NRC Pre-submission Audit

AUC LLC
The Reno Creek Project

Hydrogeological Characterization

The Reno Creek Project

November 15, 2011

Reno Creek
Hydrogeological Characterization

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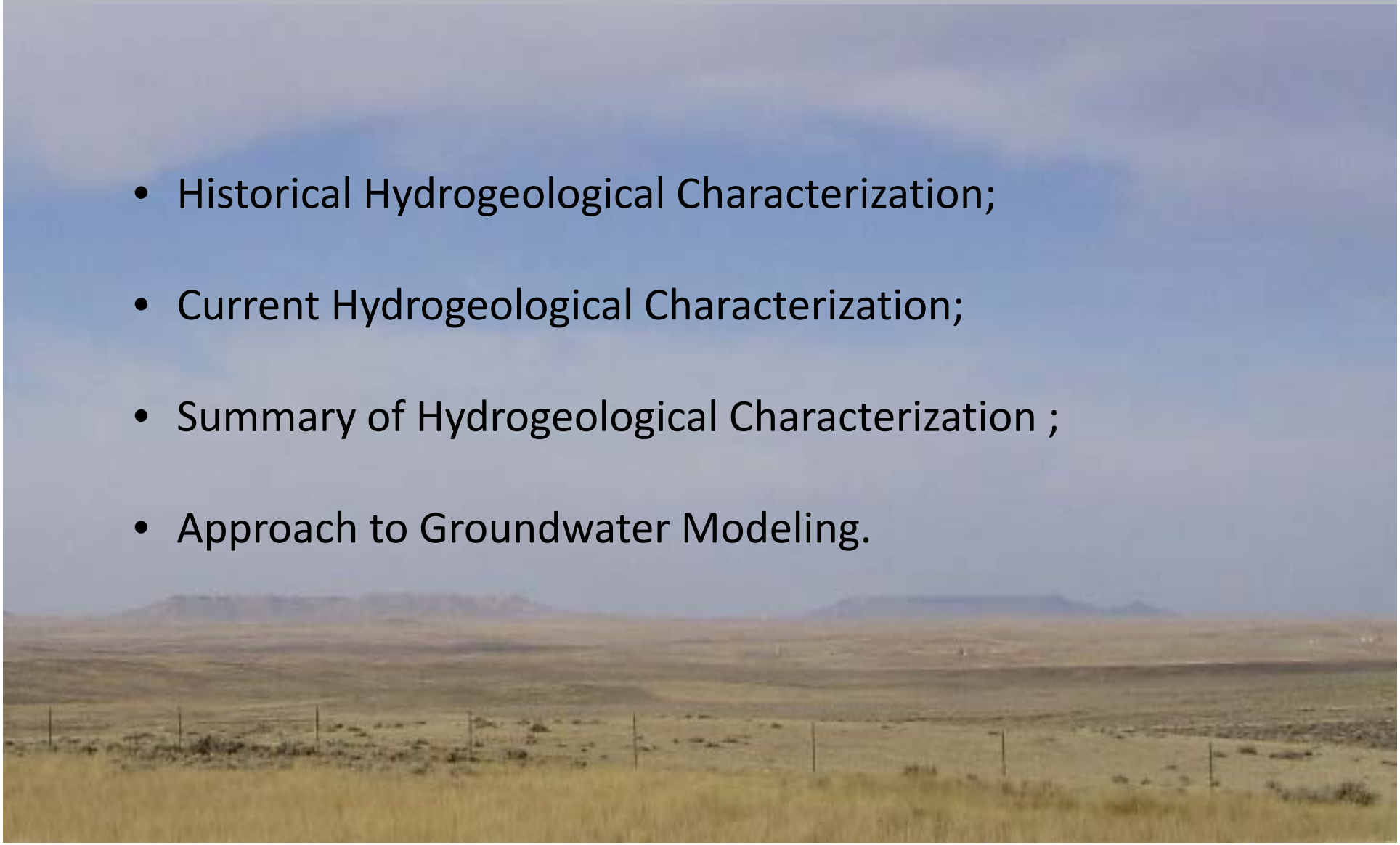

- Historical Hydrogeological Characterization;
- Current Hydrogeological Characterization;
- Summary of Hydrogeological Characterization ;
- Approach to Groundwater Modeling.

Historical Hydrogeological Characterization

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- Hydrogeologic characterization primarily focused on the Production Zone Sand, Overlying Aquitard and Overlying Aquifer;
- Majority of historical hydraulic testing consisted of small scale multi-well and single-well tests;
- Production Zone Aquifer (PZA) is geologically confined; however, groundwater occurs under fully saturated and partially saturated aquifer conditions;
- Integrity testing identified no communication between the PZA and the Overlying Aquifer.

Summary of Historical Pump Tests Results

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- **Results are similar to aquifer properties where ISR has been successfully performed:**

Year	Test	Range of Values	Representative Value
1979 - 1980	**RME Single and Multi Well Tests - PZA**		
	Transmissivity (T; ft^2/d)	72 to 867	200
	Hydraulic Conductivity (k; ft/day)	0.6 to 5.3	2.0
	Storativity (S)		
1982	**Hydrogeologic Integrity Evaluation - PZA**		
	Transmissivity (T; ft2/d)	149 to 555	272
	Hydraulic Conductivity (k; ft/day)	0.9 to 4.1	2.3
	Storativity (S)	4.0E-05 to 1.0E-03	5.50E-04
1993	**Hydro/EFNI Single-well Tests - PZA**		
	Transmissivity (T; ft^2/d)	85 to 639	200
	Hydraulic Conductivity (k; ft/day)		2.0
	Storativity (S)		
1993	**Hydro/EFNI Single-well Tests - Overlying Aquifer**		
	Transmissivity (T; ft2/d)	0.24 to 164	uncertain
	Hydraulic Conductivity (k; ft/day)		
	Storativity (S)		
1994	**EFNI Mine Unit I Test - PZA**		
	Transmissivity (T; ft^2/d)	47.4 to 52.5	50.7
	Hydraulic Conductivity (k; ft/day)	0.46 to 0.51	0.5
	Storativity (5)	6.9E-05 to 1.4E-04	1.40E-04

