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# Addendum
# to the
# Kingston Ash Recovery Project
# Groundwater Flow and Transport Model Report

**Prepared for:**
**the Tennessee Valley Authority**

| Revision | Description | Date |
|---|---|---|
| 00 | Groundwater Model Report Addendum for TVA Review | July 3, 2012 |
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# List of Acronyms

| | |
|---|---|
| CSMoS | Center for Subsurface Modeling Support |
| cm/s | centimeter per second |
| EPA | U.S. Environmental Protection Agency |
| ft | foot/feet |
| K | hydraulic conductivity |
| Kd | partition coefficient |
| KIF | Kingston Fossil Plant |
| LIDAR | Light Detection and Ranging |
| msl | mean sea level |
| PWS | Perimeter Wall Stabilization |
| Shaw | Shaw Environmental & Infrastructure, Inc. |
| Stantec | Stantec Consulting Services, Inc. |
| TVA | Tennessee Valley Authority |

# 1. INTRODUCTION

## 1.1 BACKGROUND

The goal of groundwater flow and transport modeling is to quantify ash-related constituent concentrations and mass loadings entering the Emory River and Swan Pond Embayment via groundwater seepage from ash source areas at the Tennessee Valley Authority's (TVA's) Kingston Fossil Plant (KIF). These predictions were subsequently be used in evaluating potential long-term risks to human and aquatic receptors.

A report documenting the groundwater flow and transport model (TVA 2011) was issued July 25, 2011 and submitted to the U.S. Environmental Protection Agency (EPA) for review. The report was reviewed by its contractor (Shaw Environmental & Infrastructure, Inc.) and a memorandum (Shaw 2011) documenting report comments was forwarded to TVA from EPA's Center for Subsurface Modeling Support (CSMoS).

CSMoS's primary concern was that the groundwater flow model had been calibrated to only one comprehensive area-wide water level collection event corresponding to high (summer)reservoir pool elevations from July 28 to 30, 2010. In subsequent correspondence, it was agreed that the groundwater flow model would be validated based on a water level collection event representing low reservoir pool conditions.

## 1.2 PURPOSE AND SCOPE

This addendum has been prepared to document the behavior of the groundwater flow model based on site conditions observed in February 2012. Figure 1 is an aerial photograph of the site taken in February 2012. Model revisions include changes in topography and modifications to flow model boundary conditions resulting from ash removal, ash redeposition, engineered features, and partial installation of the Perimeter Wall Stabilization(PWS). Comprehensive surface water and groundwater level data were collected in February 2012 to support this secondary validation of the groundwater flow model.

# 2. FEBRUARY 2012 WATER LEVEL MEASUREMENTS

To gather data representing low reservoir pool conditions, a single, site-wide groundwater and surface water level measurement event was performed from February 13 to 14, 2012. This time period also corresponds to relatively high seasonal groundwater elevations. Site precipitation for January and February 2012 totaled 9.9 inches.

Groundwater elevation data were collected from 302 wells and piezometers. Water level data were grouped according to screened media (i.e., ash, fill, residuum, alluvial sand, alluvial clay, and bedrock). Table 1 provides water level data along with well and media information and Figure 2 depicts monitoring well locations. The groundwater level data are supplemented by surface water level measurements at 31 locations shown on Figure 3 and provided in Table 2. The water level in the Emory River was 736.9 ft-msl, compared to the higher water level of 740.8 in July 2010.

The data were analyzed and potentiometric plots for different media were constructed. Similar to the July 2010 data (TVA 2011), the first occurrence of groundwater below ash disposal areas (i.e., Former Dredge Cell, Ash Pond, Settling Basin, and Ball Field) is generally within existing ash fill. Figure 4 illustrates shallow groundwater levels at the site. Note that water level data associated with surface water features (boundary conditions) were also used in the construction of Figure 4. As shown, groundwater gradients trend easterly in areas of the Ball Field, Ash Pond, and Settling Basin toward surface water features. In southern portion of the former Dredge Cells, shallow groundwater elevations are highest (near 770 ft-msl) in the relict portion of Dredge Cell 1. Ground (ash) surface elevations in this vicinity are relatively high compared to other ash disposal areas.

Figure 5 depicts potentiometric heads in alluvial clay beneath the site. Groundwater gradients in this unit are a subdued reflection of shallow groundwater gradient trends with a dominant easterly flow field. This is further illustrated on Figure 6 which shows potentiometric heads in alluvial sand beneath the site. Potentiometric mapping was not performed for bedrock (Conasauga shale) due to sparse data.

Results suggest mostly upward vertical gradients at the foot of Pine Ridge, the primary source of lateral groundwater inflow to the shallow aquifer beneath the proposed Ash Landfill study area. Most of the well/piezometer pairings within the proposed Ash Landfill exhibit downward vertical gradients, probably associated with seepage from plant-related impoundments currently active in this area. Locations along the Intake Channel, downgradient of the proposed Ash Landfill, show upward gradients from the bedrock to the overburden. Vertical gradients within the Ball Field facility are generally downward, as expected considering the processing of wet ash in this area.

# 3. 2012 FLOW MODEL CONSTRUCTION

## 3.1 DOMAIN AND DISCRETIZATION

The site-specific groundwater flow model domain covers an area from top of the Pine Ridge in the northwest, to the middle of the Emory River/Plant Intake Channel in the southeast, and Swan Pond Creek Diversion channels (February 2012 conditions) in the north to the line that connects the top of Pine Ridge to the east of the plant in the southwest (Figure 7). The entire model domain covers approximately 8.1 square miles.

A three-dimensional, uniformly spaced, vertically variable spaced finite-difference grid was used for the site model. It was unnecessary to revise the horizontal discretization for this validation. The model consists of 8 layers, 860 columns, and 680 rows. The horizontal spacing of the finite-difference cells is 10 ft across the model domain while the vertical spacing of the cell varies based on site-specific lithological data described in TVA (2011).

## 3.2 MODEL LAYER GEOMETRY

The upper boundary of the model is represented by the 2012 surface topography obtained from a high resolution LIDAR survey performed on February 3, 2012. Surface water bathymetric surfaces are identical to those of the previously calibrated model (TVA 2011). Underlying model layers geometry does not deviate from the previously calibrated model (TVA 2011). Figure 8 illustrates profiles of the model in the vertical sections.

## 3.3 BOUNDARY CONDITIONS

### 3.3.1 Head and Flow Boundary Conditions

Figure 9 shows model boundary conditions for the 2012 model. The groundwater system at the site is bounded by Pine Ridge to the west. Pine ridge is a narrow and steep ridge, forming a surface water divide at the top. Since it is generally assumed that the shallow and active groundwater divide will mirror the surface water divide, the groundwater divide plane extending vertically downward from the crests of the ridges are specified to be no-flow boundaries for the groundwater flow system, and there is no groundwater import or export across the ridge crests.

To the southwest, there is not a clear topographic relief to mark a groundwater divide. However the groundwater flow is likely down the Pine Ridge slope toward the Plant Intake Channel. On this basis, the southwestern model boundary follows an assumed groundwater streamline representing a no-flow boundary condition. This is identical to the previously calibrated flow model (TVA 2011).

The Swan Pond Diversion Channel, forming the northern model boundary, is a continuous flowing stream. The north boundary is assigned as constant head boundary condition in the model based on water level measurements (Table 2).

The Emory River and Plant Intake Channel form the east and southeast model flow boundary and are represented by river boundary conditions. The streambed bottom elevation varies according to bottom bathymetry as described in TVA (2011). The constant surface water elevation of the Emory River is 736.92 ft-msl, the average elevation from February 13 to 14, 2012 measurements. The surface water elevation of the Plant Intake Channel is 736.92 ft-msl, which is an average elevation from February 13 to 14, 2012 measurements.

Surface drainage features are represented in the model as drain cells. The drain cell elevations are set at 0.5 ft below the surface ditch elevation at its location. River cells are used to represent the Sluice Trench at elevation range of 762.03ft-msl and three small constructed wetlands near the Plant Intake Channel at elevations of 748.7, 747.5, and 744.3ft-msl, respectively.

Constant head cells are used to represent constant surface water bodies, including the Ash Pond, Stilling Pond, and three water bodies (a drainage channel in the south and ponded water to the north). The Ash Pond and Stilling Pond are set at 760.14 and 754.44ft-msl, respectively, based on February 13 to 14, 2012 surface water level measurements. The surface water elevation of the southern drainage channel is at 757.18ft-msl which is an average elevation from February 13 to 14, 2012 surface water measurements. The larger northern water pond is set at 740.67 ft-msl and the smaller pond to northeast is set at 760.0 ft-msl.

The PWS was simulated using the Horizontal Flow Barrier Package in MODFLOW. The walls are ultimately designed to extend around the perimeter of the Closed Ash Landfill. However, the stabilization walls are currently under construction and only a portion of the walls (Figure 9) were completed by February 2012.

According to design information provided by TVA and Stantec Consulting Services, Inc., the target wall thickness is 3 ft (per wall) and this was assigned in the model. Values of hydraulic conductivity (K) for the wall vary depending on the hydrogeologic unit intersected. K values assigned for the wall boundary are 5.0E-06 cm/s for ash layers 1 to 5, 2.0E-08 cm/s for alluvial clay (layer 6), and 1.0E-07 cm/s for alluvial sand (layer 7). The walls do not penetrate bedrock (layer 8). TVA (2011) provides detailed information related to the stabilization walls.

### 3.3.2 Recharge

Recharge to the groundwater system at the site includes precipitation and potential seepage from plant-related surface water bodies (e.g., sluice channels and impoundments). Seepage from the surface water body to groundwater is computed internally during the model calculation based on the given boundary head condition.

Precipitation is the most important source of groundwater recharge in the site. The natural groundwater recharge is a function of precipitation, runoff, and evapotranspiration. The net recharge to groundwater thus is a function of the hydraulic properties of geologic media above the groundwater zone, surface slope, and vegetation.

For the modified groundwater flow model in this evaluation, recharge values were identical to the previously calibrated flow model (TVA 2011).

### 3.4 HYDRAULIC PROPERTIES

For the modified groundwater flow model in this validation, hydraulic properties were identical to the previously calibrated flow model (TVA 2011) with the exception of the addition properties associated with the PWS.

The stabilization walls are proposed to be used to stabilize the foundation beneath the dikes around the circumference of the closed Ash Landfill as part of a perimeter containment system. The wall system is composed double-wall (inboard and outboard) design that uses in-situ soil mixing and grouting methods from the regraded ground surface to competent bedrock. Each wall is 3 ft in thickness and separated by a horizontal distance of 90 ft. As previously mentioned, the stabilization walls are under construction and only a portion of the walls (Figure 9) were completed by February 2012.

As described in TVA (2011), laboratory analysis of soilcrete specimens provided hydraulic conductivities for the treated ash, alluvial clay, and alluvial sand. The hydraulic conductivities are 5.0E-06, 2.0E-08, and 1.0E-07 cm/s, respectively. These K values were used for the wall properties during construction of the 2012 groundwater flow model.

## 4. MODEL VALIDATION

### 4.1 VALIDATION PROCESS

Calibration of a groundwater flow model refers to the process of adjusting model input parameters (e.g., hydraulic conductivity) and boundary conditions (e.g., recharge) to obtain a reasonable match between measured and predicted groundwater potentiometric levels within the model domain. In practice, this usually involves an iterative process of adjusting hydraulic properties and/or boundary conditions assigned in the model. At all stages of the model calibration process, parameter values and boundary conditions are constrained by hydrogeological data collected in the field and engineering design values.

To validate the KIF groundwater model initially calibrated to the July 2010 condition, the water level data collected in February 2012 were used. The goal is to verify the model internal parameters, such as hydraulic conductivities, will be consistent and applicable for various conditions that may be affected by the change in boundary condition, such as river stage, constant head, topography, drainage features, and recharge. If the boundary condition changes of the model in response to applicable condition can match the measured data while the internal constant parameters, such as hydraulic conductivities of various media, remain the same, it is an indication that the model is properly calibrated and reflects site conditions.

For the validation, the model input parameters (hydraulic conductivities) and recharge boundary conditions remained the same as 2012 condition. However, the model boundary conditions that reflect the 2012 conditions (surface water body, drainage features, and topographic changes), as discussed earlier, were utilized.

The validated model of February 2012 was used to develop groundwater head distributions, calibration statistics, and a mass balance summary.

## 4.2 VALIDATION RESULTS

### 4.2.1 Predicted Heads

A contour map of the model predicted steady-state water table from the calibrated 2012 model is shown in Figure 10. The water table matches with the general understanding of the water table distribution at the area as shown in the Figure 4.

Contour maps of the steady-state hydraulic head distribution in ash (model layer 5), alluvial clay (model layer 6), alluvial sand (model layer 7), and bedrock (model layer 8) as predicted by the model are shown in Figures 11 to 14, respectively. The potentiometric surfaces portrayed by model predictions mirror those maps drawn from actual water level data as shown in the Figures 4 to 6. Predicted results indicate mostly downward hydraulic gradients in ash areas, similar to field measurements. These potentiometric maps are consistent with our present understanding of the groundwater flow system in the area.

### 4.2.2 Calibration Statistics

Table 3 provides model predicted groundwater levels and residuals (i.e., differences between measured and predicted groundwater levels) for the February 2012 target locations. At a few locations within the relic portion of the Dredge Cell (PZ-R2A, PZ-R4A, and PZ-R5A), the model under-predicts water levels. This is likely caused by the local presence of finer ash layers that were not represented within the model. The residual mean is 0.03 ft, the standard error of the estimate is 0.25 ft, and the normalized root mean squared is 6.7%. Considering the large topographic relief across the site (> 300 ft) and complexity of the site-specific hydrogeologic conditions, the model calibration is considered to be acceptable.

In general, the water levels computed by the model reasonably match those observed in the field. This is illustrated in Figure 15 which shows the relationship between model-predicted and observed water levels. Most of the plotted values are close to the 45 degree line shown on the figure indicating relative close agreement between model-predicted and observed water levels. The values are randomly distributed along the 45 degree line, suggesting there is no obvious bias predicted by the model in response to biased model parameters (such as hydraulic conductivity value for a particular layer or a unit).

### 4.2.3 Mass Balance

Volumetric water balances are quantitative model estimates of the sources and sinks of water in an aquifer system. A water budget analysis is performed to better understand the movement of water in the aquifer system. The water balance error for the 2012 model was 0.45%, well within the typically accepted limit. The water balance shows that essentially all water has been mathematically accounted for and that MODFLOW simulation has correctly solved the governing flow equations.

# 5. SUMMARY

A comprehensive three-dimensional groundwater flow model was initially developed for calibration to 2010 known field conditions using available data. CSMoS's primary concern was that the groundwater flow model had been calibrated to only one comprehensive site-wide water level collection event corresponding to high (summer)reservoir pool elevations from July 28 to 30, 2010 (TVA 2011). To validate the groundwater flow model, a comprehensive site-wide groundwater and surface water level measurement event was performed from February 13 to 14, 2012. This time period corresponds to low (winter) reservoir pool conditions and to relatively high seasonal groundwater elevations.

For model validation, the hydraulic parameters (e.g., hydraulic conductivity) and recharge boundary conditions remained the same as the previously calibrated model (July 2010 high reservoir pool conditions). However, certain model boundary conditions that reflect February 2012 conditions (e.g., surface water elevations/locations, drainage features, and topographic changes) were utilized.

Model-predicted heads, calibration statistics, and mass balance error for the revised model indicate that model calibration is equally acceptable for conditions representing low reservoir pool conditions using identical hydraulic parameters. Based on 2012 flow model validation, the 2010 model provided reliable estimates of contaminant fate and transport.

# 6. REFERENCES

TVA 2011, *Kingston Ash Recovery Project, Groundwater Flow and Transport Model Report*, Document No. EPA-RPT-1002, prepared for the Tennessee Valley Authority, Revision 01, July 25, 2011.

Shaw 2011, *Memorandum from Rob Earle (Shaw Environmental & Infrastructure, Inc.) to Ralph Ludwig (Center for Subsurface Modeling Support, US EPA National Risk Management Research Laboratory)*, Final deliverable for 8CS230SF, November 30, 2011.

