to improve understanding of the cause of the leachate issues and possible remedies.*
- v. Status of ongoing investigation into the presence of wet CCP and potential causes for this condition.*
- vi. Progress on elimination of identified sources of water infiltration into CCP, such as removal of ponding, and improvement of drainage swales.*
- vii. Preliminary investigations into the feasibility of a pump and treat system.*
- viii. Enhanced cap inspection activities to ensure timely identification and correction of site erosion and stormwater management issues.*

(b) a status update addressing the Turner groundwater issues, including re-sampling of private wells and whether the newly installed larger pump is achieving desired capture of groundwater through the groundwater recovery well RW-1.

A status update for these issues is provided in the following sections.

2. Waugh Chapel Pit

Various activities responsive to groundwater issues at the Waugh Chapel Pit at the BBSS site are underway or have been completed. The status of specific activities is described in the following sections, which are keyed to the items referenced above in Paragraph 31(a) of the Consent Decree.

i: Sampling of Private Wells (also addressing a portion of 31(b)).

Private water supply wells have been sampled in several sampling events from October 2006 through the present. This summary includes such sampling in connection with both Waugh Chapel Pit and Turner Pit investigations, because some of the sampling events involved both areas.

October 2006

Constellation sampled the well at 1188 Summerfield Rd on 10/6/06, and followed up with a confirmatory sampling on 10/9/06. Subsequently in the same month, the following wells were sampled, a total of 14 wells:

- Summerfield Road addresses: 1179, 1181/1183 (same well serves two houses), 1184, 1188, and 1190.
- Brickhead Road addresses: 2530, 2542, 2544.
- Waugh Chapel Road addresses: 1210, 1212, 1214.
- Route 3 addresses: 1058, 1064 (Wendy's), and 1068.

All samples collected by Constellation, except the first one on 10/6/06, were analyzed by an independent laboratory certified for drinking water analyses, Phase Separation Science, Inc. The samples were analyzed in the laboratory for aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, copper, iron, lead, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, zinc, and sulfate.

March 2007

In March 2007, samples were collected again from four of the Brickhead Road wells (1179, 1181/1183, 1184, 1188). They were analyzed by Phase Separation Science, Inc. for the same analytes as the October 2006 samples, plus chloride, nitrate, and magnesium.

September 2007

Constellation collected samples from the following 24 wells:

- Summerfield Road addresses: 1179, 1181/1183, 1184, 1188, and 1190.
- Brickhead Road addresses: 2530, 2542, 2544.
- Waugh Chapel Road addresses: 1210, 1212, 1214.
- Route 3 addresses: 1058, 1064 (Wendy's), 1070, 1074, 1079A, 1082, 1085.
- 2609 Evergreen Road.
- 2400 and 2404 Queen Mitchell Road
- 2482 and 2490 Lee Street
- 2568 Shorter Road

These samples were analyzed by Phase Separation Science, Inc., for the following analytes:

- Metals: aluminum, arsenic, barium, beryllium, cadmium, calcium, chromium, iron, lead, manganese, mercury, potassium, selenium, thallium, and zinc.
- Additional metals: lithium, strontium, and boron.
- Inorganic anions: chloride, fluoride, nitrate, and sulfate.

October 2007

In October 2007, samples were collected from the following three wells at the request of the Greater Gambrells Improvement Association: 1417 Jackson Road, 2648 Evergreen Road, and 2643 Evergreen Road. They were analyzed by Phase Separation Science, Inc. for the same analytes as the September 2007 samples.

ii: Alternate Water Supplies

Bottled Water

Summerfield Road Area - In October 2006, Constellation arranged for routine bottled water deliveries to the residents. The homes in this area receiving bottled water included 11 homes on Summerfield Road, Brickhead Road, and Waugh Chapel Road. After connection of Summerfield and Brickhead Road homes to the temporary County water supply that occurred in late September and early October 2007 (see the description in the next section), these bottled water deliveries are being continued for several weeks to allow flushing of the home plumbing lines from the temporary public water line. Continuation of the deliveries to these homes will be reassessed after another round of sampling from interior spigots in late October.