Regional Potentiometric Surface Production Zone Aquifer – August 2011

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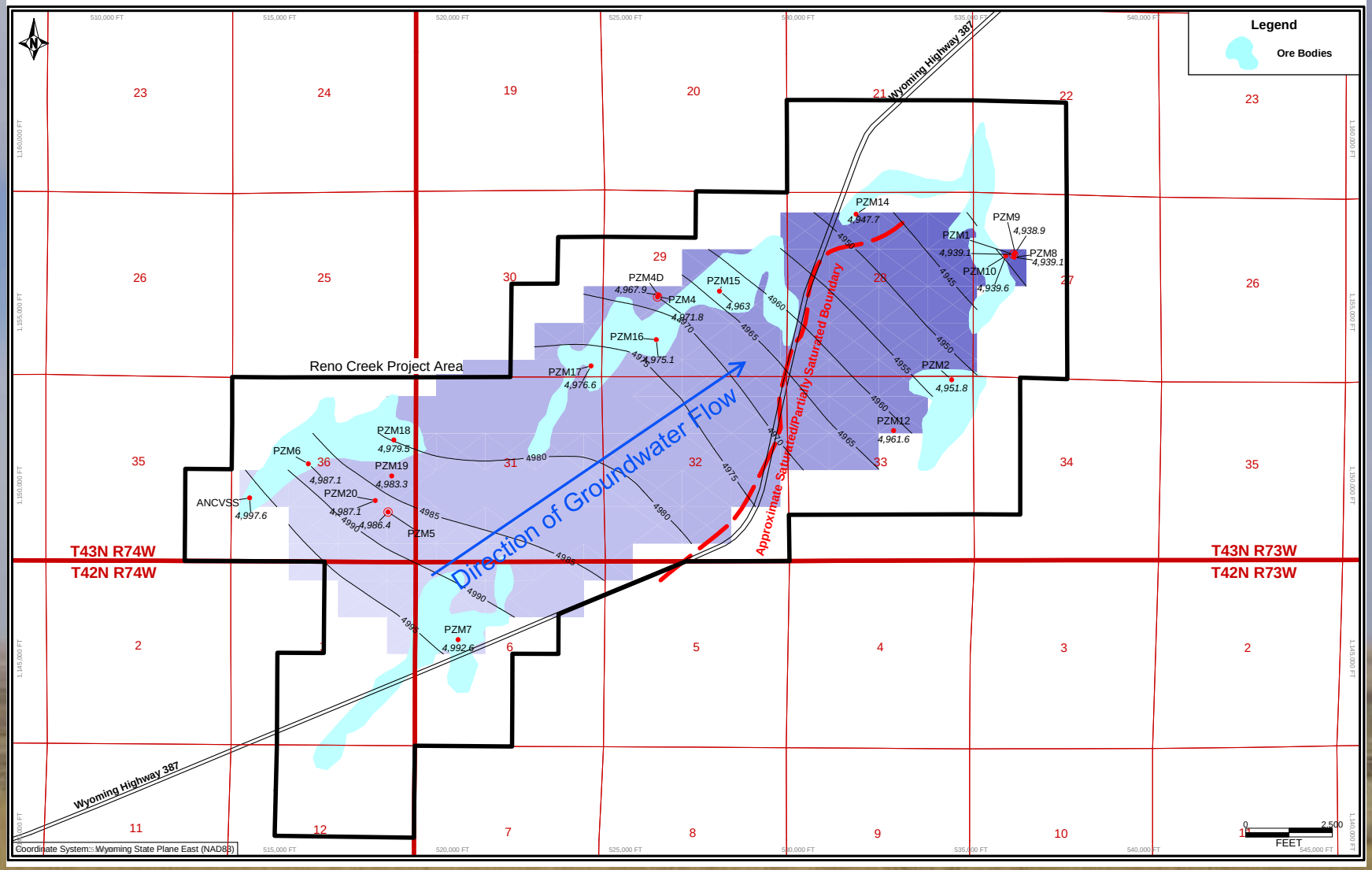
- Current and historical potentiometric surfaces of Production Zone Aquifer are consistent.



Summary of Hydrogeological Characterization Activities

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AUC has recently completed all of the required hydrogeological characterization activities as outlined in NUREG 1569 for a successful submittal of an NRC Source Material License Application. Characterization includes:

- Drilled and logged 10 strat holes to Badger Coal for geologic control;
- Installed 41 new monitor wells including:
  - 4 wells in the Shallow Water Table Zone (SM wells)
  - 7 wells in the Overlying Aquifer (OM wells)
  - 2 Piezometers in the Overlying Aquitard (OAM piezometers)
  - 21 wells in the Production Zone Aquifer (PZM wells)
  - 7 wells in the Underlying Aquifer (UM wells)

Summary of Hydrogeological Characterization Activities

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- Monthly water level monitoring;
- Baseline water quality sampling;
- Core sampling;
- Completed 4 multi-well pump tests in the Production Zone Aquifer;
- Completed 2 single-well pump tests in the Shallow Water Table Zone;
- Completed 4 single-well pump tests in the Overlying Aquifer;
- Completed 4 single-well pump tests in the Underlying Aquifer.