# Tables

# Table 1 Groundwater Elevation Data (February 13-14, 2012)

| Well / Piezometer ID | Easting (State) | Northing (State) | Screen ID | Media | Ground Elevation (ft-msl) | Top Screen Elevation (ft-msl) | Bottom Screen Elevation (ft-msl) | Middle Screen Elevation (ft-msl) | February 2012 Water Level (ft-msl) | July 2010 Water Level (ft-msl) |
|---|---|---|---|---|---|---|---|---|---|---|
| 101 | 2440334 | 557679 | A | fly ash | 768.22 | 732.22 | 730.22 | 731.22 | 749.44 | 758.21 |
| 101 | 2440334 | 557679 | B | alluvium (clay)/(sand) | 768.22 | 729.22 | 727.22 | 728.22 | 746.91 | 755.90 |
| 101 | 2440334 | 557679 | C | alluvium (sand) | 768.22 | 721.22 | 719.22 | 720.22 | 747.90 | 753.90 |
| 102 | 2440505 | 557776 | A | fly ash | 761.42 | 748.42 | 746.42 | 747.42 | NA | 757.34 |
| 102 | 2440505 | 557776 | B | fly ash | 761.42 | 736.42 | 734.42 | 735.42 | NA | 755.49 |
| 102 | 2440505 | 557776 | C | alluvium (silt) | 761.42 | 731.42 | 729.42 | 730.42 | NA | 754.41 |
| 102 | 2440505 | 557776 | D | weathered shale | 761.42 | 713.42 | 711.42 | 712.42 | NA | 753.48 |
| 103 | 2440715 | 557712 | A | fly ash | 766.37 | 733.37 | 731.37 | 732.37 | NA | 753.59 |
| 103 | 2440715 | 557712 | B | alluvium (silt) | 766.37 | 727.37 | 725.37 | 726.37 | NA | 753.36 |
| 103 | 2440715 | 557712 | D | weathered shale | 766.37 | 715.87 | 713.87 | 714.87 | NA | 752.47 |
| 106 | 2441197 | 557301 | A | alluvium (clay) | 754.69 | 725.69 | 723.69 | 724.69 | 753.76 | 746.60 |
| 106 | 2441197 | 557301 | B | alluvium (silt) | 754.69 | 716.69 | 714.69 | 715.69 | 752.83 | 749.83 |
| 106 | 2441197 | 557301 | C | alluvium (sand) | 754.69 | 706.69 | 704.69 | 705.69 | 752.06 | 749.52 |
| 109 | 2441623 | 556966 | A | fly ash | 763.41 | 744.41 | 742.41 | 743.41 | 754.94 | 754.25 |
| 109 | 2441623 | 556966 | B | alluvium (silt) | 763.41 | 733.41 | 731.41 | 732.41 | 754.32 | 754.56 |
| 109 | 2441623 | 556966 | C | alluvium (sand) | 763.41 | 723.41 | 721.41 | 722.41 | 753.17 | 754.09 |
| 109 | 2441623 | 556966 | D | alluvium (sand) | 763.41 | 703.41 | 701.41 | 702.41 | 753.16 | 754.08 |
| 211 | 2441967 | 557054 | A | shale | 765.55 | 698.05 | 696.05 | 697.05 | 745.95 | 746.88 |
| 303 | 2439975 | 555756 | A | fly ash | 817.42 | 747.42 | 745.42 | 746.42 | 767.41 | 764.87 |
| 303 | 2439975 | 555756 | B | fly ash | 817.42 | 733.42 | 731.42 | 732.42 | 766.56 | 764.72 |
| 303 | 2439975 | 555756 | C | alluvium (silt) | 817.42 | 726.92 | 724.92 | 725.92 | 767.21 | 763.75 |
| 303 | 2439975 | 555756 | D | alluvium (silt) | 817.42 | 722.42 | 720.42 | 721.42 | 765.94 | 763.40 |
| 303 | 2439975 | 555756 | E | alluvium (silt) | 817.42 | 713.42 | 711.42 | 712.42 | 765.48 | 762.94 |
| 404 | 2439087 | 556360 | A | fly ash | 763.62 | 733.62 | 731.62 | 732.62 | 767.62 | 761.86 |
| 404 | 2439087 | 556360 | B | alluvium (silt) | 763.62 | 723.62 | 721.62 | 722.62 | 769.62 | 759.93 |
| 404 | 2439087 | 556360 | C | alluvium (sand) | 763.62 | 717.62 | 715.62 | 716.62 | 774.00 | 759.08 |
| 408 | 2439699 | 556901 | A | fly ash | 764.76 | 731.76 | 728.76 | 730.26 | 760.75 | 757.75 |
| 408 | 2439699 | 556901 | B | alluvium (silt) | 764.76 | 725.76 | 723.76 | 724.76 | 762.13 | 757.75 |
| 408 | 2439699 | 556901 | C | alluvium (sand) | 764.76 | 702.76 | 700.76 | 701.76 | 763.81 | 758.97 |
| 500 | 2440228 | 556623 | A | fly ash | 757.63 | 736.63 | 734.63 | 735.63 | 770.69 | 756.39 |
| 500 | 2440228 | 556623 | B | silt fill | 757.63 | 728.63 | 726.63 | 727.63 | 769.84 | 756.93 |
| 500 | 2440228 | 556623 | C | alluvium (clay) | 757.63 | 724.63 | 722.63 | 723.63 | 767.92 | 758.69 |
| 500 | 2440228 | 556623 | D | alluvium (sand) | 757.63 | 707.63 | 705.63 | 706.63 | 766.15 | 756.69 |
| 502 | 2440873 | 556618 | A | fly ash | 752.82 | 733.82 | 731.82 | 732.82 | 763.96 | 748.97 |
| 502 | 2440873 | 556618 | B | alluvium (clay) | 752.82 | 729.32 | 727.32 | 728.32 | 762.46 | 750.23 |
| 502 | 2440873 | 556618 | C | alluvium (sand) | 752.82 | 722.82 | 720.82 | 721.82 | 762.65 | 749.96 |
| 502 | 2440873 | 556618 | D | alluvium (sand) | 752.82 | 710.82 | 709.32 | 710.07 | 761.72 | 750.88 |
| 503 | 2439908 | 556834 | A | fly ash | 768.11 | 748.61 | 746.61 | 747.61 | 765.60 | 760.49 |
| 503 | 2439908 | 556834 | B | alluvium (silt) | 768.11 | 736.11 | 734.11 | 735.11 | 765.10 | 759.10 |
| 503 | 2439908 | 556834 | C | alluvium (clay) | 768.11 | 730.11 | 728.11 | 729.11 | 764.63 | 759.56 |
| 503 | 2439908 | 556834 | D | alluvium (sand) | 768.11 | 715.11 | 713.11 | 714.11 | NA | 759.32 |
| 503 | 2439908 | 556834 | E | alluvium (sand) | 768.11 | 711.11 | 709.11 | 710.11 | NA | 759.24 |
| 600 | 2441424 | 556463 | A | alluvium (sand) | 776.66 | 721.66 | 719.66 | 720.66 | 756.20 | 758.51 |
| 603 | 2441187 | 555810 | A | weathered shale | 780.61 | 705.61 | 704.61 | 705.11 | 765.51 | 766.66 |
| 604 | 2440526 | 554800 | A | shale | 782.50 | 692.00 | 690.00 | 691.00 | 761.80 | 760.18 |
| 605 | 2441499 | 556273 | A | fly ash | 781.64 | 754.64 | 752.64 | 753.64 | 762.64 | 763.33 |
| 605 | 2441499 | 556273 | B | fly ash | 781.64 | 740.64 | 738.64 | 739.64 | 761.79 | 762.71 |
| 605 | 2441499 | 556273 | C | alluvium (silt) | 781.64 | 733.64 | 731.64 | 732.64 | NA | 761.71 |
| 605 | 2441499 | 556273 | D | weathered shale | 781.64 | 706.64 | 704.64 | 705.64 | 755.93 | 758.70 |
| 211(A) | 2441976 | 557047 | A | alluvium (silt)/(sand) | 765.43 | 734.43 | 732.43 | 733.43 | 746.91 | 747.60 |
| 211(B) | 2441970 | 557051 | A | bottom ash | 765.38 | 745.38 | 743.38 | 744.38 | 748.99 | 750.15 |
| 600(A) | 2441421 | 556462 | A | alluvium (silt) | 776.66 | 731.66 | 729.66 | 730.66 | 760.67 | 760.21 |
| 603(A) | 2441185 | 555805 | A | fly ash | 780.55 | 733.55 | 731.55 | 732.55 | 763.06 | 759.83 |
| 603(B) | 2441182 | 555801 | A | alluvium (sand) | 780.55 | 725.55 | 724.55 | 725.05 | 767.52 | 764.06 |
| 604(A) | 2440515 | 554803 | A | alluvium (clay) | 782.39 | 720.39 | 718.39 | 719.39 | 763.45 | 763.68 |
| 604(B) | 2440521 | 554802 | A | fly ash | 782.36 | 727.36 | 725.36 | 726.36 | 757.96 | 758.89 |
| 6AR | 2442760 | 553950 | A | alluvium (sand) | 749.04 | 723.09 | 713.82 | 718.46 | 732.76 | 740.89 |
| A-1 | 2439677 | 553307 | A | bottom ash | 757.02 | 753.02 | 738.02 | 745.52 | 755.36 | 753.37 |
| A-2 | 2439700 | 553255 | A | silty clay fill | 754.82 | 750.32 | 745.32 | 747.82 | 754.55 | 752.12 |
| A-3 | 2439728 | 553231 | A | silty clay fill | 747.09 | 742.09 | 727.09 | 734.59 | 747.11 | 745.38 |

# Table 1 Groundwater Elevation Data (February 13-14, 2012)

| Well / Piezometer ID | Easting (State) | Northing (State) | Screen ID | Media | Ground Elevation (ft-msl) | Top Screen Elevation (ft-msl) | Bottom Screen Elevation (ft-msl) | Middle Screen Elevation (ft-msl) | February 2012 Water Level (ft-msl) | July 2010 Water Level (ft-msl) |
|---|---|---|---|---|---|---|---|---|---|---|
| AD-1 | 2438378 | 555442 | A | weathered shale | 777.25 | 755.80 | 745.25 | 750.53 | 774.43 | 772.79 |
| AD-2 | 2439781 | 553295 | A | residuum | 753.34 | 739.44 | 729.44 | 734.44 | 745.85 | 748.45 |
| AD-3 | 2440722 | 553770 | A | weathered shale | 748.66 | 739.36 | 734.36 | 736.86 | 744.03 | 744.12 |
| B-1 | 2439911 | 553532 | A | bottom ash | 759.45 | 752.35 | 742.35 | 747.35 | 754.19 | 752.03 |
| B-2 | 2439947 | 553470 | A | silty clay fill | 753.17 | 748.17 | 733.17 | 740.67 | 751.26 | 749.13 |
| B-3 | 2439942 | 553417 | A | silty clay fill | 748.49 | 743.49 | 728.49 | 735.99 | 741.86 | 746.81 |
| C1A | 2440474 | 553673 | A | sandy clay fill | 748.44 | 738.44 | 733.44 | 735.94 | NA | NA |
| C1B | 2440474 | 553673 | B | sandy clay fill | 748.44 | 723.54 | 718.64 | 721.09 | NA | NA |
| C2 | 2440490 | 553641 | A | sandy clay fill | 743.90 | 731.97 | 726.97 | 729.47 | 738.36 | NA |
| D1A | 2440699 | 553760 | A | sandy clay fill | 748.70 | 733.84 | 728.84 | 731.34 | 738.37 | NA |
| D1B | 2440699 | 553760 | B | sandy silt fill | 748.70 | 714.70 | 709.70 | 712.20 | 748.30 | NA |
| D2 | 2440708 | 553728 | A | clayey sand fill | 743.30 | 733.23 | 728.23 | 730.73 | 737.37 | NA |
| GW-1 | 2438383 | 555460 | A | shale | 777.84 | 745.34 | 725.34 | 735.34 | 776.85 | NA |
| GW-2 | 2439721 | 557338 | A | residuum/weathered shale | 766.54 | 757.04 | 747.04 | 752.04 | 752.69 | NA |
| GW-3 | 2439734 | 557354 | A | shale | 766.63 | 741.63 | 721.63 | 731.63 | 753.11 | NA |
| KIF-22 | 2442743 | 555664 | A | fly ash/alluvium | 753.26 | 736.26 | 701.26 | 718.76 | 738.77 | 742.17 |
| P-A1 | 2439179 | 554804 | A | fly ash | 768.90 | NA | NA | 739.90 | 759.52 | 759.60 |
| PA-2 | 2439107 | 554061 | A | fly ash | 769.30 | NA | NA | 741.30 | 758.85 | 758.95 |
| PA-3A | 2439519 | 554103 | A | fly ash | 768.4 | NA | NA | 745.00 | 759.01 | 759.40 |
| P-A4 | 2439673 | 554611 | A | fly ash | 768.50 | NA | NA | 739.10 | 759.36 | 758.73 |
| P-A5 | 2439415 | 554580 | A | fly ash | 769.50 | NA | NA | 744.70 | 759.55 | 759.28 |
| PC-1 | 2439183 | 554812 | A | alluvium | 769 | NA | NA | 710.00 | 760.21 | NA |
| PC-2 | 2439104 | 554058 | A | alluvium | 768.6 | NA | NA | 719.00 | 756.42 | NA |
| P-C4 | 2439669 | 554606 | A | alluvium | 768.70 | NA | NA | 714.70 | 758.22 | 758.08 |
| P-C5 | 2439441 | 554579 | A | alluvium | 768.10 | NA | NA | 709.60 | 759.60 | 758.68 |
| PZ-1 | 2442329 | 556807 | A | alluvium (clay) | 751.20 | 731.70 | 723.70 | 727.70 | 738.49 | 742.07 |
| PZ-10 (U) | 2442840 | 554601 | A | clay fill | 765.30 | 758.50 | 751.50 | 755.00 | 754.68 | 754.67 |
| PZ-11 (L) | 2442840 | 554601 | B | bottom ash | 765.30 | 741.50 | 734.30 | 737.90 | 749.61 | 750.68 |
| PZ-11A | 2441170 | 556251 | A | fly ash | 764.80 | 746.80 | 742.80 | 744.80 | 764.80 | 757.90 |
| PZ-11B | 2441170 | 556251 | B | fly ash | 764.80 | 736.80 | 732.80 | 734.80 | 765.00 | 758.10 |
| PZ-11C | 2441170 | 556251 | C | alluvium (clay) | 764.80 | 727.80 | 723.80 | 725.80 | 764.20 | 759.50 |
| PZ-11D | 2441170 | 556251 | D | alluvium (sand) | 764.80 | 721.80 | 717.80 | 719.80 | 761.80 | 758.70 |
| PZ-12 | 2442841 | 554606 | A | alluvium (silt) | 765.30 | 714.50 | 706.50 | 710.50 | 742.57 | 745.41 |
| PZ-121(A) | 2442497 | 556248 | A | clay fill | 765.69 | 756.69 | 749.69 | 753.19 | 755.52 | 755.05 |
| PZ-121(B) | 2442497 | 556248 | B | bottom ash/alluvium (silt) | 765.69 | 741.69 | 734.69 | 738.19 | 746.58 | 749.59 |
| PZ-122 | 2442498 | 556244 | A | alluvium (sand) | 765.68 | 716.78 | 709.78 | 713.28 | 741.15 | 745.10 |
| PZ-123(A) | 2442544 | 556265 | A | alluvium (clay) | 754.75 | 746.25 | 739.25 | 742.75 | 743.73 | 744.36 |
| PZ-123(B) | 2442544 | 556265 | B | alluvium (sand) | 754.75 | 731.25 | 724.25 | 727.75 | 740.30 | 743.89 |
| PZ-124(A) | 2442849 | 555189 | A | clay fill | 766.24 | 756.74 | 749.74 | 753.24 | 750.59 | 751.85 |
| PZ-124(B) | 2442849 | 555189 | B | bottom ash/alluvium (sand) | 766.24 | 742.24 | 735.24 | 738.74 | 740.74 | 743.93 |
| PZ-125 | 2442849 | 555185 | A | alluvium (sand) | 766.22 | 721.52 | 714.52 | 718.02 | 742.15 | 745.22 |
| PZ-126(A) | 2442896 | 555195 | A | bottom ash | 753.43 | 745.43 | 738.43 | 741.93 | 739.45 | 741.48 |
| PZ-126(B) | 2442896 | 555195 | B | alluvium (clay)/(sand) | 753.43 | 731.43 | 724.43 | 727.93 | 738.05 | 741.39 |
| PZ-127(A) | 2442388 | 553927 | A | clay fill | 761.75 | 755.75 | 748.75 | 752.25 | 753.32 | 754.26 |
| PZ-127(B) | 2442388 | 553927 | B | fly ash | 761.75 | 741.75 | 734.75 | 738.25 | 749.59 | 750.95 |
| PZ-128 | 2442380 | 553924 | A | alluvium (clay) | 761.99 | 720.99 | 713.99 | 717.49 | 744.47 | 745.17 |
| PZ-129 | 2442405 | 553847 | A | fill mix | 754.85 | 741.95 | 734.45 | 738.20 | 737.01 | 740.77 |
| PZ-12A | 2441003 | 555918 | A | fly ash | 772.20 | 742.20 | 738.20 | 740.20 | 768.10 | 763.40 |
| PZ-12B | 2441003 | 555918 | B | fly ash | 772.20 | 732.70 | 728.70 | 730.70 | 768.40 | 763.70 |
| PZ-12C | 2441003 | 555918 | C | alluvium (clay) | 772.20 | 726.70 | 722.70 | 724.70 | 768.00 | 763.40 |
| PZ-12D | 2441003 | 555918 | D | alluvium (sand) | 772.20 | 721.20 | 717.20 | 719.20 | NA | 762.80 |
| PZ-13 | 2442200 | 553766 | A | clay fill | 751.90 | 744.40 | 737.90 | 741.15 | 738.57 | 741.00 |
| PZ-13A | 2440943 | 555965 | A | fly ash | 761.60 | 745.60 | 741.60 | 743.60 | 768.60 | 763.40 |
| PZ-13B | 2440943 | 555965 | B | fly ash | 761.60 | 735.60 | 731.60 | 733.60 | 768.30 | 763.20 |
| PZ-13C | 2440943 | 555965 | C | alluvium (clay) | 761.60 | 725.60 | 721.60 | 723.60 | 773.90 | 767.30 |
| PZ-13D | 2440943 | 555965 | D | alluvium (sand) | 761.60 | 717.60 | 713.60 | 715.60 | 767.50 | 763.00 |
| PZ-14 (U) | 2442182 | 553799 | A | clay fill | 764.10 | 759.40 | 752.40 | 755.90 | 756.43 | 752.87 |
| PZ-15 (L) | 2442182 | 553799 | B | clay fill | 764.10 | 744.60 | 737.60 | 741.10 | 738.29 | 740.87 |
| PZ-16 | 2442186 | 553800 | A | alluvium (sand)/shale | 764.12 | 721.42 | 714.12 | 717.77 | 745.45 | 747.16 |
| PZ-17 | 2441141 | 553734 | A | bottom ash | 753.10 | 750.90 | 746.40 | 748.65 | 748.38 | 747.71 |

