ADDENDUM 2.7-C
REGIONAL HYDRAULIC TEST REPORT

NUMERICAL MODELING OF HYDROGEOLOGIC CONDITIONS

RENO CREEK

URANIUM INSITU RECOVERY PROJECT

AUC LLC RENO CREEK PROJECT
CAMPBELL COUNTY, WY
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NUMERICAL MODELING OF HYDROGEOLOGIC CONDITIONS
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1 Introduction

AUC LLC (AUC) is submitting an application to the U.S. Nuclear Regulatory Commission (NRC) for a Source Material and 11e (2) license to conduct in-situ recovery (ISR) of uranium from the Reno Creek Project in Campbell County, Wyoming (Figure 1). The target ore zone is referred to as the Production Zone Aquifer (PZA). The PZA is a discrete and continuous aquifer across the Reno Creek Project area under variably saturated conditions that transitions from fully saturated in the western portion of the project area to partially saturated in the eastern third of the project. The 12 proposed production units and three accessory production units are presented in Figure 2.

A numerical groundwater flow model was developed using site-specific data to evaluate hydraulic responses of the PZA to proposed ISR production and groundwater restoration operations at the site. This report describes the development of the numerical model and summarizes the results of numerical simulations used to address questions from NRC that were discussed in the pre-submission audit in Wright, Wyoming, during November 15-17, 2011.

2 Purpose and Objectives

The numerical groundwater flow model was developed to support AUC in planning and operation of the uranium ISR project and to assess hydraulic response of the PZA to ISR mining.

Objectives of the numerical model included the following:

- Enhance understanding of the PZA with respect to:
    - Regional and local flow patterns
    - Recharge and discharge boundaries
    - Overall water budget (available and sustainable resources)
- Assess the amount of dewatering (specifically in the partially saturated portion) that may occur, if any, during production and restoration phases of the project.
- Estimate production unit flare during production at locations in the fully saturated and partially saturated areas of the project.
- Evaluate the proposed monitoring well spacing of 400 feet in the partially saturated project area and 500 feet in the fully saturated area of the project, to demonstrate hydraulic control at these distances to detect and recover any potential excursion.
- Evaluate potential hydraulic impacts (e.g. drawdown and potential dewatering) from production and restoration operations on both the local and regional scale.

3 Conceptual Model

Detailed description of the geology and hydrogeology of the proposed Project Area can be found in the Reno Creek Project Application NRC Technical Report (TR) Sections 2.6 and 2.7. The conceptual hydrologic model for the Reno Creek Project Area is summarized below.

The aquifer being simulated is the Production Zone Aquifer (PZA) which is the uranium production zone for the Reno Creek Project Area. The PZA is a discrete and continuous sandstone aquifer across the Reno Creek Project area that transitions from fully saturated in the western portion of the project area to partially saturated in the eastern third of the project. It is important to note that the PZA is geologically confined by the continuous overlying and underlying aquitards across all areas of the project. In the areas where the potentiometric elevation in the PZA is below the upper aquitard, hydraulic conditions are described as partially saturated. Figure 3 shows the potentiometric surface from August 2011 and shows the approximate transition boundary between fully saturated conditions to the west and partially saturated conditions in the eastern portion of the project.

The PZA sandstone occurs between depths of approximately 260 to 380 feet below ground surface (bgs) at the PZM1 cluster, 270 to 420 feet bgs at the PZM3 cluster, 220 to 380 feet bgs at PZM4 cluster, and 180 to 330 feet bgs at the PZM5 cluster. These four well clusters represent the four locations of multi-well pump testing conducted at the site and are shown on Figure 4. Based on the isopach map of the PZA across the site (see Figure 5), gross thickness of the sandstone ranges between approximately 75 and 200 feet.

Groundwater flow in the PZA is to the northeast (see Figure 3) and the structural dip, as seen in the structure map at the bottom of the Felix Coal marker bed (Figure 6), is to the northwest at approximately 35 to 50 feet per mile. Geologic confinement of the PZA by the overlying and underlying aquitards exists across the entire project area. Aquifer conditions transition from fully saturated in the western portion of the project area to partially saturated conditions in the eastern project area, as shown by the approximate boundary line on Figure 3. At PZM1 and PZM3, the saturated thickness of the PZA is approximately 94 feet and 109 feet, and total sand thickness at these locations is approximately 125 feet and 165 feet. There is a mudstone unit that is present in some portions of the project area that divides the PZA into upper and lower sand units. At the PZM4 cluster, there is a difference of approximately four to five feet in potentiometric elevation between the upper PZA and lower PZA. Further characterization of the impacts of this mudstone unit will be addressed in production unit-scale hydrologic testing at a later date. The PZA near PZM5 is fully saturated and a mudstone interval is observed, but no differences in potentiometric elevation within the PZA are observed from the available hydrologic data.

The PZA is geologically confined by the overlying aquitard and the underlying aquitard. Lying above the overlying aquitard is the overlying aquifer, which is continuous on a local scale, as observed at the PZM well clusters, but is not continuous across the project area based on geologic and potentiometric data. The overlying aquifer is partially saturated near the PZM1 cluster, and fully saturated at clusters PZM3, PZM4, and PZM5. There is no underlying aquifer relative to the PZA at Reno Creek. The underlying sand units (designated by UM-prefix wells) were evaluated at multiple locations and hydrologic testing was conducted on these ratty sands. These sands within the underlying aquitard are lenticular and discontinuous based on geologic and potentiometric data and do not correlate over appreciable distances within the project area. As detailed in Section 2.7.2, the underlying unit does not qualify as an aquifer due to the very low transmissivities and minimal well yield. No drawdown responses were observed in the overlying aquifer or the underlying unit UM-prefix wells during any PZA pump testing activities and therefore the PZA is considered isolated with respect to the overlying aquifer and any underlying sand units.

The PZA aquifer is fully saturated in the western portion of the Project Area transitioning to partially saturated aquifer conditions to the east-northeast. The potentiometric surface of the PZA across the Project Area has a hydraulic gradient ranging from 0.0017 ft/ft to 0.0035 ft/ft (9.0 to 18.5 feet/mile) toward the northeast, with an average gradient of approximately 0.0027 ft/ft (14 feet/mile) across the project area. The potentiometric surface of the PZA in August 2011 is shown on Figure 3. Water level data used to construct the potentiometric map and also used to calibrate the groundwater model are also included on this figure. Calculated transmissivities within the PZA range from approximately 20 ft^2/day to 1,428 ft^2/day and calculated hydraulic conductivities range between 0.3 ft/day and 13 ft/day (see Section 2.7.2.5 of the TR for analytical results). The transmissivity values observed in the partially saturated areas (PZM1 and PZM3) were significantly higher compared to the tests conducted in the fully saturated portion of the site (PZM5). Average transmissivity at PZM1 was approximately 560 ft^2/day and approximately 900 ft^2/day at PZM3. Transmissivities from the PZM5 test ranged between 20 and 62 ft^2/day; at PZM4D transmissivities ranged from 31 to 229 ft^2/day.

Hydraulic conductivity calculated from pumping tests ranged from approximately 4 to greater than 8 ft/d in the eastern portion of the PZA (near PZM3 and PZM1). In the central and western portions of the PZA (PZM4 and PZM5, respectively), conductivities ranged from approximately 0.4 to 2.0 ft/d. The drawdown data and aquifer properties data from each of the multi-well pump tests are summarized in Tables 1 through 8.

Storativity estimated from the pumping tests ranged between $2x10^{-4}$ to $5x10^{-3}$ in the partially saturated portion of the PZA, and between $6.5x10^{-5}$ to $8.7x10^{-4}$ in the fully saturated part of the PZA (see Tables 2, 4, 6, and 8).

Porosity for the entire model domain is estimated at 24%. This value is based on effective porosity evaluations from PZA core analysis within the project area.

The PZA is fully saturated across approximately 70% of the site. There are areas along the eastern margin of the Project Area where water level data from monitor wells indicate that the potentiometric head is below the top of the PZA and the aquifer is partially saturated. However, in those areas, the top of the ore in the PZA is between 15 to 20 feet and as much as 60 feet below the water level. Hence, it is expected that adequate head exists in the PZA to allow successful uranium recovery and groundwater restoration in the partially saturated area of the project. Historical pilot plant operation and restoration conducted in the partially saturated northeastern portion of the project by Rocky Mountain Energy in the 1980s support this conclusion (see Section 1.2 of the TR for additional discussion of historical recovery and restoration operations).

4 Model Development

The model code used to simulate the Reno Creek ISR project was MODFLOW-SURFACT (Version 3.0), developed by HydroGeologic, Inc. (1996 and 2006). SURFACT is a proprietary version of the widely used and public domain MODFLOW code developed by the U.S. Geological Survey (McDonald, 1988 and 1996). MODFLOW simulates groundwater using a block-centered, finite difference approach that is capable of a wide array of boundary conditions. The code can simulate aquifer conditions as unconfined (partially saturated), confined (fully saturated), or a combination of the two. MODFLOW also supports variable layer thicknesses (i.e., variable top and bottom aquifer elevations). Documentation of all aspects of the MODFLOW code is provided in the users manuals (McDonald, 1988 and 1996).

SURFACT was designed to enhance the groundwater flow modeling capabilities of MODFLOW. SURFACT provides significant improvements over the original MODFLOW code with respect to variably saturated flow, dewatering and rewetting of cells within the model, and simulation of wells. Similar to the MODFLOW code, SURFACT is modular by design so that specific modules can be incorporated into the model simulations to address characteristics and physical processes of the site being modeled. These modules, or packages, work in conjunction with the original MODFLOW code. Only modules that address specifics of the site need to be included in the simulation. Full description of the SURFACT packages, including verification examples, is provided in the MODFLOW-SURFACT Software (Version 3.0) Documentation (HydroGeologic, Inc., 1996, 2006). Specific modules of SURFACT employed in this Project Area Model include the following:

- BCF4 – The block center flow package available in SURFACT provides rigorous treatment of partially saturated flow using a variably saturated formulation with psuedo-soil functions. The BCF4 package is superior to earlier versions of block centered flow packages in handling dewatering and rewetting of cells within the model simulation. The formulation has been designed to provide accurate delineation of the water table and capture the delayed yield response of a partially saturated system to pumping and recharge.

- FWL4 – The SURFACT fracture well package provides rigorous treatment of well withdrawal (or injection) conditions using one-dimensional fracture tube elements to emulate a well. This package allows accurate representation of wells screened across multi-layers, apportioning flow based on transmissivity and available head in each layer. The package also automatically adjusts flow rate when over-pumpage of a partially saturated aquifer occurs to prevent dewatering of the aquifer and can also simulate well bore storage. This package couples with the BCF4 package previously described to define partially saturated flow behavior in well cells such that the water table condition within a well cell is accurately represented.

- ATO4 – This adaptive time stepping package provided with SURFACT automatically controls time step size and simulation output. This package allows a simulation to be performed more efficiently and outputs to be reported at specific desired times of the simulation.

- PCG5 – SURFACT includes the option of using this Preconditioned Conjugate Gradient solver.

A particle-tracking code was utilized that could readily incorporate information collected from the MODFLOW/SURFACT groundwater flow model. The code chosen was MODPATH, Version 3 (Pollock, 1994), which was designed to use the output head files from MODFLOW (or SURFACT) to calculate particle velocity changes over time in three dimensions. MODPATH was used to provide computations of groundwater seepage velocities and groundwater flow directions at the site. MODPATH is also a public domain code that is well accepted in the scientific community. Full documentation of the MODPATH code is provided in the MODPATH Users Guide (Pollock, 1994).

The pre/post-processor Groundwater Vistas (Environmental Simulations, Version 6, 2011) was used to assist with input of model parameters and output of model results. Groundwater Vistas serves as a direct interface with MODFLOW, SURFACT, and MODPATH. Groundwater Vistas provides an extensive set of tools for developing, modifying and calibrating numerical models and allows for ease of transition between the groundwater flow and particle tracking codes. Full description of the Groundwater Vistas program is provided in the Users Guide to Groundwater Vistas, Version 6.0 (Environmental Simulations, Version 6, 2011).

4.1 Model Domain and Grid

The model domain encompasses an area of nearly 242 square miles. The model was rotated approximately 36 degrees counter-clockwise with southwest-northeast and southeast-northwest dimensions of approximately 18.8 miles and 13.8 miles. The rotation was applied to align the strike of the PZA with the x-axis of the model. The Project Area is located in the central portion of the model domain. The boundaries of the model domain extend between 4.5 to 6.3 miles beyond the Project Area. The extent of the model domain is illustrated in Figure 7.

The model grid was designed to provide adequate spatial resolution within the Project Area in order to simulate response of the aquifer to typical extraction and injection rates anticipated for the Reno Creek uranium project. The model domain extends approximately five to ten miles beyond the production units to minimize impacts of exterior boundary conditions on the model solution in the area of interest.

Cell dimensions within the model domain range between 25 feet and 200 feet. Within the vicinity of the Project Area, grid cell size was reduced from the 200 foot cell size (which extends to the model boundary and composes the majority of model domain area) down to 25 feet across most of the Project Area. The model consists of 834 rows and 1,078 columns with one layer and contains 890,950 active cells (Figure 8).

The model layer represents the PZA, with no-flow boundaries above and below the aquifer that represent the overlying and underlying aquitard confining units. Based on the absence of any drawdown response in any adjacent aquifer or unit during pump testing activities, the simulation of the PZA as a single layer is reasonable.

The geologic data within the Project Area are based on a large number of site borings. The top structural elevation of the PZA within the model domain is presented in Figure 9, and the bottom structural elevation of the PZA is presented in Figure 10. There is a mudstone unit present in varying thicknesses across the site that locally reduces the overall permeability thickness of the PZA. Therefore, the single layer PZA represents the approximate net sand thickness of the aquifer, based on well log picks for the top and bottom of the PZA, and removal of the thickness of any significant mudstone units. To maintain a representative water level in the partially saturated portions of the site, the estimated mudstone thickness across the model domain was added to the base of the PZA. Outside of the Project Area an average thickness of approximately 110 to 120 feet is extrapolated to the model domain boundary. The structural dip from the base of the Felix Coal (Figure 6) was utilized to project the extent of the top and bottom contacts of the PZA outside of the Project Area. The outcrop of the Felix Coal, which lies within the overlying aquitard interval at Reno Creek, was identified in a regional study on the Felix Coal (Kent et al., 1988). The trace of that outcrop is shown on Figure 7.

Based on the approximate location of the Felix Coal outcrop, the base of the PZA should crop out within a few miles to the southeast (although this not been confirmed by field observation). The outcrop area of the PZA is an area of recharge in the model.

4.2 Boundary Conditions

Boundary conditions imposed on a numerical model define the external geometry of the groundwater flow system being studied as well as internal sources and sinks. Boundary conditions assigned in the model were determined from observed geologic conditions and assumptions based on the likely regional flow direction. Descriptions of the types of boundary conditions that can be implemented with the MODFLOW code are found in McDonald and Harbaugh (1988). Boundary conditions used to represent hydrologic

conditions at the Reno Creek site included general-head (GHB) and no-flow boundaries (NFB). The locations of the GHB boundary conditions are shown on Figure 7 that surrounds the model domain. Discussion of the placement and values for these boundary conditions is provided below. The well boundaries are described in the discussion of calibration and operation simulations.

GHBs were used in the Reno Creek Project Area model to account for inflow and outflow from the model domain. GHBs were assigned along the edges of the model domain where available water level data indicate the aquifer is being recharged from, or discharging to, a source external to the model domain. GHBs were used because the groundwater elevation at those boundaries can change in response to simulated stresses.

Based on the observed potentiometric flow direction to the northeast shown in Figure 3 and the outcrop trace shown in Figure 7, it is likely that the direction of groundwater flow will turn a more northerly direction as it will deflect away from the outcrop to the northeast. Lacking additional PZA potentiometric data outside of the project area, the regional potentiometric surface of the Tongue River Aquifer System (uppermost Fort Union Formation; approximately 500 to 600 feet below the PZA) shown in Figure 2.7.2-5 of the TR is a reasonable analog for regional groundwater flow in the PZA near the Reno Creek Project. Within the Tongue River Aquifer near Reno Creek, groundwater flows northeasterly from the higher recharge areas southwest of the site. For the Reno Creek groundwater model, the regional northeasterly gradient from recharge areas outside the model domain dominates flow across the site. Water enters the model system from the southwest along the southern and southwestern GHB boundaries. The southeastern GHB represents an area of recharge where the PZA crops out, and assigned water levels along this section are approximately five feet above the base of the PZA (approximately 5,065 feet amsl). This allows a minimum saturated thickness while reducing the potential for dry cells at the model edge. Potentiometric levels along the northeasterly GHB section are assigned in order to attempt to slightly “deflect” the potentiometric surface more towards the north, ranging from approximately 5,065 to 4,815 feet amsl. Potentiometric levels along the northwesterly (5,045 to 4,815 feet amsl), southwesterly (5,013 to 5,045 feet amsl), and southern GHB (5,065 to 5,013 feet amsl) were assigned based on an extrapolation of the observed potentiometric surface within the project area.

The heads in the GHBs at model boundaries were adjusted to achieve calibration of the model. Calibrations were also conducted with respect to the multi-well pump tests.

Groundwater Vistas allows the option of simulating wells using either the MODFLOW well package or as analytical elements. MODFLOW simulation of the wells using either method of input is the same. The analytical elements method was selected for this model mainly for the ease of interactively adjusting well locations and for importing large numbers of wells into the model from spreadsheets. Analytical element wells were used to simulate pump test wells and ISR injection and extraction wells.

Analytical element wells were also used to simulate well patterns of the ISR project. Within the production unit scale modeling of flare and excursion control, each individual injection and extraction well is represented to simulate operating conditions. Each well pattern is approximately 100 feet on a side which is four times the cell size in the area of the production units. For the regional modeling of drawdown associated with the Reno Creek Project, net extraction during production and restoration were assigned to analytical elements spaced approximately 200 feet apart within each of the 12 production units and accessory units. Specific rates applied to the wells varied according to the production/restoration schedule applied to the various operational simulations and are described under that section of this report.

The model domain was extended a suitable distance (five to ten miles) from the location of the proposed production units to minimize perimeter boundary effects on the interior of the model where the hydraulic stresses were applied.

4.3 Aquifer Properties

Input parameters used in the model to simulate aquifer properties are consistent with site-derived hydrologic data including; top and bottom elevations of the PZA, thickness of mudstone intervals, hydraulic gradient, hydraulic conductivity, and storativity. A determination of specific yield in the partially saturated portion of the site could not be made from the pump testing, but based on the 5-spot injection test results at Moore Ranch (located approximately 10 miles to the west-southwest), the values ranged from approximately 0.01 to 0.04 (Petrotek, 2008).

As previously discussed, the top and bottom elevations of the PZA and mudstone interval thicknesses within the Project Area were determined from site well log picks by AUC. Gridded contour maps were generated using the contouring program Surfer, Version 9.0 (Golden Software, 2009). The grid files were imported into Groundwater Vistas to represent the top and bottom elevations of the PZA (Figures 9 and 10). The initial potentiometric surface of the PZA was based on water level measurements conducted in August 2011, which is presented in Figure 3. The calibration target head values utilized in the model calibration are also shown on this figure. A contour map of that surface was generated in Surfer and then extended to the model domain boundary and used as initial conditions in the model simulations.

Hydraulic conductivity (K) determined from 2010 and 2011 pumping tests ranged from 0.3 to 13 ft/d for the PZA, depending on location (see Tables 2, 4, 6, and 8). The ranges of hydraulic conductivities determined from each of the pumping tests are summarized below.

- PZM1: 4 to 6 ft/d
- PZM3: 5 to 8 ft/d
- PZM4: 0.6 to 2 ft/d
- PZM5: 0.4 to 0.8 ft/d

Based on pump test results, higher K values were generally assigned in the eastern portion of the site (PZM3 and PZM1 areas) than the western portion of the site (PZM4 and PZM5 areas). Zones of hydraulic conductivity were setup to facilitate calibration of the model. Parameter values were maintained within the general range exhibited in the pumping tests (0.4 to 6.0 ft/day). The areas outside of the Project are assigned a conductivity of 1.0 ft/day, which is a representative approximation for ISR sites in this portion of the Powder River Basin. The final calibrated hydraulic conductivity zonation is shown on Figure 11.

Storativity and specific yield are also aquifer properties of interest with respect to the response of an aquifer to extraction or injection. MODFLOW utilizes the storativity term for model input. Storativity, or specific storage multiplied by aquifer thickness, is a measure of the water released from storage due to compaction of the aquifer and expansion of water in response to a decline in head. Storativity is the storage term used for confined (fully saturated) aquifers, where lowering of the potentiometric surface in response to pumping does not result in physical dewatering of the aquifer. Storativity of a confined (fully saturated) aquifer system is typically in the range of $5x10^{-3}$ to 10^{-6} or less. The range of storativity calculated from site pumping tests was from approximately $6x10^{-5}$ to $8.7x10^{-4}$ in the fully saturated areas of pumping testing, and between $1x10^{-5}$ to $5x10^{-3}$ in the two partially saturated pump test areas. Specific yield is the volume of water that drains from a saturated rock under gravity and is the storage term utilized for partially saturated aquifers and typically ranges from 0.01 to 0.30 (Freeze, 1979). The value of specific yield utilized during these simulations range from 0.013 to 0.015. The final calibrated storativity and specific yield zonation is shown on Figure 12.

5 Model Calibration

Groundwater flow model calibration is an integral component of groundwater modeling applications. Calibration of a numerical groundwater flow model is the process of adjusting model parameters to obtain a reasonable match between field measured values and model predicted values of heads and fluxes (Woessner and Anderson, 1992). The calibration procedure is generally performed by varying estimates of model parameters (hydraulic properties) and/or boundary condition values from a set of initial estimates until an acceptable match of simulated and observed water levels and/or flux is achieved. Calibration can be accomplished using trial and error methods or automated techniques (often referred to as inverse modeling).

The focus of calibration is two-fold and initially involves a best-fit match to static water level conditions utilizing the general head boundaries and minor adjustments on hydraulic conductivity zones within the project area. In order to assess fluid movement on a production unit scale, calibration is also conducted based on the observed drawdown responses during pump testing. The variables utilized during pump test calibration were conductivity, storativity (in fully saturated areas), and specific yield (in partially saturated areas).

The adequacy of model calibration is judged by examining model residuals. A residual, as defined for use in this modeling report, is the difference between the observed change in groundwater elevation and the change in groundwater elevation predicted by the model. The objective of model calibration should be the minimization of the residual mean, residual standard deviation, and residual sum of squares (RSS) (Duffield, et al, 1990). The mean residual is the arithmetic average of all the differences between observed and computed water levels. A positive sign indicates that the model has underpredicted the observed drawdown level and a negative sign indicates overprediction. The residual standard deviation quantifies the spread of the differences between observed and predicted drawdown around the mean residual. The ratio of residual standard deviation to the total head change across the model domain should be small, indicating the residual errors are only a small part of the overall model response (Woessner and Anderson, 1992). The RSS is computed by adding the square of each residual and is another measure of overall variability. For a statistically accurate model calibration, the residuals and the statistics based on the residual should approach zero.

5.1 Steady-State Calibration

Calibration was achieved by comparing field-measured (observed) water levels in the baseline monitor wells with heads predicted by MODFLOW-SURFACT for the same wells under simulated steady state conditions of the PZA. The hydraulic conductivity zones were adjusted within the range of observed conductivities in the Project Area and GHB heads were adjusted until the best fit to the average potentiometric surface observed in the baseline monitor wells was achieved. The calibrated potentiometric surface for the PZA over the entire model domain is shown on Figure 13. Figure 14 shows the calibrated potentiometric surface at the Project Area boundary, and calibration target heads and residuals. Figure 15 presents a plot of observed versus simulated heads from this calibration. Table 9 summarizes the head calibration residuals and calibration statistics from the steady state simulation.

Based on the calibration to the observed potentiometric surface at the site, the calibration simulation is representative of groundwater flow conditions at the site. The calibrated hydraulic gradient across the site is approximately 0.0027 ft/ft, which matches the average gradient observed across the site based on the August 2011 potentiometric surface in Figure 3. Calibration residuals compared well in the western portion of the project area and were below ± 1.3 foot (Figure 14). In the central portion of the site, simulated heads were consistently lower than observed heads, between 0.8 to 4.5 feet at wells PZM17, PZM16, and PZM15. This portion of the project area is located in an area where there is a potentiometric elevation difference between the upper and lower portions of the PZA (approximately four feet near well PZM4D), and therefore this may be a more complicated portion of the site to characterize. In the eastern portion of the project, simulated heads at PZM14 and PZM12 are within ± 1.0 foot. At PZM1 and PZM2, simulated heads are between 3.1 to 5.7 feet higher than observed (Figure 14).

Based on the results of the steady state calibration, the majority of groundwater entering the model domain originates from the southwest, in agreement with the conceptual model for the PZA at Reno Creek. Approximately 85% of inflowing groundwater (approximately 120 gpm) occurs along the southern and southwestern GHB boundaries, and the remaining (approximately 21 gpm) occurs along the southeastern GHB and along the southernmost portion of the northeastern GHB boundary (see Figure 7), which represents recharge at outcrop.

5.2 Transient Calibration/Verification

For the purposes of these modeling simulations, the PZA is treated as a single layer. The steady-state calibrated model was calibrated to three pumping tests conducted by AUC in 2010 and 2011. These include the PZM1 and PZM3 well cluster tests conducted in the partially saturated portion of the project area, and the PZM5 well cluster test conducted in the fully saturated portion of the project area (Figure 4). Calibration to the multi-well pump test conducted at the PZM4 cluster area in the central portion of the project was not conducted due to the more complex hydrology observed at this location. Further characterization of the hydrologic conditions in this portion of the project area will be accomplished during production-unit scale testing.

Observation wells monitored during pump testing were utilized as calibration targets for drawdown. Because the cell sizes within the areas of pump test calibration are 25 feet by 25 feet, the drawdown in the pumping well was not included in the calibration statistics. Factors such as well inefficiency (especially in the unsaturated portion at PZM1 and PZM3) and the apparent steepness of the drawdown cone in the immediate vicinity of the well would make inclusion of the pumping well drawdown of negligible value for model calibration.

Calibration was achieved by varying the specific yield and storativity zone values and the hydraulic conductivity zones. Whenever changes were made to hydraulic conductivity zones, the initial steady-state model was rerun to determine if additional changes had to be made to that base model. The process was repeated until a satisfactory calibration was achieved. Figures 11 and 12 show the final zone values for hydraulic conductivity and storativity and specific yield, respectively. The following details the pump testing conducted and the results of pump test calibration.

<u>PZM1 Pump Test Calibration</u>

Well PZM1 was pumped at a constant average rate of 8.9 gallons per minute (gpm) for 2,595 minutes (1.802 days). The following table details the distance of each observation well to the pumping well, observed drawdown, simulated drawdown, and the calibration residual. Figure 16 shows the simulated drawdown contour map for this pump test, and the target drawdown values and calibration residuals posted on this figure as well.

PZM1 Pump Test Calibration Data Summary				
Obs. Well Name	Distance from Pump Well (feet)	Observed Drawdown at Shut-In (feet)	Simulated Drawdown (feet)	Calibration Residual (feet)
PZM9	58	1.4	1.7	-0.27
PZM8	81	1.6	1.2	0.40
PZM10	235	0.5	0.33	0.16

The distance-drawdown response of wells PZM9 and PZM8 indicates that there is heterogeneity within the PZA that is affecting the hydraulic response to pumping, as PZM8 (located 23 feet further from the pumping well than PZM9) had a drawdown response greater than PZM9. The calibration to this pump test utilizes a single zone of conductivity and specific yield; therefore the modeled drawdown response will be more or less symmetrical. The goal of this calibration was to attempt to balance the calibration residuals between PZM8 and PZM9 and to get relatively close to the level of drawdown observed at the distant observation well. Specific yield was the more sensitive parameter in the calibration, and a value of 0.013 was utilized in conjunction with a conductivity value of 2.6 ft/day. The relatively low specific yield value is in the range observed from the Moore Ranch 5-Spot Injection Test results (Petrotek, 2008). The calibrated conductivity value of 2.6 ft/day was slightly lower than the observed conductivities from testing, but within the range of an expected value in this area of the project.

The simulated maximum drawdown at the pumping well was 4.1 feet, which is approximately 9% of the drawdown measured in the pumping well (46.8 feet, see Table 1). Although the 25 foot cell size in the area reduces the accuracy of the simulated drawdown in the pumping well, the relatively good calibration of the model to the three observation wells suggest that the pumping well is highly inefficient at this location, and that the observed drawdown in the pumping well is not representative of actual drawdown in the aquifer outside of the borehole (due to completion/development issues or skin effects). An examination of the drawdown responses without this consideration would lead one to conclude that the drawdown cone around the pumping well is much greater than it actually is. The results of this model simulation do not support a conclusion that the aquifer may be close to dewatering under ISR operating conditions. Rather, the results indicate that with efficient well completion, a pumping rate of 20 gpm at a single well (design rate in the partially saturated areas of the project) can be achieved with approximately 13 feet of drawdown (pumping duration of 1 month).

PZM3 Pump Test Calibration

Well PZM3 was pumped at a constant average rate of 9.9 gpm for 4,149 minutes (2.88 days). The following table details the distance of each observation well to the pumping well, observed drawdown, simulated drawdown, and the calibration residual. Figure 17 shows the simulated drawdown contour map for this pump test, and the target drawdown values and calibration residuals posted on this figure as well.

PZM3 Pump Test Calibration Data Summary				
Obs. Well Name	Distance from Pump Well (feet)	Observed Drawdown at Shut-In (feet)	Simulated Drawdown (feet)	Calibration Residual (feet)
PZM11	52	3.1	2.63	0.43
PZM12	102	1.5	1.98	-0.47
PZM13	199	0.7	0.80	-0.08

As was the case with the PZM1 test, the observed drawdown response is not symmetrical. The goal of this calibration was to minimize the calibration residuals of the observation wells. Specific yield was the most sensitive parameter, and a value of 0.014 was utilized in conjunction with a conductivity value of 1.65 ft/day. The relatively low specific yield value is in the range observed from the Moore Ranch 5-Spot Injection Test results (Petrotek, 2008). The conductivity value of 1.65 ft/day was slightly lower than the calculated conductivities from testing, but within the expected range in this area of the project.