Baseline and Pump Test Well Locations

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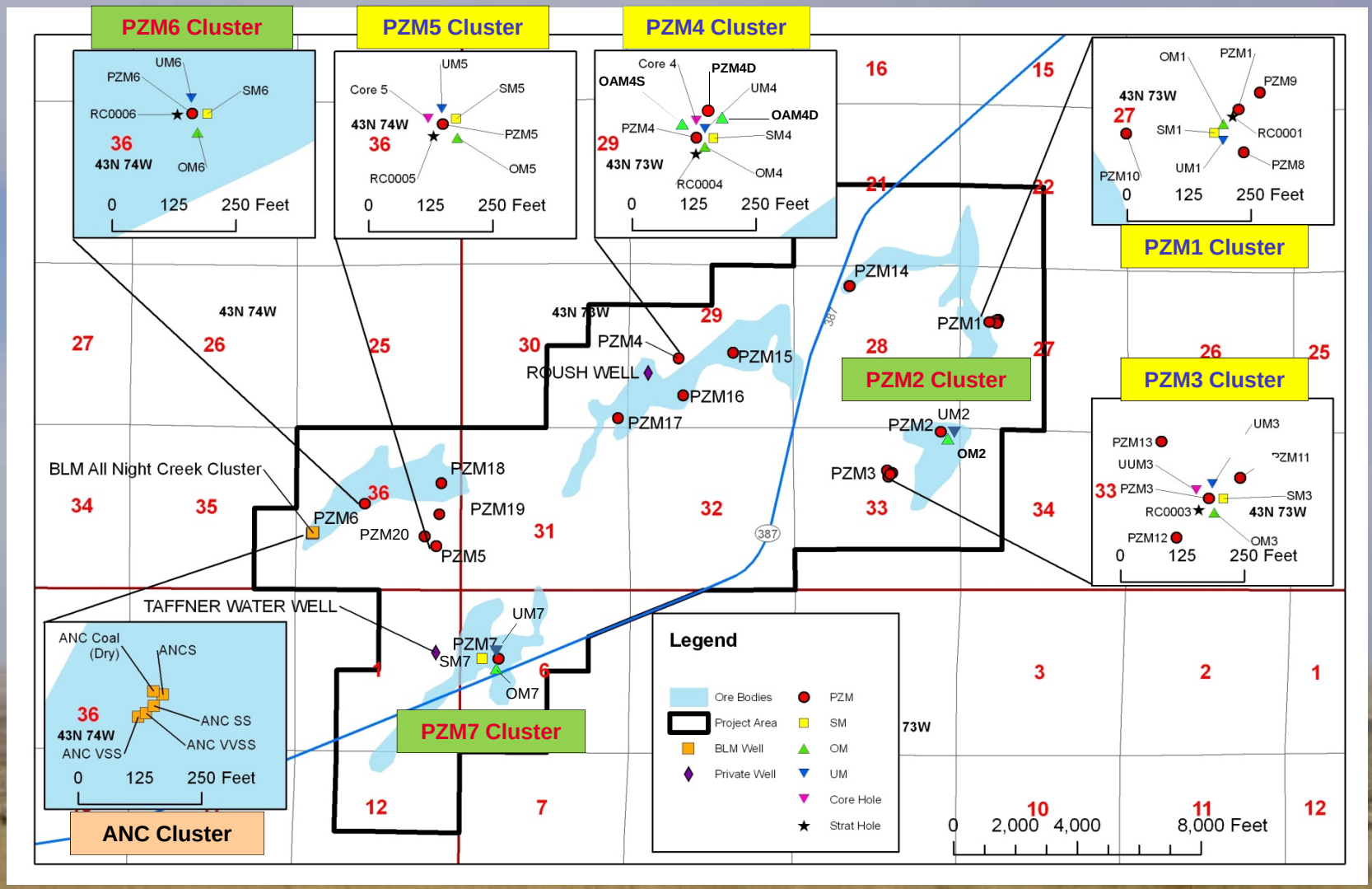