# Table 1 Groundwater Elevation Data (February 13-14, 2012)

| Well / Piezometer ID | Easting (State) | Northing (State) | Screen ID | Media | Ground Elevation (ft-msl) | Top Screen Elevation (ft-msl) | Bottom Screen Elevation (ft-msl) | Middle Screen Elevation (ft-msl) | February 2012 Water Level (ft-msl) | July 2010 Water Level (ft-msl) |
|---|---|---|---|---|---|---|---|---|---|---|
| PZ-18 (U) | 2441159 | 553772 | A | clay fill | 765.30 | 763.10 | 756.10 | 759.60 | 756.75 | 756.71 |
| PZ-19 (L) | 2441159 | 553772 | B | clay fill | 765.30 | 752.50 | 745.20 | 748.85 | 748.97 | 750.28 |
| PZ-1A | 2440140 | 556602 | A | fly ash | 757.28 | 744.30 | 740.30 | 742.30 | 773.10 | 762.40 |
| PZ-1B | 2440140 | 556602 | B | fly ash | 757.28 | 733.30 | 729.30 | 731.30 | 768.60 | 757.40 |
| PZ-1C | 2440140 | 556602 | C | alluvium (clay) | 757.28 | 721.30 | 717.30 | 719.30 | 766.10 | 757.00 |
| PZ-1D-Dike C | 2441468 | 556651 | A | fly ash | 765.30 | 745.80 | 738.80 | 742.30 | 757.21 | 756.92 |
| PZ-1D | 2440140 | 556602 | D | alluvium (gravel) | 757.28 | 716.30 | 712.30 | 714.30 | 766.20 | 756.80 |
| PZ-2 (L) | 2442260 | 556762 | B | bottom ash | 763.90 | 743.90 | 736.90 | 740.40 | 752.35 | 757.38 |
| PZ-2 (U) | 2442260 | 556762 | A | clay fill | 763.90 | 757.90 | 750.90 | 754.40 | 755.61 | 754.73 |
| PZ-20 | 2441163 | 553769 | A | alluvium (sand) | 765.30 | 726.10 | 719.10 | 722.60 | 744.91 | 746.08 |
| PZ-2A | 2440294 | 556495 | A | fly ash | 760.22 | 744.50 | 740.50 | 742.50 | 769.30 | 759.30 |
| PZ-2B | 2440294 | 556495 | B | fly ash | 760.22 | 733.50 | 729.50 | 731.50 | 769.50 | 759.90 |
| PZ-2C | 2440294 | 556495 | C | alluvium (clay) | 760.22 | 722.50 | 718.50 | 720.50 | 767.40 | 757.80 |
| PZ-2D-Dike C | 2441500 | 556636 | A | bottom ash | 766.90 | 756.90 | 750.40 | 753.65 | 756.88 | 756.94 |
| PZ-2D | 2440294 | 556495 | D | alluvium (sand) | 760.22 | 715.50 | 711.50 | 713.50 | 767.80 | 758.20 |
| PZ-3A | 2440383 | 556391 | A | fly ash | 760.32 | 747.30 | 743.30 | 745.30 | 769.10 | 760.80 |
| PZ-3B | 2440383 | 556391 | B | fly ash | 760.32 | 736.30 | 732.30 | 734.30 | 768.00 | 760.50 |
| PZ-3C | 2440383 | 556391 | C | alluvium (clay) | 760.32 | 725.30 | 721.30 | 723.30 | 767.80 | 759.40 |
| PZ-3D-Dike C | 2441589 | 556823 | A | fly ash | 766.30 | 746.60 | 739.80 | 743.20 | 756.54 | 756.24 |
| PZ-3D | 2440383 | 556391 | D | alluvium (sand) | 760.32 | 719.30 | 715.30 | 717.30 | 767.80 | 759.40 |
| PZ-4 | 2442256 | 556765 | A | alluvium (sand) | 763.80 | 724.80 | 717.80 | 721.30 | 744.01 | 747.11 |
| PZ-4A | 2440238 | 556436 | A | fly ash | 760.49 | 744.50 | 740.50 | 742.50 | 769.60 | 761.60 |
| PZ-4B | 2440238 | 556436 | B | fly ash | 760.49 | 733.50 | 729.50 | 731.50 | 772.10 | 763.50 |
| PZ-4C | 2440238 | 556436 | C | alluvium (clay) | 760.49 | 722.50 | 718.50 | 720.50 | 768.00 | 760.10 |
| PZ-4D-Dike C | 2441602 | 556814 | A | fly ash | 766.00 | 756.00 | 749.50 | 752.75 | 756.33 | 756.11 |
| PZ-4D | 2440238 | 556436 | D | alluvium (sand) | 760.49 | 715.50 | 711.50 | 713.50 | 767.20 | 759.80 |
| PZ-5 | 2442734 | 555688 | A | clay fill | 753.10 | 743.60 | 736.60 | 740.10 | 741.34 | 740.06 |
| PZ-5A | 2440335 | 556313 | A | fly ash | 769.01 | 751.00 | 747.00 | 749.00 | 774.00 | 766.70 |
| PZ-5B | 2440335 | 556313 | B | fly ash | 769.01 | 741.00 | 737.00 | 739.00 | 769.10 | 762.60 |
| PZ-5C | 2440335 | 556313 | C | alluvium (clay) | 769.01 | 728.00 | 724.00 | 726.00 | 768.20 | 761.90 |
| PZ-5D-Dike C | 2441691 | 556959 | A | fly ash | 763.70 | 744.20 | 738.20 | 741.20 | 754.37 | 754.70 |
| PZ-5D | 2440335 | 556313 | D | alluvium (sand) | 769.01 | 723.00 | 719.00 | 721.00 | 768.20 | 761.90 |
| PZ-6 (U) | 2442691 | 555670 | A | fly ash/clay fill | 765.60 | 759.60 | 752.60 | 756.10 | 754.54 | 754.60 |
| PZ-6A | 2440547 | 556150 | A | fly ash | 777.34 | 755.10 | 751.10 | 753.10 | NA | 763.80 |
| PZ-6B | 2440547 | 556150 | B | fly ash | 777.34 | 738.40 | 734.40 | 736.40 | 769.30 | 763.50 |
| PZ-6C | 2440547 | 556150 | C | alluvium (clay) | 777.34 | 727.30 | 723.30 | 725.30 | 773.40 | 766.00 |
| PZ-6D-Dike C | 2441709 | 556942 | A | fly ash | 763.70 | 753.70 | 747.20 | 750.45 | 754.90 | 754.91 |
| PZ-6D | 2440547 | 556150 | D | alluvium (sand) | 777.34 | 719.40 | 715.40 | 717.40 | 768.00 | 762.20 |
| PZ-7 (L) | 2442691 | 555670 | B | bottom ash | 765.60 | 744.60 | 737.60 | 741.10 | 744.07 | 748.09 |
| PZ-7A | 2440168 | 556361 | A | fly ash | 771.29 | 748.00 | 744.00 | 746.00 | NA | 763.10 |
| PZ-7B | 2440168 | 556361 | B | fly ash | 771.29 | 737.90 | 733.90 | 735.90 | 769.90 | 764.00 |
| PZ-7C | 2440168 | 556361 | C | alluvium (clay) | 771.29 | 725.80 | 721.80 | 723.80 | NA | 761.80 |
| PZ-7Ddc | 2441791 | 557107 | A | fly ash | 760.00 | 744.50 | 738.40 | 741.45 | 752.14 | 753.23 |
| PZ-7D | 2440168 | 556361 | D | alluvium (sand) | 771.29 | 720.30 | 716.30 | 718.30 | 767.70 | 761.60 |
| PZ-8 | 2442690 | 555672 | A | alluvium (sand) | 765.60 | 716.60 | 709.60 | 713.10 | 739.84 | 743.46 |
| PZ-8A | 2440302 | 556241 | A | fly ash | 773.13 | 752.10 | 748.10 | 750.10 | 769.30 | 763.80 |
| PZ-8B | 2440302 | 556241 | B | fly ash | 773.13 | 741.10 | 737.10 | 739.10 | 770.60 | 764.60 |
| PZ-8C | 2440302 | 556241 | C | alluvium (clay) | 773.13 | 727.10 | 723.10 | 725.10 | 768.00 | 761.20 |
| PZ-8D-Dike C | 2441819 | 557092 | A | fly ash | 760.10 | 750.10 | 743.60 | 746.85 | 752.69 | 753.66 |
| PZ-8D | 2440302 | 556241 | D | alluvium (sand) | 773.13 | 722.10 | 718.10 | 720.10 | 768.70 | 763.10 |
| PZ-9 | 2442904 | 554605 | A | clay fill | 750.00 | 739.00 | 732.00 | 735.50 | 738.64 | 741.21 |
| PZ-9A | 2441018 | 556372 | A | fly ash | 757.70 | 748.50 | 744.50 | 746.50 | 766.10 | 756.50 |
| PZ-9B | 2441018 | 556372 | B | fly ash | 757.70 | 737.50 | 733.50 | 735.50 | 764.00 | 755.70 |
| PZ-9C | 2441018 | 556372 | C | alluvium (clay) | 757.70 | 728.50 | 724.50 | 726.50 | 763.30 | 756.70 |
| PZ-9D | 2441018 | 556372 | D | alluvium (clay)/(sand) | 757.70 | 720.50 | 716.50 | 718.50 | 764.90 | 760.00 |
| PZ-B1 | 2440844 | 557650 | A | fly ash | 765.52 | 742.80 | 738.80 | 740.80 | 752.70 | NA |
| PZ-B1 | 2441018 | 556372 | B | alluvium (clay) | 757.66 | 731.80 | 727.8 | 729.80 | 753.20 | NA |
| PZ-B1 | 2441018 | 556372 | C | alluvium (sand) | 757.66 | 720.80 | 716.8 | 718.80 | 753.90 | NA |
| PZ-B10 | 2440651 | 557011 | A | fly ash | 761.60 | 740.30 | 736.3 | 738.30 | 762.50 | NA |

## Table 1 Groundwater Elevation Data (February 13-14, 2012)

| Well / Piezometer ID | Easting (State) | Northing (State) | Screen ID | Media | Ground Elevation (ft-msl) | Top Screen Elevation (ft-msl) | Bottom Screen Elevation (ft-msl) | Middle Screen Elevation (ft-msl) | February 2012 Water Level (ft-msl) | July 2010 Water Level (ft-msl) |
|---|---|---|---|---|---|---|---|---|---|---|
| PZ-B10 | 2440651 | 557011 | B | alluvium (clay) | 761.60 | 727.30 | 723.3 | 725.30 | 761.80 | NA |
| PZ-B10 | 2440651 | 557011 | C | alluvium (sand) | 761.60 | 716.30 | 712.3 | 714.30 | 760.20 | NA |
| PZ-B11 | 2440855 | 556843 | A | fly ash | 753.80 | 740.70 | 736.7 | 738.70 | 761.30 | NA |
| PZ-B11 | 2440855 | 556843 | B | alluvium (clay) | 753.80 | 729.70 | 725.7 | 727.70 | 760.00 | NA |
| PZ-B11 | 2440855 | 556843 | C | alluvium (sand) | 753.80 | 718.80 | 714.8 | 716.80 | 759.60 | NA |
| PZ-B12 | 2441064 | 556672 | A | fly ash | 761.07 | 736.20 | 732.2 | 734.20 | NA | NA |
| PZ-B12 | 2441064 | 556672 | B | alluvium (clay) | 761.07 | 725.20 | 721.2 | 723.20 | 757.30 | NA |
| PZ-B12 | 2441064 | 556672 | C | alluvium (sand) | 761.07 | 714.00 | 710 | 712.00 | 754.90 | NA |
| PZ-B13 | 2441268 | 556509 | A | fly ash | 766.69 | 748.20 | 744.2 | 746.20 | NA | NA |
| PZ-B13 | 2441268 | 556509 | B | alluvium (clay) | 766.69 | 727.40 | 723.4 | 725.40 | 757.60 | NA |
| PZ-B13 | 2441268 | 556509 | C | alluvium (sand) | 766.69 | 716.10 | 712.1 | 714.10 | 755.90 | NA |
| PZ-B14 | 2440209 | 556975 | A | fly ash | 764.95 | 739.60 | 735.6 | 737.60 | 762.60 | NA |
| PZ-B14 | 2440209 | 556975 | B | alluvium (clay) | 764.95 | 728.60 | 724.6 | 726.60 | 762.20 | NA |
| PZ-B14 | 2440209 | 556975 | C | alluvium (sand) | 764.95 | 714.50 | 710.5 | 712.50 | 761.50 | NA |
| PZ-B15 | 2440441 | 556782 | A | fly ash | 763.85 | 736.10 | 732.1 | 734.10 | 766.70 | NA |
| PZ-B15 | 2440441 | 556782 | B | alluvium (clay) | 763.85 | 725.10 | 721.1 | 723.10 | 764.50 | NA |
| PZ-B15 | 2440441 | 556782 | C | alluvium (sand) | 763.85 | 716.10 | 712.1 | 714.10 | 764.10 | NA |
| PZ-B16 | 2440647 | 556605 | A | fly ash | 757.20 | 741.30 | 737.3 | 739.30 | 767.80 | NA |
| PZ-B16 | 2440647 | 556605 | B | alluvium (clay) | 757.20 | 730.30 | 726.3 | 728.30 | 767.10 | NA |
| PZ-B16 | 2440647 | 556605 | C | alluvium (sand) | 757.20 | 714.20 | 710.2 | 712.20 | 766.30 | NA |
| PZ-B17 | 2440858 | 556429 | A | fly ash | 757.70 | 738.10 | 734.1 | 736.10 | 778.10 | NA |
| PZ-B17 | 2440858 | 556429 | B | alluvium (clay) | 757.70 | 727.10 | 723.1 | 725.10 | 755.10 | NA |
| PZ-B17 | 2440858 | 556429 | C | alluvium (sand) | 757.70 | 716.10 | 712.1 | 714.10 | 765.20 | NA |
| PZ-B18 | 2441003 | 556195 | A | fly ash | 764.61 | 742.70 | 738.7 | 740.70 | 767.60 | NA |
| PZ-B18 | 2441003 | 556195 | B | alluvium (clay) | 764.61 | 729.70 | 725.7 | 727.70 | 765.60 | NA |
| PZ-B18 | 2441003 | 556195 | C | alluvium (sand) | 764.61 | 715.90 | 711.9 | 713.90 | 764.80 | NA |
| PZ-B2 | 2441074 | 557475 | A | fly ash | 759.69 | 744.80 | 740.8 | 742.80 | 753.00 | NA |
| PZ-B2 | 2441074 | 557475 | B | alluvium (clay) | 759.69 | 733.80 | 729.8 | 731.80 | 752.70 | NA |
| PZ-B2 | 2441074 | 557475 | C | alluvium (sand) | 759.69 | 717.80 | 713.8 | 715.80 | 752.70 | NA |
| PZ-B3 | 2441469 | 557156 | A | fly ash | 756.03 | 743.40 | 739.4 | 741.40 | 752.80 | NA |
| PZ-B3 | 2441469 | 557156 | B | alluvium (clay) | 756.03 | 732.40 | 728.4 | 730.40 | 752.90 | NA |
| PZ-B3 | 2441469 | 557156 | C | alluvium (sand) | 756.03 | 724.40 | 720.4 | 722.40 | 752.70 | NA |
| PZ-B4 | 2440622 | 557418 | A | fly ash | 765.13 | 740.60 | 736.6 | 738.60 | 756.80 | NA |
| PZ-B4 | 2440622 | 557418 | B | alluvium (clay) | 765.13 | 729.60 | 725.6 | 727.60 | 756.60 | NA |
| PZ-B4 | 2440622 | 557418 | C | alluvium (sand) | 765.13 | 722.60 | 718.6 | 720.60 | 755.70 | NA |
| PZ-B5 | 2440871 | 557272 | A | fly ash | 760.67 | 738.60 | 734.6 | 736.60 | 756.70 | NA |
| PZ-B5 | 2440871 | 557272 | B | alluvium (clay) | 760.67 | 730.60 | 726.6 | 728.60 | 755.20 | NA |
| PZ-B5 | 2440871 | 557272 | C | alluvium (sand) | 760.67 | 723.60 | 719.6 | 721.60 | 755.40 | NA |
| PZ-B6 | 2441064 | 557040 | A | fly ash | 758.09 | 743.80 | 739.8 | 741.80 | 758.20 | NA |
| PZ-B6 | 2441064 | 557040 | B | alluvium (clay) | 758.09 | 733.80 | 729.8 | 731.80 | 756.40 | NA |
| PZ-B6 | 2441064 | 557040 | C | alluvium (sand) | 758.09 | 723.80 | 719.8 | 721.80 | 756.00 | NA |
| PZ-B7 | 2441273 | 556920 | A | fly ash | 763.33 | 744.60 | 740.6 | 742.60 | 757.90 | NA |
| PZ-B7 | 2441273 | 556920 | B | alluvium (clay) | 763.33 | 733.60 | 729.6 | 731.60 | 755.40 | NA |
| PZ-B7 | 2441273 | 556920 | C | alluvium (sand) | 763.33 | 722.60 | 718.6 | 720.60 | 755.60 | NA |
| PZ-B8 | 2441481 | 556758 | A | fly ash | 764.81 | 743.80 | 739.8 | 741.80 | 758.50 | NA |
| PZ-B8 | 2441481 | 556758 | B | alluvium (clay) | 764.81 | 734.80 | 730.8 | 732.80 | 755.80 | NA |
| PZ-B8 | 2441481 | 556758 | C | alluvium (sand) | 764.81 | 723.80 | 719.8 | 721.80 | 755.80 | NA |
| PZ-B9 | 2440434 | 557184 | A | fly ash | 765.71 | 739.70 | 735.7 | 737.70 | 759.70 | NA |
| PZ-B9 | 2440434 | 557184 | B | alluvium (clay) | 765.71 | 728.70 | 724.7 | 726.70 | NA | NA |
| PZ-B9 | 2440434 | 557184 | C | alluvium (sand) | 765.71 | 714.70 | 710.7 | 712.70 | 758.70 | NA |
| PZ-E1 | 2441962 | 556572 | A | fly ash | 764.82 | 743.60 | 739.6 | 741.60 | 754.20 | NA |
| PZ-E1 | 2441962 | 556572 | B | alluvium (clay) | 764.82 | 734.60 | 730.6 | 732.60 | 753.20 | NA |
| PZ-E1 | 2441962 | 556572 | C | alluvium (sand) | 764.82 | 724.60 | 720.6 | 722.60 | 753.00 | NA |
| PZ-E10 | 2441650 | 555628 | A | fly ash | 773.50 | 737.20 | 733.2 | 735.20 | 764.70 | NA |
| PZ-E10 | 2441650 | 555628 | B | alluvium (sand) | 773.50 | 725.20 | 721.2 | 723.20 | 764.50 | NA |
| PZ-E10 | 2441650 | 555628 | C | alluvium (sand) | 773.50 | 714.40 | 710.4 | 712.40 | 763.50 | NA |
| PZ-E11 | 2441966 | 555449 | A | fly ash | 765.92 | 739.90 | 735.9 | 737.90 | 760.70 | NA |
| PZ-E11 | 2441966 | 555449 | B | alluvium (sand) | 765.92 | 724.90 | 720.9 | 722.90 | 761.00 | NA |
| PZ-E11 | 2441966 | 555449 | C | alluvium (sand) | 765.92 | 713.90 | 709.9 | 711.90 | 761.00 | NA |
| PZ-E12 | 2442120 | 555280 | A | fly ash | 765.12 | 741.00 | 737 | 739.00 | 758.60 | NA |