Route 3 Area - In August 2007, Constellation arranged for bottled water deliveries to locations south of Turner Pit. Bottled water continues to be routinely delivered to 13 locations in this area.

The bulk of these recipients of bottled water have wells that have not been impacted by the activities at Waugh Chapel or Turner Pit, and the alternative water supply serves to address community questions and concerns on an interim basis.

Temporary County Water Line

A temporary water line was installed to serve the residents on Summerfield Road until a permanent water line installation is complete in 2008. The line is supplied from a fire hydrant behind the Safeway at Waugh Chapel Village.

Six homes (1179, 1181, 1183, 1184, 1188, and 1190) on Summerfield Road were connected to the temporary public water on 9/26/07. Three homes (2530, 2542, and 2544) on Brickhead Road were connected to the same supply line on 10/4/07. To reduce chances of the temporary water lines freezing in the winter, residents have been instructed to leave an inside faucet or a second outside faucet (not the supply faucet) running continuously with a low flow. The main lines will be protected by providing flow from a discharge hose at the end of the line. A maintenance contract has been set up with the installation contractor for 24/7 service repairs.

iii: Permanent Connection to County Water Supply

Plans are proceeding to install a permanent water line to provide County water to the Summerfield and Brickhead Roads locations identified in Paragraph 40 of the Consent Decree. [It should be noted that the Consent Decree Paragraph 40 erroneously identifies the well as 2542 Brickhead Road. The only Brickhead Road address for purposes of Paragraph 40 should be 2544 Brickhead Road. The well at 2542 falls within the scope of Consent Decree Paragraph 43 and Appendix B.]

An initial design submittal for Summerfield Road was made to Anne Arundel County by Constellation's design contractor Sigma Engineering, and County comments were received on 9/24/07. A second submittal of the design is scheduled for the week of 10/15/07 and will include additional homes on Brickhead Road.

In addition, Constellation has initiated the planning process for offering to replace or provide treatment for existing wells at the 34 homes listed in Appendix B of the Consent Decree.

iv: Leachate Characterization and Causation Studies

In November 2006, Constellation conducted composition and leach testing of the various fill materials present at the site to improve understanding of their properties and potential contributions to groundwater issues at the site. Samples of ash and native soil ("black soil") were tested for composition by SGS North American, Inc., and leach tested by Phase Separation Science, Inc., using the TCLP (toxic characteristic leaching procedure) and SPLP (synthetic precipitation leaching procedure).

The Electric Power Research Institute and Vanderbilt University also initiated work with Constellation to assist in leachate characterization and in understanding the factors controlling release of constituents to groundwater from ash and native soil ("black soil") containing pyrite. Equilibrium batch leaching tests and column leach tests at low liquid-to-solid ratios were performed to identify solubility and release as a function of pH. The study evaluated the behavior of aluminum, arsenic, boron, iron, manganese, nickel, potassium, selenium, thallium, sulfate, and also antimony, barium, cadmium, chromium, lithium, molybdenum, strontium, vanadium, and zinc.

The data report from the study, completed in April 2007, plots the relationships of leachate concentrations to pH and to liquid-solid ratio for the various materials and various constituents. These data may be useful as input to the understanding of locations of water infiltration to the ash fill and leachate causation, given that ash pH is generally alkaline and the local groundwater pH is generally acidic. The data will be used in the identification of sources of leachate, and the evaluation of source/plume control strategies.

Another study related to leachate characterization was an evaluation of how to distinguish natural groundwater from groundwater that is impacted by ash leachate. This study indicates that the majority of wells in the vicinity of the reclamation operations have not been shown to be

impacted by ash leachate because the data from these wells do not contain the expected ash signature.

v: Wet Ash Investigation

Various investigations have been pursued since approximately December 2006 to investigate the cause(s) of elevated constituent concentrations downgradient of Waugh Chapel Pit. This is a summary of some of the investigatory tasks. An initial phase of work included drilling borings through the ash fill and installing monitoring wells in some of those borings. Additional monitoring wells were installed downgradient of Turner Pit, and upgradient and downgradient of Waugh Chapel Pit. In addition, a pumping well and two piezometers were installed in the vicinity of MW-21, downgradient of Waugh Chapel Pit, to allow performance of a pumping test. The pumping test was performed in March 2007, as described in a later section of this report, *vii. Preliminary Investigations into Feasibility of Pump/Treat System and Other Remedial Strategies*.