The modeled maximum drawdown at the pumping well was 6.0 feet, which is approximately 19% of the observed drawdown of 32.1 feet at this well (see Table 3). Similar to the PZM1 pumping well, the PZM3 pumping well appears to be highly inefficient and the drawdown observed in the pumping well is not believed to represent aquifer conditions outside of the wellbore.

PZM5 Pump Test Calibration

Well PZM5 was pumped at a constant average rate of 10 gpm for 11,393 minutes (7.91 days). The following table details the distance of each observation well to the pumping well, observed drawdown, simulated drawdown, and the calibration residual. Figure 18 shows the simulated drawdown contour map for this pump test, and has the target drawdown values and calibration residuals posted on this figure as well.

PZM5 Pump Test Calibration Data Summary				
Obs. Well Name	Distance from Pump Well (feet)	Observed Drawdown at Shut-In (feet)	Simulated Drawdown (feet)	Calibration Residual (feet)
PZM20	499	11.7	11.7	0.04
PZM19	1,048	4.3	3.95	0.43
PZM18	2,085	0.8	1.65	-0.83
PZM6	2,696	0.9	0.87	0.05

The PZM5 pumping test included observation wells at much greater distances than the other two tests. As a result, additional hydraulic conductivity and storativity zones were added to achieve an adequate calibration to the observed drawdown data from the PZM5 pump test. Simulated zones of conductivity and storativity are illustrated on

Figures 11 and 12, respectively. Simulated conductivities were 0.16 ft/day near the pumping well and PZM20, and 0.85 ft/day in the zone encompassing PZM19 and PZM18, and 1.2 ft/day in the zone north and west of the pumping well. Storativity values for these zones were $5x10^{-5}$, $2.2x10^{-4}$, and $3.0x10^{-4}$, respectively. Drawdown calibration residuals from the pump test calibration were all within less than ± 1.0 feet.

The modeled maximum drawdown at the pumping well was 75.1 feet (observed drawdown was 102.1 feet), which appears to indicate that this pumping well is more efficient than observed at PZM1 and PZM3.

6 Operational Simulations

This numerical groundwater flow model was developed to evaluate the impacts of ISR operations on the PZA during projected ISR recovery and groundwater restoration operations. Simulations were performed using the numerical and are described in this section to provide:

- An evaluation of production unit flare;
- Demonstration that proposed monitor well spacing (400 feet in partially saturated area; 500 feet in fully saturated project area) is adequate to detect a potential horizontal excursion in the PZA;
- Demonstration that an excursion can be hydraulically controlled at the monitor well ring for partially and fully saturated production units; and,
- Demonstration of the hydraulic impacts that the ISR operation will have on the PZA, including the sustainability of anticipated production and restoration rates and anticipated regional drawdown based on the proposed maximum extraction rate of 11,000 gpm.

6.1 Initial Conditions

The initial condition for these simulations was based on the simulated steady-state calibrated potentiometric surface, which matches the average hydraulic gradient observed across the project area (Figures 13 and 14). As previously stated, the hydraulic conductivity, storativity, specific yield, and the GHB heads were adjusted to provide a reasonable match to potentiometric surface data representative of steady-state conditions. The initial condition and model input values were iteratively updated based on the calibration to the three pump tests. This final calibrated model was then used to simulate operating conditions for the Reno Creek uranium ISR project.

6.2 Flare Factor, Excursion Recovery, and Monitoring Well Spacing Evaluations

Production Unit 12 (Fully Saturated)

Flare

Production Unit 12 (PU12) in the northwestern corner of the site was chosen to conduct a horizontal production unit flare calculation, and to demonstrate excursion recovery and the adequacy of 500 foot perimeter monitoring well locations at this production unit (see Figure 2). PU12 has six 500 by 600 foot header house patterns proposed across the ore body at this location. The PU12 design includes 237 injection wells and 180 extraction wells, with the extraction wells producing at 20 gpm. A 1% bleed, which is proposed across the entire site, is utilized in this production unit simulation. Based on a 1% bleed, the extraction wells operate at a total of 3,600 gpm and the injection wells introduce 3,564 gpm of fluid. Injection wells surrounded on all sides by extraction wells inject at 19.9 gpm. Injection wells on the perimeter inject less, depending on the number of extraction wells immediately adjacent to these well. Injection wells with three extraction neighbors inject at 14.9 gpm, wells with two extraction well neighbors inject at 9.9 gpm, and injection wells at the corners (single neighboring extraction well) inject at 5.0 gpm.

Particle tracking was implemented using the MODPATH code to evaluate groundwater flowpaths during the production unit flare and excursion recovery simulations. Particles were placed around each injection well at the perimeter of the production unit. The simulation was run at 1% bleed for two years, and the particles were tracked. In plan view, the surface area circumscribing the outermost particle traces was calculated, and divided by the area of PU12 to determine horizontal production unit flare. Horizontal production unit flare at PU12 was calculated to be 1.14 (see Figure 19). This horizontal flare factor is similar to the typical value of 1.2 presented in ISR license and permit applications. Although not simulated in this model, vertical flare should be less than horizontal flare due to the anisotropy within the PZA with respect to hydraulic conductivity (i.e., conductivity in the horizontal direction is greater than vertical conductivity).

Excursion Recovery

To demonstrate that the perimeter monitor well spacing of 500 feet from the production unit and 500 feet between monitor wells is adequate to detect a potential excursion, a hypothetical scenario was simulated within the production unit model. As seen in Figure 20, the two extraction wells at the upper northeast corner are shut off, producing a hydraulic gradient away from the production unit. Particles were installed around the four outside injection wells at the location of the shut-in extraction wells corner, and the flowpaths were evaluated (see Figure 21). Based on this simulation, the majority of flow particles moves beyond the production unit and intersect several perimeter monitor

wells. Figure 22 shows the groundwater velocity vectors, indicating a direction of flow toward the northeast in the vicinity of this simulated “out-of-balance” simulation.

Recovery of the hypothetical excursion was simulated to demonstrate that groundwater at the monitor well ring at a distance of 500 feet can be hydraulically controlled from the production unit. As shown in Figure 23, the four corner injection wells are turned off, and the two extraction wells that were previously shut off are pumped at the 20 gpm design rate. The simulated potentiometric surface represented in Figure 23 is at a time of approximately 6 hours after initiation of the excursion recovery. Figure 24 shows that hydraulic control of groundwater is established at the monitor well ring by the reversal of the velocity vectors back towards the production unit.

Production Unit 6 (Partially Saturated)

Flare

Production Unit 6 (PU6) in the northeastern corner of the site was chosen to conduct a horizontal production unit flare calculation, and to demonstrate excursion recovery and the adequacy of 400 foot perimeter monitoring well locations in the partially saturated portion of the site (see Figure 2). PU6 has six 500 by 600 foot header house patterns proposed across the ore body at this location. There are 240 injection wells and 180 extraction wells, with the extraction wells producing at 20 gpm. A 1% bleed, which is proposed across the entire site, is utilized in this production unit simulation. Based on a 1% bleed, the extraction wells operate at a total production of 3,600 gpm and the injection wells introduce 3,564 gpm of fluid. Injection wells surrounded on all sides by extraction wells inject at 19.8 gpm, wells three extraction neighbors inject at 14.9 gpm, wells with two extraction neighbors inject at 9.9 gpm, and injection wells at the corners inject at 5.0 gpm.

Particles are placed around each outlying injection well around the perimeter of the production unit. The production unit simulation was run at 1% bleed for two years, and the particles were tracked. The surface area circumscribing the outermost particle traces was calculated, and divided by the area of the PU6 to determine horizontal production unit flare. Horizontal production unit flare at PU6 was calculated to be 1.15 (see Figure 25). Although not simulated in this model, vertical flare should be less than horizontal flare due to the anisotropy within the PZA with respect to hydraulic conductivity (i.e., conductivity in the horizontal direction is greater than vertical conductivity).

Excursion Recovery

To demonstrate that the perimeter monitor well spacing of 400 feet from the production unit and 400 feet between monitor wells is adequate to detect a potential excursion, a hypothetical scenario was simulated within the production unit model. As seen in Figure 26, an “out-of-balance” scenario was created when the two extraction wells at the upper northeast corner are shut off, producing a hydraulic gradient away from the production unit. Particles were placed around the three injection wells at the location of the shut-in

extraction wells, and the flow paths were evaluated (see Figure 27). Based on this simulation, many of the flow particles move beyond the production unit and intersect several perimeter monitor wells. Figure 27 and 28 show the potentiometric surface and groundwater velocity vectors, respectively, indicating a direction of flow toward the northeast near this simulated "out-of-balance" simulation.

Recovery of the hypothetical excursion was simulated to demonstrate that groundwater at the monitor well ring can be hydraulically controlled from the production unit at a distance of 400 feet. As shown in Figure 29, the three corner injection wells are turned off, and the two extraction wells that were previously shut off are turned on and set to pump at the 20 gpm design rate. The potentiometric surface represented in Figure 29 is at a time of 1.7 days after initiation of the excursion recovery. Figure 30 shows that hydraulic control of groundwater is established at the monitor well ring by the reversal of velocity vectors back towards the production unit.

6.3 Regional Drawdown and Life of Mine Simulations

A preliminary production unit operational schedule was developed by AUC for a 13 year period for production and restoration at the 12 production units and accessory units. Table 10 illustrates the projected production rates assuming a 1% bleed (overproduction). This production schedule is based upon the proposed maximum extraction rate of 11,000 gpm for the project area, which represents an upper bound of expected production at Reno Creek. Table 11 presents a chart detailing the preliminary operation schedule for the Reno Creek ISR Project, which is subject to change. When restoration occurs concurrently with production elsewhere in the project area, the restoration bleed utilizing the proposed secondary reverse osmosis unit is 3%. After the end of production, the assumed restoration bleed is 9% (years 12 to 13).

This schedule is tentative and is provided as a means of estimating regional drawdown with respect to the Project Area and maximum projected production volumes. No attempt was made to analyze or adjust individual production unit rates in order to ensure water balance between potentially competing production units. Production unit balancing will be more rigorously applied on the scale of header houses and individual well patterns during actual operations to maintain hydraulic control of production and restoration fluids.

Net withdrawal is assigned across the individual production units by wells spaced at approximately 200 foot centers. Maximum proposed production is approximately 11,000 gpm during year seven (Table 10).

Figure 31 shows the simulated drawdown after year seven of production (maximum annual production rate). The maximum observed drawdown near the center of the Project Area is approximately 35 feet. The five foot drawdown contour extends approximately 3 miles north of the project boundary. The area of fully saturated model cells is also shown on Figure 31 and can be compared to the initial conditions and area

of fully saturated cells in Figure 13, showing the small change in the area of partial saturation.

Figure 32 shows the regional drawdown after year 11 (last full year of production) and the area of fully saturated cells at the end of the simulated production. Based on the shape of the drawdown contours in Figure 32, the distant drawdown is encountering a positive boundary at the northwestern GHB. It is likely that without this boundary condition, the 5 foot drawdown contour might extend to the northwestern model domain boundary. Maximum drawdown near PU10, which is under restoration (3% bleed), is approximately 35 feet. In Figure 33, after year 13 and the end of groundwater restoration, the five foot contour has spread farther laterally and would likely extend to the model domain boundary or slightly beyond. Five years after the end of restoration, residual drawdown within and around the project area ranges from approximately 7 to 11 feet (Figure 34).

A more detailed evaluation of drawdown is presented in Figures 35 and 36 that show annual simulated drawdown contour maps for years 2 to 7 and years 8 to 13, respectively. Observation wells were placed in the center of each of the 12 production units and accessory units to monitor drawdown through time over the course of the ISR operations simulation. Simulated drawdown hydrographs for these wells for each year of the simulation for production units 1 to 4A are presented on Figure 37. Figures 38 and 39 present these drawdown hydrographs for production units 5 to 7A and production units 8 to 12A. Table 12 presents the maximum simulated drawdown for each production unit and the respective year it occurs in the simulation. The maximum simulated drawdown occurs during both the production and restoration phases for the production units. The maximum drawdown for production units 2, 3, 4, 7, 8, 9, 10, and 12A, occurs during the simulated production at these units, while maximum drawdown at unit 1 occurs during production at nearby units. The maximum drawdown for production units 4A, 5, 6, 7A, 11, and 12 occurs during the restoration phase. In the fully saturated production units (1 to 4A and 8 to 12A), maximum drawdown ranges from approximately 20 feet (production unit 4A) to 55 feet (production unit 10). At production unit 10, this level of drawdown lowers the water level in the aquifer to several feet above the top of the PZA, but the aquifer remains saturated. In the partially saturated production units (5 to 7A), maximum simulated drawdown ranges from approximately 19 to 34 feet.

Monitor wells were also placed at five locations around the project area to monitor impacts at the permit boundary (see Figures 31 to 34 for locations) and hydrographs at these locations through time are presented in Figure 40 to 44. At the northwest project boundary well, maximum simulated drawdown is approximately 32 feet, declining to approximately six feet five years after the end of restoration. At the north-central monitor well, drawdown ranges from approximately 16 to 22 feet from years four to fourteen, and declines to approximately eight feet five years after the end of restoration. At the northeast monitor well, maximum drawdown is approximately nine feet and declines to approximately eight feet five years after restoration is complete. At the southeast monitor well, drawdown reaches a maximum of approximately eight feet at

the end of production and declines to approximately seven feet after restoration is complete. At the southwest monitor well, maximum drawdown is approximately seventeen feet during production, and declines to approximately seven feet five years after the completion of restoration.

7 Summary

A numerical groundwater model was developed to evaluate the response of the PZA to hydraulic stresses imposed by operation of the Reno Creek ISR uranium project. The model was developed using site-specific data regarding top and bottom aquifer elevations and net sand thickness, saturated thickness, potentiometric surface and hydraulic gradient, hydraulic conductivity, specific yield, storativity and porosity of the PZA. The model was calibrated to static potentiometric conditions and to three pumping tests.

The calibrated model was used to simulate the complete operational cycle of the Reno Creek ISR uranium project (based on the maximum proposed extraction rate of approximately 11,000 gpm), from production through restoration. Detailed production unit scale simulations were conducted in both the fully saturated and partially unsaturated portions of the project. Simulations were run utilizing a 1% production bleed and restoration bleed between 3% - 9%. Results of the modeling indicate the following.

- Monitoring well spacing of 400 feet from the production unit is adequate for purposes of monitoring and for recovery of a potential excursion during ISR operations in the partially saturated portion of the project.
- Monitoring well spacing of 500 feet from production unit is adequate for purposes of monitoring and for recovery of a potential excursion during ISR operations in the fully saturated portions of the project.
- Simulated production at the maximum projected rates of up to 11,000 gpm with a 1.0 percent bleed for a period of several years did not result in dewatering of the aquifer or excessive drawdown outside the project area.
- Large drawdown values observed in the pumping wells during tests in the partially saturated portion of the site (e.g., PZM1 and PZM3 pump tests) are likely the result of low well efficiencies and are not indicative of dewatering in the aquifer.
- Simulated drawdown of approximately 5 feet or more extends several miles beyond the Project Area in response to ISR operations. Much of the drawdown extends into the fully saturated and more confined portions of the PZA where there is greater available head. Results are based on the maximum proposed extraction volume of 11,000 gpm; actual volumes during production and restoration could be less and therefore the regional drawdown represents a conservative evaluation of regional impacts.
- Based on the available head in the PZA, a drawdown of 5 feet is not considered to adversely impact offsite groundwater users.

- Simulated horizontal production unit flare in the fully saturated project area and the partially saturated area were 1.14 and 1.15, respectively. These values are lower than the production unit flare factor (1.2) typically presented in ISR permit and license applications. Although not simulated in this model, vertical flare should be less than horizontal flare due to the anisotropy within the PZA with respect to hydraulic conductivity (i.e., Kh > Kv).

8 References

Duffield, G.M., D.R. Buss, and D.E. Stephenson. 1990. Velocity prediction errors related to flow model calibration uncertainty, *In*: *Calibration and Reliability in Groundwater Modeling* (K. Kovar, ed.), IAHS Publication 195, pp. 397-406.

Environmental Simulations, Inc. 2011. Guide to Using Groundwater Vistas, Version 6. pp 213. Prepared by Environmental Simulations, Inc., Reinholds, VA

Golden Software, Inc., 2009. *Surfer 9, Contouring and 3D Surface Mapping for Scientists and Engineers*. Golden, CO

Hydrogeologic, Inc., 1996. MODFLOW-Surfact Software (Version 2.2). Documentation – Users Manual. Prepared by Hydrogeologic, Herndon, VA.

Hydrogeologic, Inc., 2006. MODFLOW-Surfact Software (Version 3.0). Documentation – Users Manual. Prepared by Hydrogeologic, Herndon, VA.

Kent, B.H., et al., 1988. Geology and Resource Appraisal of the Felix Coal Deposit, Powder River Basin Wyoming: A Research Project with the People's Republic of China. U.S. Geological Survey Bulletin 1818.

McDonald, M.G., and A.W. Harbaugh. 1988. *MODFLOW, A Modular Three-Dimensional Finite Difference Flow Model*. Techniques of Water-Resources Investigations, Book 6, Chapter A1. U.S. Geological Survey.

McDonald, M.G., and A.W. Harbaugh. 1996. *User's Documents for MODFLOW-96, an update to the U.S. Geological Survey modular finite difference ground-water flow model*. Open-File Report 96-485, U.S. Geological Survey.

Petrotek, 2008. Numerical Modeling of Groundwater Conditions Related to Insitu Recovery at the Moore Ranch Uranium Project, Wyoming.

Pollack, D.W. 1994. *Users Guide for MODPATH/MODPATH-PLOT, Version 3: A particle tracking post-processing package for MODFLOW, the U.S. Geological Survey finite-difference ground-water flow model*. Open-File Report 94-464. U.S. Geological Survey, Reston, VA.

Woessner, W.W. and M.P. Anderson. 1992. *Selecting Calibration Values and Formulating Calibration Targets for Ground-Water Flow Simulations*, proceedings of the NWWA Conference on Solving Ground-Water Models.

Table 1. PZM1 Pump Test Drawdown Results Summary
Reno Creek ISR Project

Well Name	Well Type	Monitored Sand	Distance from PW (feet)	Observed Drawdown at Shut-in (feet)
PZM1	Pumping	Production Zone Aquifer	0	46.8
PZM9	Observation	Production Zone Aquifer	58	1.4
PZM8	Observation	Production Zone Aquifer	81	1.6
PZM10	Observation	Production Zone Aquifer	235	0.5
OM1	Observation	Overlying Aquifer	34	No Response
UM1	Observation	Underlying Aquifer	48	No Response

Notes:
Drawdown is calculated from BP corrected water level data.

Table 2. PZM1 Pump Test Analytical Results Summary
Reno Creek ISR Project

Well Name	Well Type	Distance from PW (feet)	Theis Drawdown, Jacob Corrected			Theis Recovery	
			T (ft^2/d)	K (ft/d)	S	T (ft^2/d)	K (ft/d)
PZM1	Pump	0	--	--	--	389	4.1
PZM9	Obs.	58	427	4.5	5.0E-03	469	5.0
PZM8	Obs.	81	559	5.9	6.0E-04	586	6.2
PZM10	Obs.	235	694	7.4	3.2E-03	710	7.6
		Averages:	**560**	**6.0**	**2.9E-03**	**588**	**6.3**

Notes:
Hydraulic conductivity (K) based on 94 ft saturated PZM aquifer thickness.
Drawdown data from PZM1 could not be analyzed.
Jacob correction ($s' = s - s^2/2B$; s = drawdown, B = saturated thickness, s' = corrected drawdown) for partially saturated conditions applied to Theis drawdown data.
Theis recovery analysis conducted assuming saturated conditions. Late-time data were evaluated for recovery.

Table 3. PZM3 Pump Test Drawdown Results Summary
Reno Creek Project

Well Name	Well Type	Monitored Sand	Distance from PW (feet)	Observed Drawdown at Shut-in (feet)
PZM3	Pumping	Production Zone Aquifer	0	32.1
PZM11	Observation	Production Zone Aquifer	52	3.1
PZM12	Observation	Production Zone Aquifer	102	1.5
PZM13	Observation	Production Zone Aquifer	199	0.7
SM3	Observation	Water Table	37	No Response
OM3	Observation	Overlying Aquifer	41	No Response
UM3R	Observation	Underlying Aquifer	60	No Response

Notes:
Drawdown is calculated from BP corrected water level data.

Table 4. PZM3 Pump Test Analytical Results Summary
Reno Creek ISR Project

Well Name	Well Type	Distance from PW (feet)	Theis Drawdown, Jacob Corrected			Cooper Jacob Drawdown, Jacob Corrected			Theis Recovery	
			T (ft^2/d)	K (ft/d)	S	T (ft^2/d)	K (ft/d)	S	T (ft^2/d)	K (ft/d)
PZM3	Pump	0	--	--	--	--	--	--	588	5.4
PZM11	Obs.	52	587	5.4	1.0E-05	535	4.9	2.7E-05	748	6.9
PZM12	Obs.	102	830	7.6	2.0E-04	841	7.7	1.9E-04	748	6.9
PZM13	Obs.	199	1327	12.2	8.3E-04	1428	13.1	6.2E-04	1131	10.4
		Averages:	**914**	**8.4**	**3.5E-04**	**934**	**8.6**	**2.8E-04**	**804**	**7.4**

Notes:
109 ft saturated PZM aquifer thickness.
Drawdown data from PZM3 could not be analyzed.
Jacob correction for partially saturated conditions applied to Theis drawdown data.
Theis recovery analysis conducted assuming confined conditions. Late-time data were evaluated for recovery.

Table 5. PZM4D Pump Test Drawdown Results Summary
Reno Creek ISR Project

Well Name	Well Type	Monitored Zone	Distance from PW (feet)	Observed Drawdown at Shut-in (feet)
PZM4D	Pumping	Lower Production Zone Aquifer	0	119.2
PZM16	Observation	Lower Production Zone Aquifer	1,288	1.2
PZM15	Observation	Lower Production Zone Aquifer	1,771	4.5
PZM17	Observation	Production Zone Aquifer	2,827	0.3
PZM14	Observation	Production Zone Aquifer	6,178	No Response
PZM4	Observation	Upper Production Zone Aquifer	57	0.6
OAM4S	Observation	Upper Felix Coal	45	No Response
OAM4D	Observation	Lower Felix Coal	19	No Response
OM4	Observation	Overlying Aquifer	69	No Response
UM4	Observation	Underlying Aquifer	34	No Response

Notes:
Drawdown is calculated from BP corrected water level data.

Table 6. PZM4D Pump Test Analytical Results Summary
Reno Creek ISR Project

Well Name	Well Type	Distance from PW (feet)	Theis Drawdown			Theis Recovery	
			T (ft^2/d)	K (ft/d)	S	T (ft^2/d)	K (ft/d)
PZM4D	Pump	0	--	--	--	31	0.3
PZM16	Obs.	1,288	229	2.3	8.7E-04	286	2.9
PZM15	Obs.	1,771	57	0.6	1.3E-04	63	0.6
PZM17	Obs.	2,827	--	--	--	--	--
		Averages:	**143**	**1.4**	**5.0E-04**	**126**	**1.3**

Notes:
98.75 ft saturated PZM aquifer thickness.
Drawdown data from PZM4 could not be analyzed.
Drawdown analysis performed on data from 0 - 8,375 minutes prior to pump problems.
Unable to perform analysis of PZM17 with any level of certainty.
Theis recovery analyses are based on an average test rate of 14.1 gpm which includes pump problems.

Table 7. PZM5 Pump Test Drawdown Results Summary
Reno Creek ISR Project

Well Name	Well Type	Monitored Sand	Distance from PW (feet)	Observed Drawdown at Shut-in (feet)
PZM5	Pumping	Production Zone Aquifer	0	102.1
PZM20	Observation	Production Zone Aquifer	499	11.7
PZM19	Observation	Production Zone Aquifer	1,048	4.3
PZM18	Observation	Production Zone Aquifer	2,085	0.8
PZM6	Observation	Production Zone Aquifer	2,696	0.9
BLM ANCVS	Observation	Production Zone Aquifer	4,026	0.2
SM5	Observation	Water Table	30	No Response
OM5	Observation	Overlying Aquifer	41	No Response
UM5	Observation	Underlying Aquifer	31	No Response
UM6	Observation	Underlying Aquifer	31	No Response

Notes:
Drawdown is calculated from BP corrected water level data.

Table 8. PZM5 Pump Test Analytical Results Summary
Reno Creek ISR Project

Well Name	Well Type	Distance from PW (feet)	Completed Thickness	Drawdown, Leaky (Hantush-Jacob)			Drawdown (Cooper-Jacob)			Theis Recovery	
				T (ft^2/d)	K (ft/d)	S	T (ft^2/d)	K (ft/d)	S	T (ft^2/d)	K (ft/d)
PZM5	Pump	0	132	--	--	--	--	--	--	61.8	0.5
PZM20	Obs.	499	47	20.2	0.4	7.9E-05	26.7	0.6	6.5E-05	31.0	0.7
PZM19	Obs.	1,048	56	26.0	0.5	1.1E-04	Not Valid	Not Valid	Not Valid	47.0	0.8
Averages:				**23**	**0.4**	**9.4E-05**	**27**	**0.6**	**6.5E-05**	**NA**	**0.7**

Notes:
Pumping rate for PZM5 well is 10 gpm; 7 gpm flow apportioned for wells PZM20 and PZM19, which are completed in lower sand of PZM. Pumping well completed across
Cooper-Jacob requirement for $u < 0.05$ not met at well PZM19, therefore solution not valid.
Hydraulic conductivity values based on completed sand thickness.