# Table 1 Groundwater Elevation Data (February 13-14, 2012)

| Well / Piezometer ID | Easting (State) | Northing (State) | Screen ID | Media | Ground Elevation (ft-msl) | Top Screen Elevation (ft-msl) | Bottom Screen Elevation (ft-msl) | Middle Screen Elevation (ft-msl) | February 2012 Water Level (ft-msl) | July 2010 Water Level (ft-msl) |
|---|---|---|---|---|---|---|---|---|---|---|
| PZ-E12 | 2442120 | 555280 | B | alluvium (clay) | 765.12 | 725.00 | 721 | 723.00 | 757.60 | NA |
| PZ-E12 | 2442120 | 555280 | C | alluvium (sand) | 765.12 | 714.00 | 710 | 712.00 | 756.40 | NA |
| PZ-E13 | 2441176 | 555553 | A | fly ash | 764.50 | 735.90 | 731.9 | 733.90 | 766.90 | NA |
| PZ-E13 | 2441176 | 555553 | B | alluvium (clay) | 764.50 | 724.90 | 720.9 | 722.90 | 766.60 | NA |
| PZ-E13 | 2441176 | 555553 | C | alluvium (sand) | 764.50 | 714.90 | 710.9 | 712.90 | 766.50 | NA |
| PZ-E14 | 2441422 | 555352 | A | fly ash | 765.20 | 736.70 | 732.7 | 734.70 | 762.90 | NA |
| PZ-E14 | 2441422 | 555352 | B | alluvium (clay) | 765.20 | 725.70 | 721.7 | 723.70 | 762.60 | NA |
| PZ-E14 | 2441422 | 555352 | C | alluvium (sand) | 765.20 | 716.70 | 712.7 | 714.70 | 762.40 | NA |
| PZ-E15 | 2441665 | 555156 | A | fly ash | 772.40 | 734.90 | 730.9 | 732.90 | 764.50 | NA |
| PZ-E15 | 2441665 | 555156 | B | alluvium (sand) | 772.40 | 725.90 | 721.9 | 723.90 | 761.40 | NA |
| PZ-E15 | 2441665 | 555156 | C | alluvium (sand) | 772.40 | 717.10 | 713.1 | 715.10 | 754.00 | NA |
| PZ-E16 | 2441886 | 555013 | A | fly ash | 772.40 | 728.80 | 724.8 | 726.80 | 760.10 | NA |
| PZ-E16 | 2441886 | 555013 | B | alluvium (clay) | 772.40 | 720.80 | 716.8 | 718.80 | 760.60 | NA |
| PZ-E16 | 2441886 | 555013 | C | alluvium (sand) | 772.40 | 713.00 | 709 | 711.00 | 760.80 | NA |
| PZ-E17 | 2441998 | 554946 | A | fly ash | 762.50 | 733.20 | 729.2 | 731.20 | 759.40 | NA |
| PZ-E17 | 2441998 | 554946 | B | alluvium (clay) | 762.50 | 722.20 | 718.2 | 720.20 | 759.10 | NA |
| PZ-E17 | 2441998 | 554946 | C | alluvium (sand) | 762.50 | 711.20 | 707.2 | 709.20 | 757.80 | NA |
| PZ-E2 | 2441765 | 556428 | A | fly ash | 771.20 | 742.20 | 738.2 | 740.20 | 755.30 | NA |
| PZ-E2 | 2441765 | 556428 | B | alluvium (clay) | 771.20 | 734.70 | 730.7 | 732.70 | 754.70 | NA |
| PZ-E2 | 2441765 | 556428 | C | alluvium (sand) | 771.20 | 726.40 | 722.4 | 724.40 | 754.20 | NA |
| PZ-E3 | 2442088 | 556246 | A | fly ash | 766.28 | 742.00 | 738 | 740.00 | 754.00 | NA |
| PZ-E3 | 2442088 | 556246 | B | alluvium (sand) | 766.28 | 734.00 | 730 | 732.00 | 753.30 | NA |
| PZ-E3 | 2442088 | 556246 | C | alluvium (sand) | 766.28 | 726.00 | 722 | 724.00 | 753.20 | NA |
| PZ-E4 | 2441643 | 556171 | A | fly ash | 768.60 | 741.00 | 737 | 739.00 | 758.60 | NA |
| PZ-E4 | 2441643 | 556171 | B | alluvium (clay) | 768.60 | 730.00 | 726 | 728.00 | 758.30 | NA |
| PZ-E4 | 2441643 | 556171 | C | alluvium (sand) | 768.60 | 722.00 | 718 | 720.00 | 757.20 | NA |
| PZ-E5 | 2441885 | 555944 | A | fly ash | 773.80 | 740.40 | 736.4 | 738.40 | 759.30 | NA |
| PZ-E5 | 2441885 | 555944 | B | alluvium (clay) | 773.80 | 729.40 | 725.4 | 727.40 | 758.90 | NA |
| PZ-E5 | 2441885 | 555944 | C | alluvium (sand) | 773.80 | 718.60 | 714.6 | 716.60 | 757.90 | NA |
| PZ-E6 | 2442246 | 555785 | A | fly ash | 766.70 | 742.70 | 738.7 | 740.70 | 751.70 | NA |
| PZ-E6 | 2442246 | 555785 | B | alluvium (clay) | 766.70 | 731.70 | 727.7 | 729.70 | 750.50 | NA |
| PZ-E6 | 2442246 | 555785 | C | alluvium (sand) | 766.70 | 720.70 | 716.7 | 718.70 | 749.80 | NA |
| PZ-E7 | 2442332 | 555546 | A | fly ash | 764.30 | 742.90 | 738.9 | 740.90 | 751.80 | NA |
| PZ-E7 | 2442332 | 555546 | B | alluvium (clay) | 764.30 | 731.90 | 727.9 | 729.90 | 751.00 | NA |
| PZ-E7 | 2442332 | 555546 | C | alluvium (sand) | 764.30 | 722.90 | 718.9 | 720.90 | 750.40 | NA |
| PZ-E8 | 2442425 | 555457 | A | fly ash | 762.54 | 742.90 | 738.9 | 740.90 | 756.90 | NA |
| PZ-E8 | 2442425 | 555457 | B | alluvium (clay) | 762.54 | 729.90 | 725.9 | 727.90 | 750.80 | NA |
| PZ-E8 | 2442425 | 555457 | C | alluvium (sand) | 762.54 | 720.90 | 716.9 | 718.90 | 750.30 | NA |
| PZ-E9 | 2441400 | 555870 | A | fly ash | 774.80 | 737.40 | 733.4 | 735.40 | 766.20 | NA |
| PZ-E9 | 2441400 | 555870 | B | alluvium (clay) | 774.80 | 726.40 | 722.4 | 724.40 | 766.20 | NA |
| PZ-E9 | 2441400 | 555870 | C | alluvium (sand) | 774.80 | 715.40 | 711.4 | 713.40 | 765.10 | NA |
| PZ-R1A | 2439484 | 555967 | A | fly ash | 789.48 | 770.88 | 768.98 | 769.93 | 770.50 | 767.00 |
| PZ-R2A | 2439706 | 556102 | A | fly ash | 805.45 | 785.45 | 752.15 | 768.80 | 784.00 | 775.20 |
| PZ-R2B | 2439706 | 556102 | B | bottom ash | 805.45 | 747.55 | 737.45 | 742.50 | 767.30 | 765.80 |
| PZ-R2C | 2439706 | 556102 | C | bottom ash | 805.45 | 734.55 | 729.65 | 732.10 | 766.80 | 765.40 |
| PZ-R3A | 2439760 | 556420 | A | bottom ash | 783.30 | 760.40 | 758.80 | 759.60 | 768.40 | 766.40 |
| PZ-R4A | 2440074 | 555986 | A | bottom ash | 807.83 | 789.33 | 746.63 | 767.98 | 788.90 | 789.20 |
| PZ-R4B | 2440074 | 555986 | B | bottom ash | 807.83 | 742.83 | 739.83 | 741.33 | 767.90 | 766.20 |
| PZ-R4C | 2440074 | 555986 | C | bottom ash | 807.83 | 736.33 | 729.83 | 733.08 | 767.40 | 765.60 |
| PZ-R5A | 2440386 | 555579 | A | fly ash | 818.11 | 804.61 | 799.61 | 802.11 | 801.90 | 802.10 |
| PZ-R5B | 2440386 | 555579 | B | fly ash | 818.11 | 748.11 | 744.11 | 746.11 | 766.10 | 764.90 |
| PZ-R5C | 2440386 | 555579 | C | fly ash | 818.11 | 733.11 | 730.91 | 732.01 | 765.60 | 764.70 |
| PZ-R6A | 2439817 | 555389 | A | fly ash | 812.26 | 748.26 | 744.96 | 746.61 | 765.00 | 764.80 |
| PZ-R6B | 2439817 | 555389 | B | fly ash | 812.26 | 735.56 | 731.56 | 733.56 | 764.50 | 763.90 |
| PZ-R6C | 2439817 | 555389 | C | fly ash | 812.26 | 729.06 | 725.56 | 727.31 | 764.40 | 763.90 |
| PZ-R6D | 2439817 | 555389 | D | fly ash | 812.26 | 724.86 | 719.56 | 722.21 | 763.80 | 764.10 |
| PZ-R6E | 2439817 | 555389 | E | alluvium (silt) | 812.26 | 715.56 | 711.26 | 713.41 | 764.00 | 763.20 |
| TWP-04 | 2439793 | 556467 | A | alluvium (clay) | 782.91 | 718.91 | 708.91 | 713.91 | 768.77 | 759.71 |
| TWP-05 | 2441057 | 555671 | A | alluvium (sand) | 789.01 | 714.11 | 704.11 | 709.11 | 770.30 | 761.51 |
| TWP-06 | 2442124 | 554760 | A | alluvium (sand) | 766.96 | 723.96 | 703.96 | 713.96 | 755.68 | NA |

## Table 1 Groundwater Elevation Data (February 13-14, 2012)

| Well / Piezometer ID | Easting (State) | Northing (State) | Screen ID | Media | Ground Elevation (ft-msl) | Top Screen Elevation (ft-msl) | Bottom Screen Elevation (ft-msl) | Middle Screen Elevation (ft-msl) | February 2012 Water Level (ft-msl) | July 2010 Water Level (ft-msl) |
|---|---|---|---|---|---|---|---|---|---|---|
| TWP-24 | 2439787 | 556447 | A | shale | 783.21 | 703.81 | 688.91 | 696.36 | 768.83 | NA |
| TWP-25 | 2441047 | 555658 | A | shale | 788.93 | 699.93 | 673.43 | 686.68 | 764.30 | NA |
| TWP-26 | 2442113 | 554746 | A | shale | 767.13 | 679.13 | 654.13 | 666.63 | 759.06 | NA |

**Table 2 Surface Water Elevation Data (February 13-14, 2012)**

| Location ID | Easting | Northing | Elevation (ft-msl) |
|---|---|---|---|
| ER-1 | 2442993 | 557903 | 736.90 |
| ER-2 | 2442523 | 558228 | 736.90 |
| SP-7 | 2442227 | 558194 | 738.60 |
| SP-4 | 2440740 | 558413 | 740.25 |
| SP-3 | 2440203 | 558377 | 740.29 |
| SP-2 | 2439772 | 558364 | 740.14 |
| SP-1 | 2439273 | 558306 | 740.17 |
| RW-1 | 2438762 | 553702 | 757.47 |
| RW-2 | 2438899 | 553115 | 756.90 |
| IC-6 | 2439598 | 552841 | 736.79 |
| IC-5 | 2439760 | 553186 | 736.88 |
| IC-4 | 2440549 | 553632 | 737.02 |
| IC-2 | 2442500 | 553759 | 736.92 |
| IC-3 | 2442471 | 553744 | 736.91 |
| IC-1 | 2443151 | 553948 | 736.99 |
| ER-8 | 2443231 | 553935 | 737.04 |
| ER-7 | 2443010 | 554396 | 736.97 |
| ER-6 | 2442887 | 555515 | 736.88 |
| ER-5 | 2442705 | 556174 | 737.01 |
| ER-4 | 2442521 | 556643 | 737.09 |
| ER-3 | 2442075 | 557173 | 737.06 |
| SP-8 | 2442089 | 557913 | 740.67 |
| SP-6 | 2442089 | 558219 | 738.68 |
| AP-1 | 2442713 | 555435 | 760.11 |
| ASP-1 | 2442818 | 554385 | 754.43 |
| AP-2 | 2442072 | 554723 | 760.13 |
| AP-3 | 2441585 | 554114 | 760.16 |
| ASP-2 | 2441649 | 554085 | 754.44 |
| SC-5 | 2440501 | 554601 | 760.87 |
| SP-5 | 2441434 | 558438 | 739.72 |
| SC-1 | 2439278 | 553293 | 762.03 |

**Table 3 Comparison of Model Predicted and Measured Groundwater Elevations**

| Well | Observed (ft-msl) | Predicted (ft-msl) | Residue (Predicted - Observed) (ft) |
|---|---|---|---|
| 101/B | 746.91 | 756.84 | 9.93 |
| 101/C | 747.90 | 756.46 | 8.56 |
| 101/A | 749.44 | 756.84 | 7.40 |
| 106/C | 752.06 | 754.53 | 2.47 |
| 106/B | 752.83 | 754.53 | 1.70 |
| 106/A | 753.76 | 755.62 | 1.86 |
| 109/D | 753.16 | 753.45 | 0.29 |
| 109/C | 753.17 | 753.45 | 0.28 |
| 109/B | 754.32 | 754.05 | -0.27 |
| 109/A | 754.94 | 754.67 | -0.27 |
| 211/A | 745.95 | 748.10 | 2.15 |
| 211(A)/A | 746.91 | 749.36 | 2.45 |
| 211(B)/A | 748.99 | 750.68 | 1.69 |
| 303/E | 765.48 | 768.15 | 2.67 |
| 303/D | 765.94 | 768.15 | 2.21 |
| 303/B | 766.56 | 769.21 | 2.65 |
| 303/C | 767.21 | 768.15 | 0.94 |
| 303/A | 767.41 | 769.26 | 1.85 |
| 404/A | 767.62 | 763.65 | -3.97 |
| 404/B | 769.62 | 763.92 | -5.70 |
| 404/C | 774.00 | 763.92 | -10.08 |
| 408/A | 760.75 | 761.62 | 0.87 |
| 408/B | 762.13 | 761.62 | -0.51 |
| 408/C | 763.81 | 761.99 | -1.82 |
| 500/D | 766.15 | 763.39 | -2.76 |
| 500/C | 767.92 | 763.92 | -4.00 |
| 500/B | 769.84 | 764.48 | -5.36 |
| 500/A | 770.69 | 764.48 | -6.21 |
| 502/D | 761.72 | 761.68 | -0.04 |
| 502/B | 762.46 | 762.25 | -0.21 |
| 502/C | 762.65 | 761.68 | -0.97 |
| 502/A | 763.96 | 762.86 | -1.11 |
| 503/C | 764.63 | 767.45 | 2.82 |
| 503/B | 765.10 | 767.45 | 2.35 |
| 503/A | 765.60 | 767.45 | 1.85 |
| 600/A | 756.20 | 758.93 | 2.73 |
| 600(A)/A | 760.67 | 759.66 | -1.01 |
| 603/A | 765.51 | 762.81 | -2.70 |
| 603(A)/A | 763.06 | 764.37 | 1.31 |
| 603(B)/A | 767.52 | 763.60 | -3.92 |
| 604/A | 761.80 | 762.94 | 1.14 |
| 604(A)/A | 763.45 | 763.52 | 0.07 |
| 604(B)/A | 757.96 | 764.02 | 6.06 |
| 6AR/A | 732.76 | 743.43 | 10.67 |