Regional Hydrostratigraphic Cross Section A-A' Location Map

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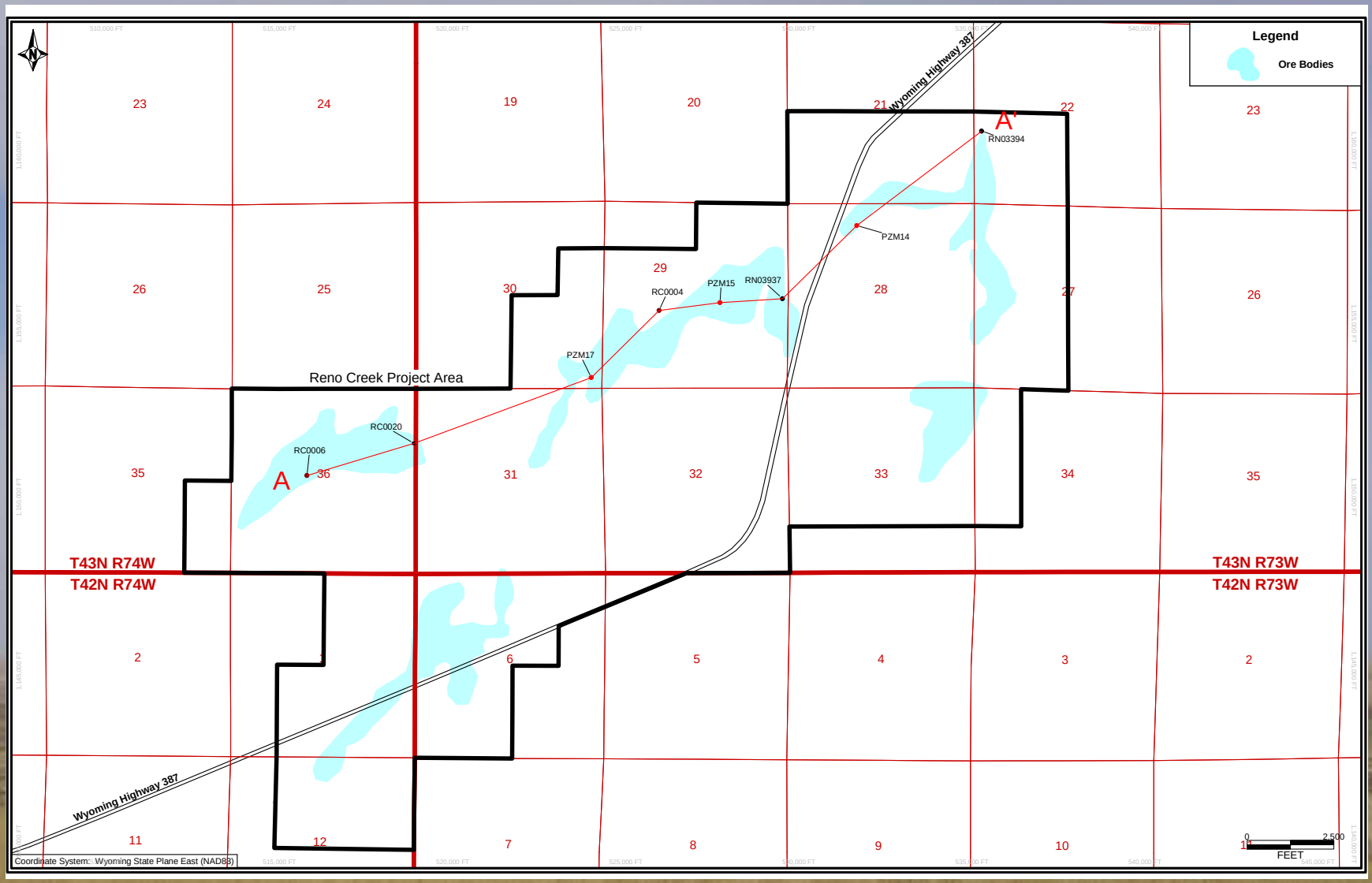

Regional Hydrostratigraphic Cross Section A-A’

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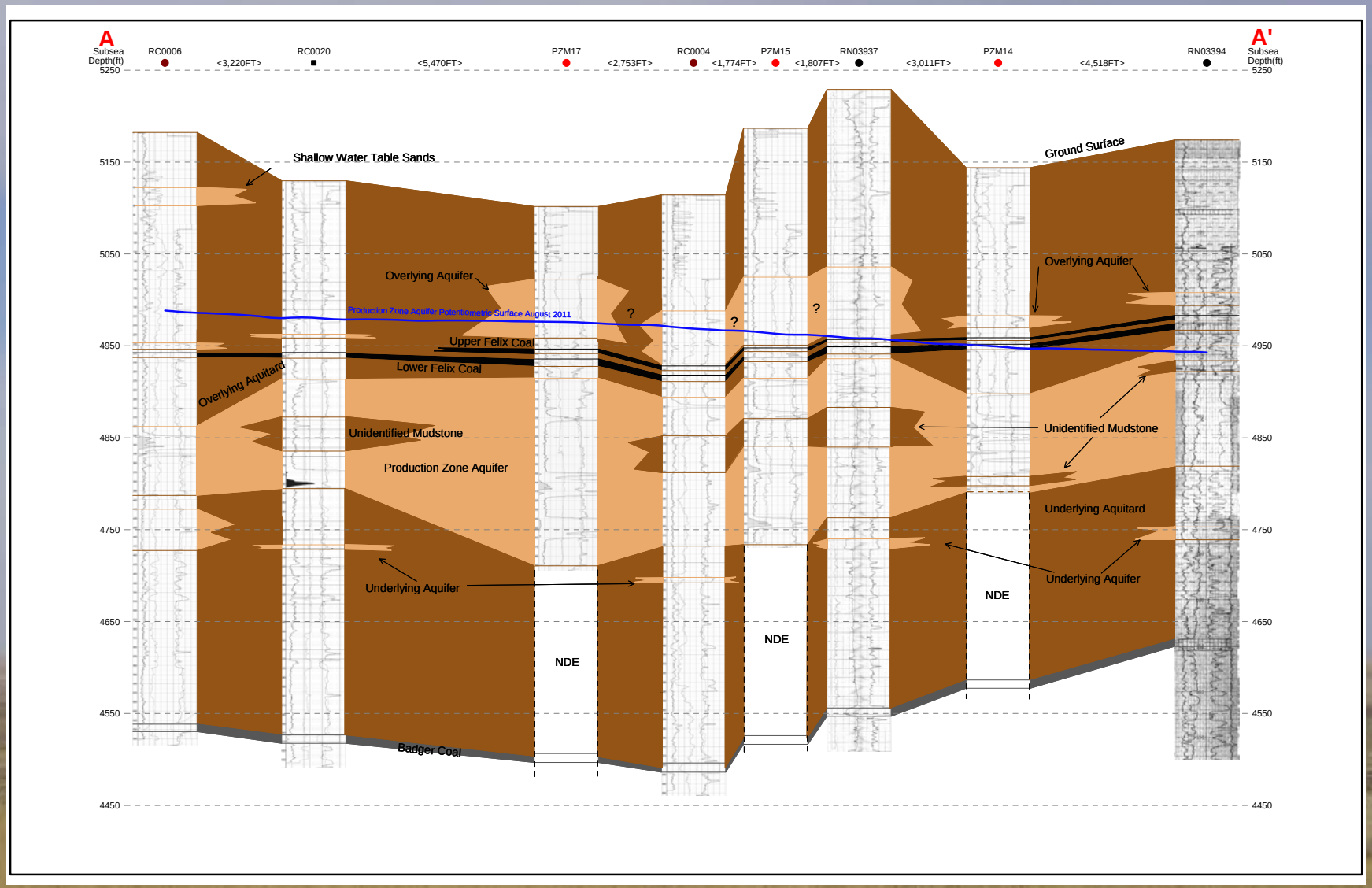