Table 9. Calibration Statistics, Steady State Simulation, Reno Creek Simulation Model

Calibration Statistic	Layer 1
Residual Mean	-0.22
Absolute Residual Mean	1.72
Residual Standard Deviation	2.42
Sum of Squares	70.91
Residual Mean Squared Error	2.43
Minimum Residual	-5.72
Maximum Residual	4.48
Number of Observations	12
Range in Observations	53.5
Scaled Standard Deviation	0.045
Scaled Absolute Mean	0.032
Scaled Residual Mean Squared	0.045

Target ID	Easting (ft)	Northing (ft)	Observed Head* (ft amsl)	Simulated Head (ft amsl)	Residual (ft)
PZM1	380207	1095947	4939.1	4944.8	-5.7
PZM2	378414	1092328	4951.8	4954.9	-3.1
PZM5	362105	1088510	4986.4	4986.7	-0.3
PZM6	359794	1089900	4987.1	4987.8	-0.7
PZM7	364129	1084824	4992.6	4993.9	-1.3
PZM12	376735	1090861	4961.6	4960.7	0.9
PZM14	375648	1097110	4947.7	4947.5	0.2
PZM15	371697	1094886	4963.0	4962.2	0.8
PZM16	369866	1093485	4975.1	4970.6	4.5
PZM17	367978	1092727	4976.6	4974.6	2.0
PZM19	362207	1089554	4983.3	4983.8	-0.5
PZM20	361732	1088843	4987.1	4986.5	0.6

* Water levels observed during August 2011

Table 10. Preliminary Production Schedule for Model Simulation, Proposed Maximum Extraction Rate of 11,000 GPM

Production

Year	1	2	3	4	5	6	7	8	9	10	11	12	13
Avg. Annual Flow	gpm	gpm	gpm	gpm	gpm	gpm	gpm	gpm	gpm	gpm	gpm	gpm	gpm
PU1	300	3000	2814	171	0	0	0	0	0	0	0	0	0
PU2	0	1950	3000	1335	0	0	0	0	0	0	0	0	0
PU3	0	300	3300	3414	528	0	0	0	0	0	0	0	0
PU4	0	0	900	3000	2328	57	0	0	0	0	0	0	0
PU4A	0	0	0	900	1200	414	0	0	0	0	0	0	0
PU5	0	0	0	900	3600	2928	114	0	0	0	0	0	0
PU6	0	0	0	0	1800	3600	2142	0	0	0	0	0	0
PU7	0	0	0	0	0	2100	2400	528	0	0	0	0	0
PU7A	0	0	0	0	0	450	600	207	0	0	0	0	0
PU8	0	0	0	0	0	900	3600	2928	114	0	0	0	0
PU9	0	0	0	0	0	0	1800	3600	2142	0	0	0	0
PU10	0	0	0	0	0	0	0	2400	3000	885	0	0	0
PU11	0	0	0	0	0	0	0	450	1800	1521	0	0	0
PU12	0	0	0	0	0	0	0	0	2700	3600	1242	0	0
PU12A	0	0	0	0	0	0	0	0	150	600	507	0	0
Total	300	5,250	10,014	9,720	9,456	10,449	10,656	10,113	9,906	6,606	1,749	0	0

Groundwater Restoration

Year	4	5	6	7	8	9	10	11	12	13
Avg. Annual Flow	gpm	gpm	gpm	gpm	gpm	gpm	gpm	gpm	gpm	gpm
PU1	721	0	0	0	0	0	0	0	0	0
PU2	66	656	0	0	0	0	0	0	0	0
PU3	0	394	473	0	0	0	0	0	0	0
PU4	0	0	578	144	0	0	0	0	0	0
PU4A	0	0	0	289	0	0	0	0	0	0
PU5	0	0	0	618	249	0	0	0	0	0
PU6	0	0	0	0	801	65	0	0	0	0
PU7	0	0	0	0	0	578	0	0	0	0
PU7A	0	0	0	0	0	145	0	0	0	0
PU8	0	0	0	0	0	263	604	0	0	0
PU9	0	0	0	0	0	0	446	420	0	0
PU10	0	0	0	0	0	0	0	630	93	0
PU11	0	0	0	0	0	0	0	0	433	0
PU12	0	0	0	0	0	0	0	0	525	341
PU12A	0	0	0	0	0	0	0	0	0	145
Total	788	1050	1050	1050	1050	1050	1050	1050	1050	486

*3% bleed during RO while production occuring
*9% bleed when no production is occuring

Table 11. Preliminary Operating Schedule, Reno Creek ISR Project

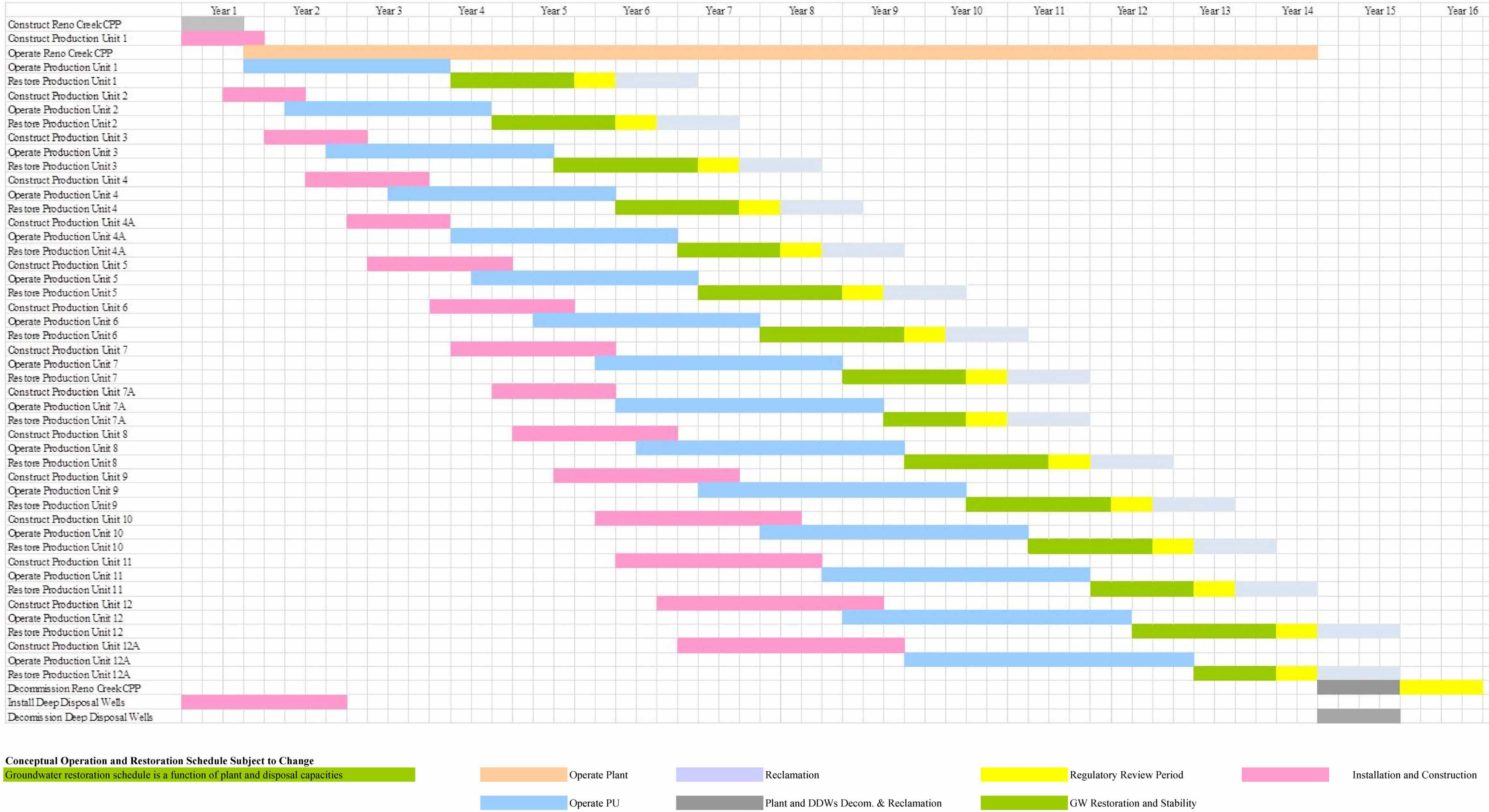
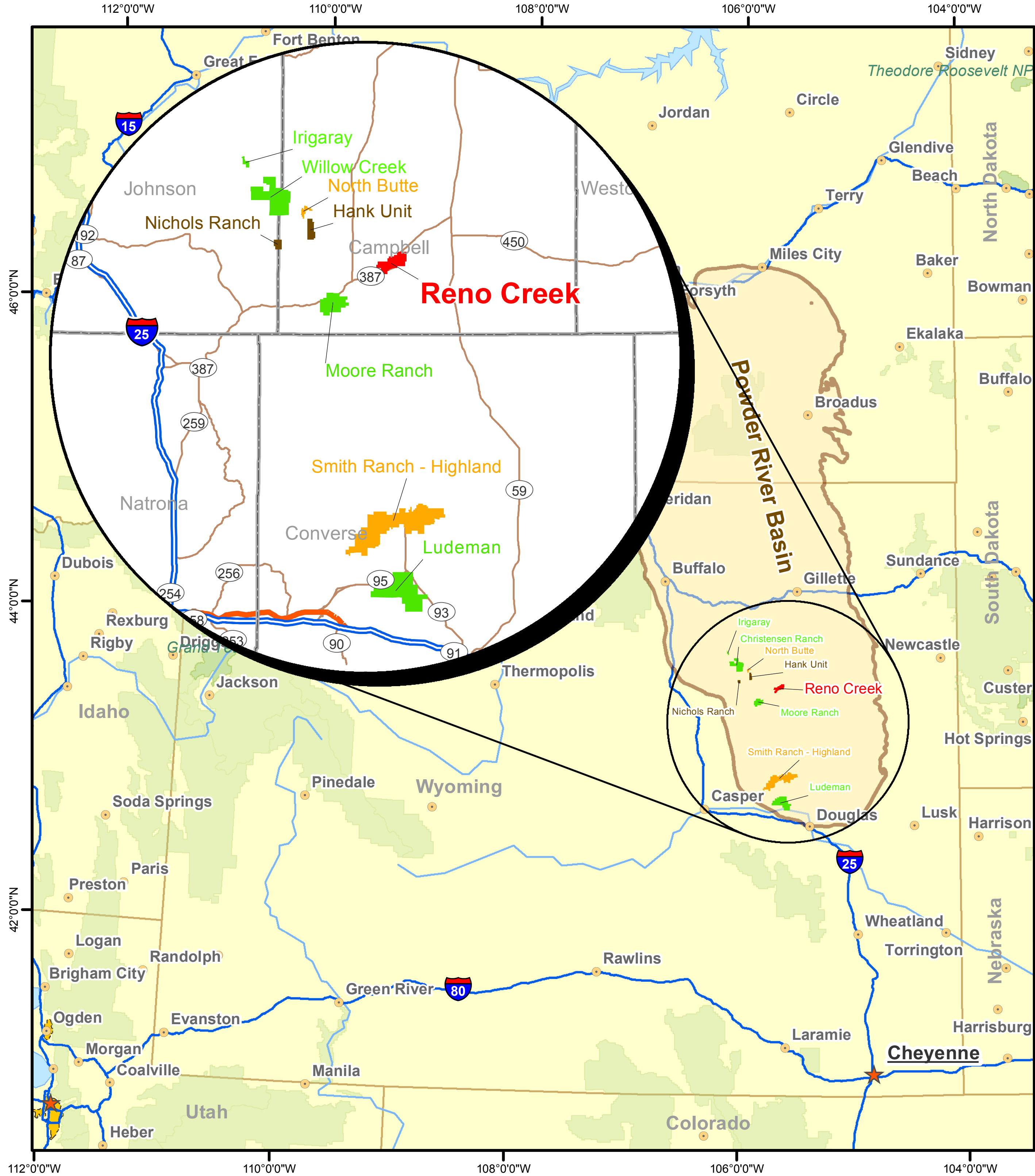


Table 12. Maximum Simulated Drawdown per Production Unit

Production Unit	Maximum Simulated Drawdown (feet)	Simulation Year
PU1	40	9
PU2	36	3
PU3	39	4
PU4	37	4
PU4A	20	7
PU5	33	7
PU6	19	8
PU7	34	7
PU7A	23	9
PU8	38	8
PU9	43	8
PU10	55	9
PU11	33	12
PU12	54	12
PU12A	38	10



Projection: Wyoming State Plane East, NAD83 (feet)

0 25 50 75 100 Miles

N

AUC LLC

THE RENO CREEK PROJECT

Figure 1
Reno Creek Project
Location Map

Scale: 1:4,000,000	Date: January 2012
GW_Mod_Rpt_Fig_01	By: KRS — Checked: HD

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Littleton, Colorado 80127-4239 USA
303-290-9414
www.petrotek.com

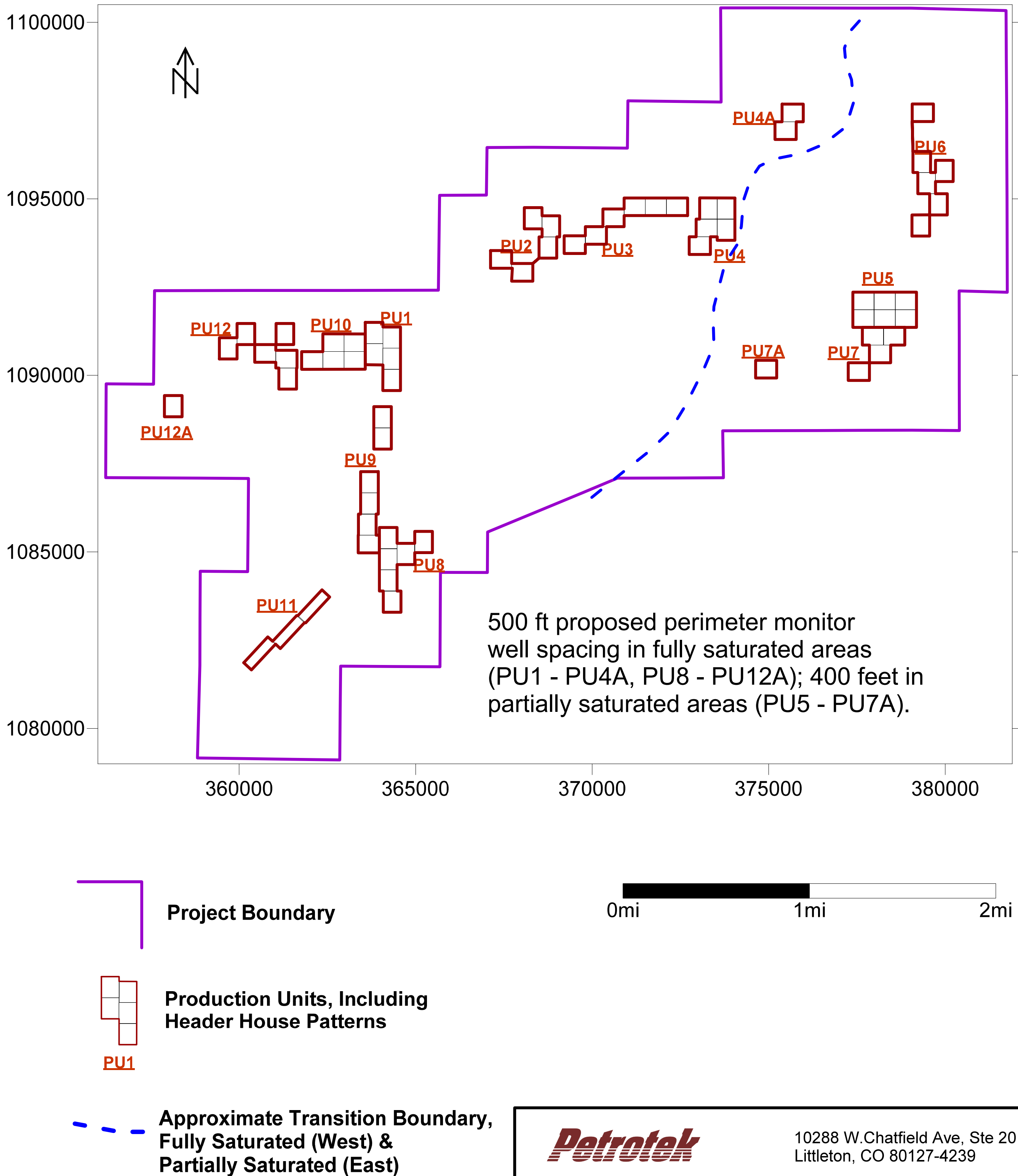

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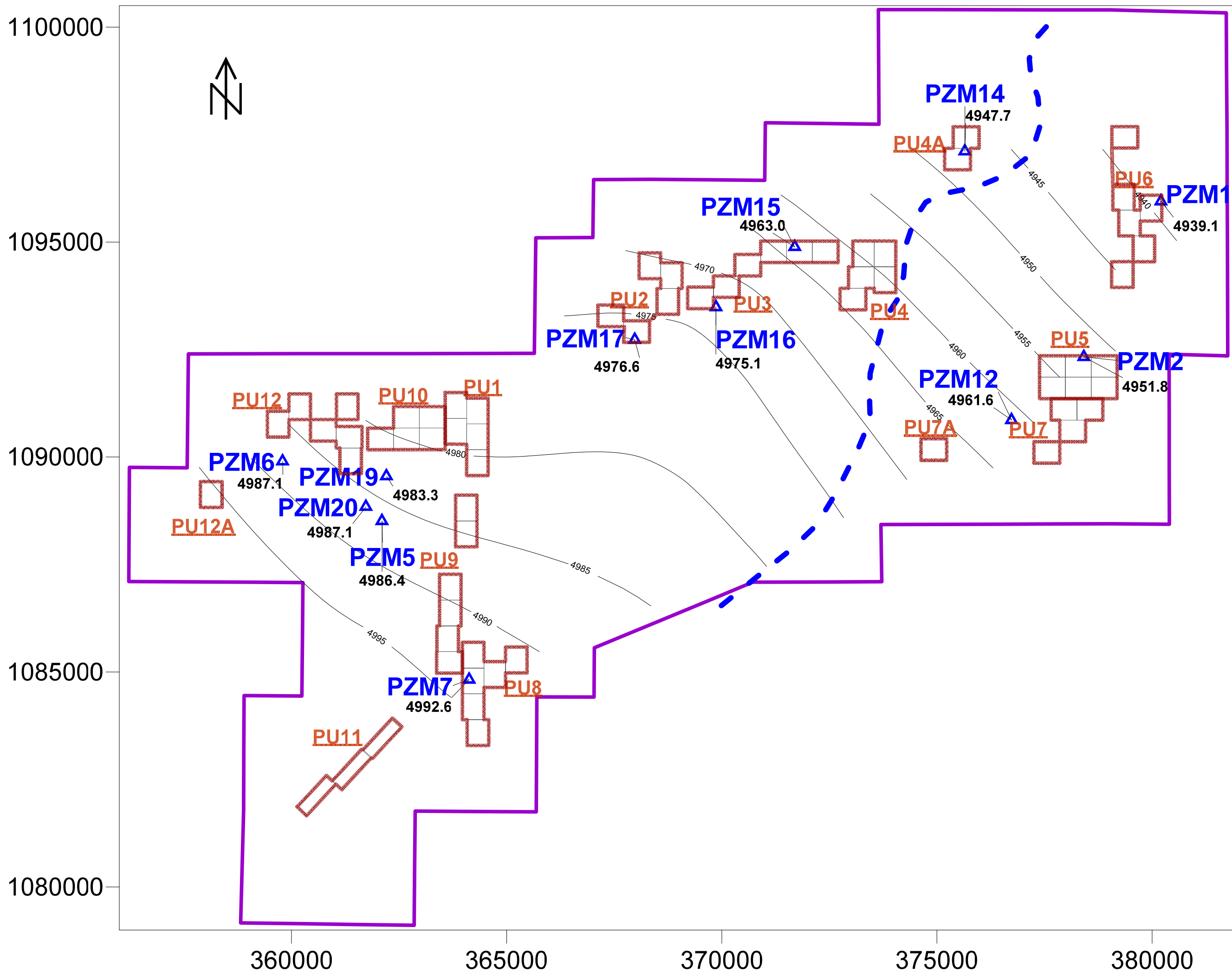
Figure 2. Proposed Production Units
Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_2.srf Date: 8/15/12



Potentiometric Surface Calibration Target, Observation Well

4992.6 Water Level Elevation (ft amsl)

0mi 1mi 2mi

Approximate Transition Boundary, Fully Saturated (West) & Partially Saturated (East)

4980 Potentiometric Elevation (ft AMSL) Contour Interval, 5 feet

Project Boundary

PU1 Production Units, Including Header House Patterns

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Figure 3. Observed Potentiometric Surface (August 2011) and Calibration Targets Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_3.srf Date: 8/15/12

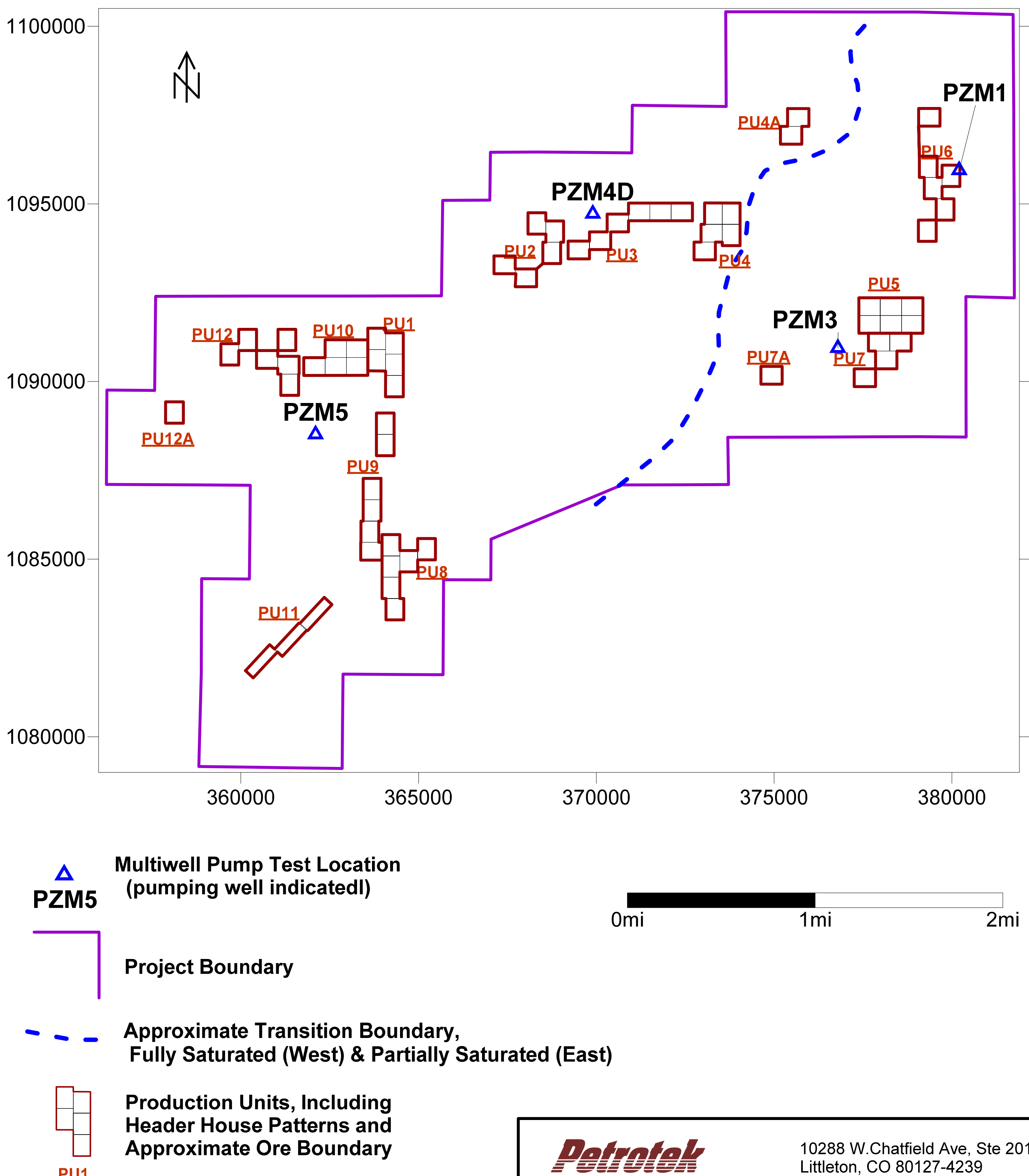

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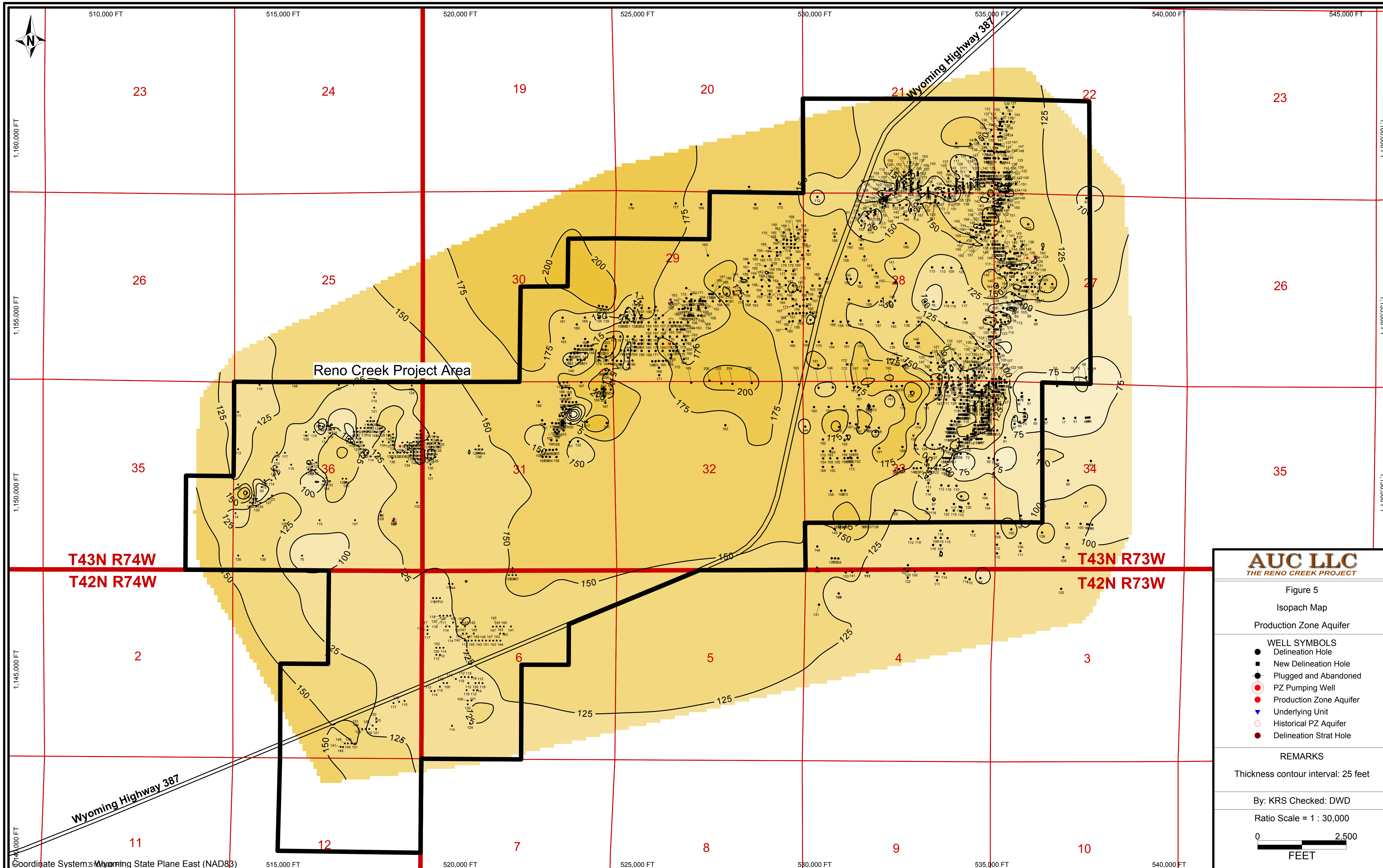
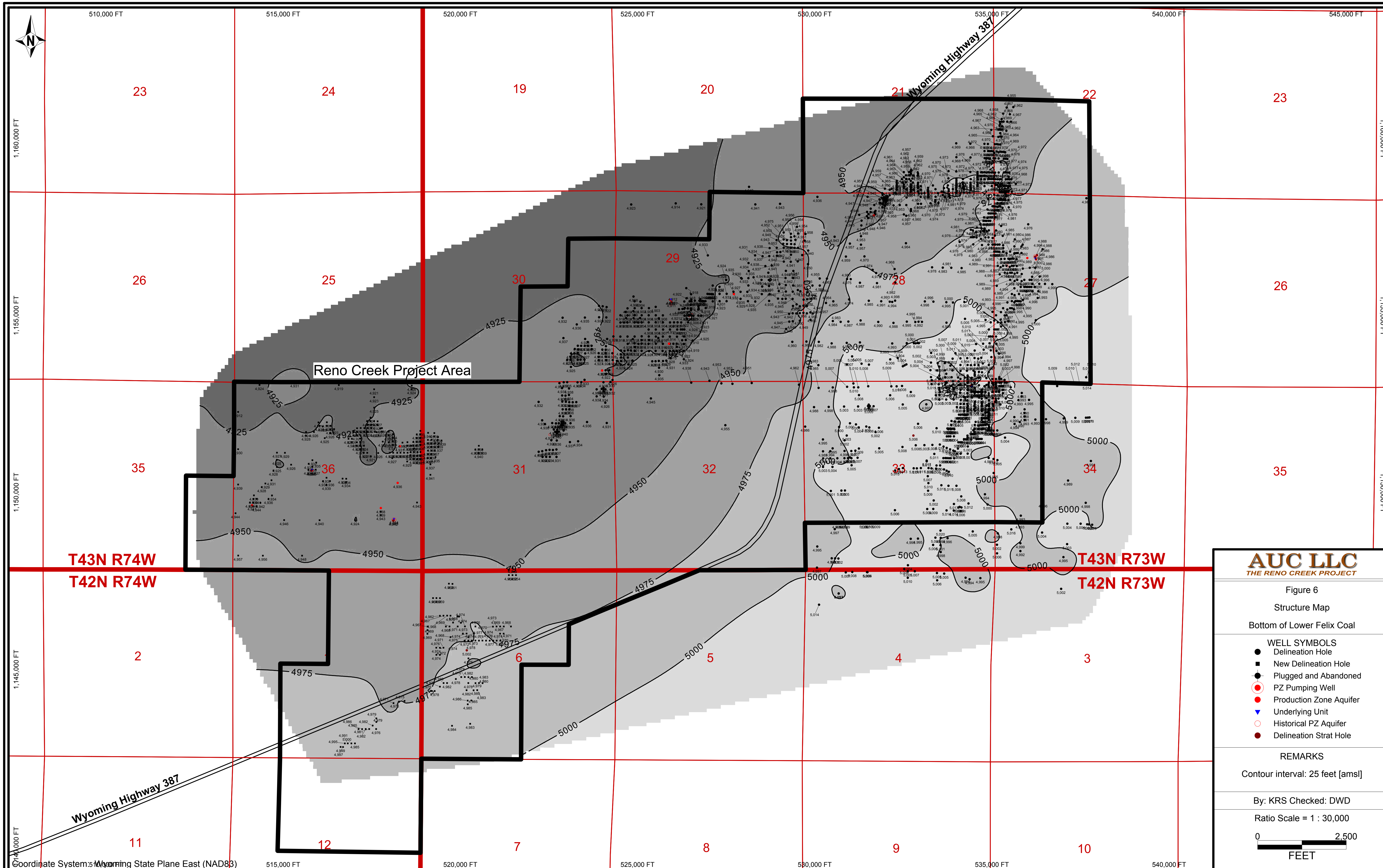
Figure 4. Pump Test Well Cluster Locations
Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_4.srf Date: 8/15/12


AUC LLC
THE RENO CREEK PROJECT
Figure 5
Isopach Map
Production Zone Aquifer
WELL SYMBOLS
Delineation Hole
New Delineation Hole
Plugged and Abandoned
PZ Pumping Well
Production Zone Aquifer
Underlying Unit
Historical PZ Aquifer
Delineation Strat Hole
REMARKS
Thickness contour interval: 25 feet
By: KRS Checked: DWD
Ratio Scale = 1 : 30,000
0
2,500
FEET
Reno Creek Project Area
Wyoming Highway 387
T43N R74W
T42N R74W
T43N R73W
T42N R73W
Coordinate System: Wyoming State Plane East (NAD83)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THE RENO CREEK PROJECT
Figure 6
Structure Map
Bottom of Lower Felix Coal
WELL SYMBOLS
Delineation Hole
New Delineation Hole
Plugged and Abandoned
PZ Pumping Well
Production Zone Aquifer
Underlying Unit
Historical PZ Aquifer
Delineation Strat Hole
REMARKS
Contour interval: 25 feet [amsl]
By: KRS Checked: DWD
Ratio Scale = 1 : 30,000
0
2,500
FEET
Reno Creek Project Area
Wyoming Highway 387
Wyoming Highway 387
T43N R74W
T42N R74W
T43N R73W
T42N R73W
510,000 FT
515,000 FT
520,000 FT
525,000 FT
530,000 FT
535,000 FT
540,000 FT
545,000 FT
1,160,000 FT
1,155,000 FT
1,150,000 FT
1,145,000 FT
1,140,000 FT
Coordinate System: Wyoming State Plane East (NAD83)
4925
4950
4975
5000