**Table 3 Comparison of Model Predicted and Measured Groundwater Elevations**

| Well | Observed (ft-msl) | Predicted (ft-msl) | Residue (Predicted - Observed) (ft) |
|---|---|---|---|
| A-1/A | 755.36 | 748.56 | -6.80 |
| A-2/A | 754.55 | 744.94 | -9.61 |
| A-3/A | 747.11 | 742.86 | -4.25 |
| AD-1/A | 774.43 | 771.19 | -3.24 |
| AD-2/A | 745.85 | 743.68 | -2.17 |
| AD-3/A | 744.03 | 744.42 | 0.39 |
| B-1/A | 754.19 | 749.99 | -4.20 |
| B-2/A | 751.26 | 745.03 | -6.23 |
| B-3/A | 741.86 | 742.82 | 0.96 |
| C2/A | 738.36 | 740.59 | 2.23 |
| D1A/A | 738.37 | 744.15 | 5.78 |
| D1B/B | 748.30 | 748.11 | -0.19 |
| D2/A | 737.37 | 742.28 | 4.91 |
| GW-1/A | 776.85 | 771.09 | -5.76 |
| GW-2/A | 752.69 | 762.78 | 10.09 |
| GW-3/A | 753.11 | 762.45 | 9.34 |
| KIF-22/A | 738.77 | 744.78 | 6.02 |
| P-A1/A | 759.52 | 768.13 | 8.61 |
| P-A4/A | 759.36 | 766.36 | 7.01 |
| P-A5/A | 759.55 | 766.93 | 7.38 |
| P-C4/A | 758.22 | 765.61 | 7.39 |
| P-C5/A | 759.60 | 765.98 | 6.38 |
| PA-2/A | 758.85 | 763.83 | 4.99 |
| PA-3A/A | 759.01 | 763.69 | 4.68 |
| PC-1/A | 760.21 | 767.34 | 7.12 |
| PC-2/A | 756.42 | 763.09 | 6.67 |
| PZ-1/A | 738.49 | 746.72 | 8.23 |
| PZ-10 (U)/A | 754.68 | 749.39 | -5.29 |
| PZ-11 (L)/B | 749.61 | 747.76 | -1.85 |
| PZ-11A/A | 764.80 | 763.23 | -1.57 |
| PZ-11B/B | 765.00 | 763.17 | -1.83 |
| PZ-11C/C | 764.20 | 762.45 | -1.75 |
| PZ-11D/D | 761.80 | 761.78 | -0.02 |
| PZ-12/A | 742.57 | 745.14 | 2.57 |
| PZ-121(A)/A | 755.52 | 749.93 | -5.60 |
| PZ-121(B)/B | 746.58 | 745.94 | -0.64 |
| PZ-122/A | 741.15 | 745.53 | 4.38 |
| PZ-123(A)/A | 743.73 | 744.47 | 0.74 |
| PZ-123(B)/B | 740.30 | 744.54 | 4.24 |
| PZ-124(A)/A | 750.59 | 749.55 | -1.04 |
| PZ-124(B)/B | 740.74 | 745.82 | 5.08 |
| PZ-125/A | 742.15 | 744.88 | 2.73 |
| PZ-126(A)/A | 739.45 | 743.55 | 4.10 |

**Table 3 Comparison of Model Predicted and Measured Groundwater Elevations**

| Well | Observed (ft-msl) | Predicted (ft-msl) | Residue (Predicted - Observed) (ft) |
|---|---|---|---|
| PZ-126(B)/B | 738.05 | 743.61 | 5.56 |
| PZ-127(A)/A | 753.32 | 751.67 | -1.65 |
| PZ-127(B)/B | 749.59 | 751.44 | 1.85 |
| PZ-128/A | 744.47 | 749.69 | 5.22 |
| PZ-129/A | 737.01 | 747.78 | 10.77 |
| PZ-12A/A | 768.10 | 765.22 | -2.88 |
| PZ-12B/B | 768.40 | 765.14 | -3.26 |
| PZ-12C/C | 768.00 | 764.41 | -3.59 |
| PZ-13/A | 738.57 | 750.34 | 11.77 |
| PZ-13A/A | 768.60 | 765.43 | -3.17 |
| PZ-13B/B | 768.30 | 765.36 | -2.94 |
| PZ-13C/C | 773.90 | 764.63 | -9.27 |
| PZ-13D/D | 767.50 | 763.94 | -3.56 |
| PZ-14 (U)/A | 756.43 | 751.98 | -4.45 |
| PZ-15 (L)/B | 738.29 | 750.99 | 12.70 |
| PZ-16/A | 745.45 | 747.33 | 1.88 |
| PZ-17/A | 748.38 | 746.05 | -2.33 |
| PZ-18 (U)/A | 756.75 | 758.52 | 1.77 |
| PZ-19 (L)/B | 748.97 | 747.91 | -1.06 |
| PZ-1A/A | 773.10 | 764.70 | -8.40 |
| PZ-1B/B | 768.60 | 764.61 | -3.99 |
| PZ-1C/C | 766.10 | 764.09 | -2.01 |
| PZ-1D/D | 766.20 | 763.62 | -2.58 |
| PZ-1DDC/A | 757.21 | 759.01 | 1.80 |
| PZ-2 (L)/B | 752.35 | 754.47 | 2.12 |
| PZ-2 (U)/A | 755.61 | 754.57 | -1.04 |
| PZ-20/A | 744.91 | 748.19 | 3.28 |
| PZ-2A/A | 769.30 | 765.45 | -3.85 |
| PZ-2B/B | 769.50 | 765.37 | -4.13 |
| PZ-2C/C | 767.40 | 764.71 | -2.69 |
| PZ-2D/D | 767.80 | 764.10 | -3.70 |
| PZ-2DDC/A | 756.88 | 758.89 | 2.01 |
| PZ-3A/A | 769.10 | 765.93 | -3.17 |
| PZ-3B/B | 768.00 | 765.85 | -2.15 |
| PZ-3C/C | 767.80 | 765.16 | -2.64 |
| PZ-3D/D | 767.80 | 764.52 | -3.28 |
| PZ-3DDC/A | 756.54 | 756.93 | 0.39 |
| PZ-4/A | 744.01 | 747.82 | 3.81 |
| PZ-4A/A | 769.60 | 765.84 | -3.76 |
| PZ-4B/B | 772.10 | 765.76 | -6.34 |
| PZ-4C/C | 768.00 | 765.12 | -2.88 |
| PZ-4D/D | 767.20 | 764.52 | -2.68 |
| PZ-4DDC/A | 756.33 | 756.90 | 0.57 |

**Table 3 Comparison of Model Predicted and Measured Groundwater Elevations**

| Well | Observed (ft-msl) | Predicted (ft-msl) | Residue (Predicted - Observed) (ft) |
|---|---|---|---|
| PZ-5/A | 741.34 | 745.10 | 3.76 |
| PZ-5A/A | 774.00 | 766.37 | -7.63 |
| PZ-5B/B | 769.10 | 766.27 | -2.83 |
| PZ-5C/C | 768.20 | 765.61 | -2.59 |
| PZ-5D/D | 768.20 | 765.61 | -2.59 |
| PZ-5DDC/A | 754.37 | 754.35 | -0.02 |
| PZ-6 (U)/A | 754.54 | 749.93 | -4.62 |
| PZ-6B/B | 769.30 | 766.48 | -2.82 |
| PZ-6C/C | 773.40 | 765.76 | -7.64 |
| PZ-6D/D | 768.00 | 765.10 | -2.90 |
| PZ-6DDC/A | 754.90 | 754.54 | -0.36 |
| PZ-7 (L)/B | 744.07 | 747.43 | 3.36 |
| PZ-7B/B | 769.90 | 766.20 | -3.70 |
| PZ-7D/D | 767.70 | 765.01 | -2.69 |
| PZ-7DDC/A | 752.14 | 751.66 | -0.48 |
| PZ-8/A | 739.84 | 745.87 | 6.03 |
| PZ-8A/A | 769.30 | 766.88 | -2.42 |
| PZ-8B/B | 770.60 | 766.71 | -3.89 |
| PZ-8C/C | 768.00 | 766.01 | -1.99 |
| PZ-8D/D | 768.70 | 765.36 | -3.34 |
| PZ-8DDC/A | 752.69 | 751.83 | -0.86 |
| PZ-9/A | 738.64 | 744.62 | 5.98 |
| PZ-9A/A | 766.10 | 763.58 | -2.52 |
| PZ-9B/B | 764.00 | 763.52 | -0.48 |
| PZ-9C/C | 763.30 | 762.83 | -0.47 |
| PZ-9D/D | 764.90 | 762.17 | -2.73 |
| PZ-B1/A | 752.70 | 753.01 | 0.31 |
| PZ-B1/B | 753.20 | 753.58 | 0.38 |
| PZ-B1/C | 753.90 | 753.97 | 0.07 |
| PZ-B10/C | 760.20 | 759.88 | -0.32 |
| PZ-B10/B | 761.80 | 760.30 | -1.50 |
| PZ-B10/A | 762.50 | 760.75 | -1.75 |
| PZ-B11/C | 759.60 | 760.33 | 0.73 |
| PZ-B11/B | 760.00 | 760.88 | 0.88 |
| PZ-B11/A | 761.30 | 761.50 | 0.20 |
| PZ-B12/C | 754.90 | 761.59 | 6.69 |
| PZ-B12/B | 757.30 | 761.59 | 4.29 |
| PZ-B13/C | 755.90 | 761.33 | 5.43 |
| PZ-B13/B | 757.60 | 761.33 | 3.73 |
| PZ-B14/C | 761.50 | 760.90 | -0.60 |
| PZ-B14/B | 762.20 | 760.89 | -1.31 |
| PZ-B14/A | 762.60 | 760.88 | -1.72 |
| PZ-B15/C | 764.10 | 762.03 | -2.07 |

**Table 3 Comparison of Model Predicted and Measured Groundwater Elevations**

| Well | Observed (ft-msl) | Predicted (ft-msl) | Residue (Predicted - Observed) (ft) |
|---|---|---|---|
| PZ-B15/B | 764.50 | 762.45 | -2.05 |
| PZ-B15/A | 766.70 | 762.90 | -3.80 |
| PZ-B16/C | 766.30 | 762.66 | -3.64 |
| PZ-B16/B | 767.10 | 763.24 | -3.86 |
| PZ-B16/A | 767.80 | 763.91 | -3.89 |
| PZ-B17/B | 755.10 | 763.42 | 8.32 |
| PZ-B17/C | 765.20 | 762.75 | -2.45 |
| PZ-B17/A | 778.10 | 764.11 | -13.99 |
| PZ-B18/C | 764.80 | 762.98 | -1.82 |
| PZ-B18/B | 765.60 | 763.67 | -1.93 |
| PZ-B18/A | 767.60 | 764.48 | -3.12 |
| PZ-B2/B | 752.70 | 754.81 | 2.11 |
| PZ-B2/C | 752.70 | 754.01 | 1.31 |
| PZ-B2/A | 753.00 | 755.72 | 2.72 |
| PZ-B3/C | 752.70 | 753.21 | 0.51 |
| PZ-B3/A | 752.80 | 754.14 | 1.34 |
| PZ-B3/B | 752.90 | 753.64 | 0.74 |
| PZ-B4/C | 755.70 | 756.80 | 1.10 |
| PZ-B4/B | 756.60 | 756.75 | 0.15 |
| PZ-B4/A | 756.80 | 756.70 | -0.10 |
| PZ-B5/B | 755.20 | 757.71 | 2.51 |
| PZ-B5/C | 755.40 | 757.00 | 1.60 |
| PZ-B5/A | 756.70 | 758.44 | 1.74 |
| PZ-B6/C | 756.00 | 757.75 | 1.75 |
| PZ-B6/B | 756.40 | 759.30 | 2.90 |
| PZ-B6/A | 758.20 | 759.35 | 1.15 |
| PZ-B7/B | 755.40 | 757.94 | 2.54 |
| PZ-B7/C | 755.60 | 757.14 | 1.54 |
| PZ-B7/A | 757.90 | 758.82 | 0.92 |
| PZ-B8/B | 755.80 | 757.44 | 1.64 |
| PZ-B8/C | 755.80 | 756.60 | 0.80 |
| PZ-B8/A | 758.50 | 758.35 | -0.15 |
| PZ-B9/C | 758.70 | 759.92 | 1.22 |
| PZ-B9/A | 759.70 | 759.92 | 0.22 |
| PZ-E1/C | 753.00 | 753.43 | 0.43 |
| PZ-E1/B | 753.20 | 755.14 | 1.94 |
| PZ-E1/A | 754.20 | 756.92 | 2.72 |
| PZ-E10/C | 763.50 | 759.73 | -3.77 |
| PZ-E10/B | 764.50 | 760.69 | -3.81 |
| PZ-E10/A | 764.70 | 761.68 | -3.02 |
| PZ-E11/A | 760.70 | 759.49 | -1.21 |
| PZ-E11/B | 761.00 | 758.33 | -2.67 |
| PZ-E11/C | 761.00 | 757.19 | -3.81 |

**Table 3 Comparison of Model Predicted and Measured Groundwater Elevations**

| Well | Observed (ft-msl) | Predicted (ft-msl) | Residue (Predicted - Observed) (ft) |
|---|---|---|---|
| PZ-E12/C | 756.40 | 756.00 | -0.40 |
| PZ-E12/B | 757.60 | 757.53 | -0.07 |
| PZ-E12/A | 758.60 | 759.09 | 0.49 |
| PZ-E13/C | 766.50 | 762.93 | -3.57 |
| PZ-E13/B | 766.60 | 763.68 | -2.92 |
| PZ-E13/A | 766.90 | 764.47 | -2.43 |
| PZ-E14/C | 762.40 | 761.21 | -1.19 |
| PZ-E14/B | 762.60 | 761.86 | -0.74 |
| PZ-E14/A | 762.90 | 762.53 | -0.37 |
| PZ-E15/C | 754.00 | 759.48 | 5.48 |
| PZ-E15/B | 761.40 | 760.18 | -1.22 |
| PZ-E15/A | 764.50 | 760.94 | -3.56 |
| PZ-E16/A | 760.10 | 759.89 | -0.21 |
| PZ-E16/B | 760.60 | 758.86 | -1.74 |
| PZ-E16/C | 760.80 | 757.90 | -2.90 |
| PZ-E17/C | 757.80 | 756.98 | -0.82 |
| PZ-E17/B | 759.10 | 758.35 | -0.75 |
| PZ-E17/A | 759.40 | 759.80 | 0.40 |
| PZ-E2/C | 754.20 | 756.17 | 1.97 |
| PZ-E2/B | 754.70 | 757.34 | 2.64 |
| PZ-E2/A | 755.30 | 758.54 | 3.24 |
| PZ-E3/C | 753.20 | 754.54 | 1.34 |
| PZ-E3/B | 753.30 | 754.54 | 1.24 |
| PZ-E3/A | 754.00 | 755.97 | 1.97 |
| PZ-E4/C | 757.20 | 758.45 | 1.25 |
| PZ-E4/B | 758.30 | 759.50 | 1.20 |
| PZ-E4/A | 758.60 | 760.57 | 1.97 |
| PZ-E5/C | 757.90 | 756.81 | -1.09 |
| PZ-E5/B | 758.90 | 758.07 | -0.83 |
| PZ-E5/A | 759.30 | 759.35 | 0.05 |
| PZ-E6/C | 749.80 | 752.80 | 3.00 |
| PZ-E6/B | 750.50 | 754.16 | 3.66 |
| PZ-E6/A | 751.70 | 755.57 | 3.87 |
| PZ-E7/C | 750.40 | 752.85 | 2.45 |
| PZ-E7/B | 751.00 | 754.72 | 3.72 |
| PZ-E7/A | 751.80 | 756.67 | 4.87 |
| PZ-E8/C | 750.30 | 752.09 | 1.79 |
| PZ-E8/B | 750.80 | 754.79 | 3.99 |
| PZ-E8/A | 756.90 | 757.61 | 0.71 |
| PZ-E9/C | 765.10 | 761.30 | -3.80 |
| PZ-E9/A | 766.20 | 762.99 | -3.21 |
| PZ-E9/B | 766.20 | 762.13 | -4.07 |
| PZ-R1A/A | 770.50 | 768.07 | -2.43 |

**Table 3 Comparison of Model Predicted and Measured Groundwater Elevations**

| Well | Observed (ft-msl) | Predicted (ft-msl) | Residue (Predicted - Observed) (ft) |
|---|---|---|---|
| PZ-R2A/A | 784.00 | 767.75 | -16.25 |
| PZ-R2B/B | 767.30 | 767.59 | 0.29 |
| PZ-R2C/C | 766.80 | 767.52 | 0.72 |
| PZ-R3A/A | 768.40 | 765.60 | -2.80 |
| PZ-R4A/A | 788.90 | 768.56 | -20.34 |
| PZ-R4B/B | 767.90 | 768.44 | 0.54 |
| PZ-R4C/C | 767.40 | 768.35 | 0.95 |
| PZ-R5B/B | 766.10 | 768.40 | 2.30 |
| PZ-R5C/C | 765.60 | 768.30 | 2.70 |
| PZ-R6A/A | 765.00 | 769.27 | 4.27 |
| PZ-R6B/B | 764.50 | 769.20 | 4.70 |
| PZ-R6C/C | 764.40 | 769.20 | 4.80 |
| PZ-R6D/D | 763.80 | 768.28 | 4.48 |
| PZ-R6E/E | 764.00 | 768.28 | 4.28 |
| TWP-04/A | 768.77 | 764.49 | -4.29 |
| TWP-05/A | 770.30 | 763.65 | -6.65 |
| TWP-06/A | 755.68 | 755.33 | -0.34 |
| TWP-24/A | 768.83 | 764.58 | -4.25 |
| TWP-25/A | 764.30 | 763.67 | -0.62 |
| TWP-26/A | 759.06 | 755.34 | -3.71 |

