

# Section 2

## Hydrogeologic Investigation

### 2.1 Fly Ash Sampling

On August 11<sup>th</sup> and 12<sup>th</sup> of 2009, CDM collected fly ash samples for analyses from three borings (LW-1, LW-2, and LW-3). CDM had intended to install a monitoring well at these locations to collect water samples from within the fly ash to characterize the associated water quality. However, insufficient evidence of water was observed during drilling at two locations (LW-1 and LW-3) to warrant well installation. A well was installed at location LW-2 but this well went dry upon attempts to purge the well and no water sample was collected.

CDM collected depth-composited samples from the fly ash at three depth intervals from each boring. The samples were analyzed for total metals, ammonia nitrogen, nitrate, nitrite, and moisture content. **Table 2-1** provides a summary of the laboratory data from the fly ash samples and **Appendix A** includes the laboratory report. The boring locations are shown on Figure 1-5.

### 2.2 Groundwater and Surface Water Analyses

CDM collected 22 groundwater samples and 10 surface water samples in September of 2009 and 20 groundwater samples in October 2009. Water levels were also collected from 24 wells and 9 surface water staff gauges. The surface water data are summarized in **Table 2-2** and the groundwater data are summarized in **Table 2-3**. The full laboratory reports are included in **Appendix B**. **Table 2-4** includes a summary of duplicate water sample analyses.

Groundwater was purged from the wells using a peristaltic pump following the low-flow technique at flow rates less than 200 milliliters per minute. Parameters monitored during purging included temperature, pH, conductivity, dissolved oxygen, oxidation reduction potential, and turbidity. These parameters were monitored and purging continued until they had stabilized to within ten percent. Once the parameters had stabilized, samples were collected directly from the peristaltic pump tubing. All pump tubing was new upon use and discarded between each well location. The surface water samples were collected using the dip technique. The sample container was dipped into the water to allow the sample to flow into the sample container. The groundwater and surface water samples were analyzed for total metals, nitrate, nitrite, and ammonia by Test America in Pittsburgh, PA. Field analyses were also performed for ferrous iron, total iron, sulfate, and sulfide. These results are included in **Table 2-5**.

### 2.3 Aquifer Performance Test

During November 2009, CDM conducted an APT at test well TW-1 located up gradient of the site. The APT pumping was performed over a three day period. Water level loggers were installed in 5 monitoring wells (MW-3A, -3B, -3C, -5A, and -5C)

and 2 piezometers (PZ-1 and -2). The piezometers and test wells are fully penetrating wells in the surficial aquifer. The MW-3 series wells are near the APT location and the MW-5 wells were used to monitor ambient water level fluctuations. Water levels were monitored continuously from November 16<sup>th</sup> until November 20<sup>th</sup>. The pumping was initiated on November 17<sup>th</sup> at 9:37 a.m. and flow rate of 32.85 gallons per minute was sustained throughout the three day pumping period. The pumping was concluded at 9:00 a.m. on November 20<sup>th</sup> and data were then collected for the recovery portion of the APT. Over the three day period, the water level in the pumping well declined 6.48 feet. Hydrographs prepared from the APT data are included in **Appendix C**.

## 2.4 Investigation Derived Waste

Cuttings from the fly ash borings were contained in drums along with the drilling decontamination solutions. Groundwater derived from monitoring well purging was also placed in drums. The drummed wastes were characterized for disposal purposes and the laboratory reports are included in Appendix B. Based on the laboratory results on the individual fly ash samples discussed above and additional analyses on a composite sample, the wastes were considered to be non-hazardous. The disposal services were provided by PetroChem Recovery Services.

## 2.5 Additional Data Sources

Several investigations have recently been conducted for the site and include reports prepared for the EPA, Dominion Generation, and the City of Chesapeake. Data from these additional sources include extensive laboratory data for groundwater and surface water, fly ash characterization data, and aquifer hydraulic property data. For data analysis purposes, CDM prepared a comprehensive water quality database from these investigations and the database is included in **Appendix D**. These additional data sources are referenced below.

MACTEC, *Post-Construction Ash Fill, Soil Cover and Groundwater Evaluation Report, Battlefield Golf Club Ash Reuse Site*, Chesapeake, Virginia, prepared for Dominion Generation, December 17, 2009.

Tetra Tech, *Final Site Inspection for the Battlefield Golf Club Site*, City of Chesapeake, Virginia, prepared for U.S. EPA Region 3, April 16, 2010.

Tetra Tech, *Draft Site Inspection for the Battlefield Golf Club Site*, City of Chesapeake, Virginia, prepared for U.S. EPA Region 3, March 30, 2009.

URS, *Task 7 Off Site Groundwater Investigation*, Battlefield Golf Club Water Project, prepared for the City of Chesapeake, November 5, 2009.

URS, *Water Supply Feasibility Study*, Battlefield Golf Club Water Project, prepared for the City of Chesapeake, April 10, 2009.