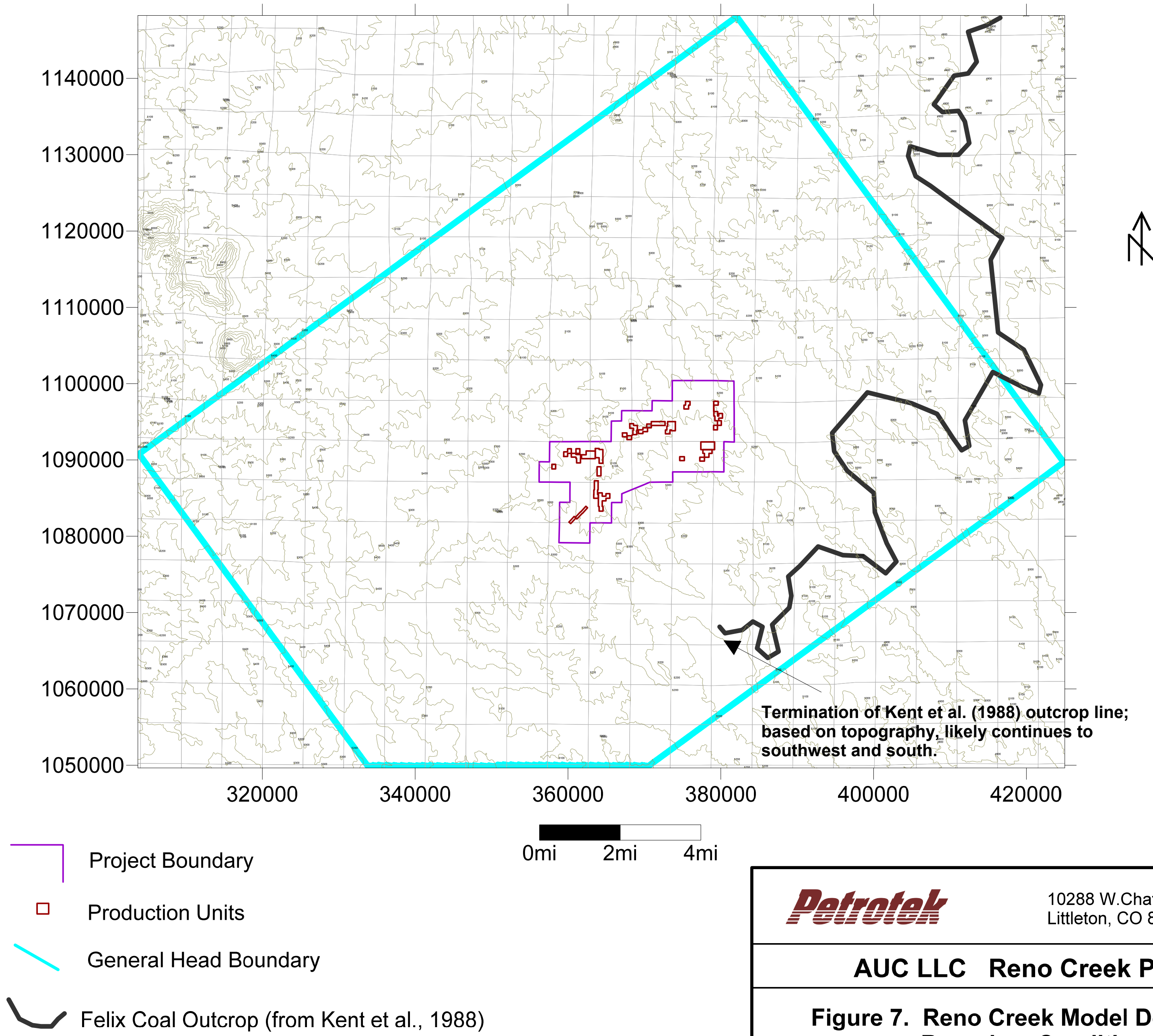

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Figure 7. Reno Creek Model Domain and Boundary Conditions Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_7.srf Date: 08/15/12

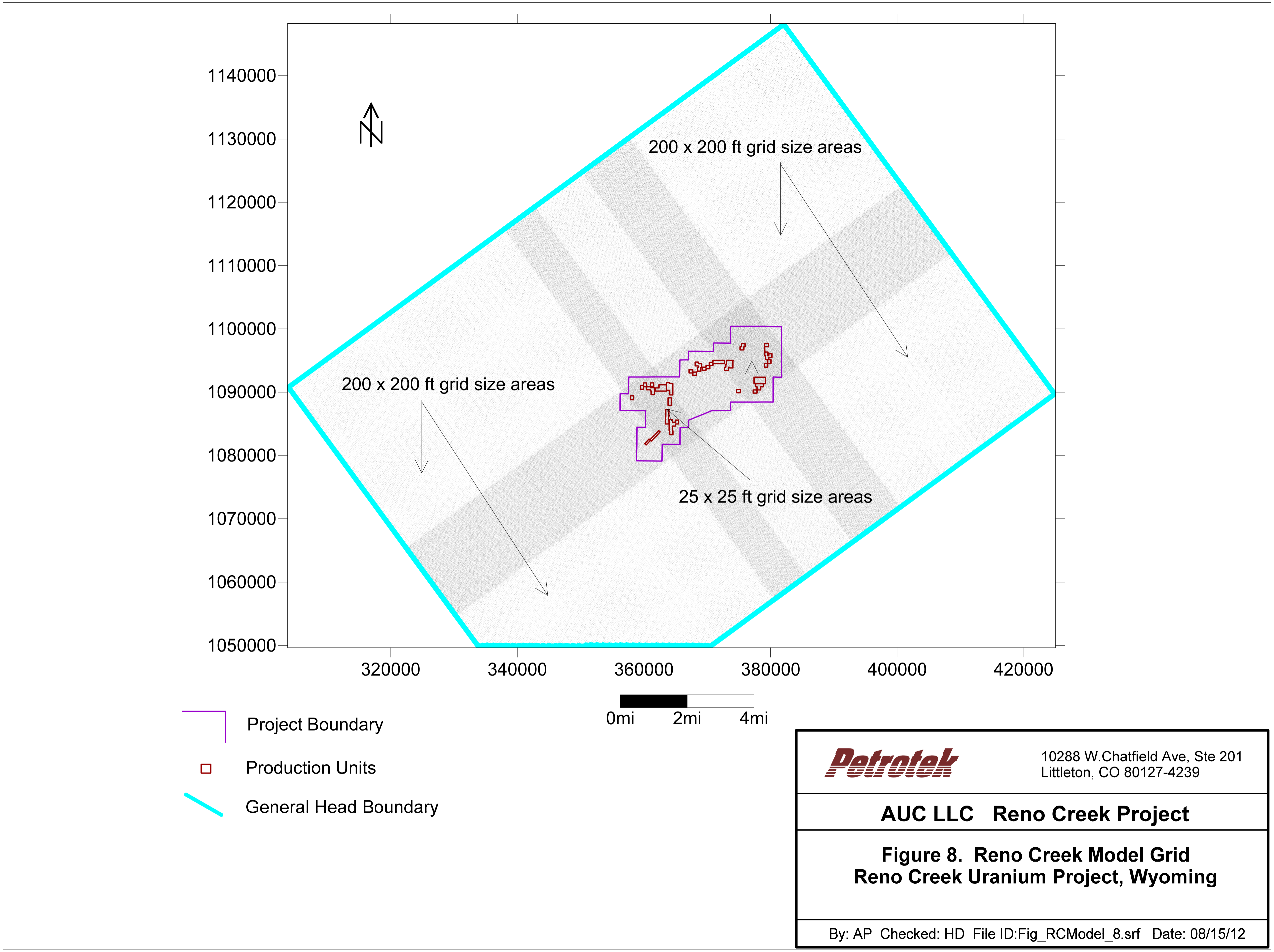

Figure 8. Reno Creek Model Grid
Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_8.srf Date: 08/15/12

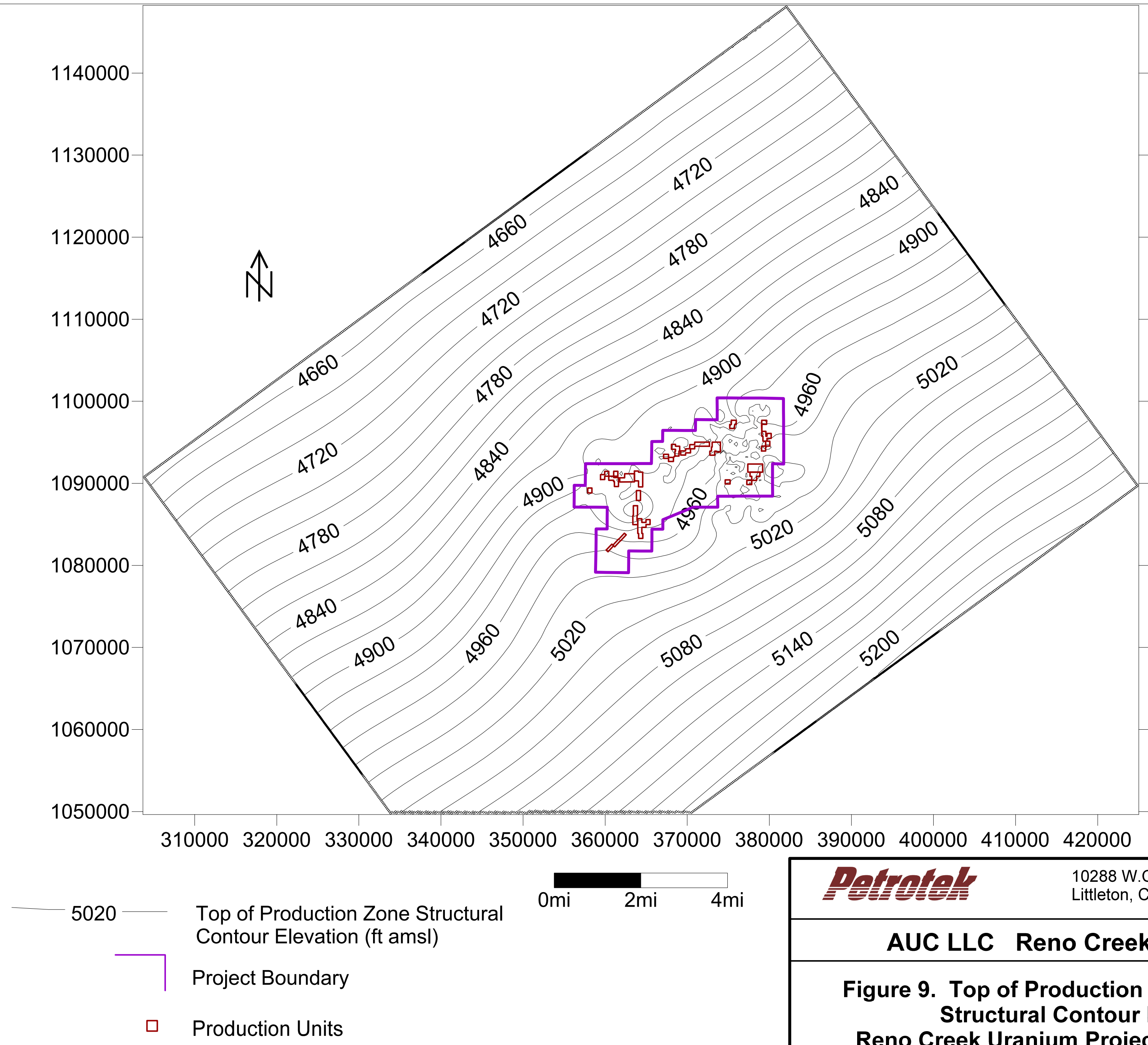

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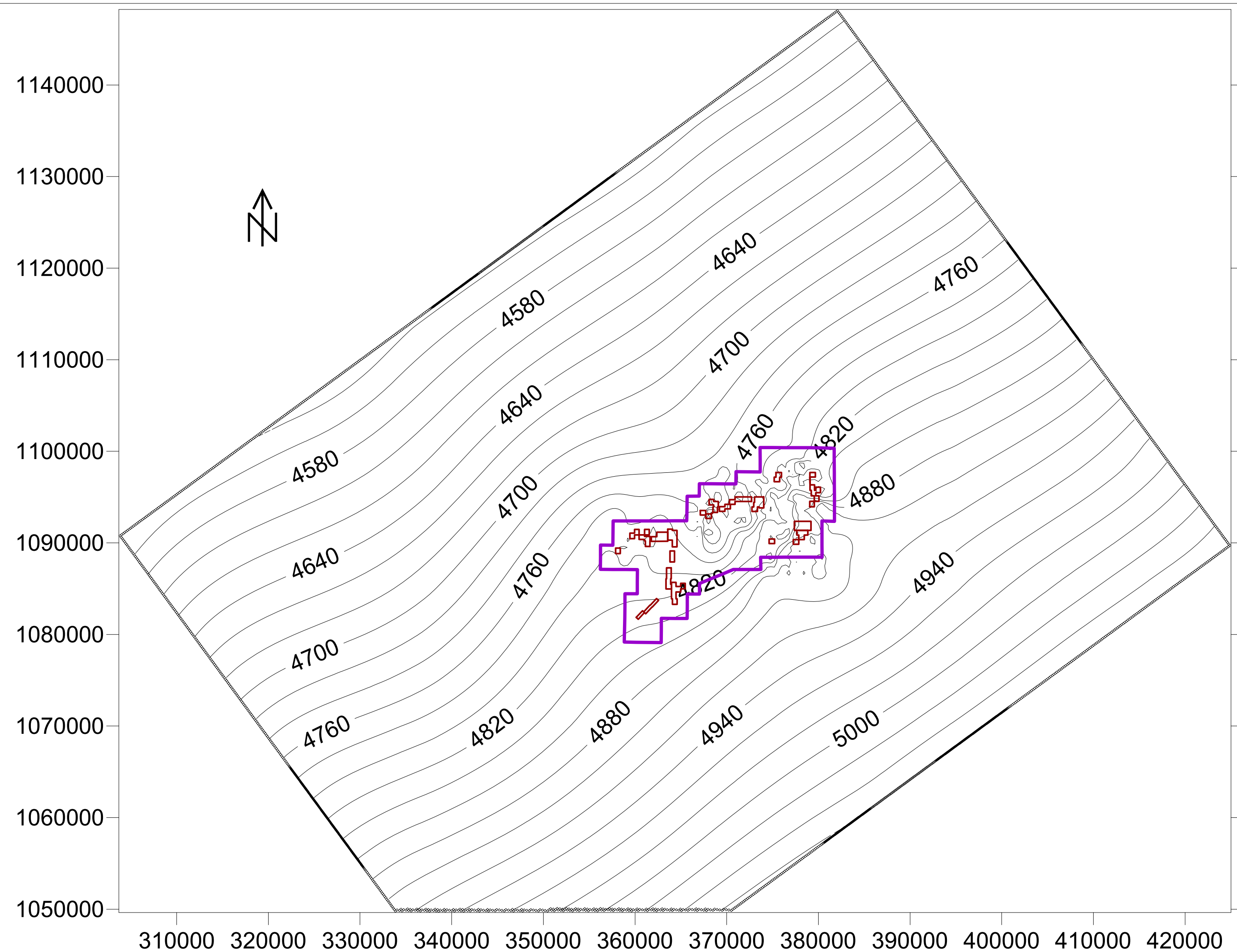
Figure 9. Top of Production Zone Aquifer Structural Contour Map
Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_9.srf Date: 08/15/12



5020 Bottom of Production Zone Structural Contour Elevation (ft amsl)

Project Boundary

Production Units

0mi 2mi 4mi

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Figure 10. Bottom of Production Zone Aquifer Structural Contour Map Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_10.srf Date: 08/15/12

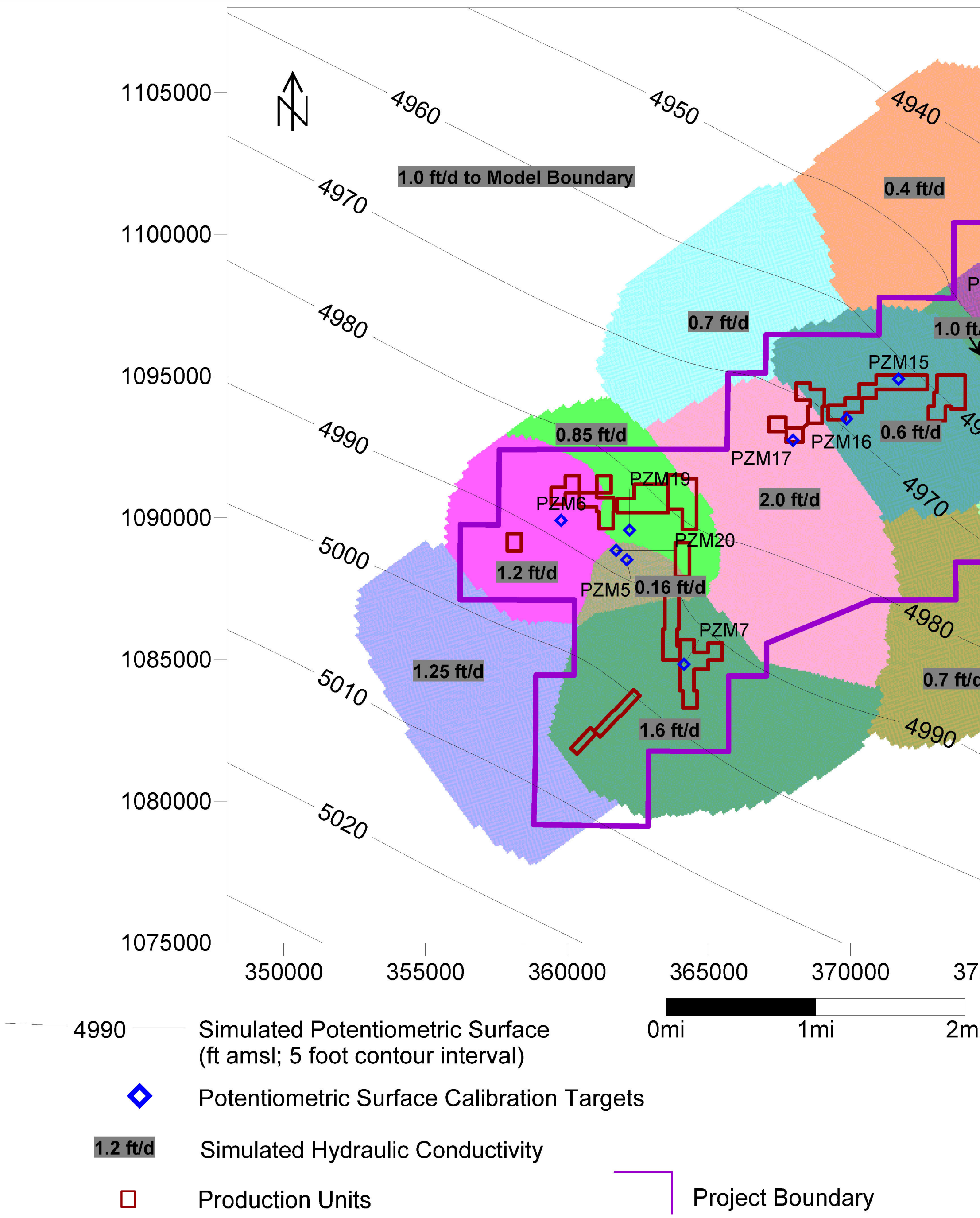

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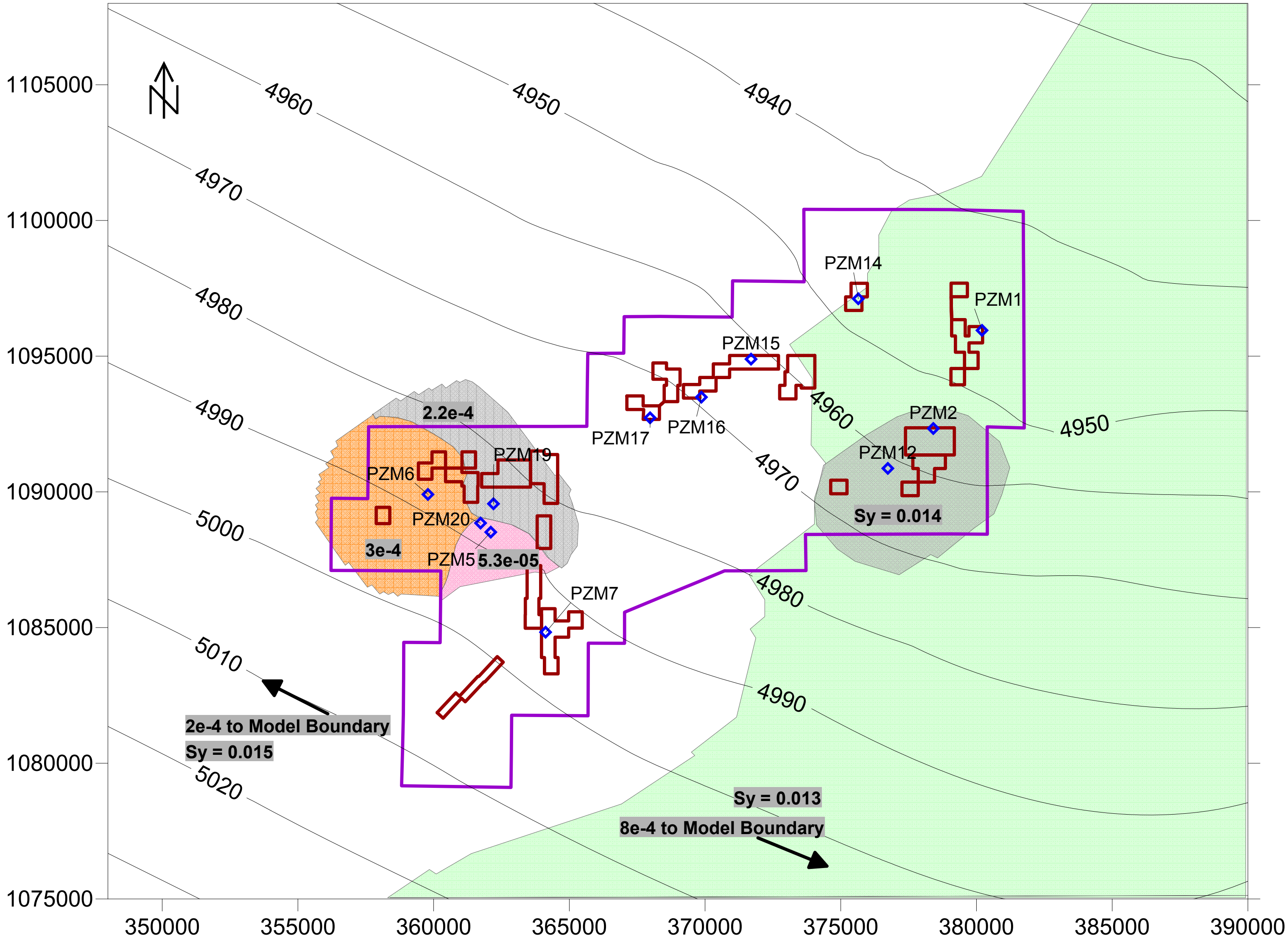
Figure 11. Hydraulic Conductivity Zones and Simulated Potentiometric Surface

By: AP Checked: HD File ID:Fig_RCModel_11.srf Date: 08/15/12



4990 Simulated Potentiometric Surface (ft amsl; 5 foot contour interval)

Potentiometric Surface Calibration Targets

2e-4 Simulated Storativity

Sy = 0.015 Simulated Specific Yield

Production Units

Project Boundary

0mi 1mi 2mi

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Figure 12. Storativity and Specific Yield Zones and Simulated Potentiometric Surface

By: AP Checked: HD File ID:Fig_RCModel_12.srf Date: 08/15/12

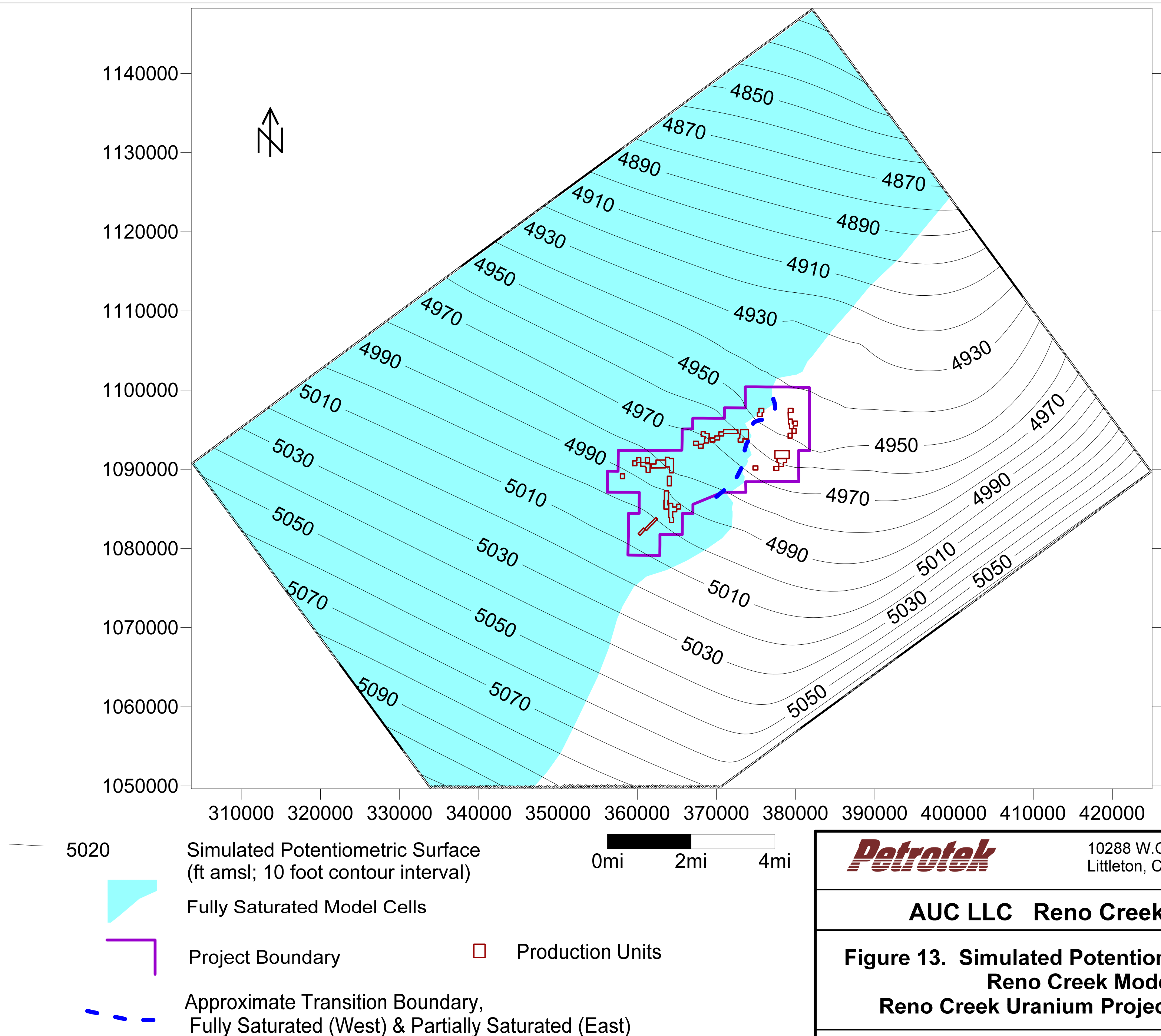

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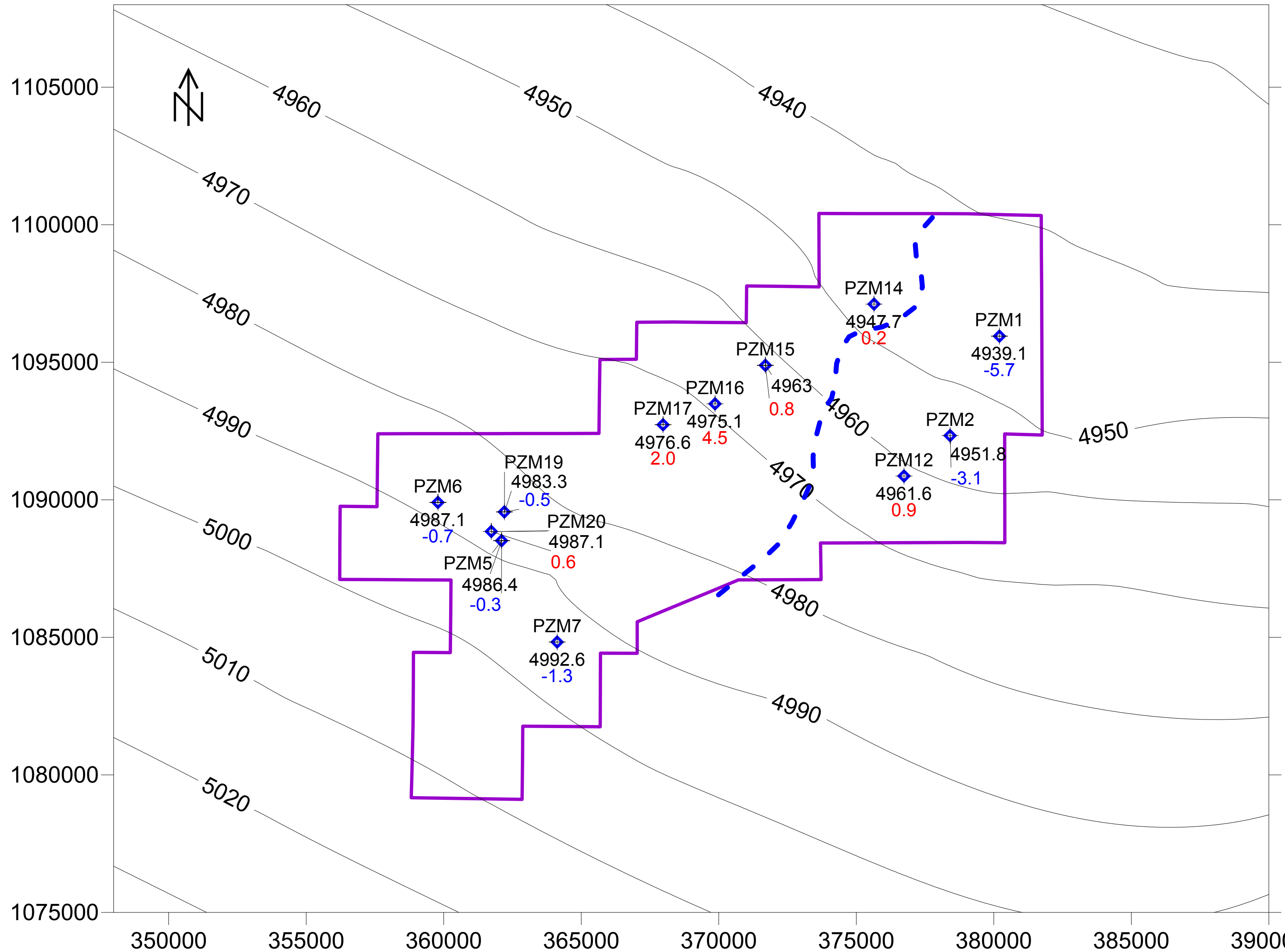
Figure 13. Simulated Potentiometric Surface, Reno Creek Model Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_13.srf Date: 08/15/12