# Figures

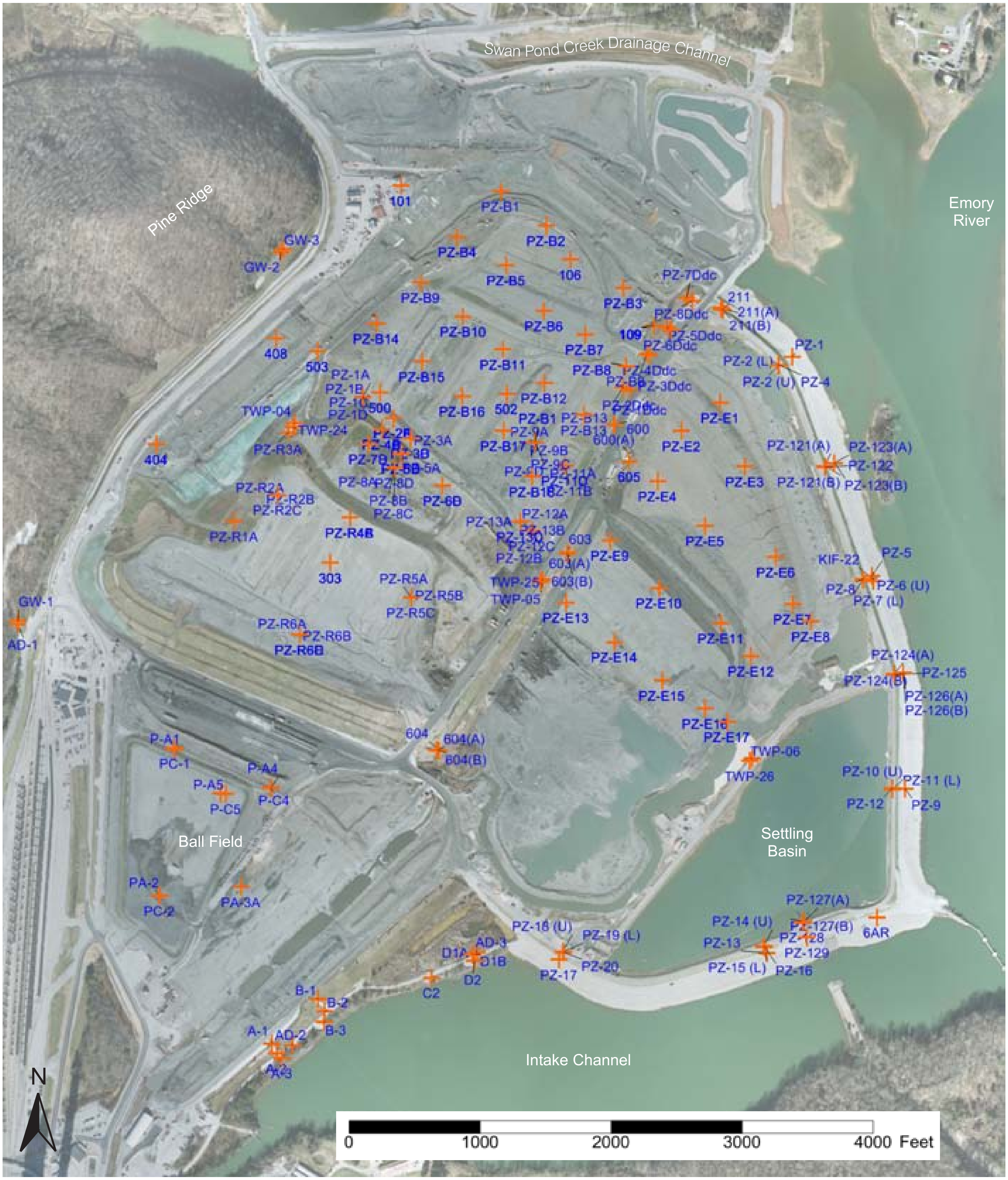

Geosyntec JACOBS TVA

February 2012
Site Features

TVA Kingston Fossil Plant

6-27-12
Figure 01_SiteFeaturesFeb2012.cdr

Figure 1

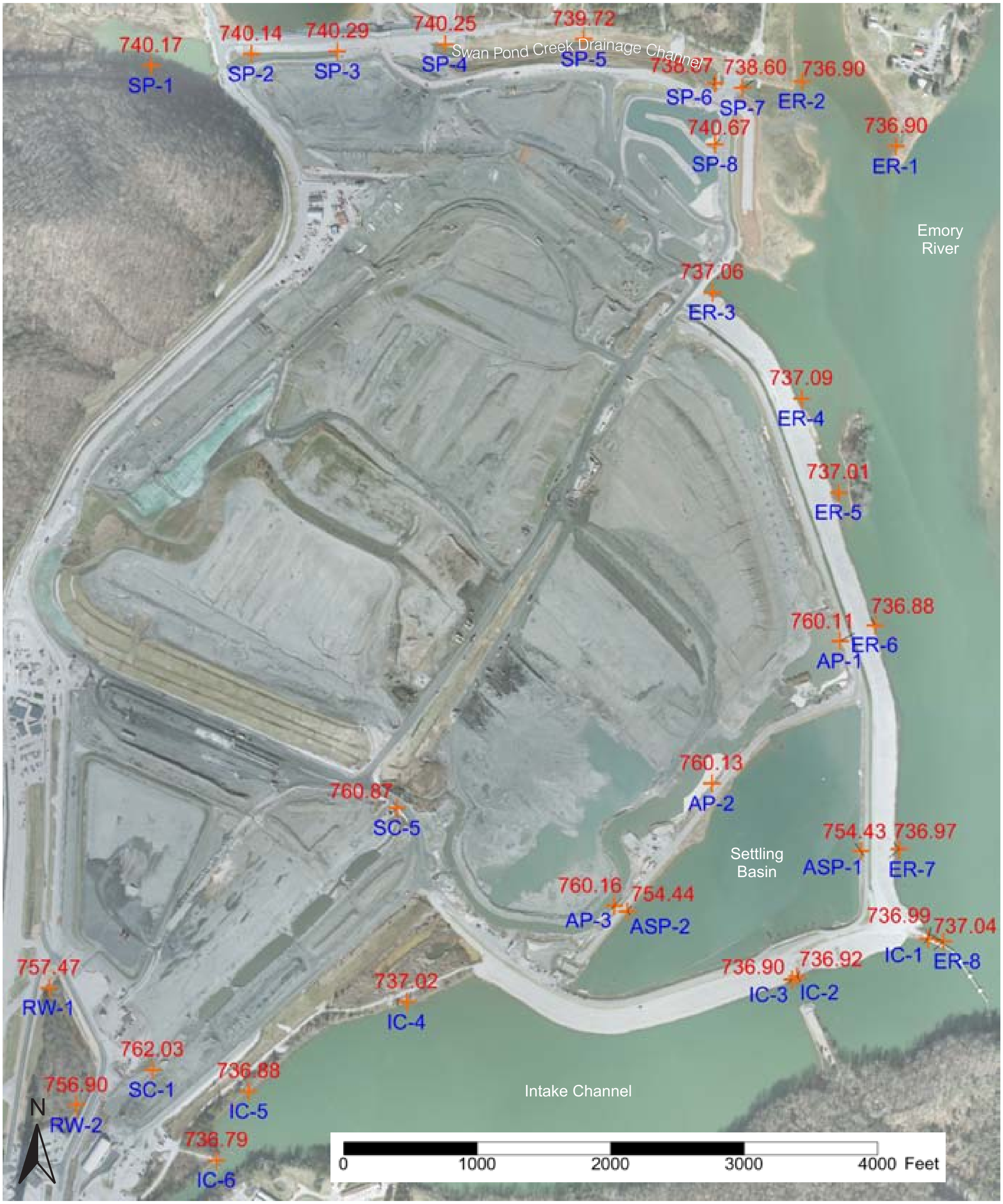



Groundwater Measurement Locations (February 2012)

TVA Kingston Fossil Plant

6-27-12
Figure 02_GW-LocMapFeb2012.cdr

Figure 2



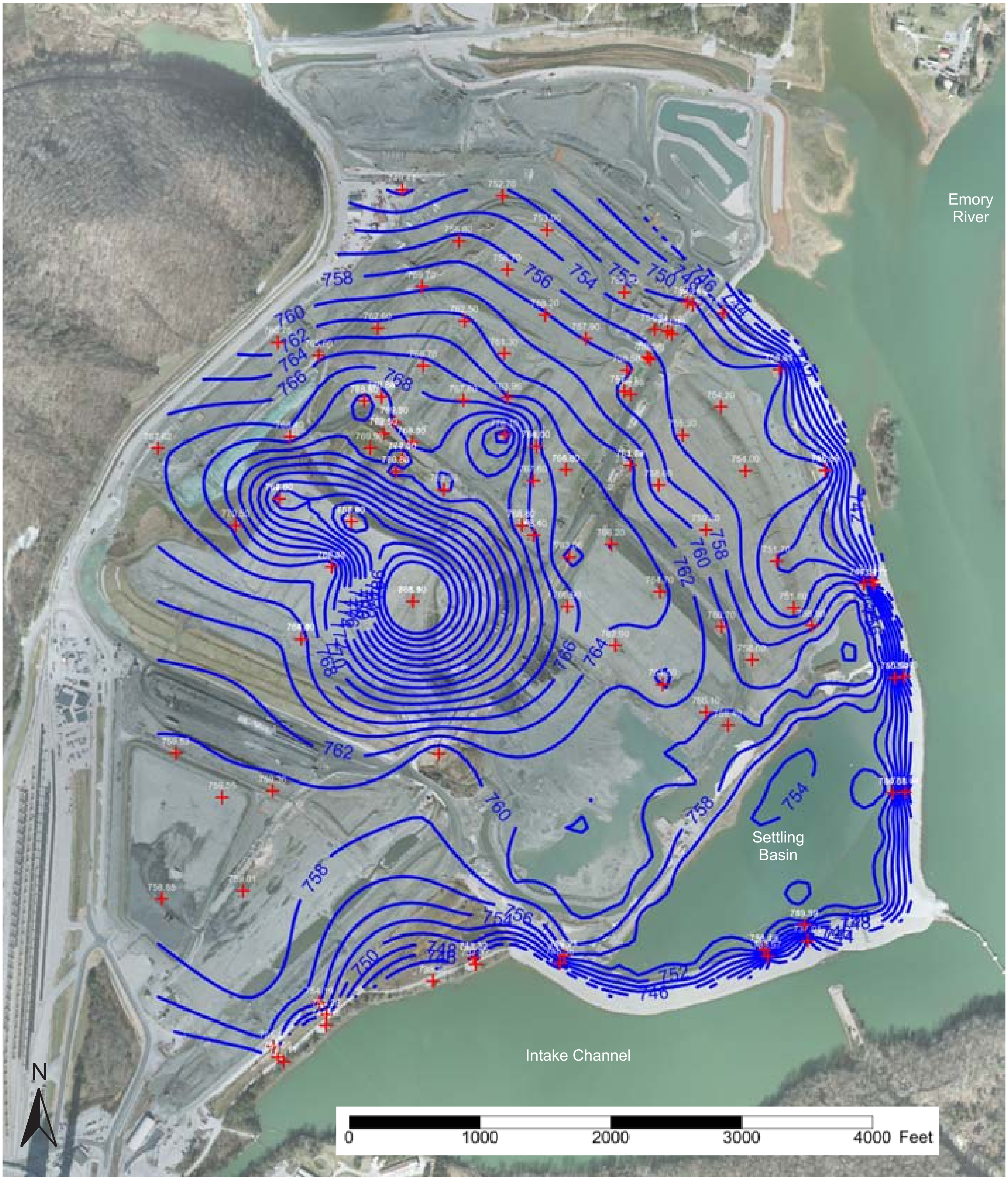

Geosyntec JACOBS TVA

Surface Water Measurement Locations (February 2012)

TVA Kingston Fossil Plant

6-27-12
Figure 03_SW-MeasFeb2012.cdr

Figure 3



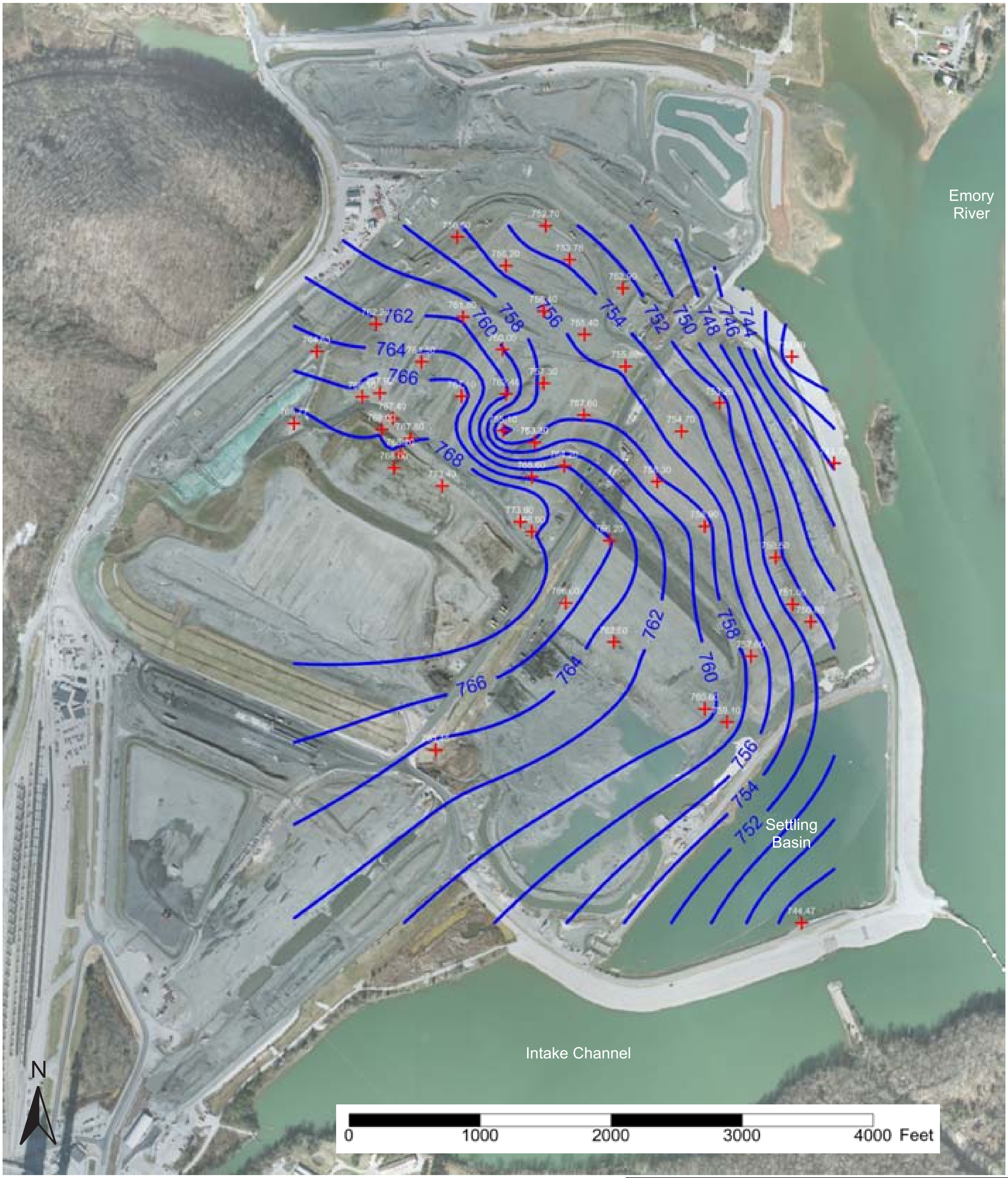

Geosyntec JACOBS TVA

Groundwater Elevations in Ash and Shallow Soils (February 2012)