PZM1 Cluster
Hydrostratigraphic Diagram

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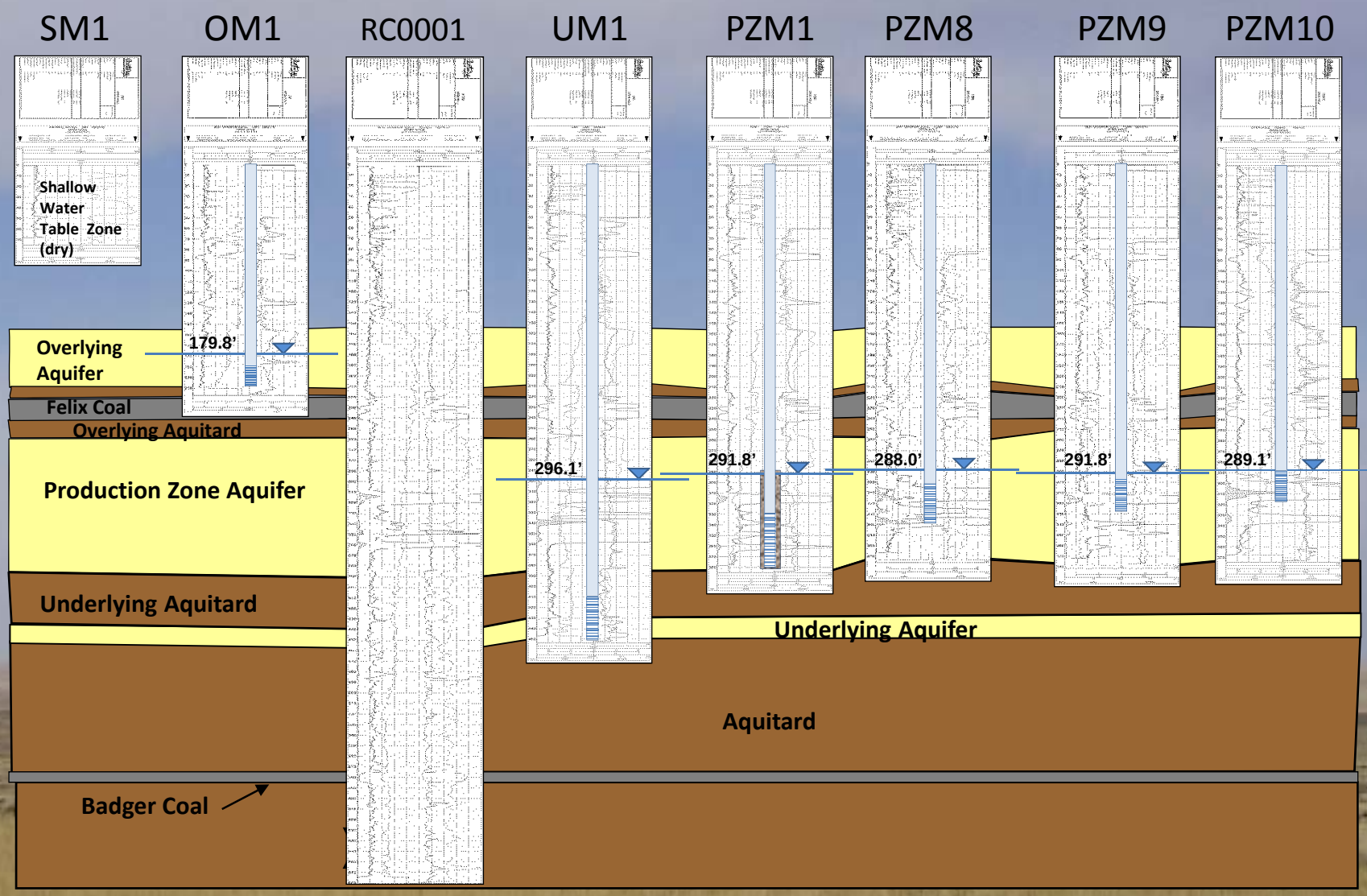