4990 — Simulated Potentiometric Surface (ft amsl)

◇ Potentiometric Surface Calibration Targets

4939.1 Observed Water Level Elevation (ft amsl)

-0.7 Calibration Residual Value (ft)

Negative residual (red) - simulated elevation > observed elevation
Positive residual (blue) - simulated elevation < observed elevation

Project Area Boundary

0mi 1mi 2mi

Approx. Transition Boundary; Fully Saturated (West) & Partially Saturated (East)

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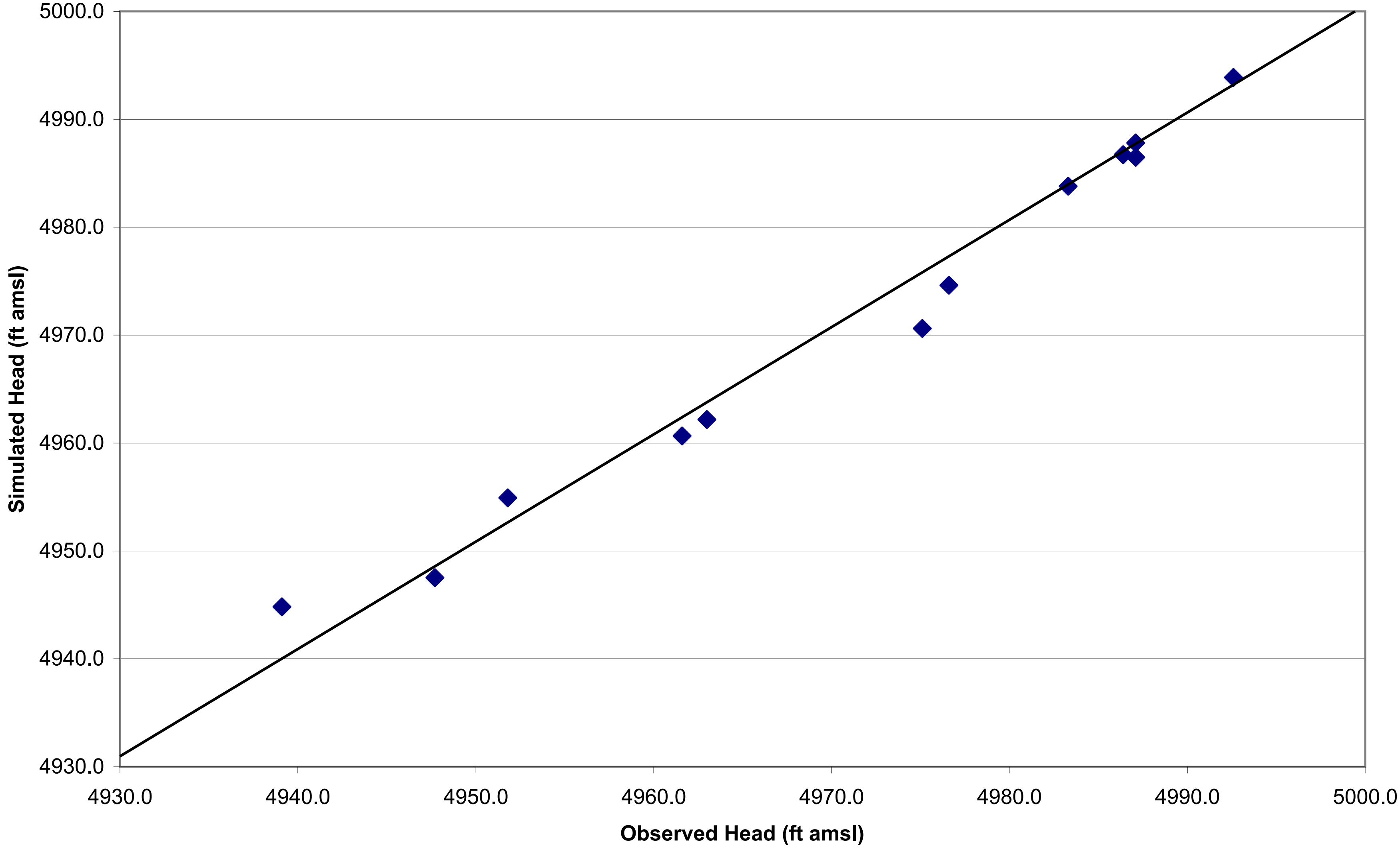
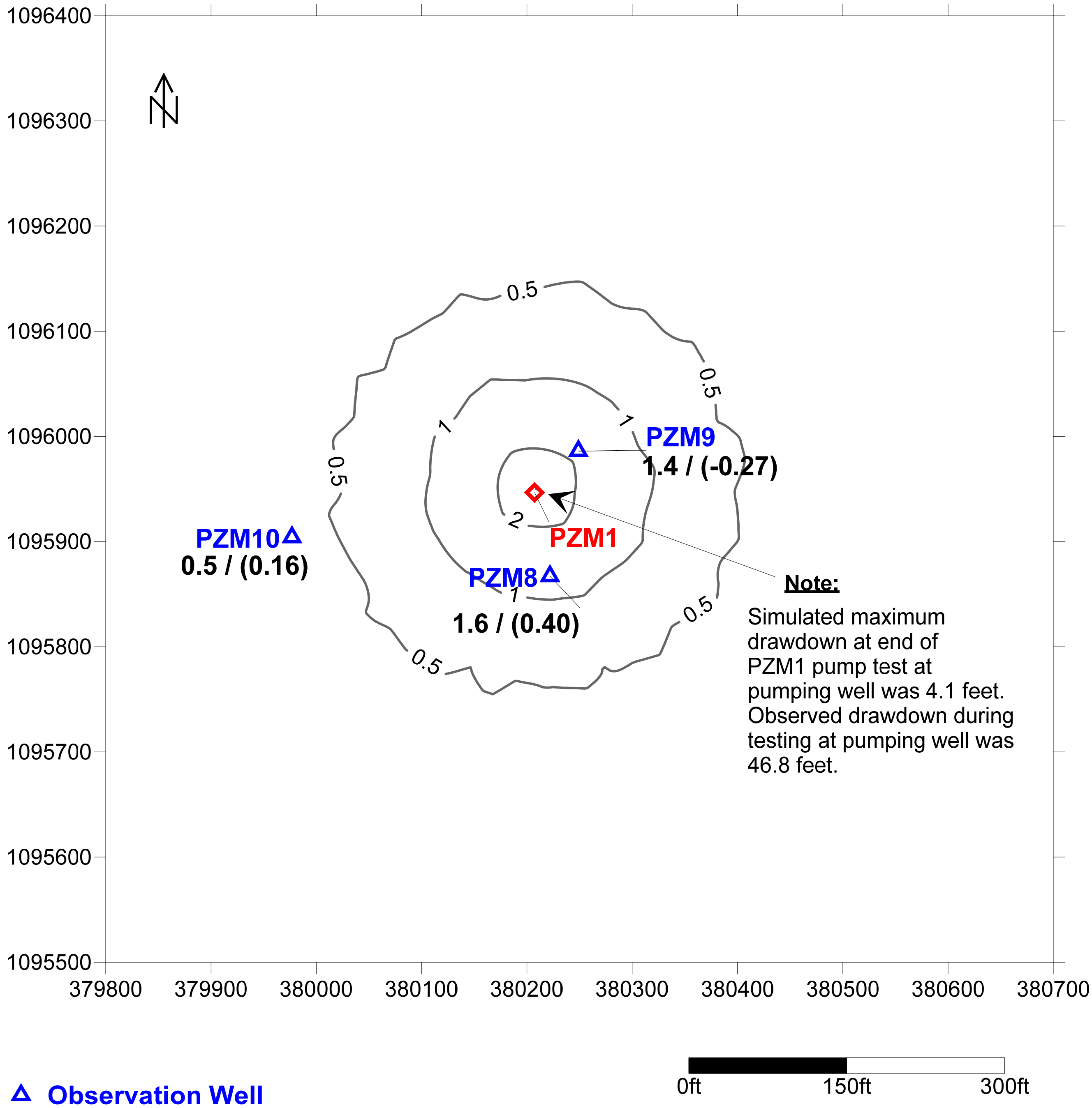
Figure 14. Simulated Potentiometric Surface and Calibration Residuals
Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_14.srf Date: 8/15/12

Figure 15. Observed Versus Simulated Heads, Steady State Calibration Simulation





Observation Well

0.5 / (-0.16) Observed Drawdown (ft) / (Simulated Drawdown Residual [ft])

* Negative residual = Overprediction of drawdown
Positive residual = Underprediction of drawdown

Pumping Well

2 **Simulated Drawdown Contour (feet)**

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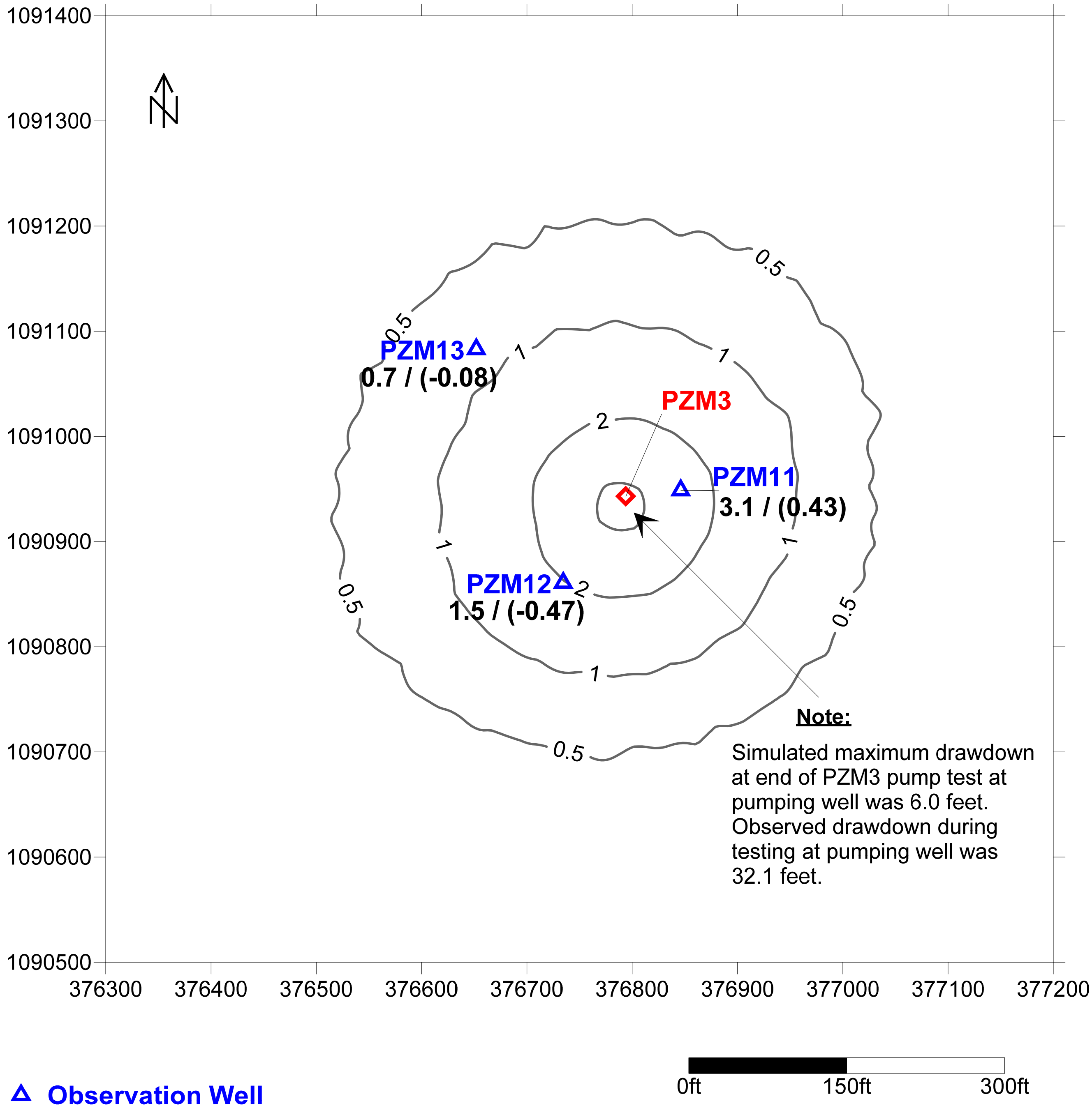
Figure 16. PZM1 Pump Test Calibration and Model Calibration Residuals Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_16.srf Date: 8/15/12



Observation Well

0.7 / (-0.08) Observed Drawdown (ft) / (Modeled Drawdown Residual (ft))

* Negative residual = Overprediction of drawdown
Positive residual = Underprediction of drawdown

Pumping Well

2 **Simulated Drawdown Contour (feet)**

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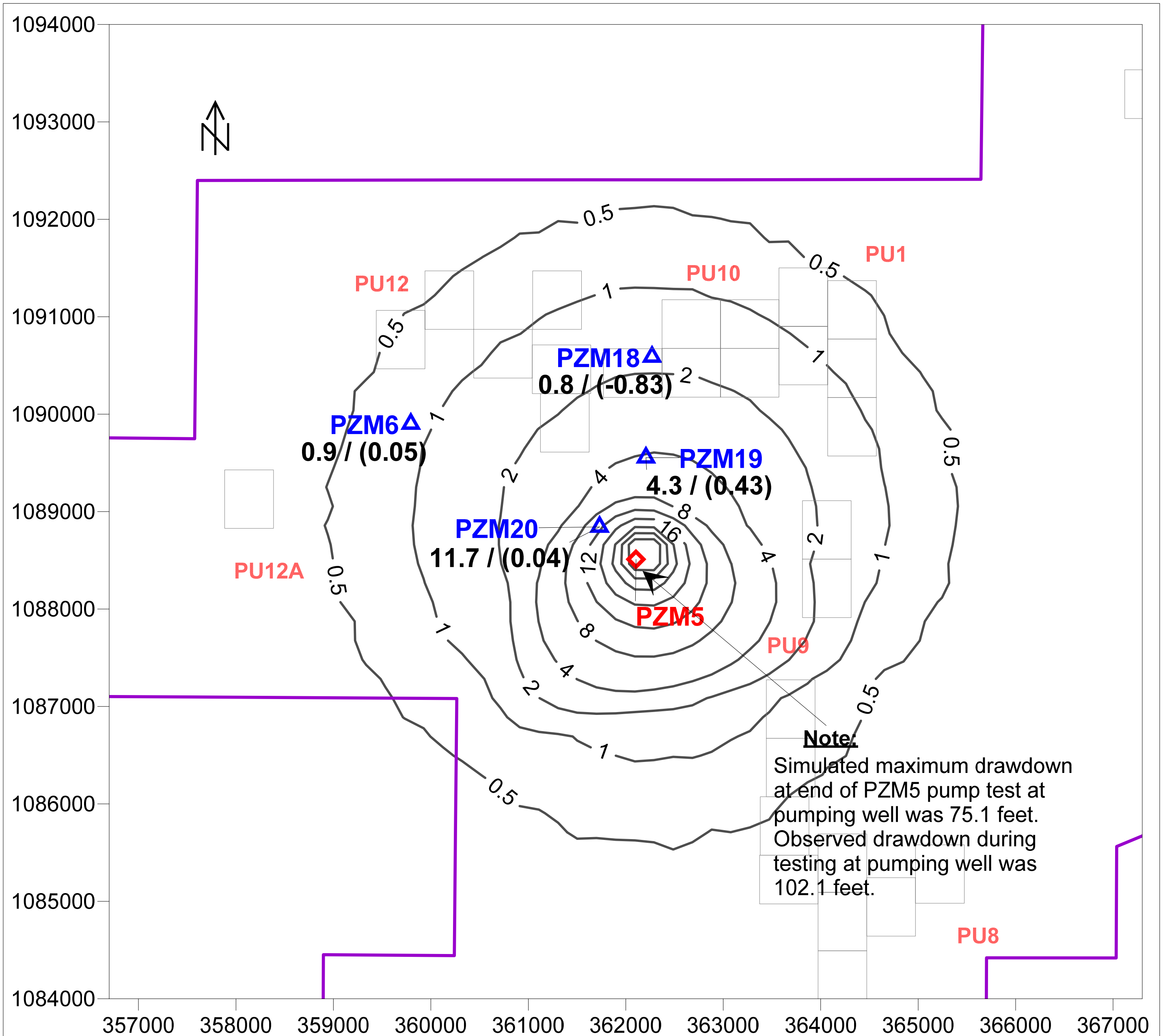
Figure 17. PZM3 Pump Test Calibration and Model Calibration Residuals Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_17.srf Date: 8/15/12



Observation Well

0ft 1000ft 2000ft

0.9 / (0.05) Observed Drawdown (ft) / (Modeled Drawdown Residual (ft))

* Negative residual = Overprediction of drawdown
  Positive residual = Underprediction of drawdown

Pumping Well

2 **Simulated Drawdown Contour (feet)**

Project Area Boundary

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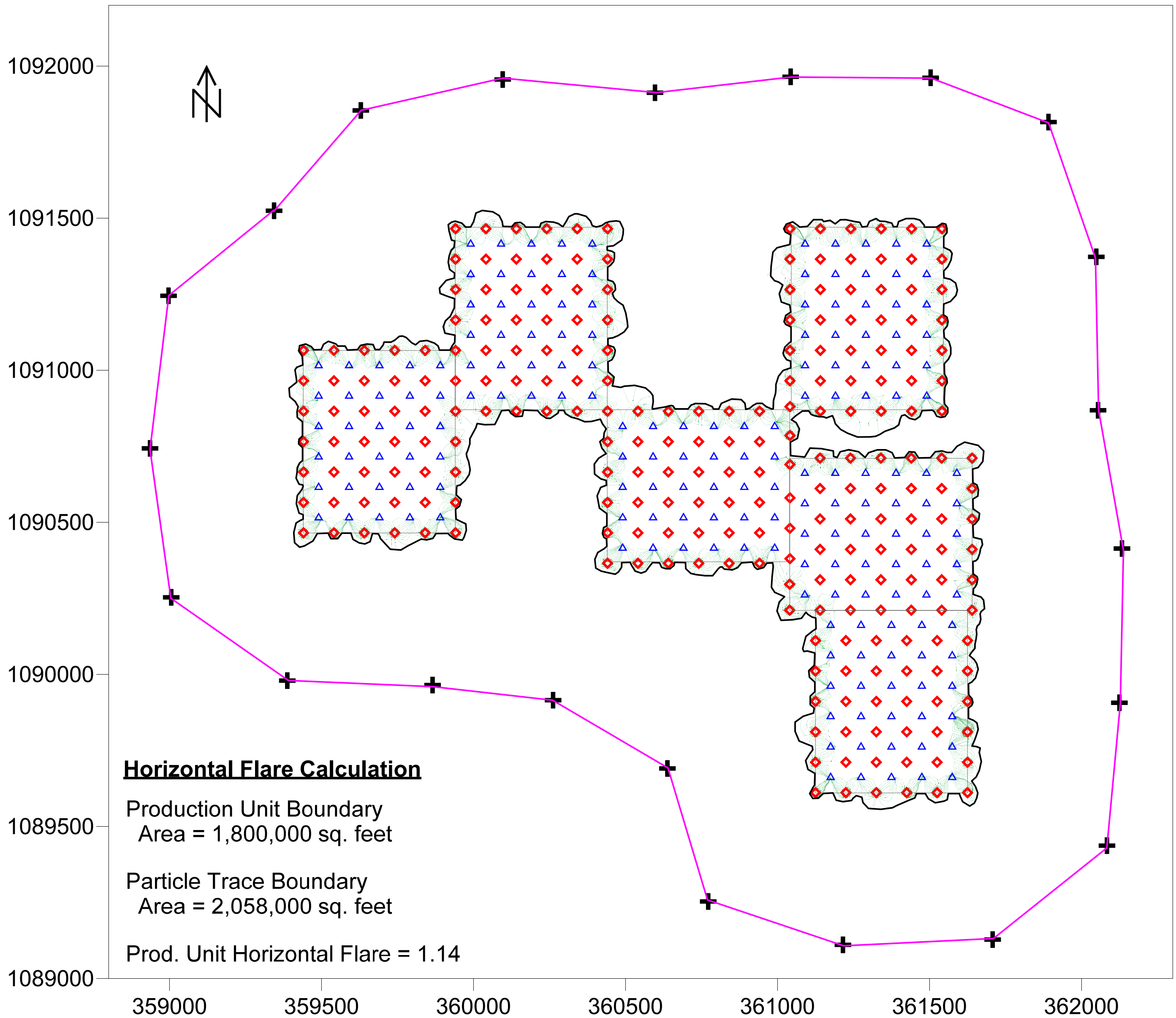
Figure 18. PZM5 Pump Test Calibration and Model Calibration Residuals Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_18.srf Date: 8/15/12



Note:
Perimeter monitor wells spaced 500 ft from production units and 500 ft apart, consistent with proposed spacing in fully saturated areas of project.

0ft 500ft 1000ft

Injection Well

Extraction Well

Perimeter Monitor Well, 500 ft spacing

Monitor Well Ring, 500 ft from production unit perimeter

Horizontal Flare Boundary

Particle Flow Path

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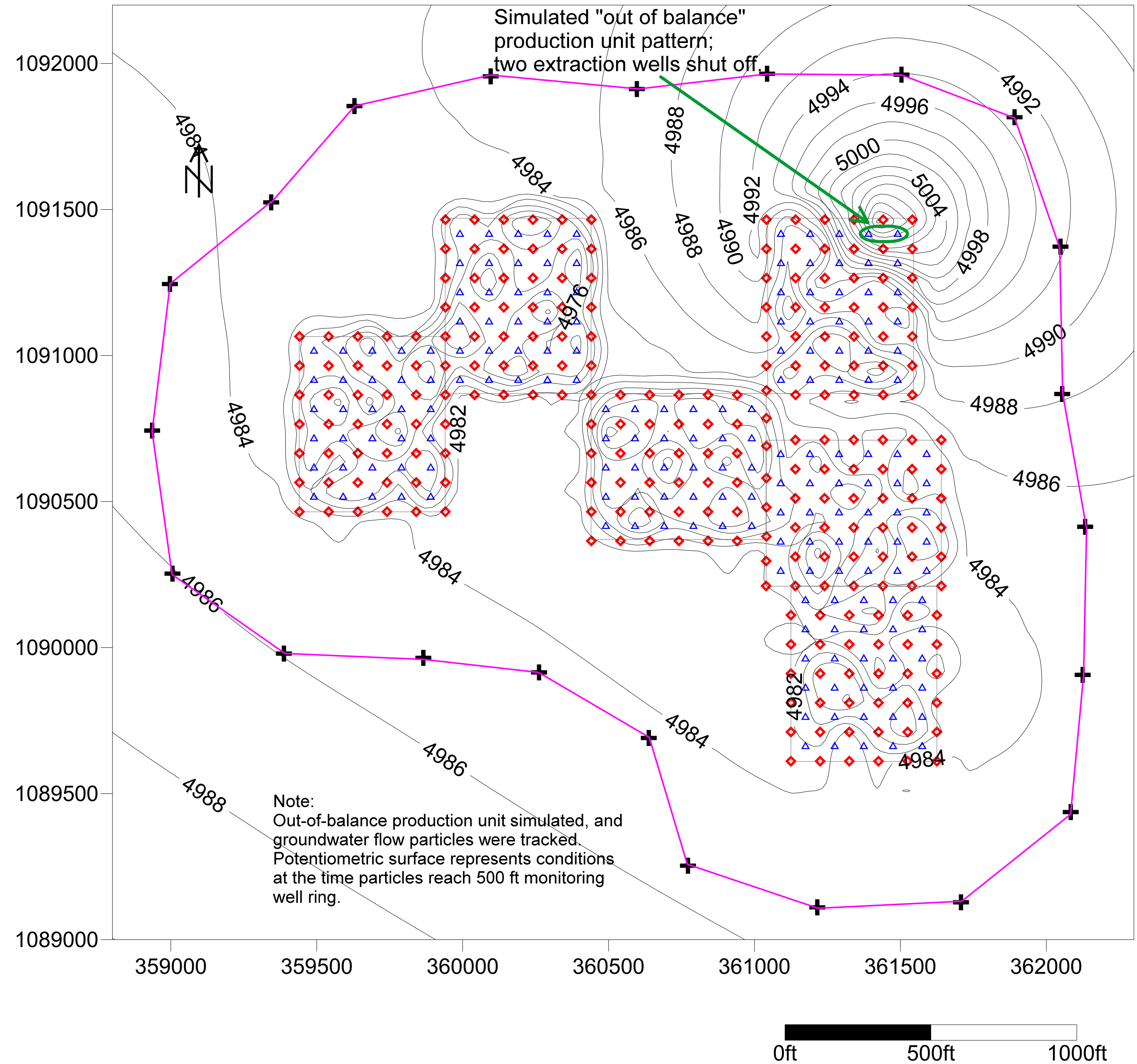
Figure 19. Production Unit 12 Horizontal Flare, 1% Bleed, 2 Year Simulation
Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_19.srf Date: 8/15/12



Injection Well

Extraction Well

Perimeter Monitor Well, 500 ft spacing

Monitor Well Ring, 500 ft from production unit perimeter

4986 Potentiometric Surface Contour (ft amsl)

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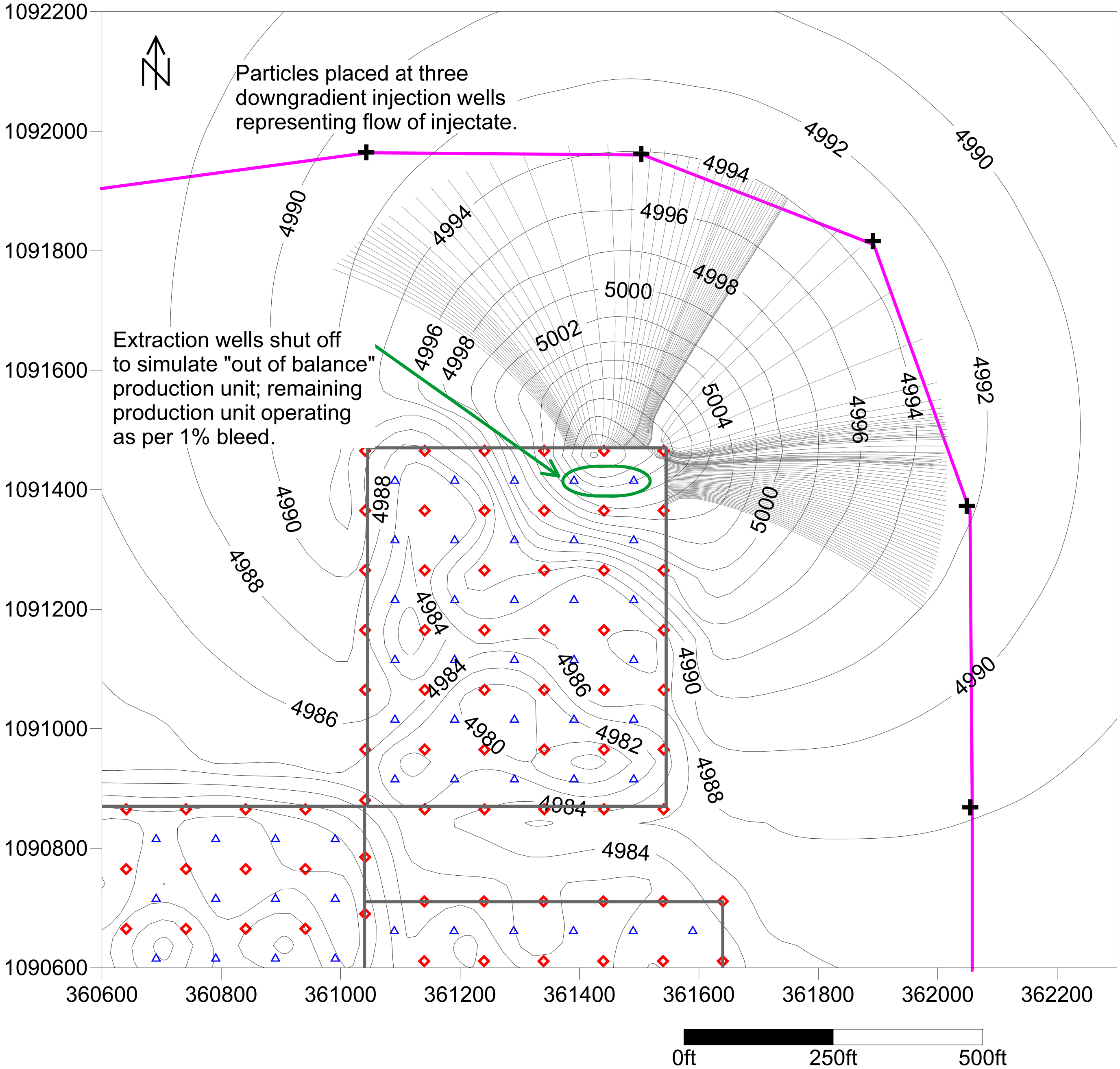
Figure 20. Production Unit 12 Simulated Excursion, Potentiometric Surface Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_20.srf Date: 8/15/12



Injection Well

Extraction Well

Perimeter Monitor Well, 500 ft spacing

Monitor Well Ring, 500 ft from production unit perimeter

4986 Potentiometric Surface Contour (ft amsl)

Particle Flow Path

Note:
Out-of-balance production unit simulated, and groundwater flow particles were tracked. Potentiometric surface represents conditions at the time particles reach 500 ft monitoring well ring.

