Groundwater Modeling for Closure of the Little Blue Run CCR Disposal Area

Prepared By
Brianne J. Hastings and
H. Thomas Walsh
Civil & Environmental Consultants, Inc.
333 Baldwin Rd. Pittsburgh, PA 15205
FirstEnergy Generation, LLC

Introduction
Little Blue Run CCR Disposal Impoundment
- Located in Beaver County, PA and Hancock County, WV
- Disposal area for FirstEnergy’s Bruce Mansfield Station
- In use since 1975 for CCR disposal

Little Blue Run CCR Disposal Impoundment
- Impoundment formed behind 400 ft. high dam
- LBR Valley is dominated by steep slopes and drains to the Ohio River
- CCR was pumped as a slurry from the power station to the impoundment
- Low permeability CCR solids settle filling Little Blue Run Stream valley
- Standing water present over portions of CCRs

Closure Plan
- Consent decree entered in 2012, requiring cessation of CCR disposal at LBR on December 31, 2016
- Major permit modification approved to
  - Reduce standing water and main pool
  - Place geomembrane liner, cushion geotextile, and one foot thick final cover soil layer
- Closure to be performed over 15 years,
  - The final permit was approved to occur over 12 years, completing in 2028
Proposed Phasing Plan for Closure

Model Purpose

► Elimination of standing water and capping expected to greatly reduce water levels within CCR material
► Water level changes expected to significantly impact settlement, slopes, and surface drainage.
► Groundwater modeling was performed to prepare a prediction of water level drawdown
► Water level drawdown was used to perform a settlement analysis

Groundwater Modeling

► Computer software used to simulate groundwater flow field during and after closure
► Based on an interpretation of geological, hydrological, and site-specific conditions.

Groundwater Model Build-Out

► Model area separated horizontally into model cells.
  • 130 Rows
  • 120 Columns
  • Variable size to show greater detail over impoundment
  • Cell size range 112’ by 112’ to 900’ by 900’
► Model area separated vertically into layers.
  • 9 Layers
    • 5 Aquifers
    • 4 Aquitards

LBR Model Area
5 miles by 5 miles

LBR Model Grid
130 Rows
120 Columns
Variable size

Layer 5 Kittanning Aquifer
Model Calibration

- Model calibrated to match observed water levels in the various aquifers and observed hydrologic volumetric budget
- Input Parameters Modified:
  - Boundary Conditions
  - Recharge – based on HELP modeling
  - Horizontal and Vertical Hydraulic Conductivities
    - Aquifers
    - Aquitards
    - Weathering rind
    - Fracture traces
    - CCR

Layer 1 Boundary Conditions
Simulated Groundwater Contour Map, L1

Layer 1 Recharge and Boundary Conditions

Model Simulation Timeline

2013

2016

2017
Conclusions

► (1) Reductions in water levels within the CCR will be realized prior to cap placement because of reductions in the aerial extent of standing water pools within LBR.

► (2) Reductions in water levels will occur within the CCR at a higher rate after cession of pumping CCR, reduction of the main pool, and initiation of cap placement.

► (3) The majority of draw-down within the CCR may occur in less than 30 years of the cessation of pumping CCR and the initiation of cap placement, with a smaller percentage of additional draw-down happening after.

► (4) The greatest amount of draw-down within the CCR will be realized in the northern and central portions of the impoundment where the CCR deposits are thickest.

► (5) Only portions of CCR in Layer 1 completely dewater over the course of the 250 year model simulation.