PZM3 Cluster
Hydrostratigraphic Diagram

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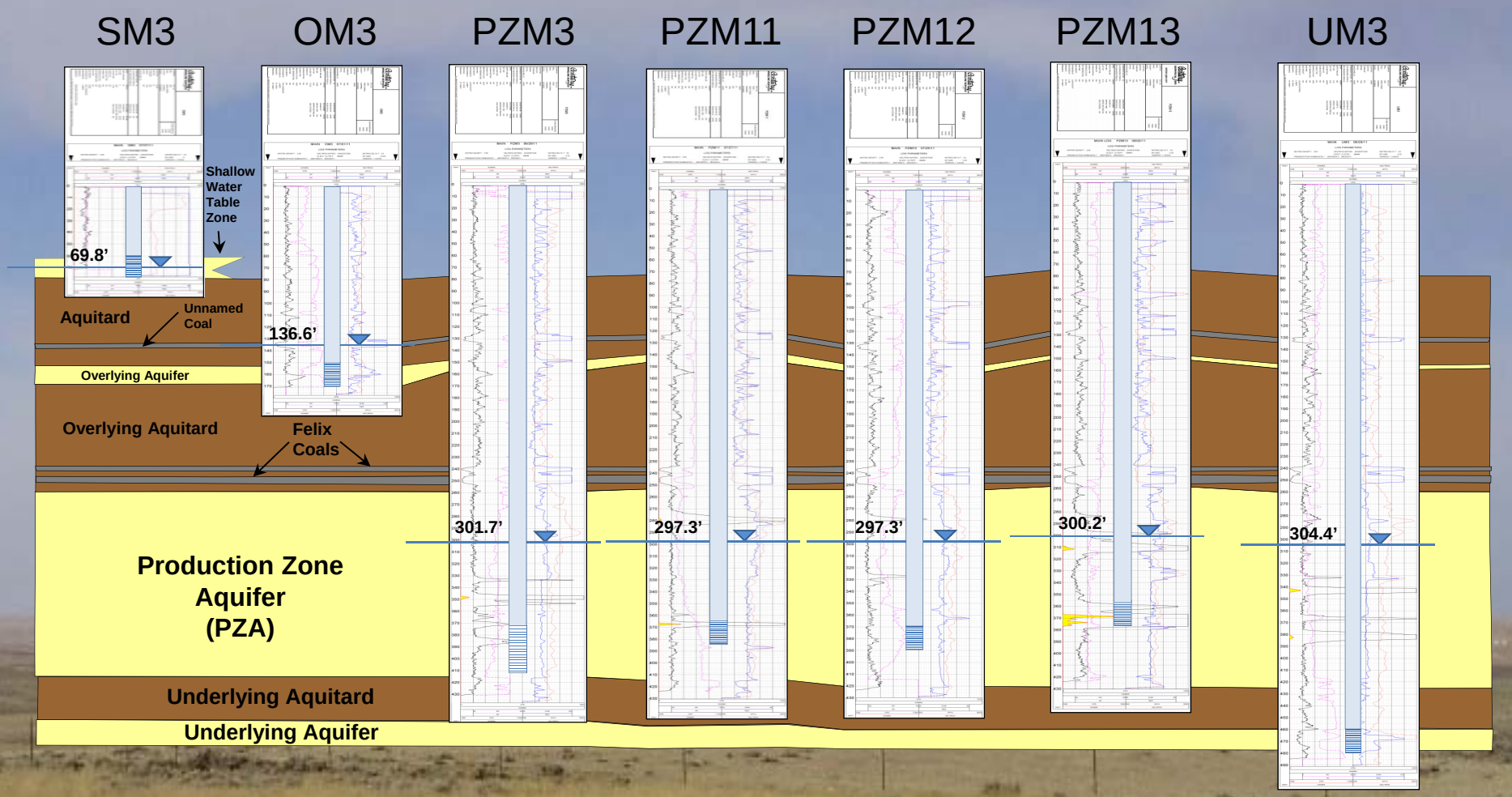

PZM4 Cluster Hydrostratigraphic Diagram

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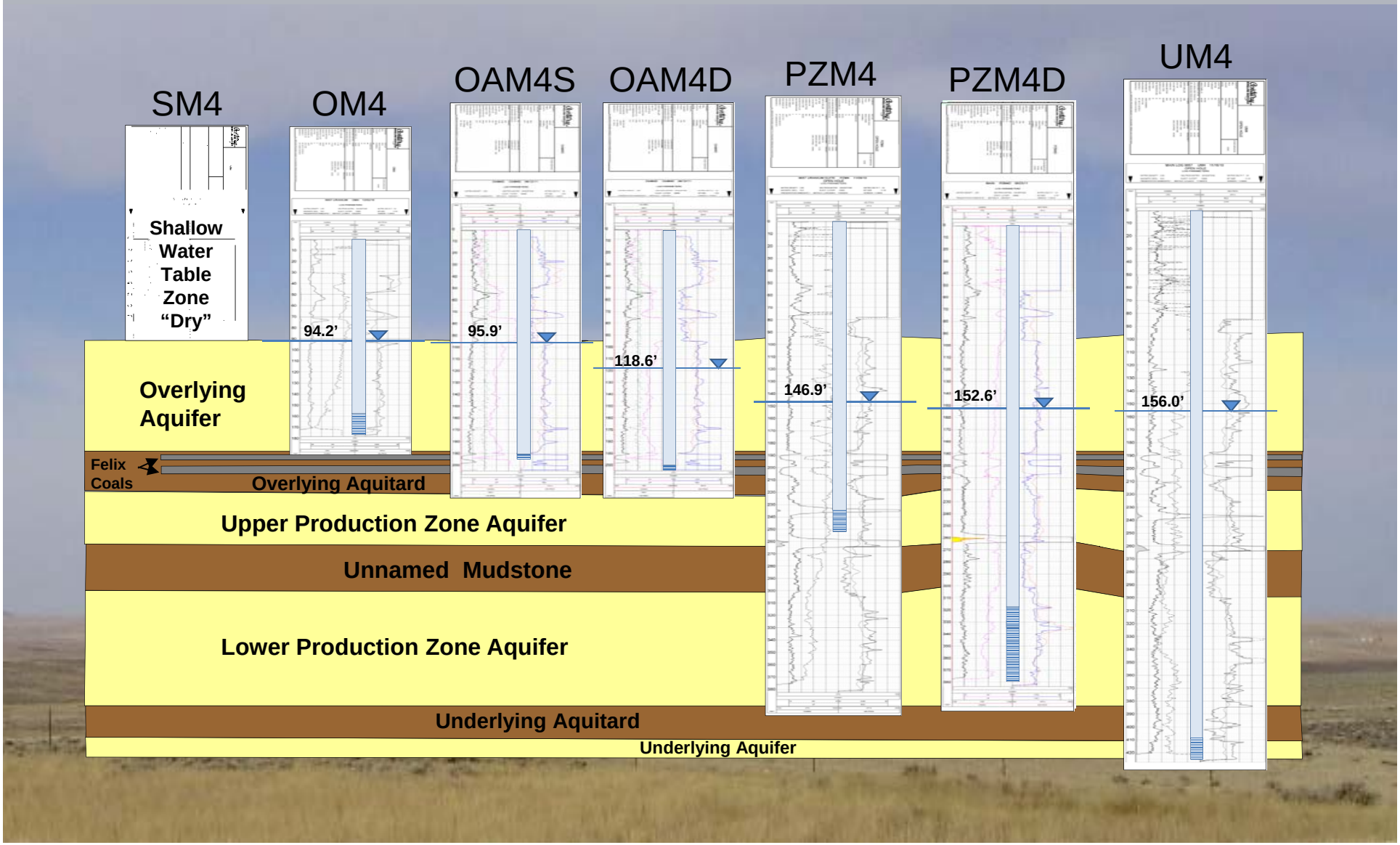

