Groundwater Model Status Report

Powertech Dewey-Burdock
Uranium In Situ Recovery Project

Fall River and Custer Counties, South Dakota

December 7, 2011

Note: This presentation of the hydrogeological model and preliminary results is a continuation and follow-up of the April 7-8, 2011 public meeting wherein Powertech agreed to develop a model for the proposed Dewey-Burdock Project and present the results to NRC staff. This presentation is preliminary in nature and is not a final product. It is subject to change based upon comments by the NRC staff and finalization of technical details by the consultant. Consequently, this presentation is not intended to be relied upon by the NRC staff nor any of the parties involved in the ongoing litigation regarding the proposed Dewey-Burdock Project and Powertech’s application for a uranium recovery license from the NRC as it is not part of the application currently.
Per Request by NRC

Regional Groundwater Flow Model

- Better Define Recharge/Discharge Boundaries
- Evaluate Regional Flow
- Assess Water Budget
  - available and sustainable resources
  - potential long term impacts to aquifers from ISR operations
- Assess Hypothetical Pathways
  - Breccia Pipes
Dewey-Burdock Model Objectives (II)

Wellfield Scale Model

- Hydrologic Test Design
- Monitor Ring Spacing/Excursion Detection
- Wellfield Design/Balance (Wellfield Flare)
- Localized Hydraulic Response to ISR Operations
- Excursion Recovery
Dewey Burdock Physiographic Setting
Dewey-Burlock Project Area Geology
Potentiometric Surface-Chilson, April 2011
Potentiometric Surface-Fall River, April 2011
Model Codes

• GROUNDWATER FLOW MODELING
  MODFLOW2000 (USGS)
  MODFLOW SURFACT (V 3.0 Hydrogeologic Inc)

• FLOWPATHS/CAPTURE ZONES
  MODPATH (V. 3.0, USGS)

• PRE-POST PROCESSING
  Groundwater Vistas (V. 6, Environmental Simulations)
Dewey-Burdock Model Layers

Layer 1 - Graneros Group
Layer 2 - Fall River Sandstone
Layer 3 - Fuson Shale
Layer 4 - Chilson Sandstone
Alluvium
Dewey-Burdock Model Grid and Boundary Conditions
Dewey-Burdock Model

Top Elevation of Upper Layer (Ground Surface)
Calibration Statistics
RM 1.16
ARM 5.16
RSS 506
SRSD 0.051

CALIBRATION SIMULATION-LAYER 4 (CHILSON)
Calibration.  
Statistics  
RM  -3.14  
ARM  7.67  
RSS  1750  
SRSD  0.04  

CALIBRATION SIMULATION-LAYER 2 (FALL RIVER)
CALIBRATION TARGETS – OBSERVED VS SIMULATED
10 Burdock Wellfields
9 Chilson
1 Fall River

4 Dewey Wellfields
2 Chilson
2 Fall River

12 Stress Periods
Cover Production and Restoration of all Wellfields over 8 1/4 years

LIFE OF MINE PRODUCTION/RESTORATION SIMULATIONS
DEWEY BURDOCK LIFE-OF-MINE SIMULATIONS
PRODUCTION/RESTORATION SCHEDULE
Drawdown after 730 Days
Production at Wellfield BWF1

(End of Stress Period 1)

Chilson Drawdown - Simulation of 4000 gpm and 0.875% Bleed
Drawdown after 366 Days
Production at BWF7, BWF8 and DWF2
(End of Stress Period 9)

Chilson Drawdown -Simulation of 4000 gpm and 0.875% Bleed
Drawdown At End of ISR Operations
(End of Stress Period 12)

Chilson Drawdown - Simulation of 4000 gpm and 0.875% Bleed
Drawdown after 730 Days
Production at Wellfield DWF1
(End of Stress Period 1)

Fall River Drawdown -Simulation of 4000 gpm and 0.875% Bleed
Fall River Drawdown - Simulation of 4000 gpm and 0.875% Bleed
Drawdown At End of ISR Operations

(End of Stress Period 12)

Fall River Drawdown-Simulation of 4000 gpm and 0.875% Bleed
Chilson Drawdown-Simulation of 4000 gpm and 0.875% Bleed with GWS

Drawdown after 183 Days Production at BWF3, BWF4 and BWF5 and Restoration at BWF2 (End of Stress Period 4)
Drawdown At End of ISR Operations
(End of Stress Period 12)

Chilson Drawdown-Simulation of 4000 gpm and 0.875% Bleed with GWS
Drawdown After 1177 Days of Production at DWF1 and 91 Days of Restoration at DWF1
(End of Stress Period 4)

Fall River Drawdown-Simulation of 4000 gpm and 0.875% Bleed with GWS
Fall River Drawdown-Simulation of 4000 gpm and 0.875% Bleed with GWS
Drawdown At End of ISR Operations (End of Stress Period 12)

Fall River Drawdown-Simulation -4000 gpm and 0.875% Bleed with GWS (Full Model Domain)
Drawdown At End of ISR Operations (End of Stress Period 12)

Chilson Drawdown-Simulation -4000 gpm and 0.875% Bleed with GWS (Full Model Domain)
Simulated Potentiometric Surface-Life of Mine Dewey Wellfield Area

- Ground Surface is at 3622
- Top of Fall River at 3127 ft amsl, Top of Chilson at 2933 ft amsl

Simulation Time (days)

Potentiometric Surface (ft amsl)
Simulated Potentiometric Surface - Life of Mine, Burdock Wellfield Area
Drawdown after 183 Days
Production at BWF3, BWF4 and BWF5 and
Restoration at BWF
(End of Stress Period 4)

Comparison of Chilson Drawdown- For 4000 and 6000 gpm
Simulations with and 0.875% Bleed and GWS
Drawdown At End of ISR Operations (End of Stress Period 12)

Comparison of Chilson Drawdown- For 4000 and 6000 gpm Simulations with 0.875% Bleed and GWS
Drawdown After 1177 Days of Production at DWF1 and 91 Days of Restoration at DWF1 (End of Stress Period 4)

Comparison of Fall River Drawdown- For 4000 and 6000 gpm Simulations with and 0.875% Bleed and GWS
Drawdown At 12 End of ISR Operations
(End of Stress Period 12)

Comparison of Fall River Drawdown- For 4000 and 6000 gpm Simulations with and 0.875% Bleed and GWS
Summary of Life of Mine Simulations

- Simulated Production at 4000 and 6000 gpm with 0.875 % Net Bleed both with and without Groundwater Sweep
- Simulated Drawdown Outside of Permit Area is Generally < 10 feet During All Phases of Production and Restoration
- Modeling Supports Viability of ISR Mining for Uranium in the Fall River and Chilson Aquifers
Simulation of Hypothetical Breccia Pipe Release in the Chilson Within the Permit Area at 200 gpm
Hydraulic Profile (East-West) Through Hypothetical Breccia Pipe
WELLFIELD SIMULATIONS

- Wellfield Flare
- Monitor Ring Spacing/Excursion Detection
- Excursion Recovery
- Wellfield Balance
Simulation of Wellfield Balancing and Wellfield Flare Calculation

(Previously Submitted to NRC)

(Dewey Fall River Wellfield)
SUMMARY

• Groundwater Model Developed and Calibrated using Site-Specific Geologic and Hydrologic Data

• Model Simulations Support Aquifer Sustainability at Projected Production Rates for Life of Mine Operations

• Modeling Supports Viability of ISR Mining for Uranium in the Fall River and Chilson Aquifers
QUESTIONS?

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COMMENTS?