TVA Kingston Fossil Plant

6-27-12
Figure 04_GWAshFeb2012.cdr

Figure 4



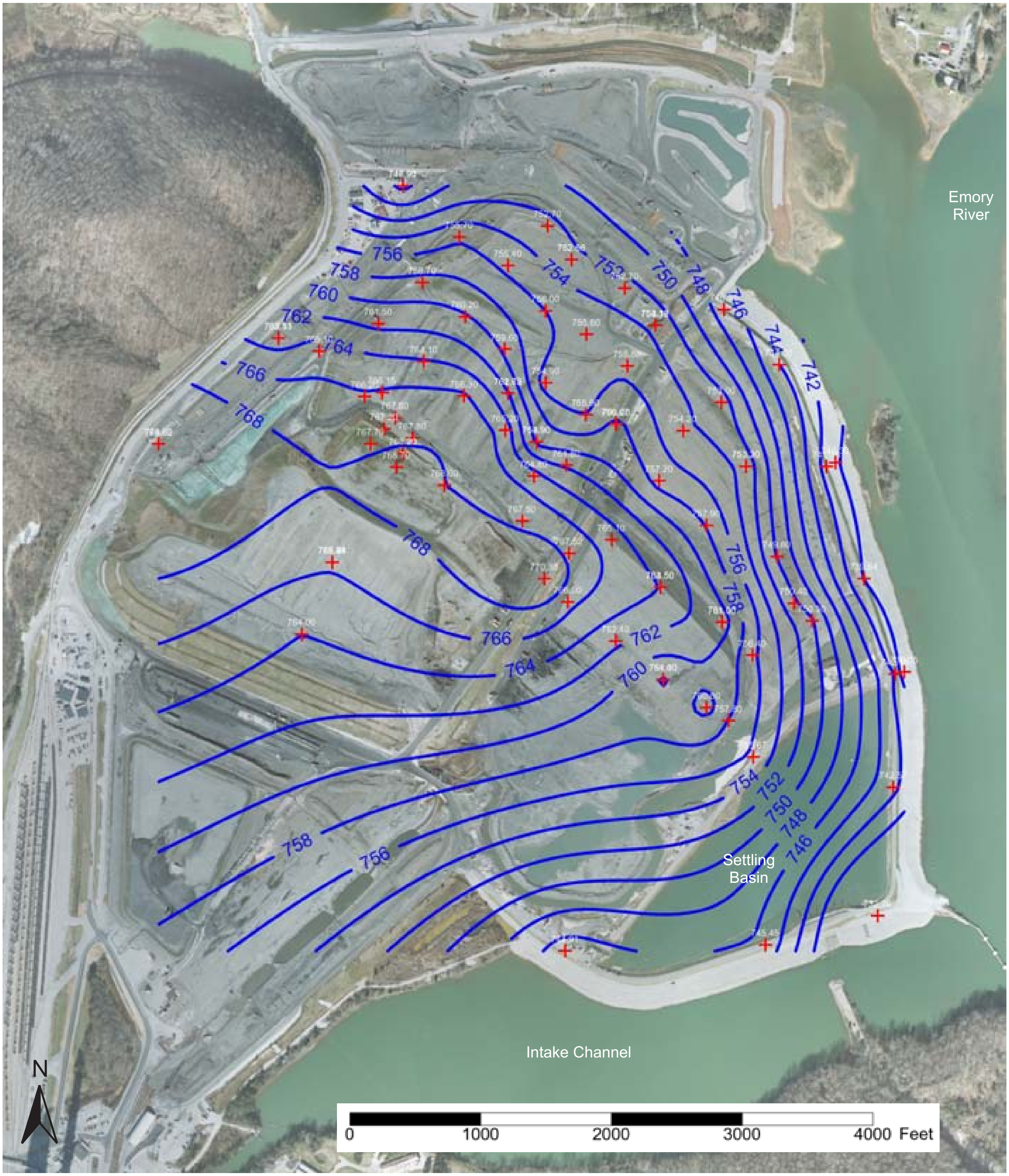

Geosyntec JACOBS TVA

## Groundwater Elevations in Alluvial Clay (February 2012)

TVA Kingston Fossil Plant

6-27-12
Figure 05_GWClayFeb2012.cdr

Figure 5




Geosyntec JACOBS TVA

Groundwater Elevations in Alluvial Sand (February 2012)

TVA Kingston Fossil Plant

6-27-12
Figure 06_GWSandFeb2012.cdr

Figure 6

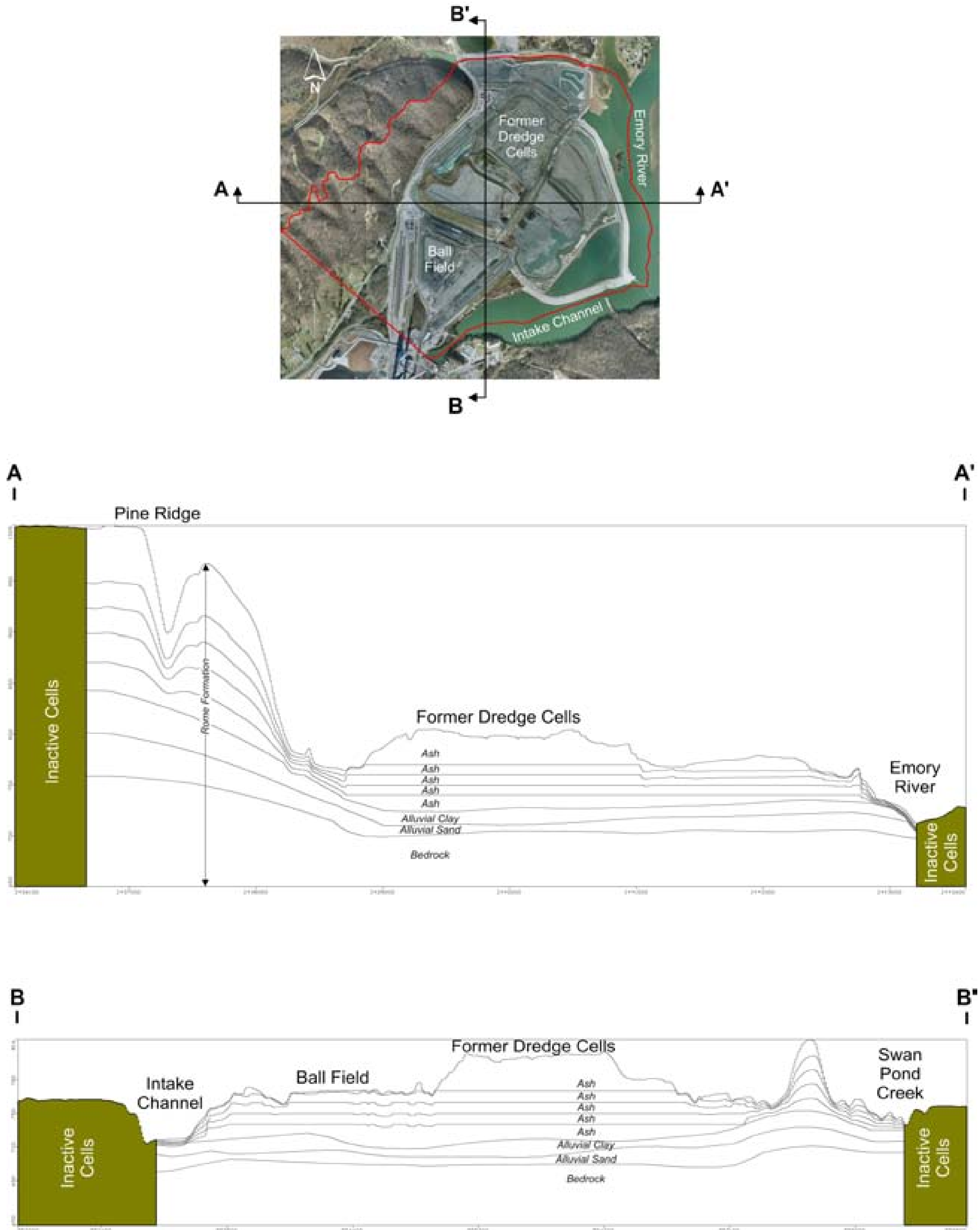

Geosyntec JACOBS TVA

2012 Topography Showing Model Domain

TVA Kingston Fossil Plant

6-27-12
Figure 07_ModelDomain2012.cdr

Figure 7

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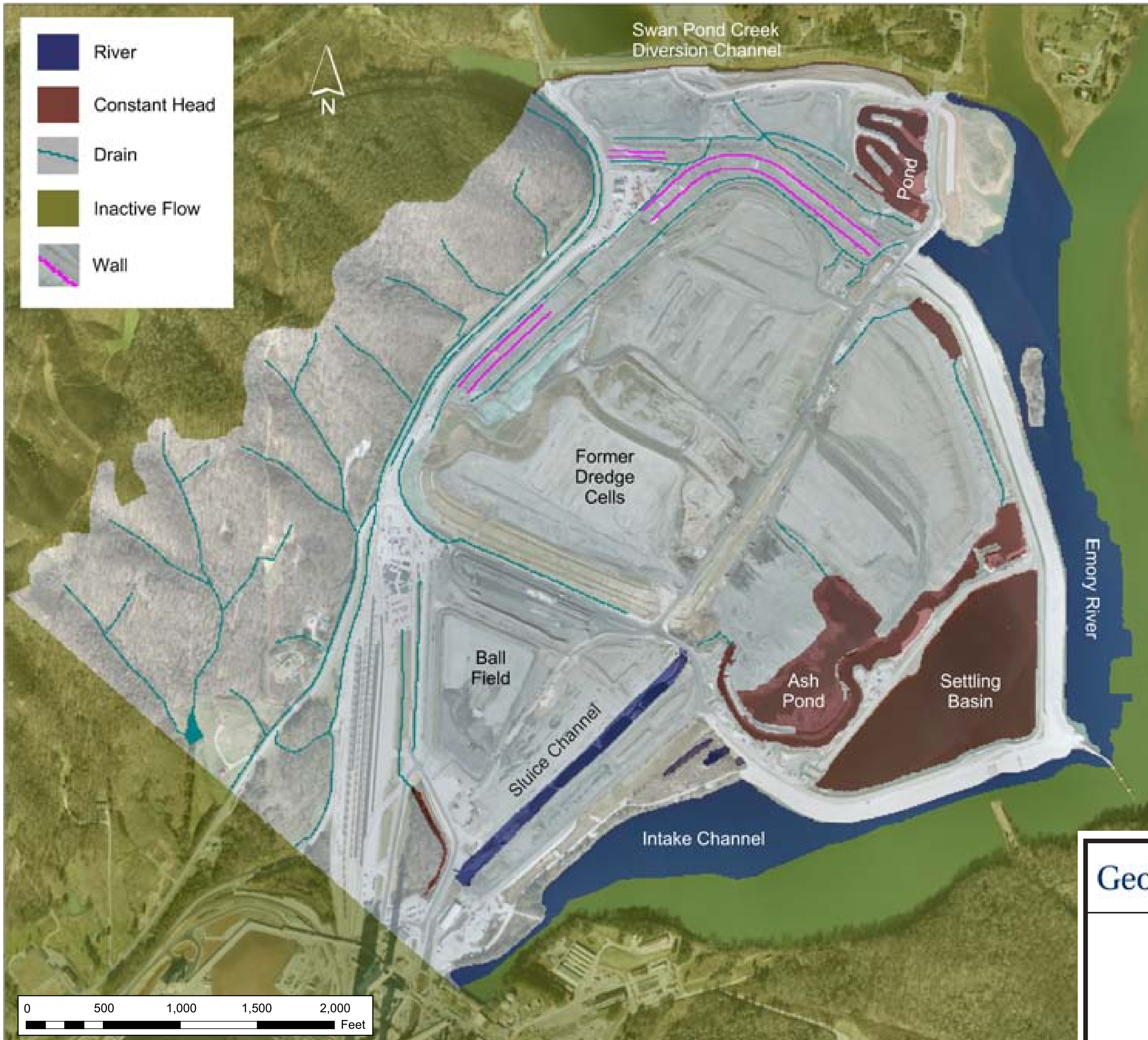
Cross-Sections Showing Model Layering