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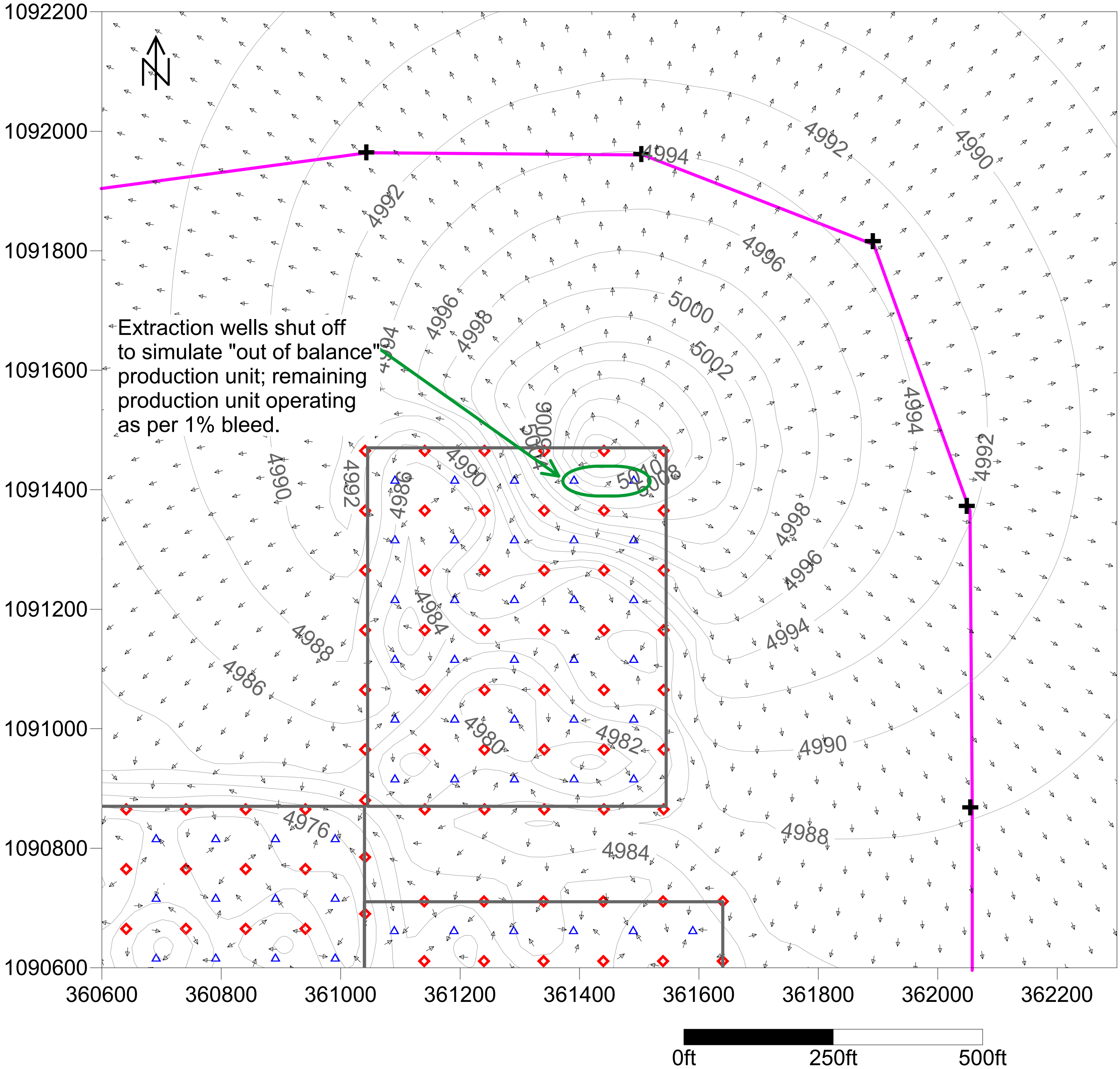
Figure 21. Production Unit 12 Simulated Excursion, Groundwater Flow Particles Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_21.srf Date: 8/15/12



Injection Well

Extraction Well

Perimeter Monitor Well, 500 ft spacing

Monitor Well Ring, 500 ft from production unit perimeter

4986 Potentiometric Surface Contour (ft amsl)

Groundwater Flow Velocity Vector

Note:
Out-of-balance production unit simulated, and groundwater flow particles were tracked. Velocity vectors represents conditions at the time particles reach 500 ft monitoring well ring.

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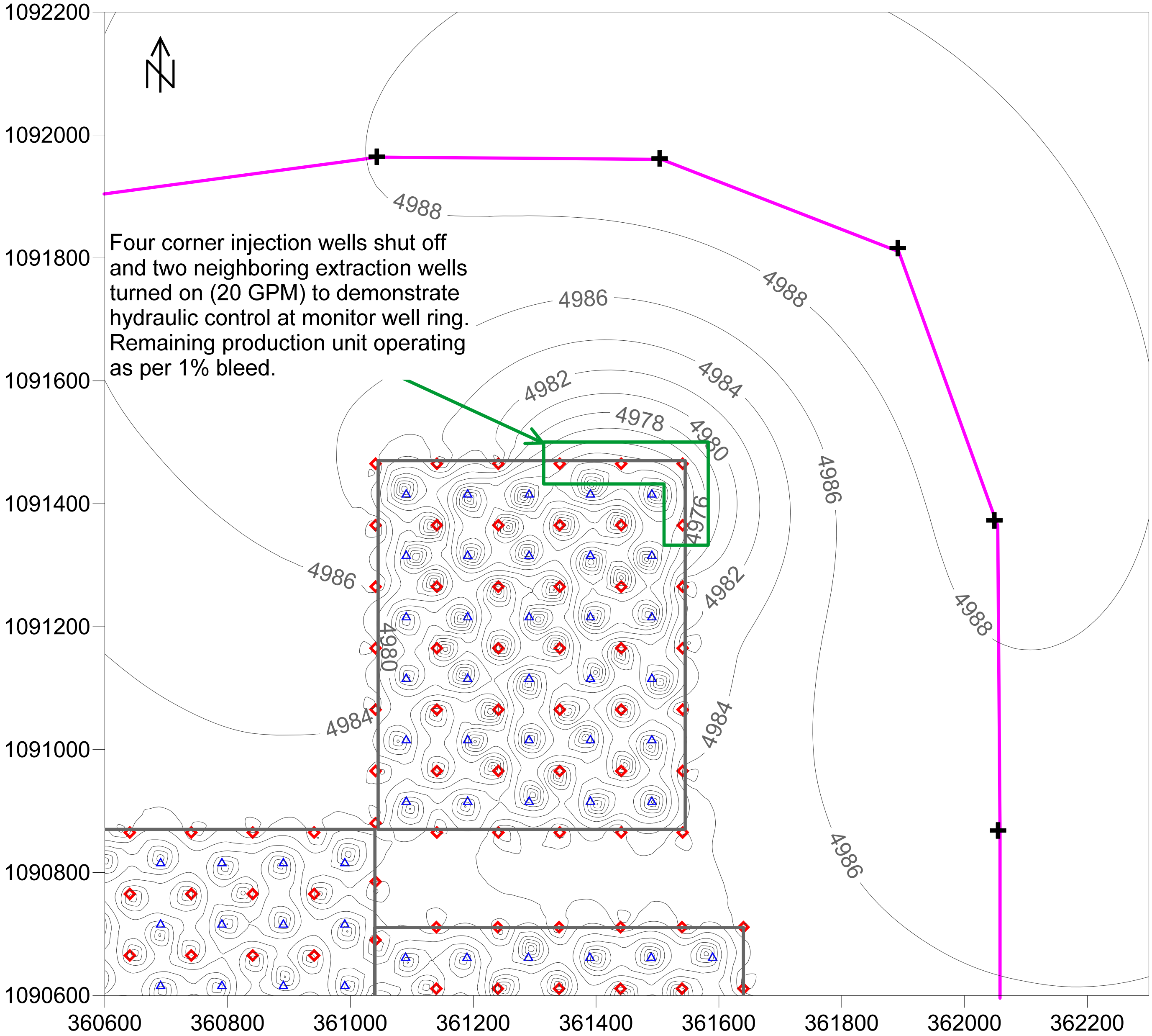
Figure 22. Production Unit 12 Simulated Excursion, Groundwater Velocity Vectors Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_22.srf Date: 8/15/12



Note:
Potentiometric surface at approximately 6 hours after start of excursion recovery, when grounderwater flow direction at the monitor well ring is reversed.

Injection Well

Extraction Well

Perimeter Monitor Well, 500 ft spacing

Monitor Well Ring, 500 ft from production unit perimeter

4986 Potentiometric Surface Contour (ft amsl)

Groundwater Flow Velocity Vector

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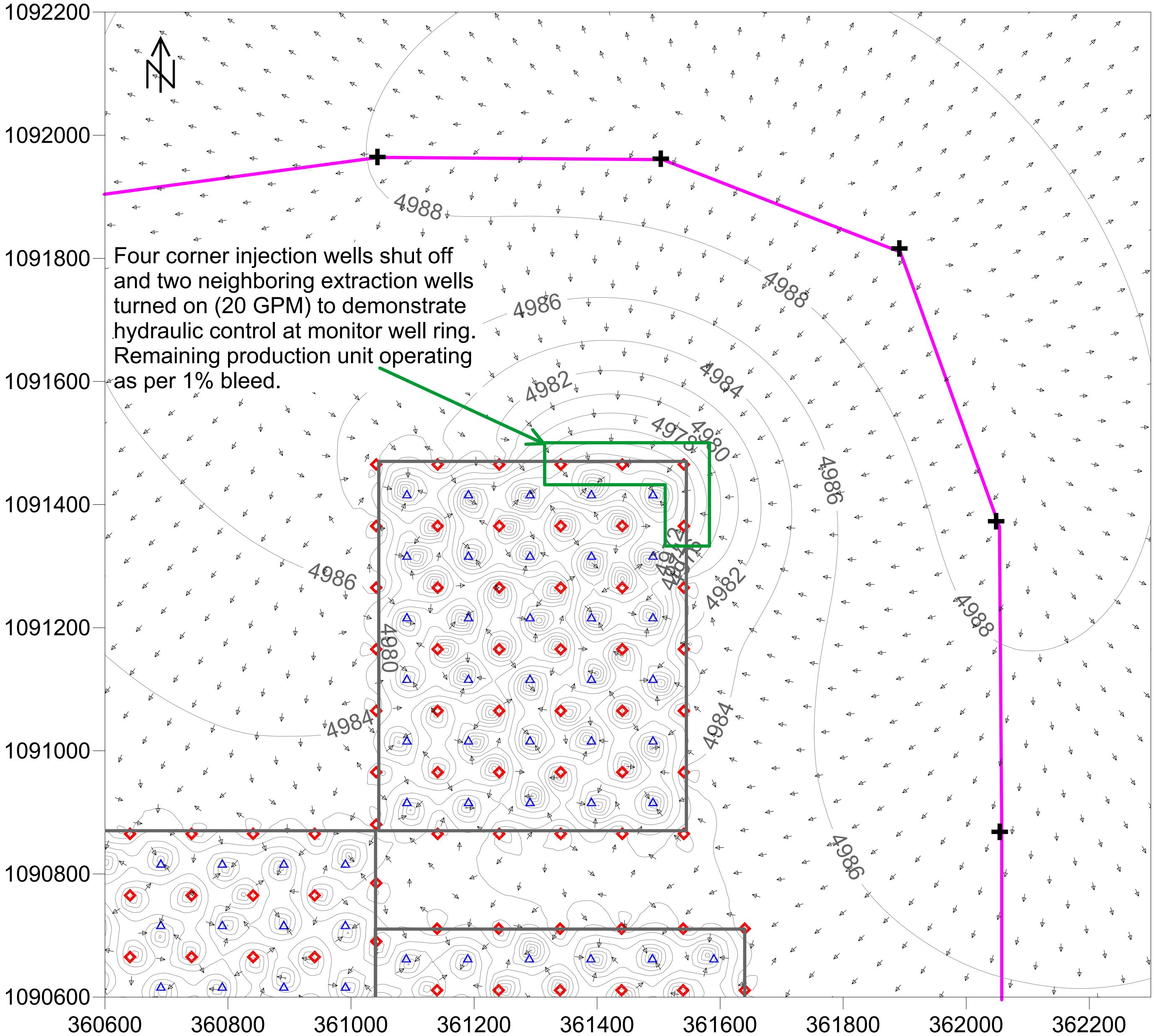
Figure 23. Production Unit 12 Simulated Excursion Recovery, Potentiometric Surface Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_23.srf Date: 8/15/12



Note:
Velocity vectors shown at 6 hours after start of excursion recovery, when grounderwater flow direction near the simulated excursion at the monitor well ring is reversed back towards the production unit.

0ft 250ft 500ft

Injection Well

Extraction Well

Perimeter Monitor Well, 500 ft spacing

Monitor Well Ring, 500 ft from production unit perimeter

4986 Potentiometric Surface Contour (ft amsl)

Groundwater Flow Velocity Vector

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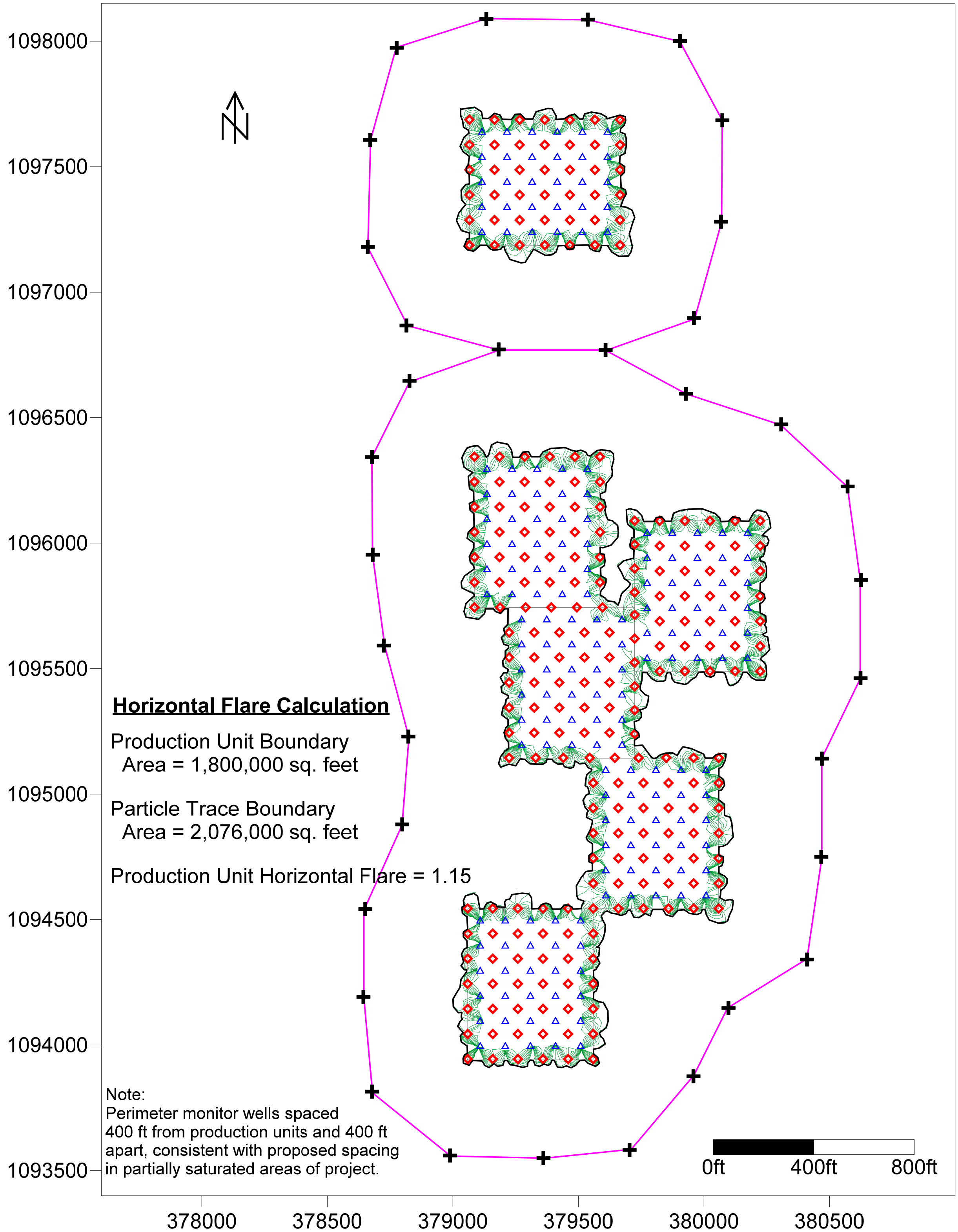
Figure 24. Production Unit 12 Simulated Excursion Recovery, Groundwater Velocity Vectors Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_24.srf Date: 8/15/12



Injection Well

Extraction Well

Perimeter Monitor Well, 400 ft spacing

Monitor Well Ring, 400 ft from production unit perimeter

Horizontal Flare Boundary

Particle Flow Path

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Figure 25. Production Unit 6 Horizontal Flare, 1% Bleed, 2 Year Simulation
Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_25.srf Date: 8/15/12

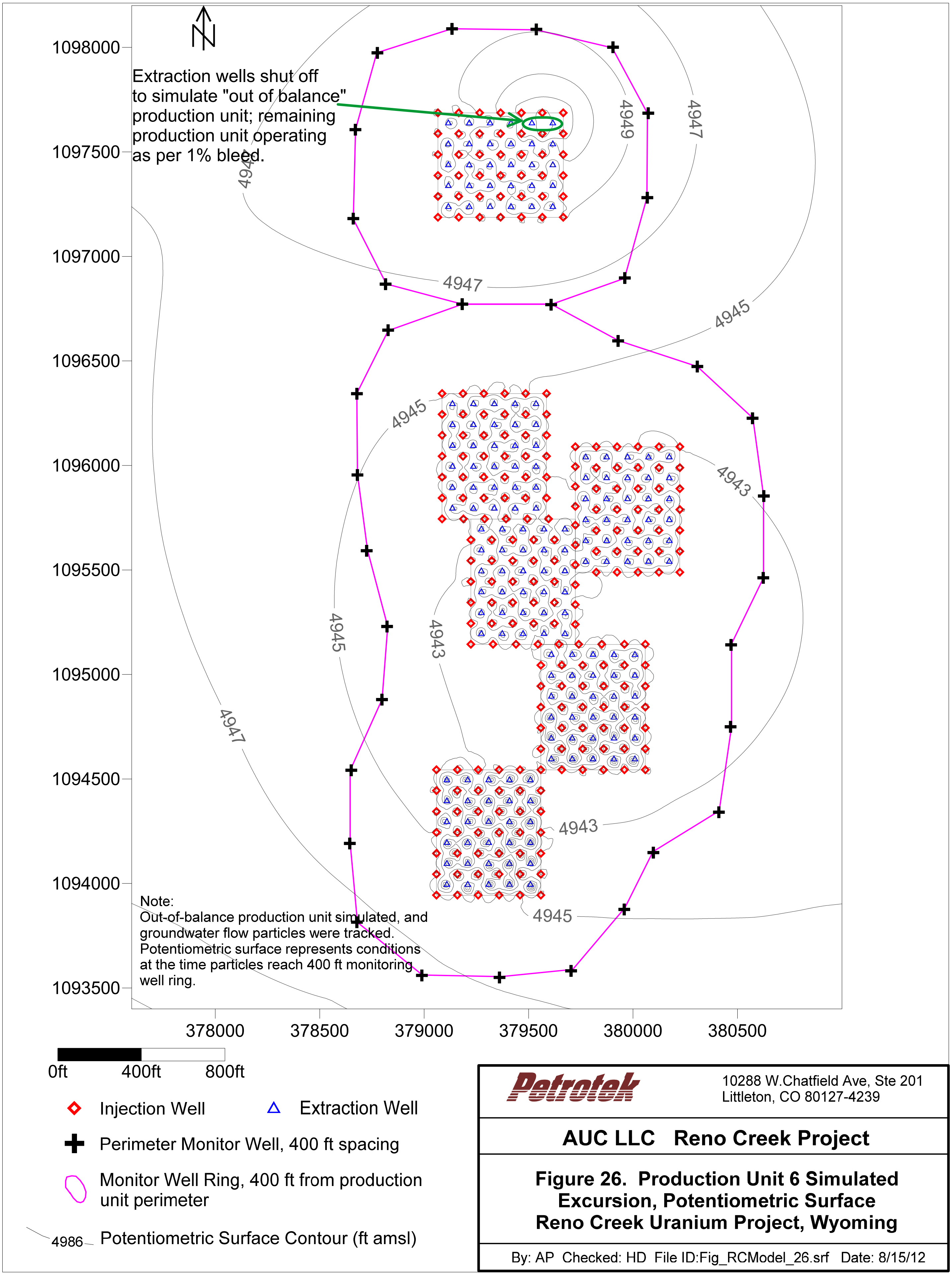

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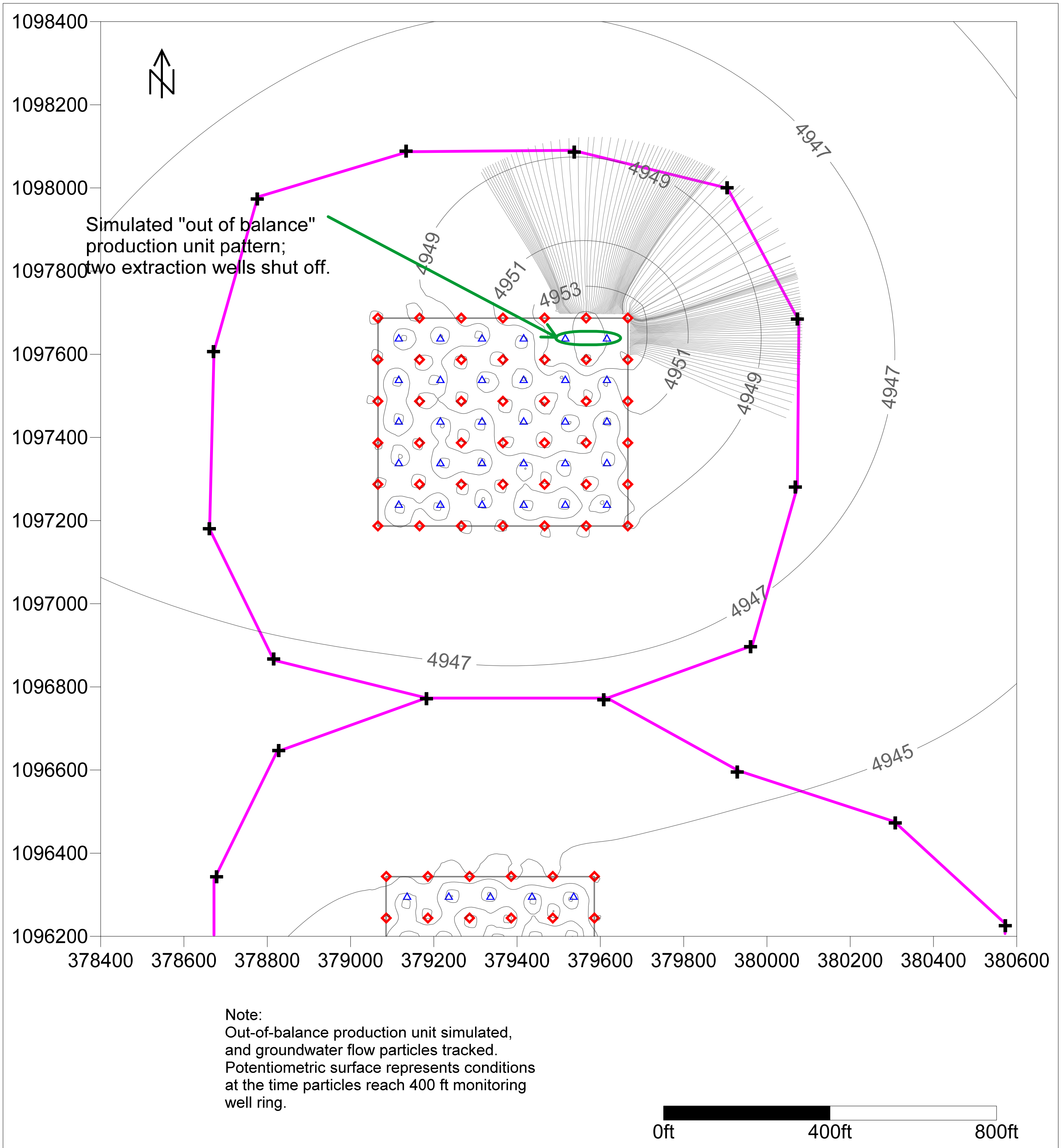
Figure 26. Production Unit 6 Simulated Excursion, Potentiometric Surface Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_26.srf Date: 8/15/12



Note:
Out-of-balance production unit simulated, and groundwater flow particles tracked. Potentiometric surface represents conditions at the time particles reach 400 ft monitoring well ring.

- Injection Well
- Extraction Well
- Perimeter Monitor Well, 400 ft spacing
- Monitor Well Ring, 400 ft from production unit perimeter
- 4947 Potentiometric Surface Contour (ft amsl)
- Particle Flow Path

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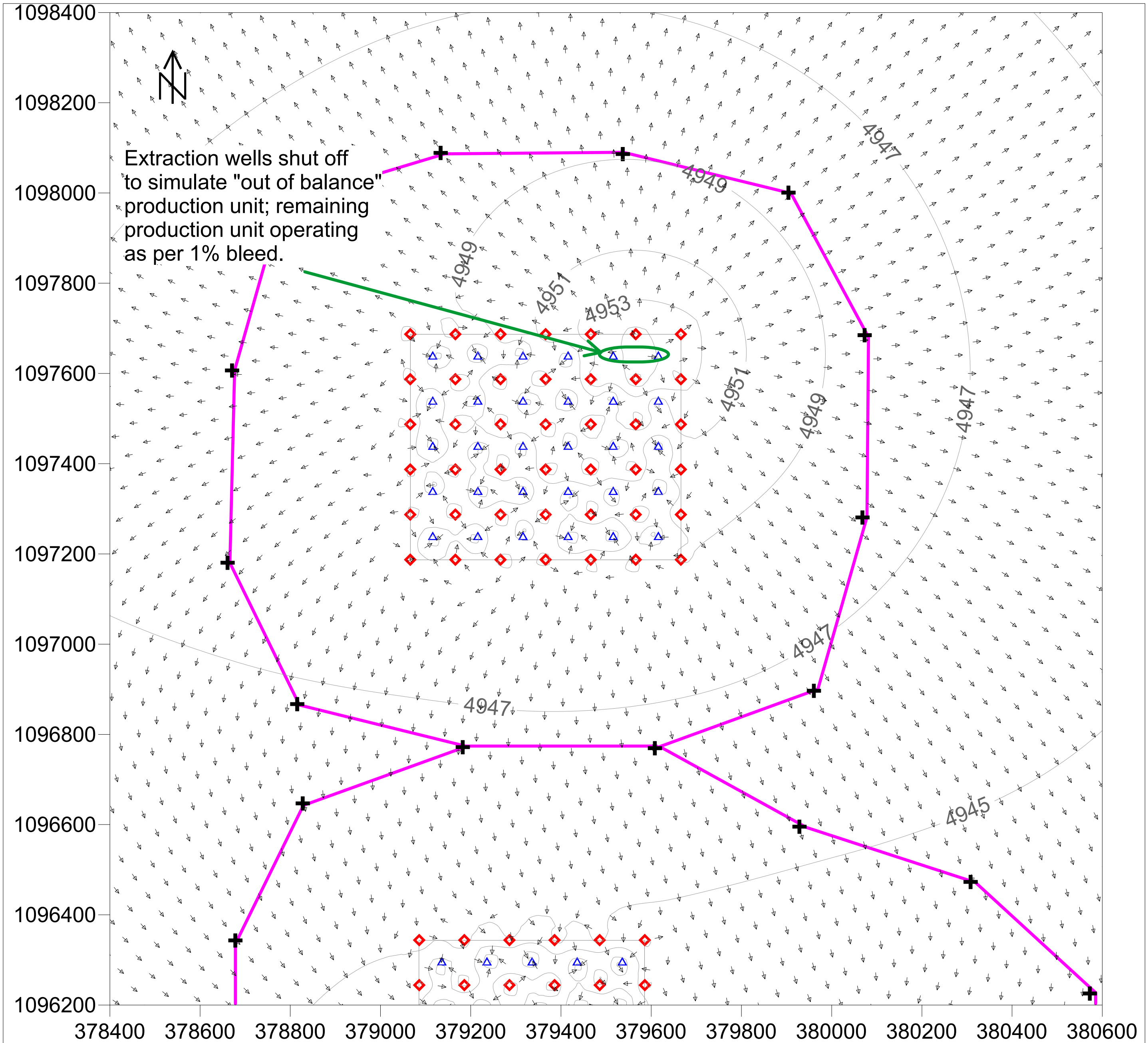
AUC LLC Reno Creek Project

Figure 27. Production Unit 6 Simulated Excursion, Groundwater Flow Particles Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_27.srf Date: 8/15/12



Note:
Out-of-balance production unit simulated, and groundwater flow particles were tracked. Velocity vectors represents conditions at the time particles reach 400 ft monitoring well ring.