PZM5 Cluster Hydrostratigraphic Diagram

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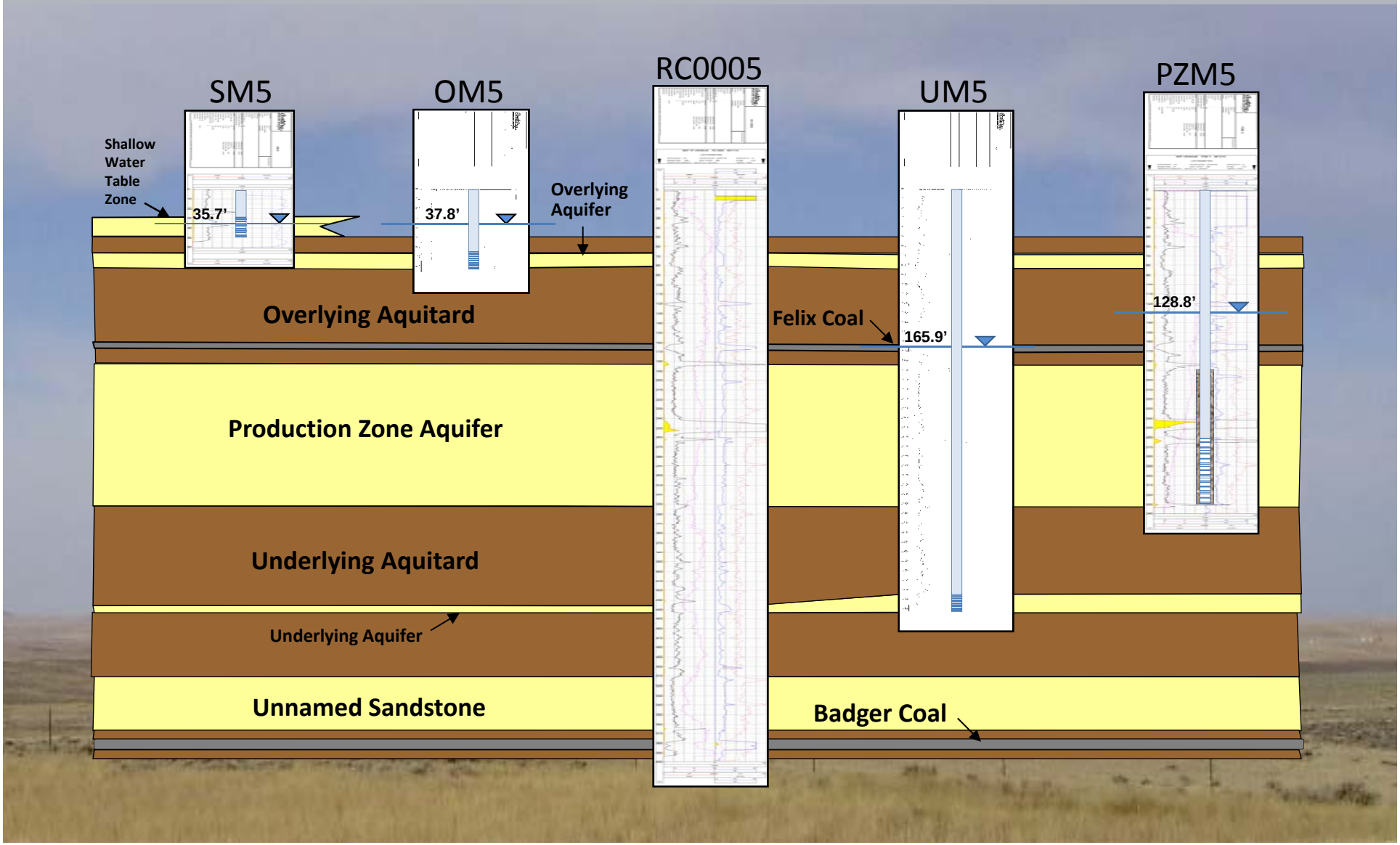

Reno Creek Pump Tests

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- **PZM1 Pump Test** Completed in December 2010;
- **PZM5 Pump Test** Completed in February 2011;
- **PZM4 Pump Test** Completed in August 2011;
- **PZM3 Pump Test** Completed in October 2011;
- **10 Single-well Tests** Completed in October and November 2011.

