

## **SECOND REVISED PLAN FOR CHARACTERIZATION OF WATER IMPACT BBSS COAL ASH RECLAMATION SITE (August 13, 2010)**

### **Introduction**

The original version of this plan was submitted in November 2007 in response to paragraph 33 of the Consent Decree between Maryland Department of the Environment (MDE), Constellation Power Source Generation, Inc. (CPSG), and BBSS, Inc., effective October 1, 2007. That plan addressed characterization of the extent of groundwater and surface water impact related to the Waugh Chapel and Turner Pit coal combustion byproducts (CCB) fill areas, including additional proposed monitoring well locations, monitoring frequency and analytes, and methodology for evaluating the extent of contamination. That original plan was developed in conjunction with the original response to Consent Decree paragraph 42 (“CD42”) and is now outdated.

On March 22, 2010, CPSG submitted a Revised Plan to MDE following discussions and communications with MDE in May, June, July and December, 2009 and February, 2010. That Revised Plan reflected an updated approach to monitoring site conditions in light of additional data that has been collected, as well as the discussions with MDE. By letter dated July 28, 2010 (received by CPSG on August 3, 2010), MDE conditionally approved the Revised Plan but required additional amendments consistent with MDE’s detailed comments. This August 13, 2010 Second Revised Plan is intended to address MDE’s July 28, 2010 comments and to supersede the earlier versions of this plan.

Current and planned sampling locations both on-site and off-site (Table 1 attached) serve distinct purposes, and include:

- Groundwater monitoring wells – for characterizing groundwater quality and groundwater elevations. These wells are located outside the fill areas.
- Leachate wells – for characterizing water that leaches through the CCBs and which could potentially affect groundwater quality. These wells are located in the CCB footprint and are screened within the fill material.
- Compliance wells – for determining and confirming compliance with established groundwater quality standards. These wells are located at or just beyond the site boundaries in a general downgradient direction.
- Sentinel wells - for identifying early indications of CCB impacts to groundwater at a distance from the fill areas.
- Groundwater sampling points – used similarly to a sentinel well; however, these wells are former residential potable wells. They are not constructed as monitoring wells, and as such, may be subject to other (surface) impacts.

- Groundwater recovery wells – for extracting groundwater for treatment and for establishing hydraulic control and capture of migrating contaminants. These wells are located at the downgradient end of the fill area.
- Surface water sampling locations – for determining potential impacts to surface water in Towsers Branch that may result from natural recharge to the stream from groundwater.

The intention is for every sample and analysis to serve one of the following purposes:

- Early detection, early warning (sentinel wells, groundwater sampling points and surface water sampling locations)
- Demonstration of remediation effectiveness and compliance with established standards (compliance wells).
- Ongoing evaluation and progress tracking (monitoring and leachate wells).
- Evaluation of remediation operation and effectiveness (leachate and recovery wells).

If monitoring of any well, or if specific data collection parameters or sampling frequencies no longer serve one of these purposes, then monitoring parameters may be adjusted with MDE concurrence to minimize the collection of data that does not contribute to useful site characterization.

The analytical results of the groundwater sampling event will be interpreted and evaluated by comparing them to:

- Representative background concentrations.
- Established standards contained in the Remedial Response Contingency Plan and referenced in the Consent Decree.
- Previous historical results as required to establish trends or source determinations.

### **Proposed Additional Monitoring Wells**

Monitoring to characterize the extent of groundwater and surface water contamination attributed to the site will include groundwater monitoring at existing monitoring wells and surface water locations specified in the Pollution Prevention Plan dated October 11, 2007, and submitted to MDE on that date in compliance with paragraph 45 of the Consent Decree.

In addition to those existing locations, seven additional monitoring wells are proposed (and approved by MDE per its July 28, 2010 letter), as follows:

Monitoring Well I.D.	Proposed Location	Rationale
MW-27	In Rt 3 median, down-gradient of MW-7, contingent on access approval from owner State Hwy Admin.	Compliance well -to assist in evaluating extent of groundwater impact from Turner/WC Pit and effectiveness of hydraulic barrier in groundwater quality recovery.
MW-28	In Rt 3 median, down-gradient of MW-13, contingent on access approval from owner State Hwy Admin.	Compliance well -to assist in evaluating extent of groundwater impact from Turner/WC Pit and effectiveness of hydraulic barrier in groundwater quality recovery.
MW-29	West of Rt 3, on inside of bend in Evergreen Rd, location to be coordinated with owner BBSS.	Compliance well -to assist in evaluating extent of groundwater impact from Turner/WC Pit.
MW-30	North side of Evergreen Rd, between MW-10 and MW-11, location to be coordinated with owner BBSS.	Monitoring well -to provide data regarding groundwater flow direction and groundwater impact from Turner/WC Pit.
MW-32	At eastern edge of BGE right-of-way between MW-12 and MW-11, contingent on access approval from owner BGE.	Monitoring well -to assist in evaluating possible groundwater impact from treatment ponds or other sources west of Turner/WC Pit.
MW-33	In Rt 3 median, between Turner Pit and downgradient wells, contingent on access approval from property owners.	Sentinel well -to serve as early indicator for potential impacts to downgradient wells.
MW-34	In Rt 3 median, down-gradient of MW-16, contingent on access approval from owner State Hwy Admin.	Compliance well -to assist in evaluating extent of groundwater impact from Turner/WC Pit and effectiveness of hydraulic barrier in groundwater quality recovery.