0ft 400ft 800ft

Injection Well
Extraction Well
Perimeter Monitor Well, 400 ft spacing
Monitor Well Ring, 400 ft from production unit perimeter
4947 Potentiometric Surface Contour (ft amsl)
Groundwater Flow Velocity Vector

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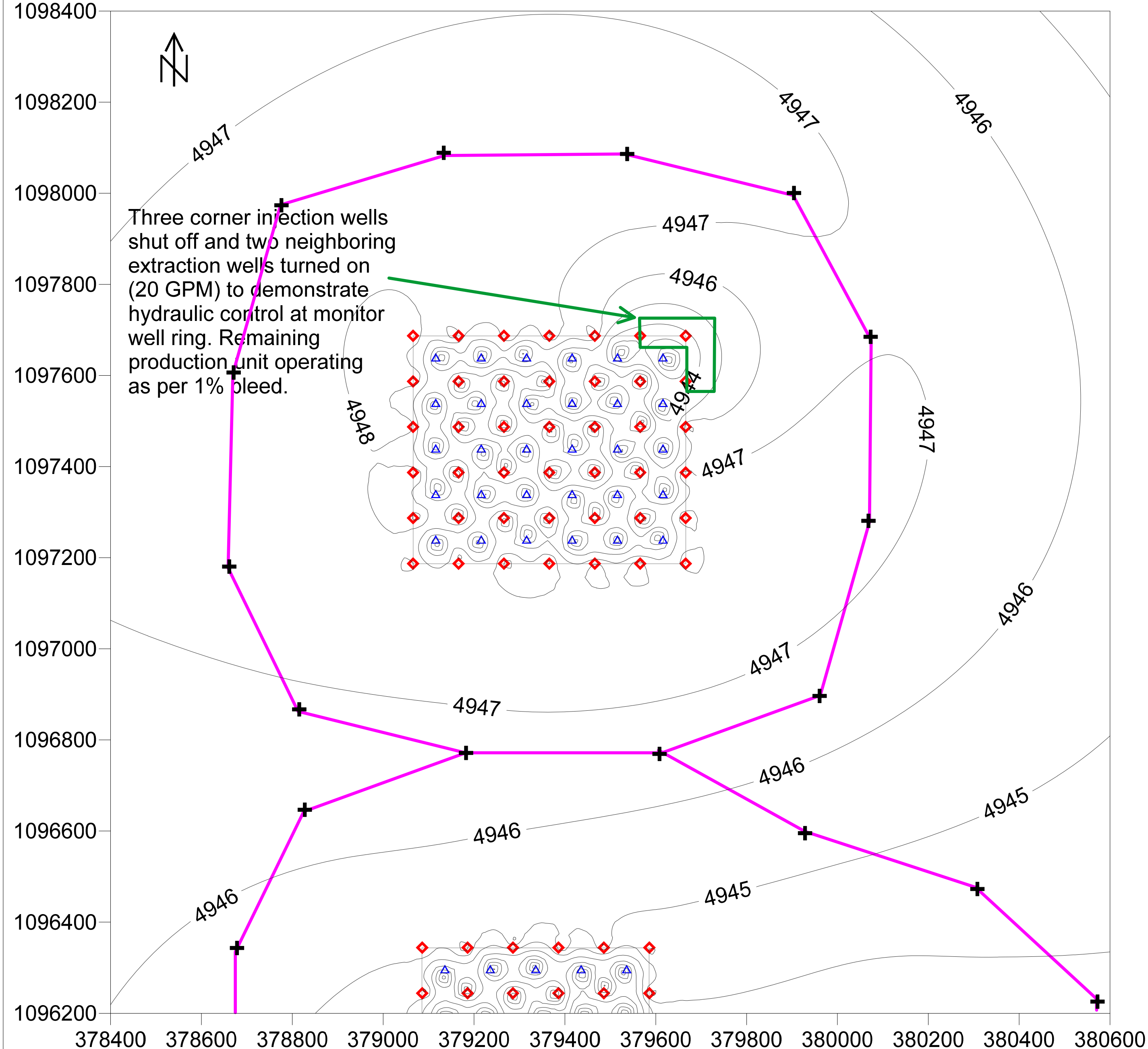
Figure 28. Production Unit 6 Simulated Excursion, Groundwater Velocity Vectors Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_28.srf Date: 8/15/12



Note:
Potentiometric surface at 1.7 days after start of excursion recovery, when grounderwater flow direction at the monitor well ring is reversed.

0ft 400ft 800ft

Injection Well

Extraction Well

Perimeter Monitor Well, 400 ft spacing

Monitor Well Ring, 400 ft from production unit perimeter

4947 Potentiometric Surface Contour (ft amsl)

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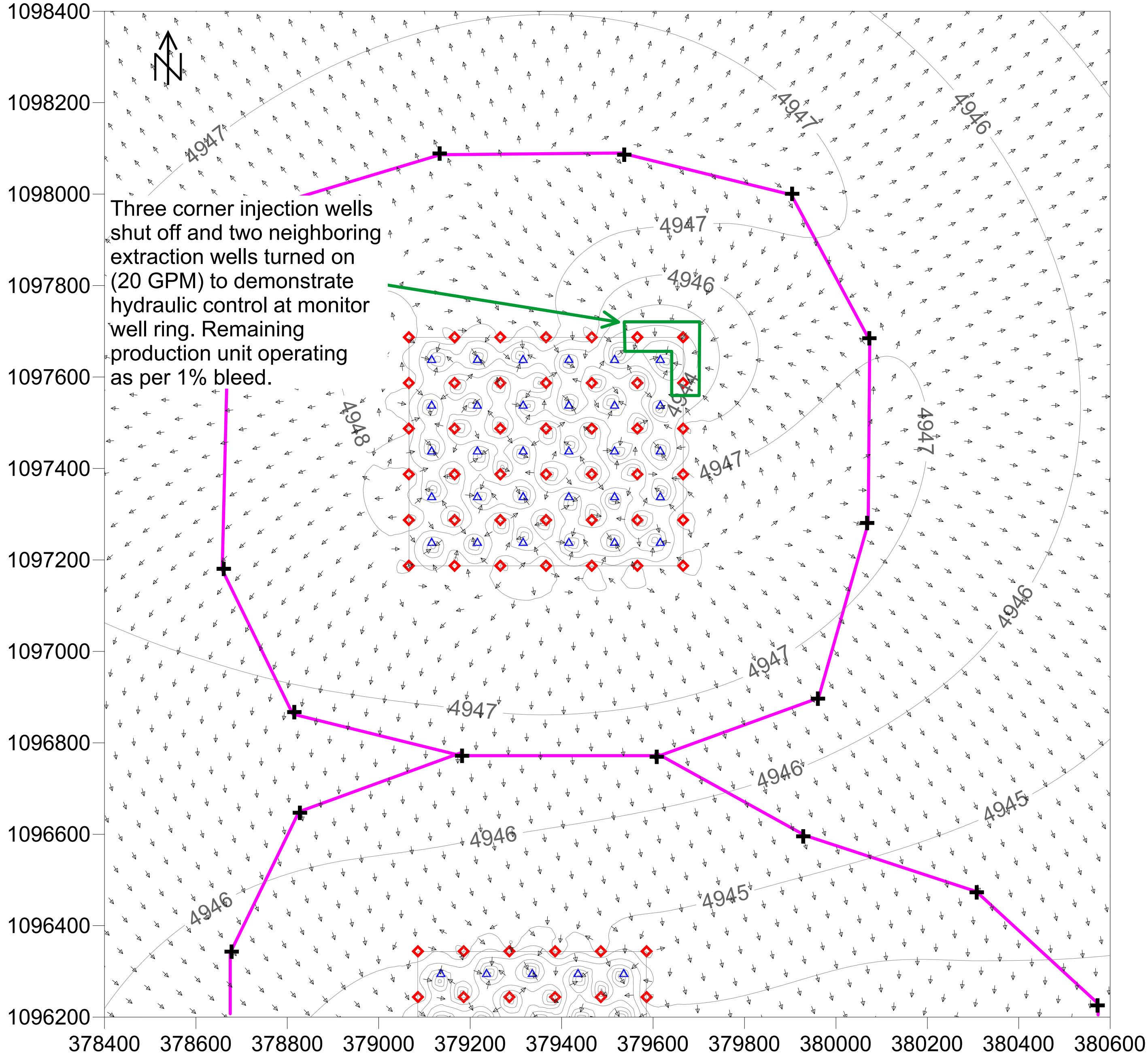
Figure 29. Production Unit 6 Simulated Excursion Recovery, Potentiometric Surface Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_29.srf Date: 8/15/12



Note:
Velocity vectors shown at 1.7 days after start of excursion recovery, when grounderwater flow direction near the simulated excursion at the monitor well ring is reversed back towards the production unit.

0ft 400ft 800ft

Injection Well
Extraction Well
Perimeter Monitor Well, 400 ft spacing
Monitor Well Ring, 400 ft from production unit perimeter
4947 Potentiometric Surface Contour (ft amsl)
Groundwater Flow Velocity Vector

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Figure 30. Production Unit 6 Simulated Excursion Recovery, Groundwater Velocity Vectors Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_30.srf Date: 8/15/12

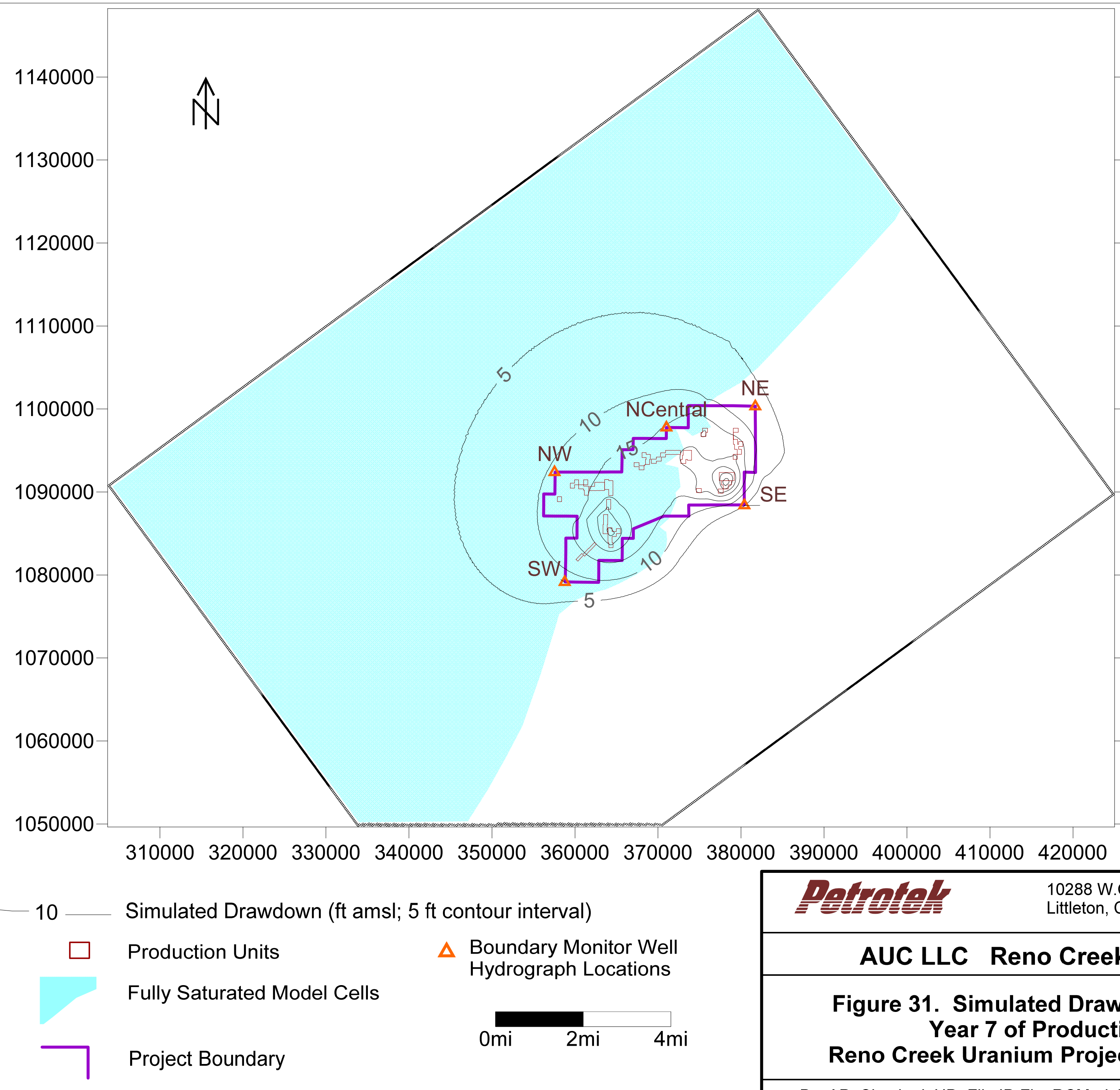

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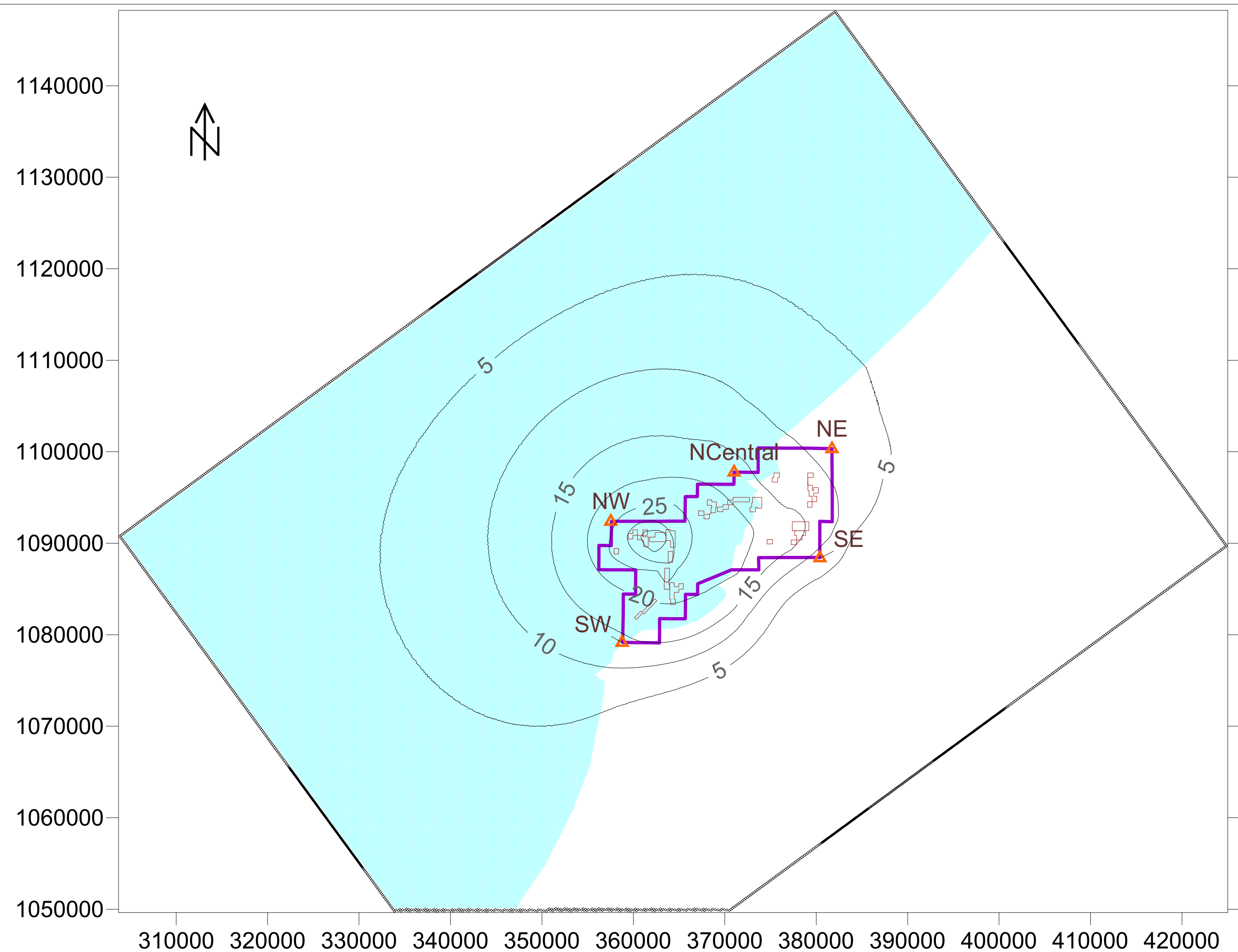
Figure 31. Simulated Drawdown After Year 7 of Production Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_31.srf Date: 8/15/12



10 Simulated Drawdown (ft amsl; 5 ft contour interval)

Production Units

Monitor Well Hydrograph Locations

Fully Saturated Model Cells

0mi 2mi 4mi

Project Boundary

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Figure 32. Simulated Drawdown After End of Mine Production (Year 11)
Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_32.srf Date: 1/27/12

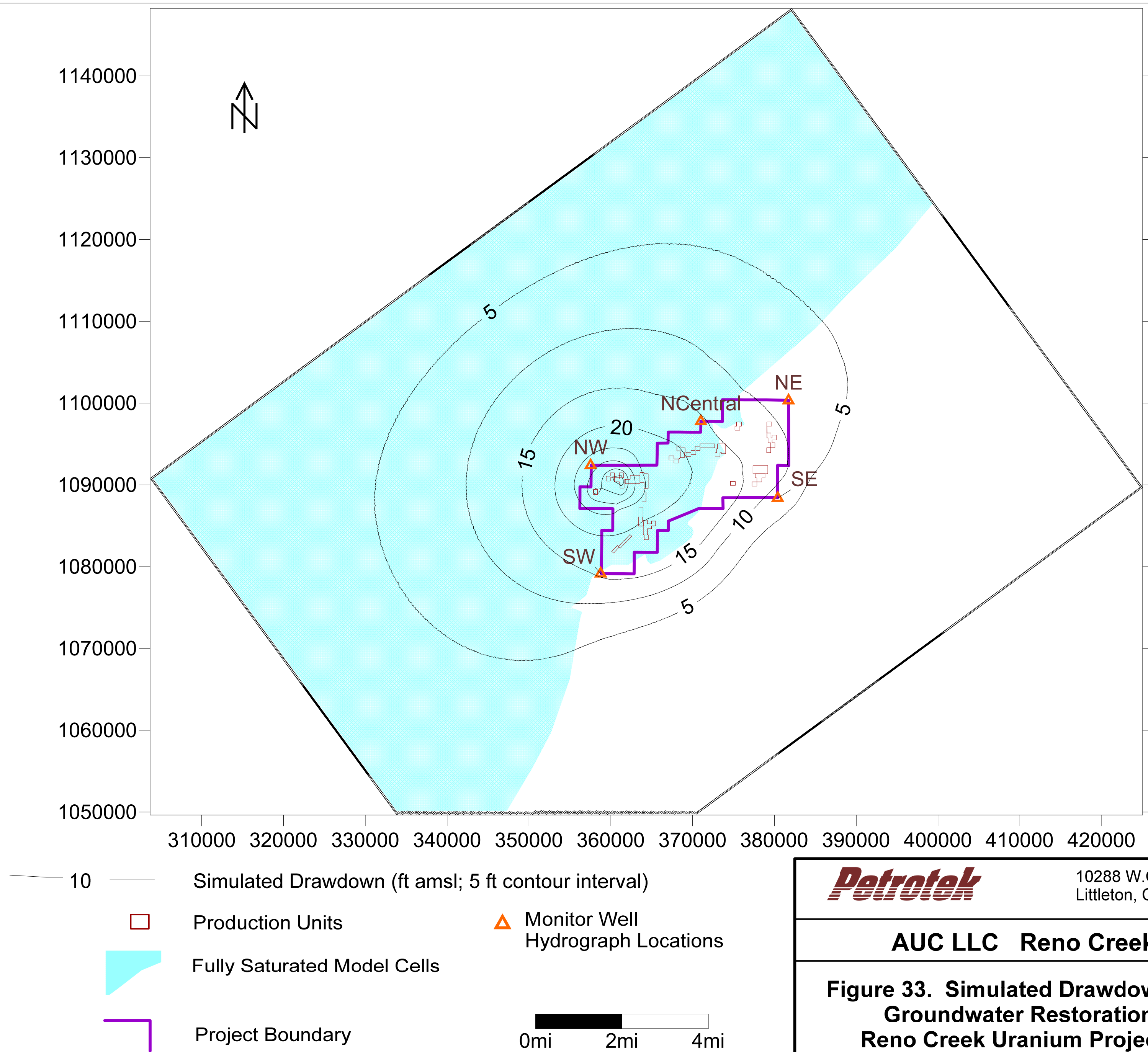

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Figure 33. Simulated Drawdown After End of Groundwater Restoration (Year 13)
Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_33.srf Date: 1/27/12

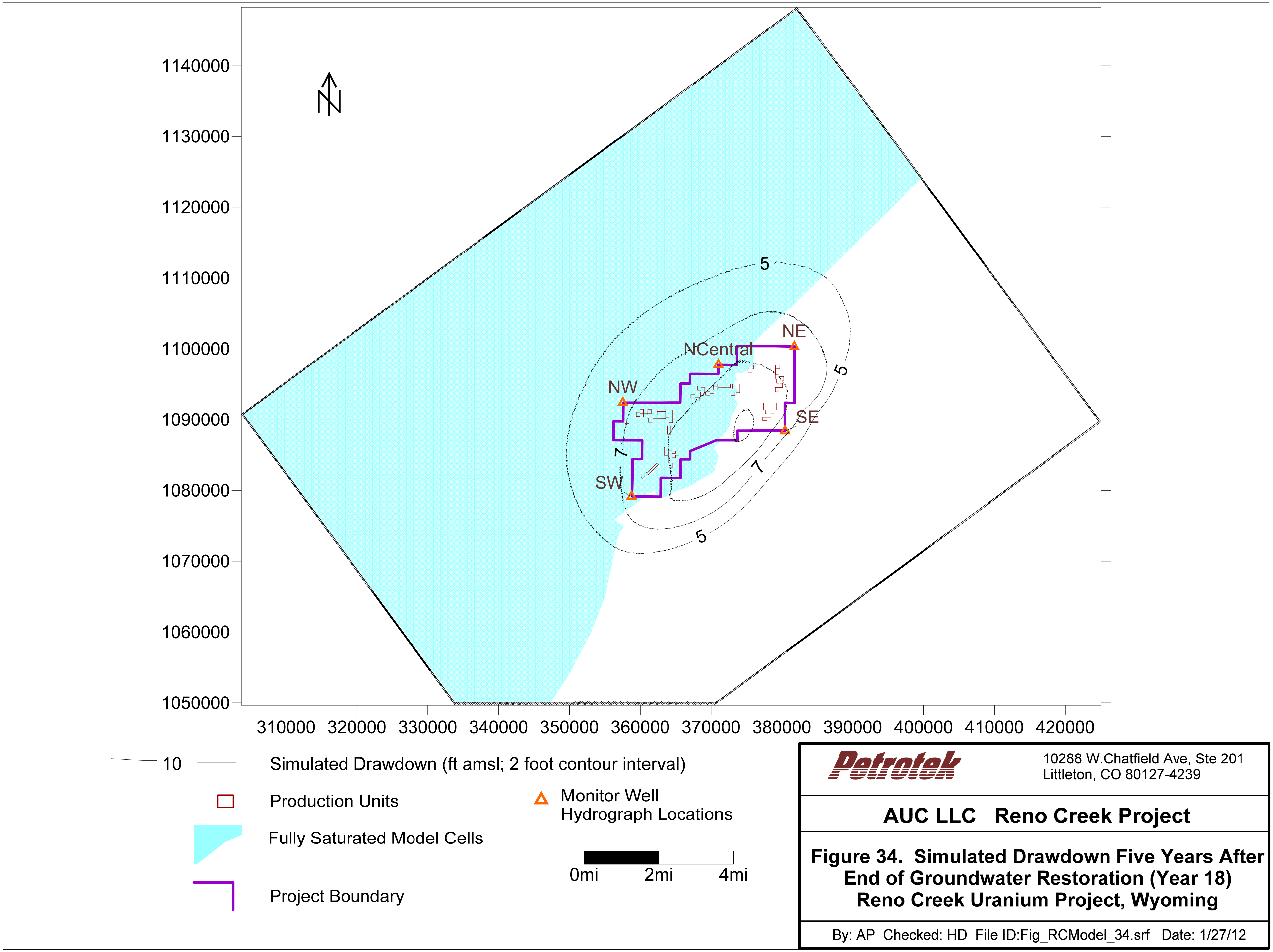

Figure 34. Simulated Drawdown Five Years After End of Groundwater Restoration (Year 18) Reno Creek Uranium Project, Wyoming

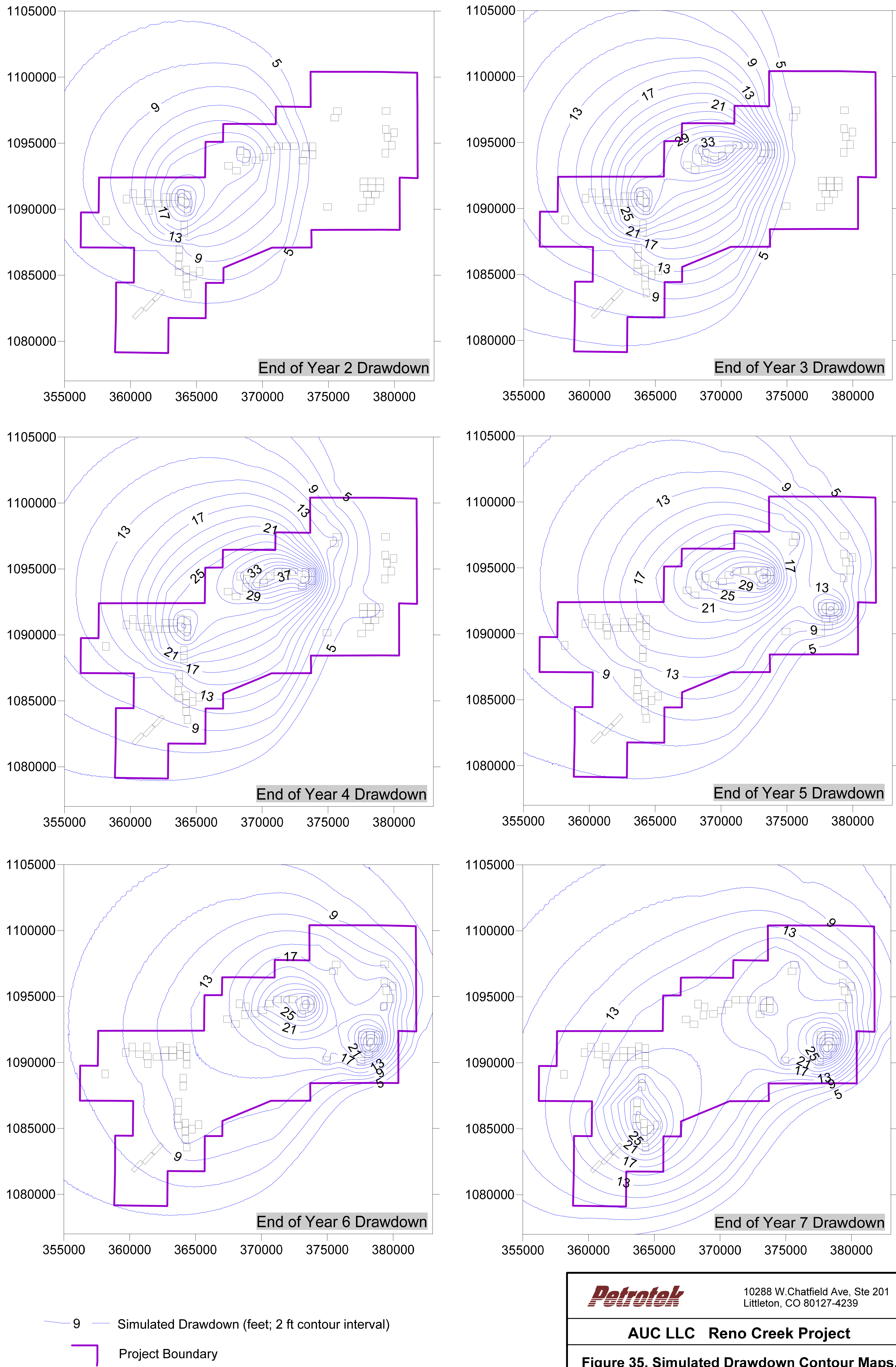

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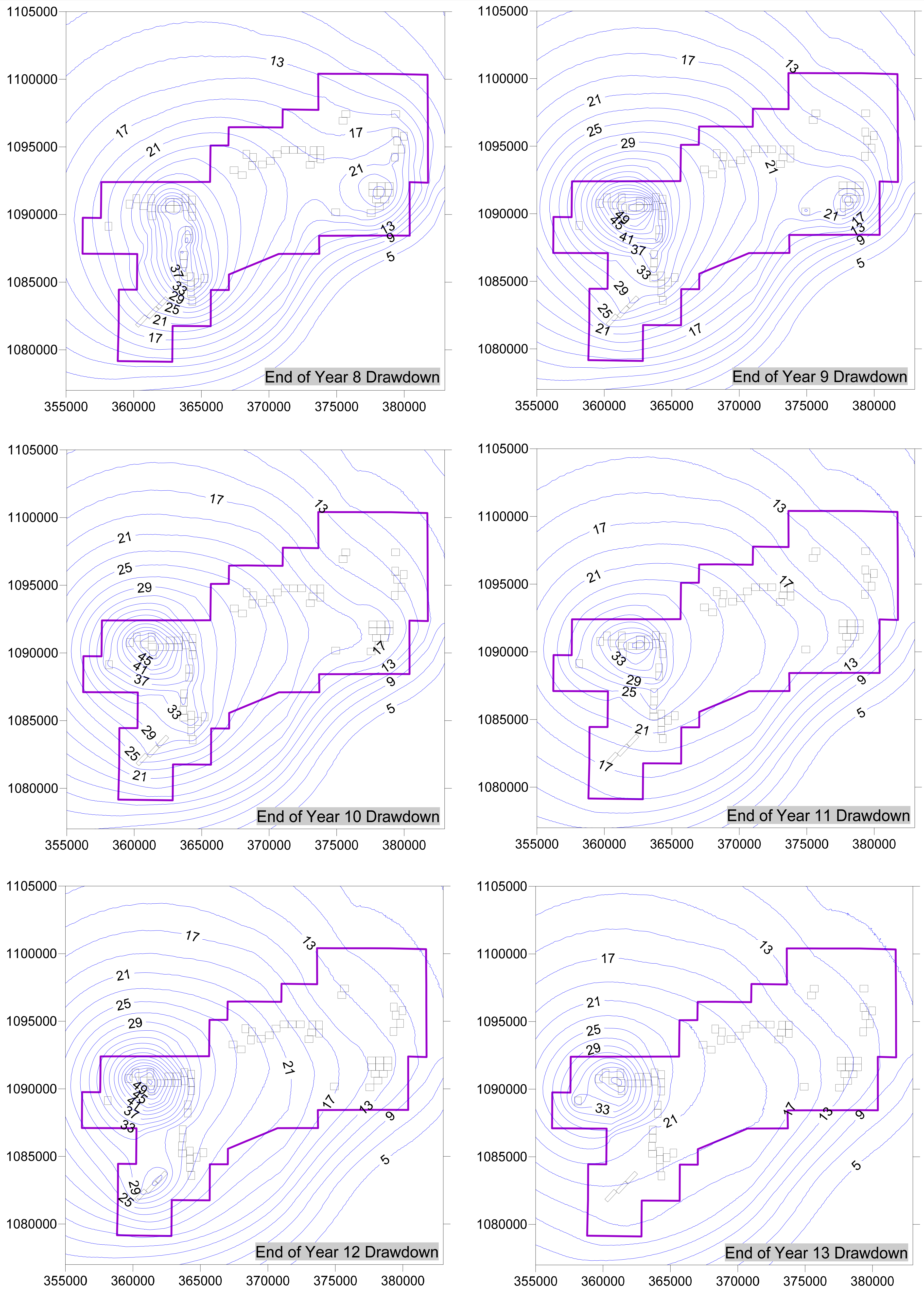
Figure 35. Simulated Drawdown Contour Maps, Simulated ISR Operations, Years 2 to 7 Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_35.srf Date: 8/15/12