TVA Kingston Fossil Plant

6-27-12
Figure 08_CrossSections.cdr

Figure 8



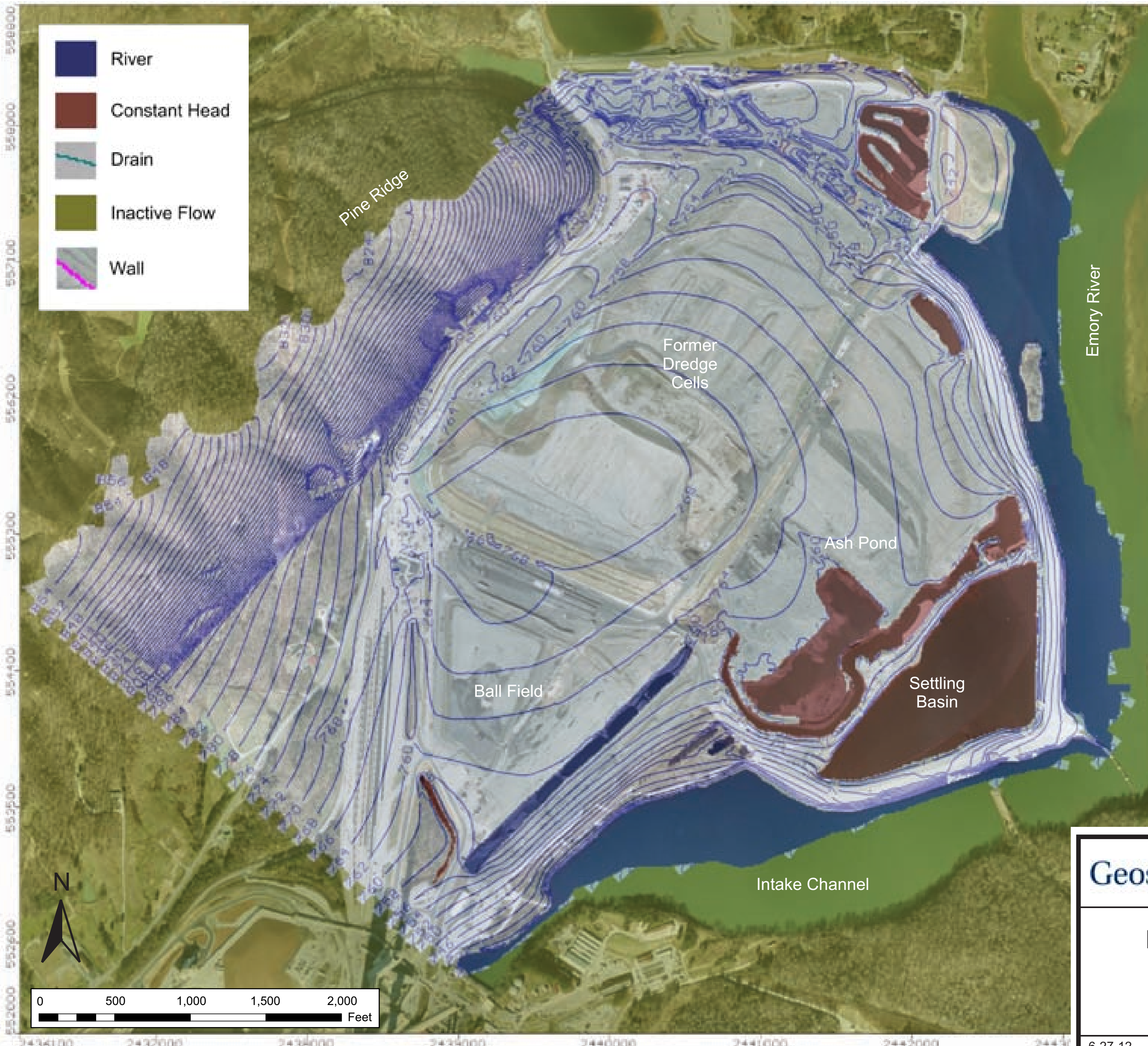

Geosyntec JACOBS TVA

2012 Model
Boundary Conditions

TVA Kingston Fossil Plant

6-27-12
Figure 09_ModelBoundaries2012.cdr

Figure 9



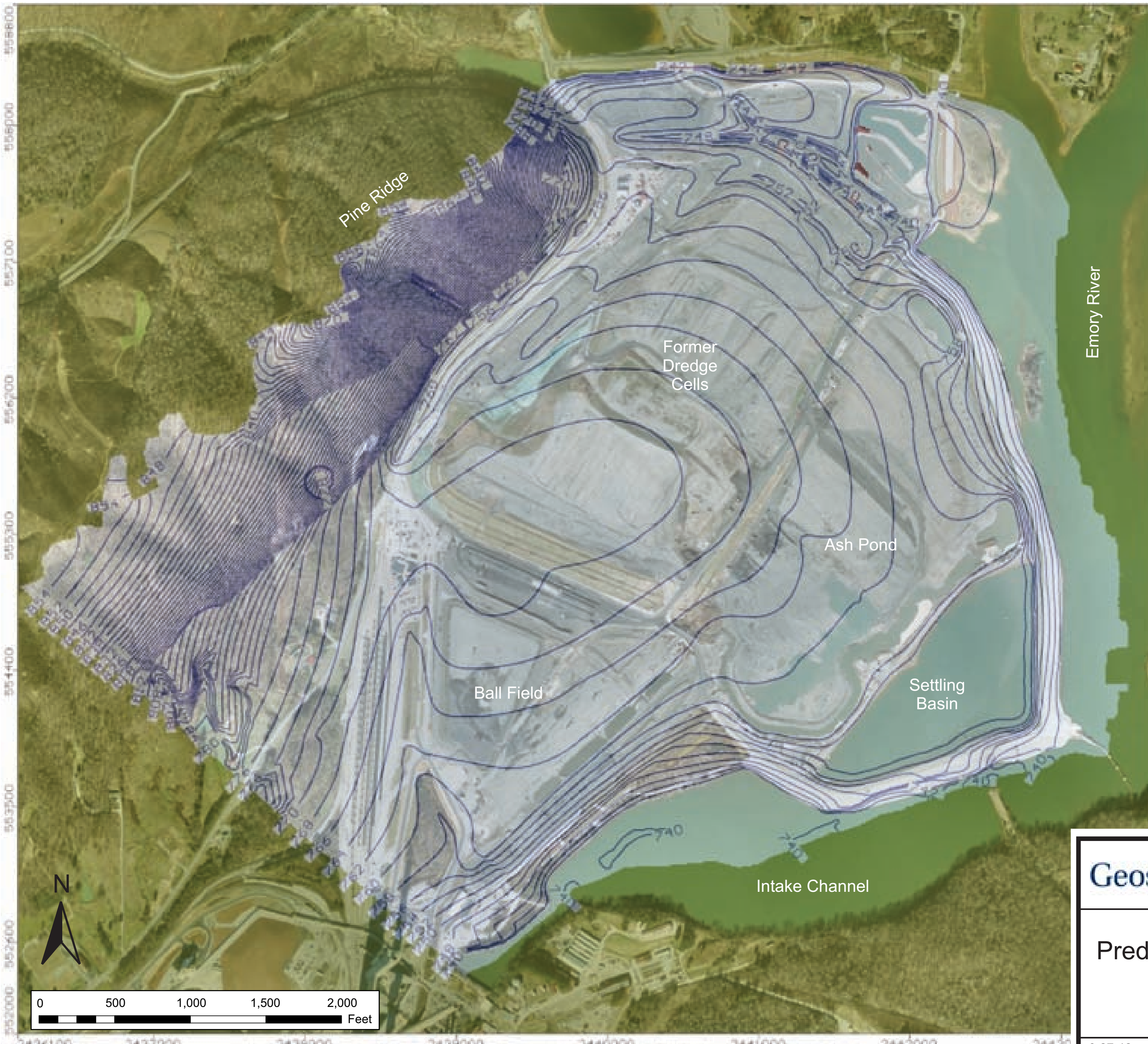

Geosyntec JACOBS TVA

Predicted Water Table for 2012 Model

TVA Kingston Fossil Plant

6-27-12
Figure 10_PredictedWTFeb2012.cdr

Figure 10



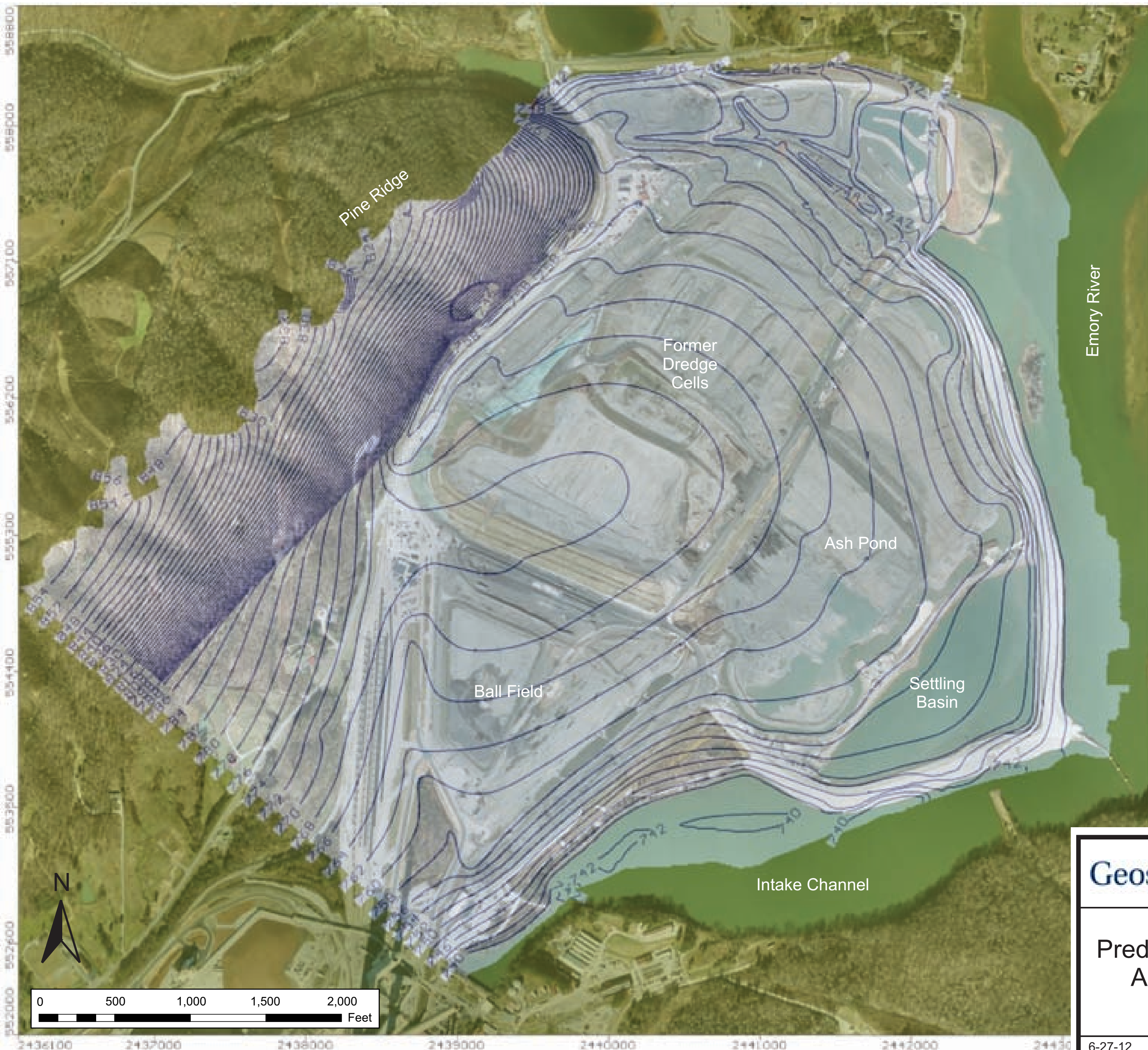

Geosyntec JACOBS TVA

# Predicted Potentiometric Heads in Ash for 2012 Model

TVA Kingston Fossil Plant

6-27-12
Figure 11_PredHeadAshFeb2012.cdr

Figure 11



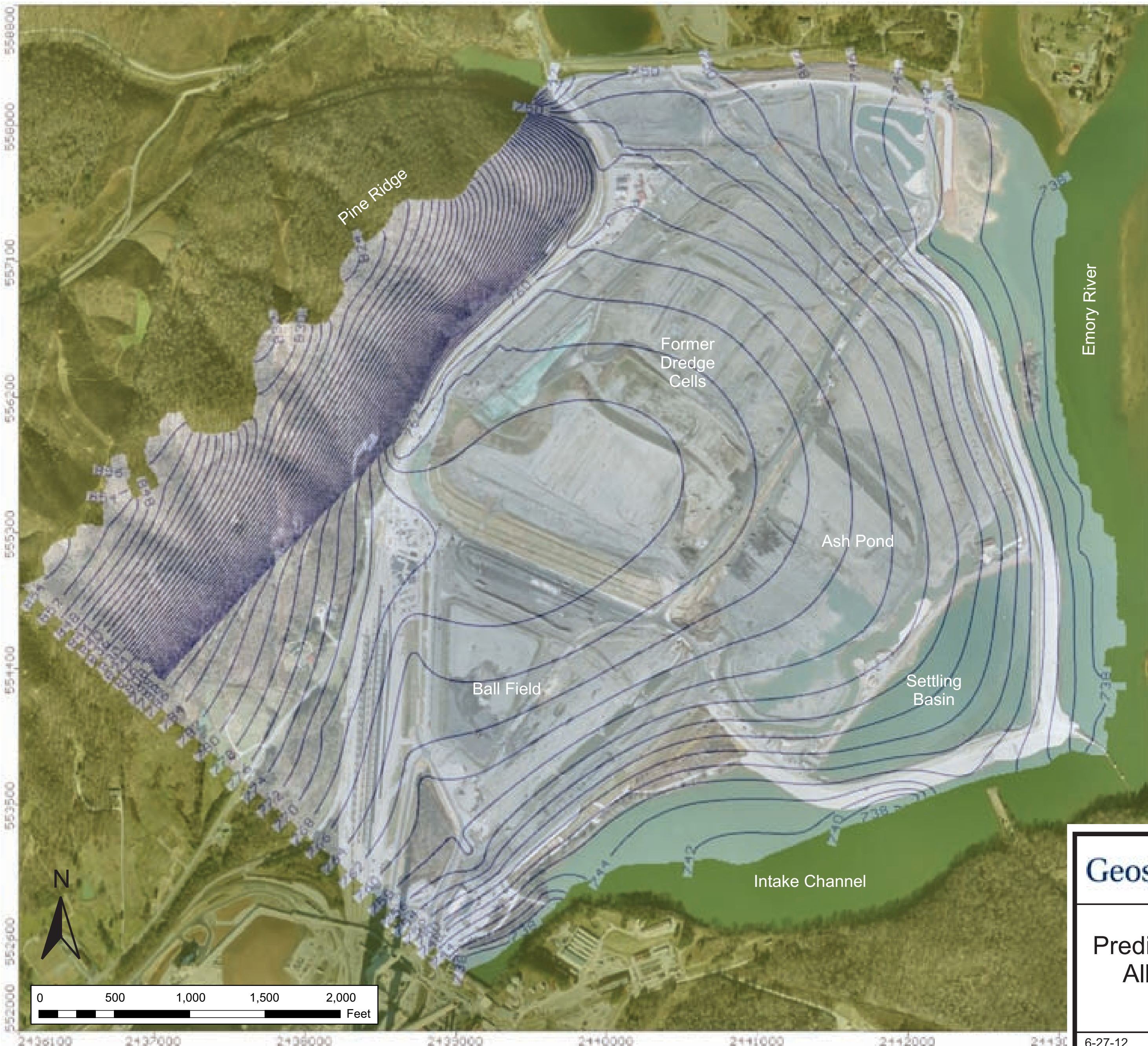

Geosyntec JACOBS TVA

## Predicted Potentiometric Heads in Alluvial Clay for 2012 Model

TVA Kingston Fossil Plant

6-27-12
Figure 12_PredHeadClayFeb2012.cdr

Figure 12



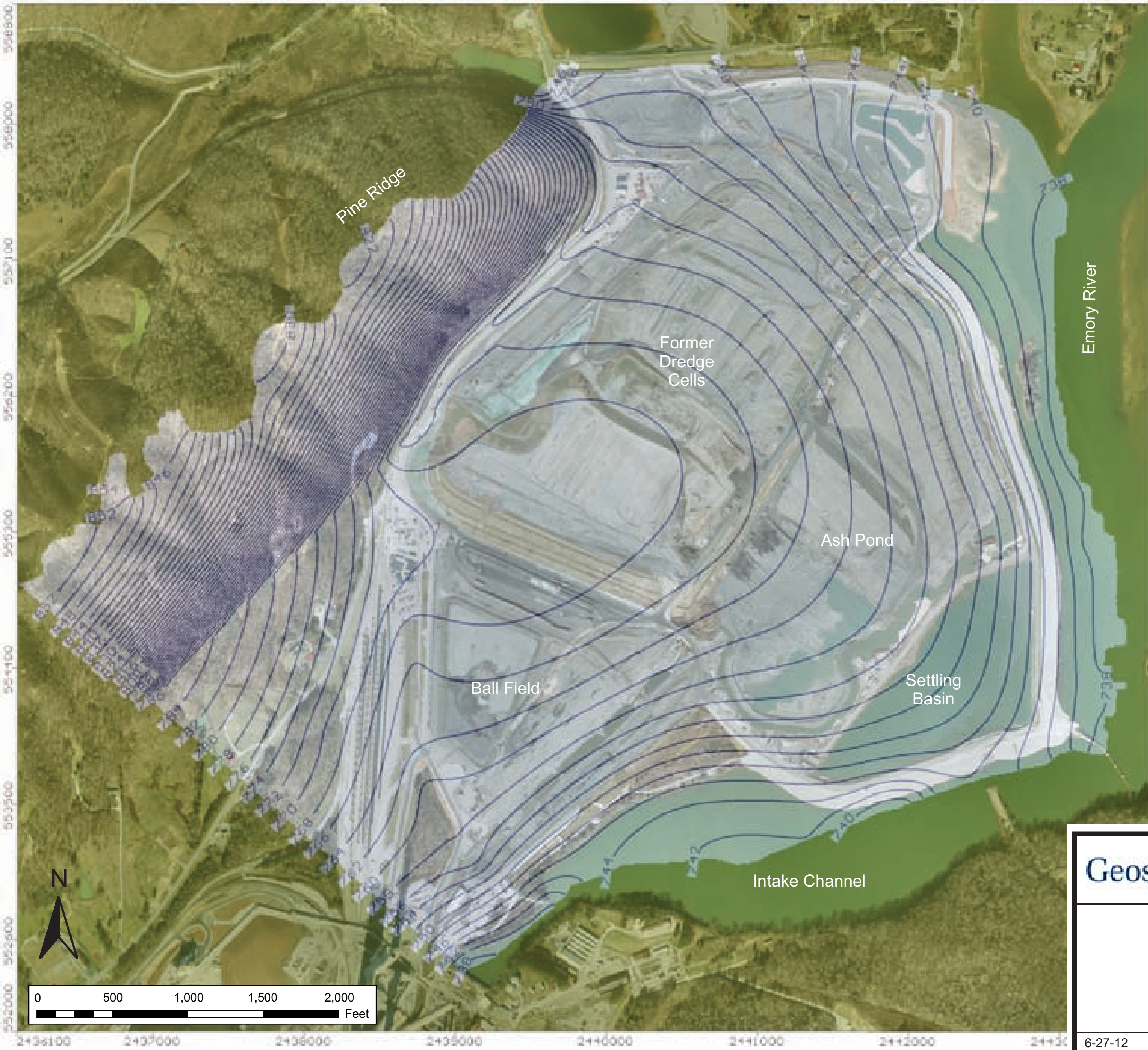

Geosyntec JACOBS TVA

## Predicted Potentiometric Heads in Alluvial Sand for 2012 Model

TVA Kingston Fossil Plant

6-27-12
Figure 13_PredHeadSandFeb2012.cdr

Figure 13



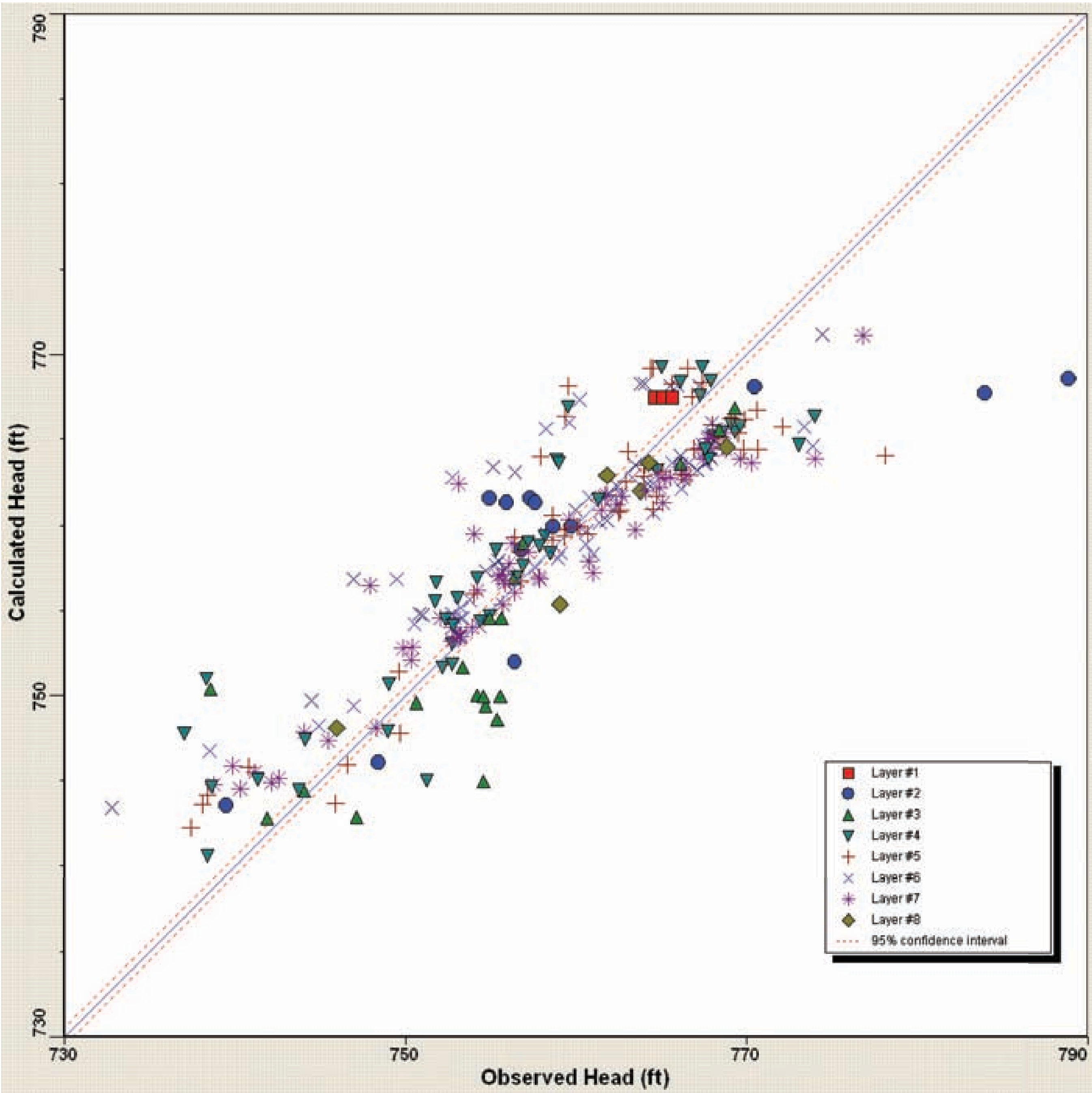

Geosyntec JACOBS TVA

Predicted Potentiometric Heads in Bedrock for 2010 Model

TVA Kingston Fossil Plant

6-27-12
Figure 14_PredHeadBedrockFeb2012.cdr

Figure 14




Geosyntec JACOBS TVA

Model Calculated Head vs Observed Head

TVA Kingston Fossil Plant

6-27-12
Figure 15_ModelCalibrationFeb2012.cdr

Figure 15