These proposed new well locations are illustrated in Figure 1 (attached). It is likely that some wells in the Turner Pit area may have to be relocated so as not to interfere with site development. MDE will be notified in advance of any well replacements or relocations.

MDE proposed (December 2, 2009) that existing monitoring wells MW-9, MW-10, MW-11 and MW-26 be used for compliance monitoring along Evergreen Road. In that same letter, MDE approved the removal of monitoring wells MW-23 and MW-31 from the monitoring plan on the basis that the direction of groundwater flow and the presence of a groundwater divide make it unlikely that these wells would serve a useful purpose.

A sixth recovery well, RW-6, has been proposed and already authorized by MDE. An additional compliance well, MW-34, has been proposed and approved for groundwater compliance monitoring in the Route 3 median.

These locations for proposed new wells are based on the assumption that legal access to the properties can be obtained for well installation and periodic monitoring. If legal access cannot be arranged, Constellation will attempt to obtain legal access to a nearby location that will serve a similar purpose.

Each new well will be constructed in accordance with MDE standards, with well screen extending to a depth approximately 10 to 15 feet below encountered water level, to allow for seasonal fluctuation in water levels. Each well screen will be 20 feet long with a slot size of 0.010 inch.

In addition to the new monitoring wells two existing residential wells in the vicinity of Waugh Chapel Pit (1210 Waugh Chapel Road and 2530 Brickhead Road) are now being used as groundwater sampling points to observe groundwater quality variation over time. Former residential wells at 1190 Summerfield Road and 2544 Brickhead Road were preserved for possible use as groundwater sampling points. Per MDE's July 28, 2010 request and pending access approval, one or both of the wells located at 1190 Summerfield Road and 2544 Brickhead Road will be sampled per the schedule discussed below. Permanent connections to the Anne Arundel County public water system have been made for the residents of Summerfield, Waugh Chapel and Brickhead Roads which enabled the use of these former residential potable wells for these groundwater sampling points.

In addition, groundwater quality monitoring will occur at a location which is off-site and to the south/southeast of the Turner Pit. To this end, CPSG proposes to use the private water supply wells at 1058 Route 3N, 1085 Route 3N, and 2482 Lee Street, which are down-gradient from Turner/WC Pits, and beyond the sentinel well MW-33, as groundwater sampling points to observe groundwater quality variation over time. Use of these proposed sampling points is dependent on whether legal access to these wells for periodic monitoring can be obtained. If legal access cannot be arranged for sampling of these wells, then other off-site groundwater locations will be identified and proposed for use. Should new sampling locations be needed, the Approved Monitoring Plan will be resubmitted to MDE for review and approval.

To determine if there are potential impacts to surface water in Towsers Branch resulting from natural recharge to the stream from groundwater, three additional surface water sampling locations will be added in addition to existing locations SW-1 and SW-2 that are identified in Appendix A of the Pollution Prevention Plan.

- Location SW-3 will be added the location of Outfall 001 for the Turner Pit Pump and Treat system (NPDES Permit #MD0068993 / State Discharge Permit #03-DP-3431).
- Location SW-4 will be added downstream from existing location SW-2 near monitoring well MW-11.
- Location SW-5 will be added upstream from Outfall 001, and downstream from the Brickhead Road crossing (to supplement MDE's July 28, 2010 requirements).

### **Monitoring Frequency and Analytes**

Upon MDE approval of this plan and installation of the new wells, the new and existing wells will be gauged and sampled as described below and summarized in Table 1 (attached):

**Frequency:** The monitoring/compliance wells, groundwater sampling points, and surface water sampling points will be sampled quarterly until such time as MDE approves an alternate schedule.

**Analytes:** The Remedial Response Contingency Plan and Consent Decree stipulate that the groundwater samples be analyzed for the parameters listed in COMAR 26.04.01.06 (Maximum Contaminant Levels for Inorganic Chemicals in Drinking Water - not including asbestos), plus pH, sulfate, chloride and total dissolved solids (TDS) (together referred to as "Consent Decree Analytical Parameters"). The current analytical suite includes these Consent Decree Analytical Parameters, plus the metals (total): aluminum, boron, calcium, iron, lithium, magnesium, manganese, nickel, potassium, sodium, and zinc; and the additional inorganics: alkalinity, hardness and turbidity (together referred to as "2009 Analytical Suite").