A subsequent phase of the site exploration involved performing an electrical resistivity imaging survey in March 2007. Imaging was performed along three lines across the ash fill, extending to depths of approximately 100 feet. When correlated to boring data and moisture profiles, the imaging assists in identification of higher moisture areas in the ash and soil.

Additional site exploration in July 2007 consisted of advancing Geoprobe borings at 12 locations to further evaluate the presence of wet ash, obtain samples for moisture testing, and evaluate if ash was present below the water table. These data allowed development of a moisture profile with depth in each boring, to assist in evaluation of water entry locations into the ash fill. Although wet zones exist within the ash, these data demonstrate that a separation has been maintained between the base of ash and the regional water table.

vi: Elimination of Water Infiltration Sources

Various measures have been taken in the field operations in recent months to eliminate or minimize possible water infiltration sources to the ash fill, to help control leachate generation. These measures have included the following:

- A clay-lined stormwater management pond, planned as part of the long-term stormwater design for the site, was completed alongside the haul road in the vicinity of well MW-20.
- A stockpile of native pyritic soil present at the site was encapsulated in clay.
- A ponded area of stormwater adjacent to the bottom of the western ash slope was drained and regraded to prevent ponding.
- The drainage swale along the northeast perimeter of the ash fill, parallel to Waugh Chapel Road, was regraded and lined with clay, to repair erosion and reinforce positive drainage of stormwater around the fill and toward the south.
- Erosion rivulets in a portion of the western ash slope cap were repaired.
- The temporary cap on the western ash slope was upgraded to 18" of clay.

vii: Preliminary Investigations into Feasibility of Pump/Treat System and Other Remedial Strategies

Pumping Test

A field pumping test to evaluate aquifer properties was performed by Constellation's contractor URS Corporation at the Waugh Chapel Pit site in March 2007. Preparation for the test included installation of one pumping well, which can be converted to a recovery well if a pumping system is subsequently installed, and two piezometers. The pumping test was performed for approximately 48 hours, during which water levels were measured electronically in five nearby wells and manually in eight nearby wells. The pumping test water was piped approximately 1,600 feet to the onsite treatment ponds.

Aquifer properties calculated from the pumping test included horizontal and vertical hydraulic conductivity, transmissivity, specific yield, and storativity. These properties will be utilized in evaluating feasibility of various source and plume control options, including calculation of water quantity to be discharged from a potential groundwater pump/treat system.

viii: Enhanced Site Inspection

Activities consistent with a new quality assurance and quality control (QA/QC) plan have already been implemented at the site. The activities include, for example, enhanced inspections on specified schedules; repairing in a timely manner any erosion or stormwater management problems; and maintaining the integrity of the cover system, including the clay cap, topsoil cover, and surface vegetation. Further information can be found in the QA/QC Plan.

3. Turner Pit

Re-sampling of Private Wells

This sampling is discussed earlier in this report, in the section titled *Waugh Chapel Pit*, in the subsection *Sampling of Private Wells*.

Adjustment to Existing Groundwater Recovery System

In May 2004, a groundwater recovery system began continuous operation at the downgradient edge of the earliest ash fill portion of Turner Pit. The system consisted of five pumping wells, and was permitted for a total discharge of 108 gallons per minute (gpm) to Towser's Branch after treatment. At the northeastern end of the recovery well array, constituent concentrations in MW-7 have decreased, and water levels indicate that desired groundwater capture is being achieved. With respect to the southwestern end, in August 2007, a larger capacity pump was installed in RW-1. An evaluation of groundwater flow now indicates that the treatment system (as currently configured and with the original pump) provides a hydraulic barrier to the area initially targeted, including MW-7 and MW-13. However, enhancements will be evaluated to extend the capture zone to MW-8.

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