9 Simulated Drawdown (feet; 2 ft contour interval)

Project Boundary

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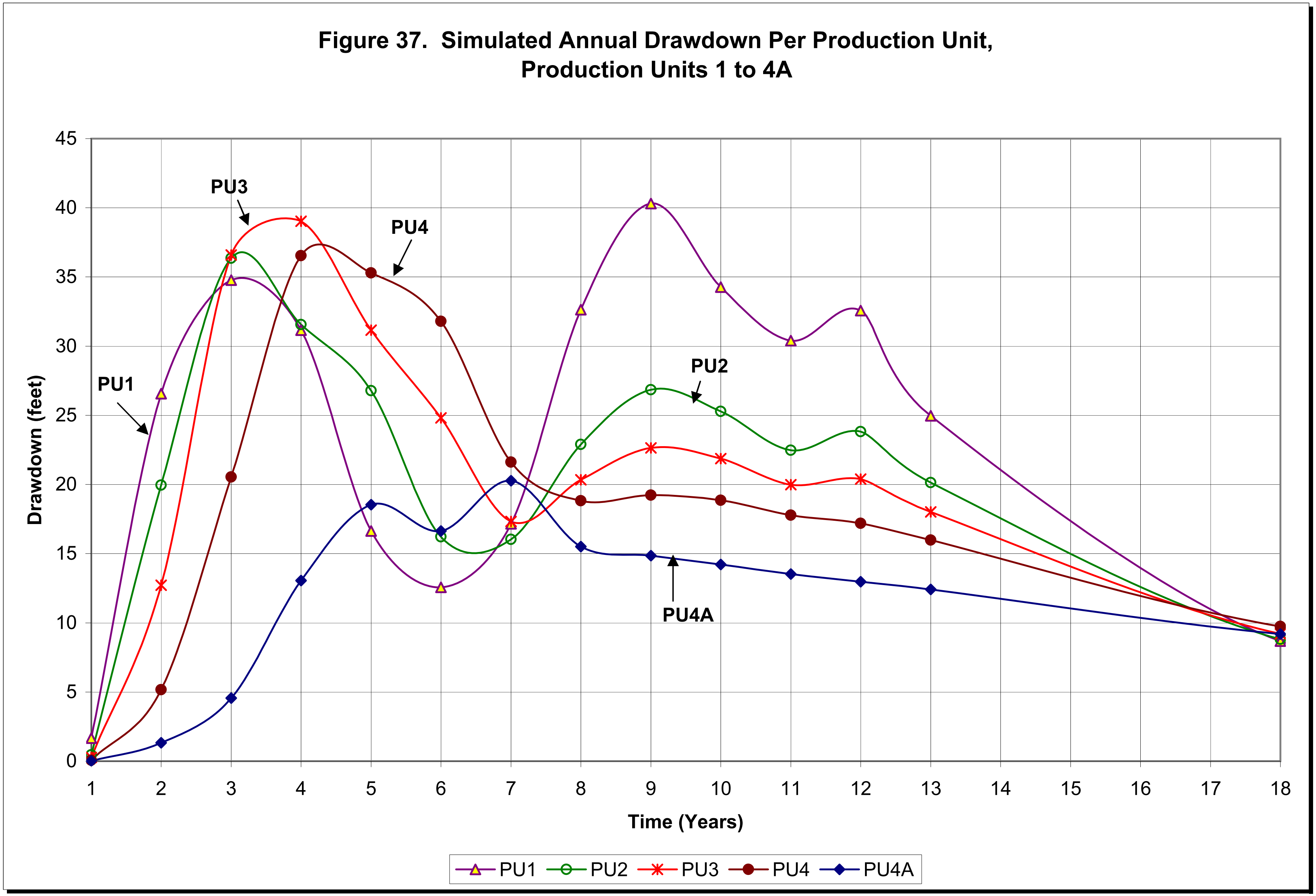
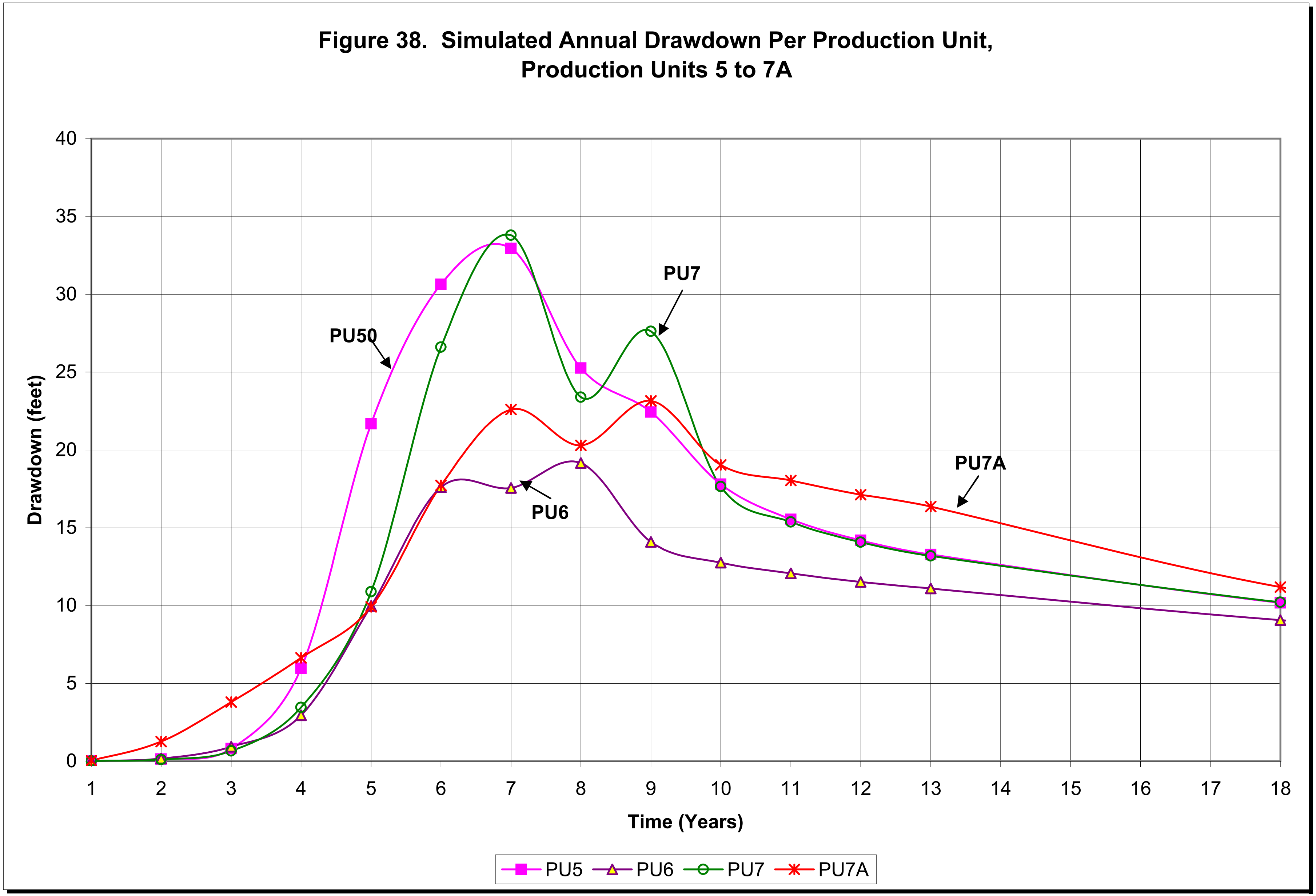
Figure 36. Simulated Drawdown Contour Maps, Simulated ISR Operations, Years 8 to 13 Reno Creek Uranium Project, Wyoming

By: AP Checked: HD File ID:Fig_RCModel_36.srf Date: 8/15/12



Numerical Modeling of Hydrogeologic Conditions
Reno Creek ISR Project, Wyoming
AUC LLC, August 2012



Numerical Modeling of Hydrogeologic Conditions
Reno Creek ISR Project, Wyoming
AUC LLC, March 2012

Figure 39. Simulated Annual Drawdown Per Production Unit, Production Units 8 to 12A

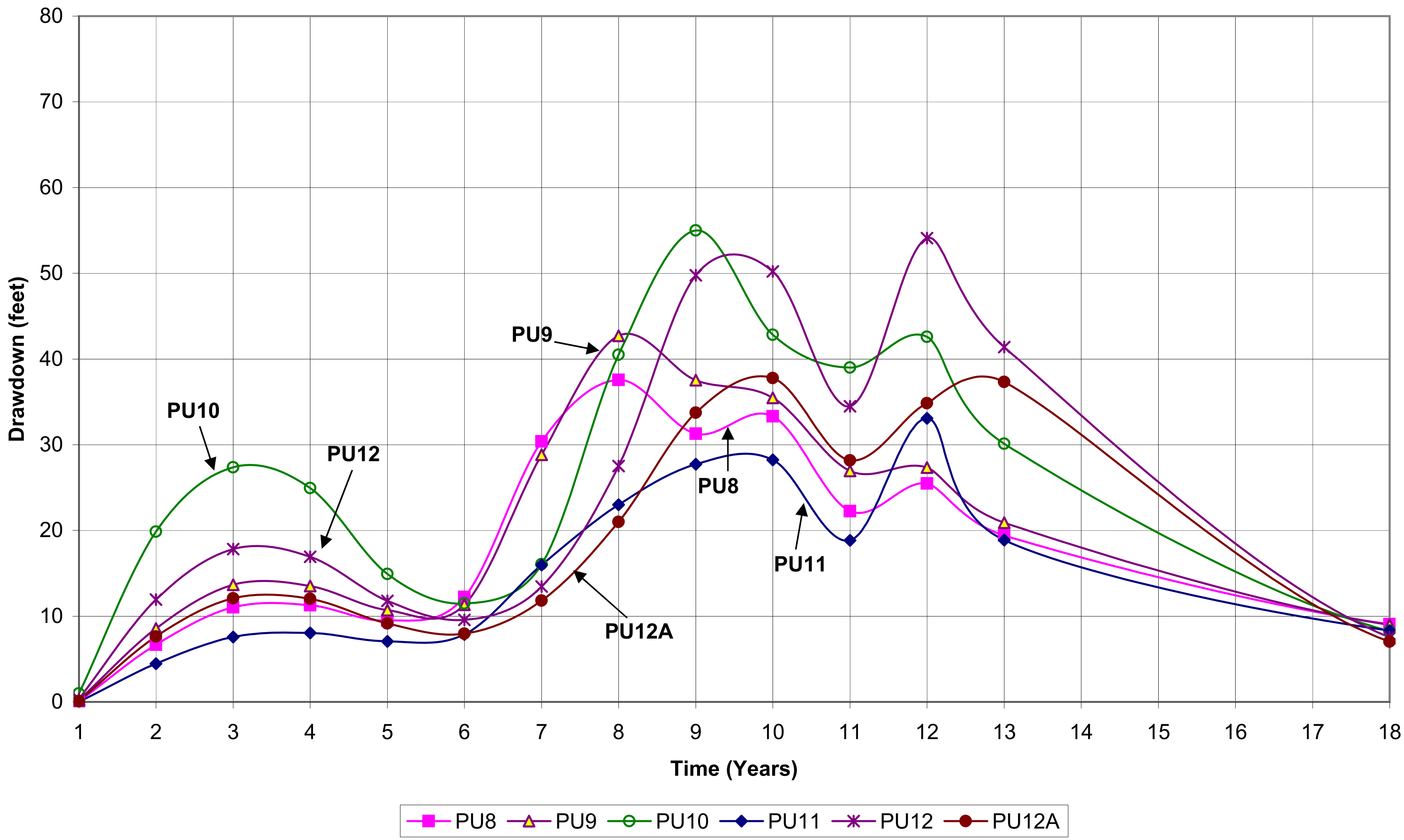


Figure 40. Northwest Project Boundary Monitor Well Simulated Drawdown Hydrograph, Life of Mine

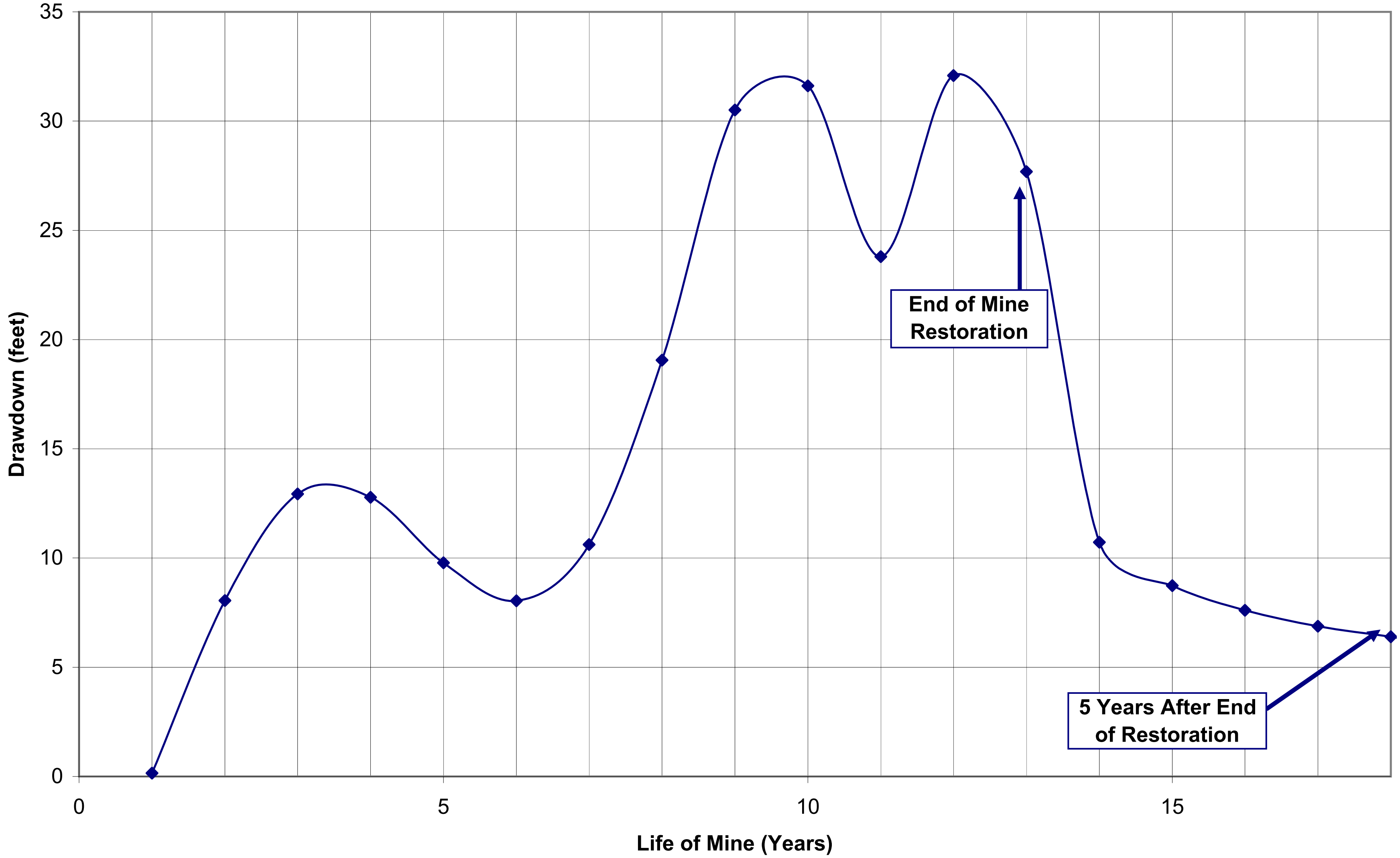
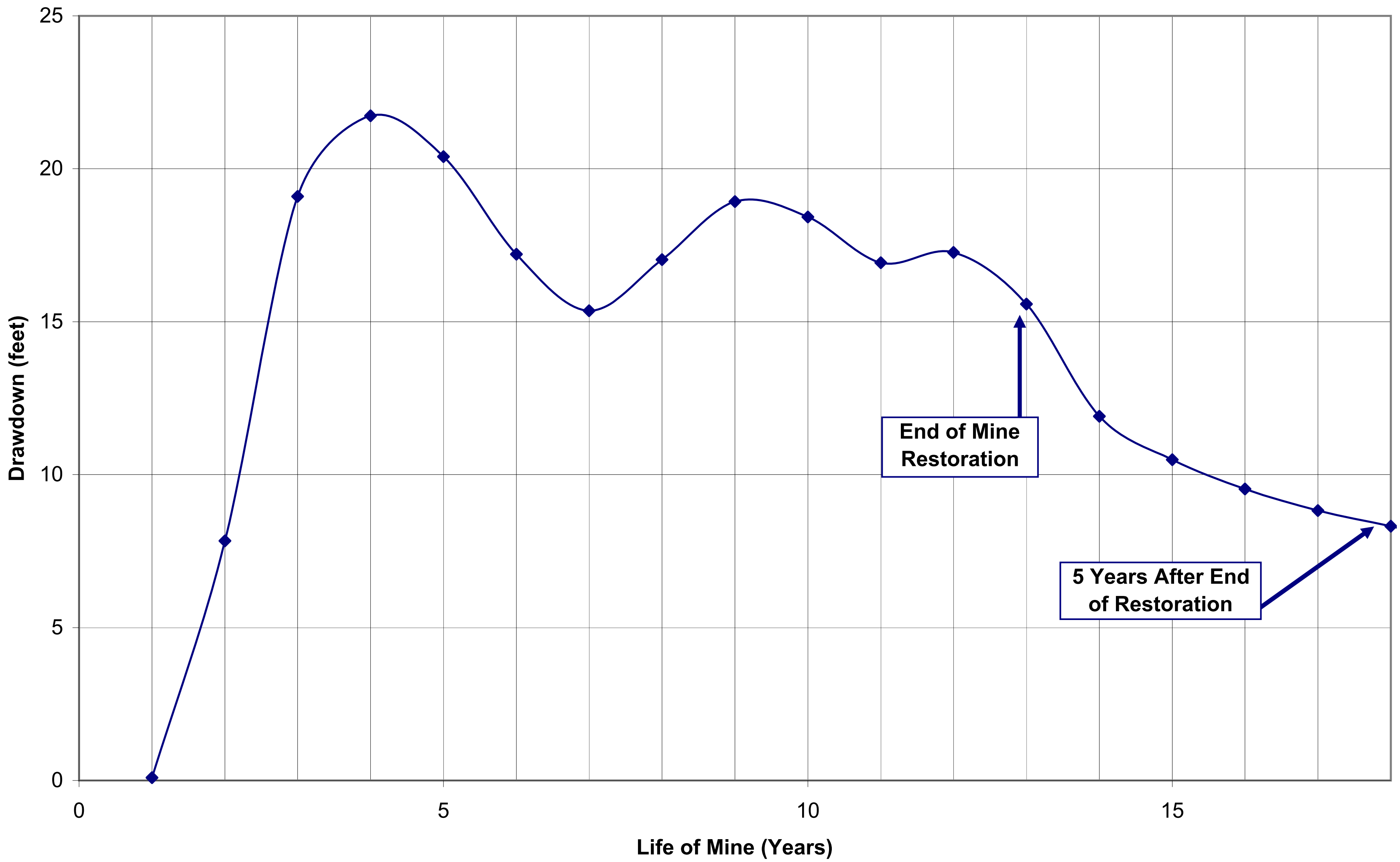
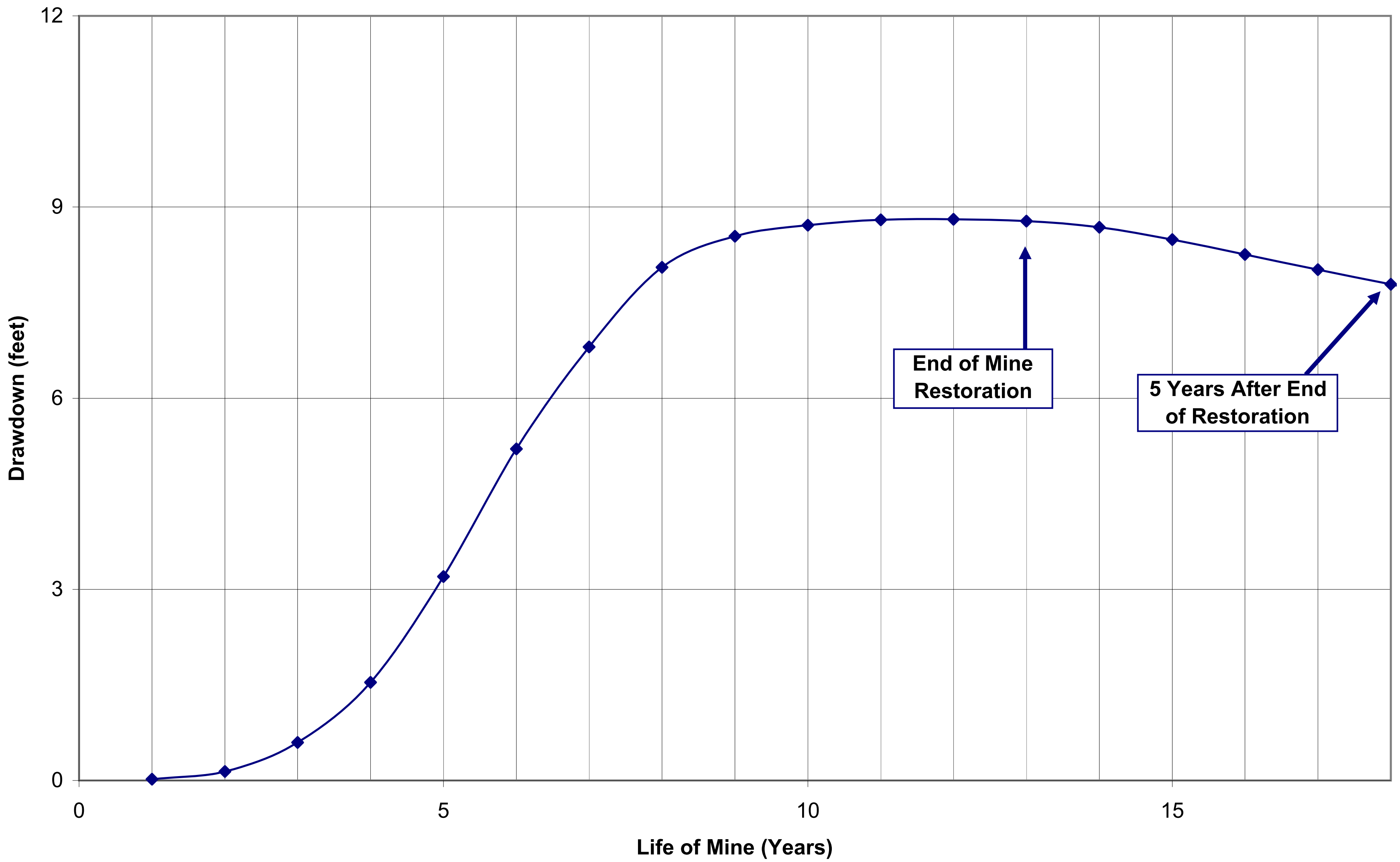


Figure 41. Northcentral Project Boundary Monitor Well Simulated Drawdown Hydrograph, Life of Mine



Numerical Modeling of Hydrogeologic Conditions
Reno Creek ISR Project, Wyoming
AUC LLC, March 2012

Figure 42. Northeast Project Boundary Monitor Well Simulated Drawdown Hydrograph, Life of Mine



Numerical Modeling of Hydrogeologic Conditions
Reno Creek ISR Project, Wyoming
AUC LLC, March 2012

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Figure 43. Southeast Project Boundary Monitor Well Simulated Drawdown Hydrograph, Life of Mine

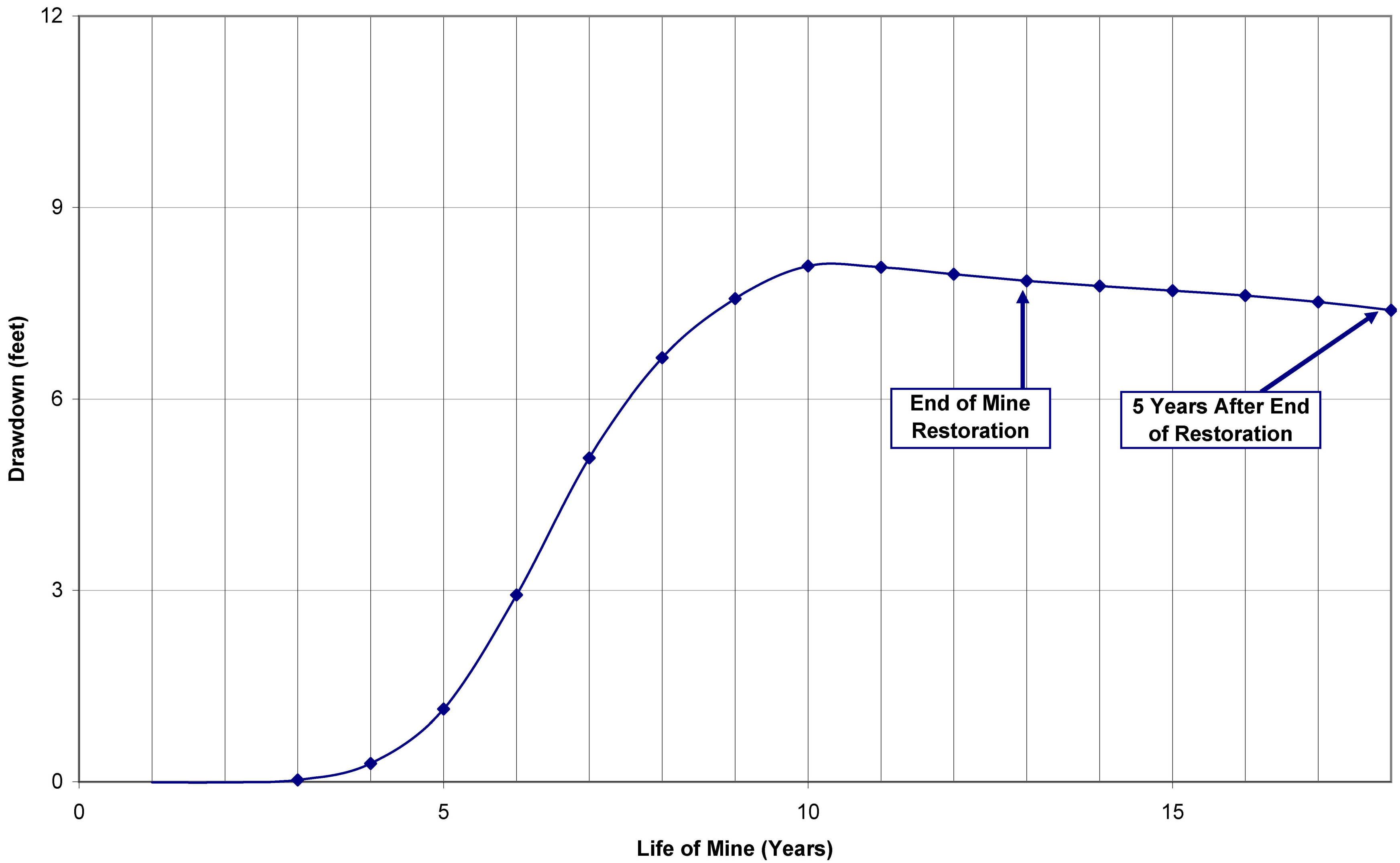

Figure 44. Southwest Project Boundary Monitor Well Simulated Drawdown Hydrograph, Life of Mine