- i. For a trial period of four quarters, the groundwater samples collected from all monitoring wells, compliance wells and leachate wells will be analyzed for an expanded list of analytes comprised of the 2009 Analytical Suite plus the CCB parameters listed in COMAR 26.21.04.07 (D) (referred to as the Expanded MDE CCB list in Table 1).
- ii. For a trial period of two years, the groundwater samples collected quarterly from all sentinel wells and the groundwater sampling points will be analyzed for the parameters listed in COMAR 26.21.04.07 (D) (referred to as MDE CCB list in Table 1).
- iii. The groundwater samples collected from all recovery wells will be analyzed for the 2009 Analytical Suite.
- iv. For a trial period of four quarters, the surface water samples collected from Towsers Branch will be analyzed for the Expanded MDE CCB, including both Total and Dissolved metals).

- v. After the trial periods in subparagraphs i, ii and iv above (for monitoring, compliance, leachate and sentinel wells, groundwater sampling points and surface water samples), the list of analytes will return to the 2009 Analytical Suite. In addition, if required by MDE based upon the data developed during the trial periods, analysis of MDE-identified analytes from the CCBs parameters list would continue as long as this supplemental data provides information that is useful for monitoring site progress or contaminant migration.

Depending on the constituents detected, their levels and the trends exhibited over the year, consideration will be given to whether the 2009 Analytical Suite should be refined periodically (with MDE concurrence) to minimize the collection of less useful data.

For all wells and groundwater sampling points (except the leachate and recovery wells), if an exceedance of the standards defined in the Remedial Response Contingency Plan occurs, then that well will be resampled to confirm the exceedance within 30 days of receipt of the results that exceed the levels. If the exceedance is confirmed by the re-sampling results, the well will be sampled monthly for the parameter(s) for which there is an observed exceedance. The sampling frequency will return to quarterly when one of the following occurs:

- It is demonstrated that over a period of one year, the fluctuation of the pollutant concentrations detected in the monthly samples is less than 5 percent of the mean concentration, or
- The pollutant concentration decreases to below the applicable standards for three consecutive sampling events.

(Note: This proposed frequency provides further guidance to the protocol under the Pollution Prevention Plan for down-gradient perimeter wells.)

Schedule for Monitoring Wells: Monitoring of existing wells is ongoing. Installation and monitoring of the seven new monitoring wells was initiated on August 9, 2010 and will be completed by November 1, 2010 (90 days after receipt of MDE's conditional approval of those locations).

Schedule for Groundwater Sampling Points: Monitoring of the groundwater sampling points at 1210 Waugh Chapel Road and 2530 Brickhead Road has already been initiated. Monitoring of groundwater sampling points (currently planned for 1190 Summerfield Road and/or 2544 Brickhead Road, and for 1058 Route 3N, 1085 Route 3N, and 2482 Lee Street) will be initiated within 60 days after connection of the permanent water line, or within 60 days after obtaining access permission, whichever is later. If legal access to sample an off-site well cannot be obtained within 90 days of CPSG's receipt of MDE approval of the monitoring plan, then within 30 days thereafter, CPSG shall notify MDE of the delay in obtaining access and the reasons for the delay, and submit for MDE

review and approval a new proposed schedule and plan, with new sampling locations if necessary.

### **Data Evaluation**

Water levels and water quality results from the sampled wells and the surface water monitoring points will be used to evaluate groundwater flow directions, groundwater quality trends, and extent of impact that may extend from the site. The data will also be used to evaluate the effectiveness of remedial options already implemented, as well as the feasibility and design of additional remedial options that may be employed.

The methodology for initial and ongoing characterization of the extent of contamination from the site will take into account temporal and spatial variability of both CCB leachate and groundwater flow characteristics. The characterization methodology will include the following components:

- Monitoring water quality at a number of locations on a periodic basis, as described above, to obtain data on spatial and temporal variability.
- Using the monitoring data for sulfate and certain other parameters that have been previously detected at the site above established screening levels to prepare and evaluate time-series plots in order to graphically determine groundwater quality trends for each monitoring well, compliance well, sentinel well and groundwater sampling point. The data may also be statistically evaluated to identify trends that may vary over time, distance and location relative to the CCB placement sites.

Per Consent Decree requirements (Paragraph 51), the collected groundwater data will be incorporated into reports submitted to MDE quarterly, and will be used to prepare a long term trend analysis and summary of the status and effectiveness of the treatment system. The trend analysis and summary report will be submitted to MDE annually. Per MDE's July 28, 2010 letter, the surface water sampling results will also be included in the quarterly reports.