All testing clearly demonstrated confinement above and below the PZA

Summary of Water Levels Observed in Shallow Water Table During Multi-well Pump Tests

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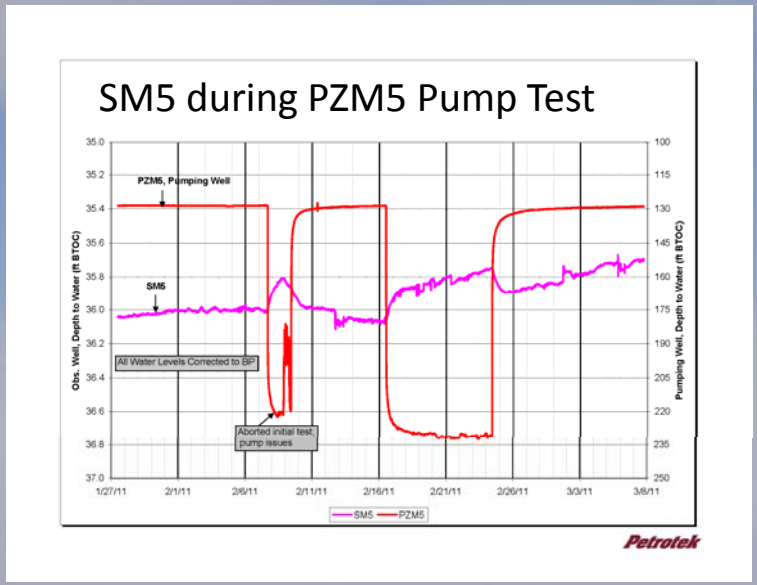
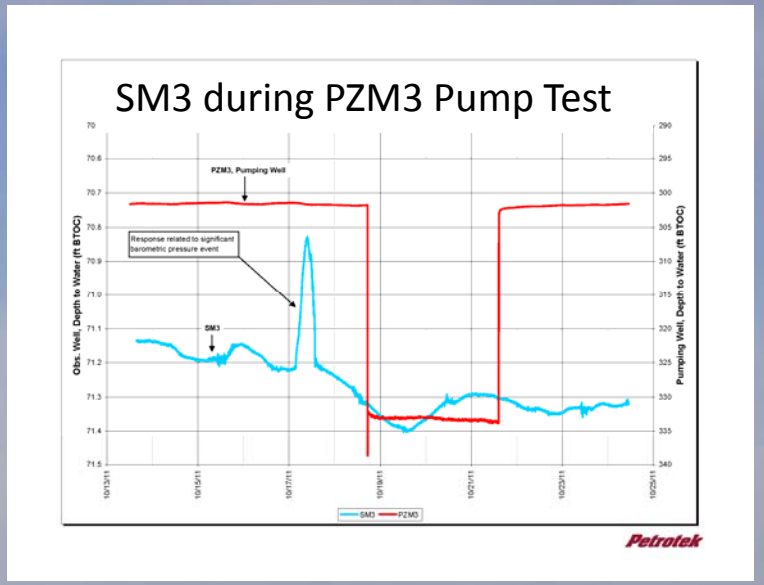
No response observed in the Shallow Water Table Zone during pumping.



West – Saturated PZA



East – Unsaturated PZA

Summary of Water Levels Observed in Overlying Aquifer During Multi-well Pump Tests

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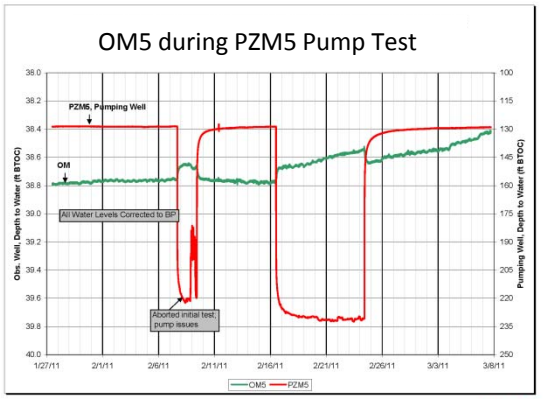
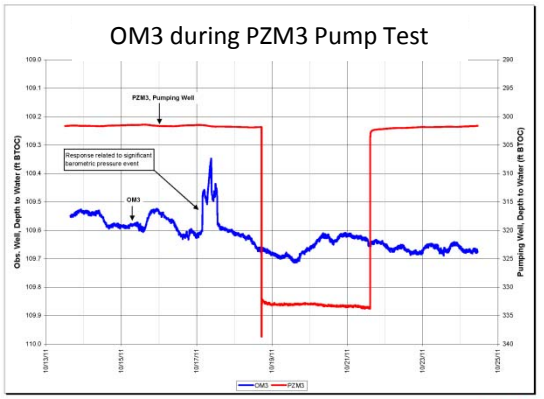
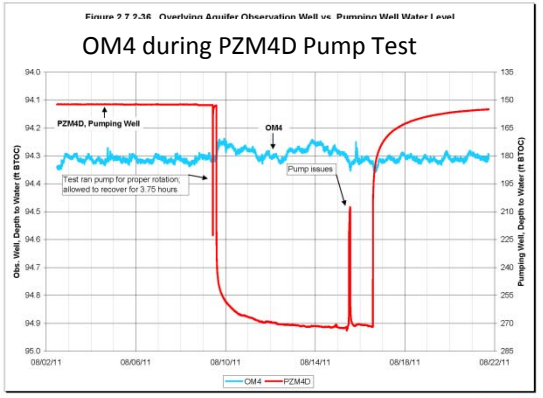
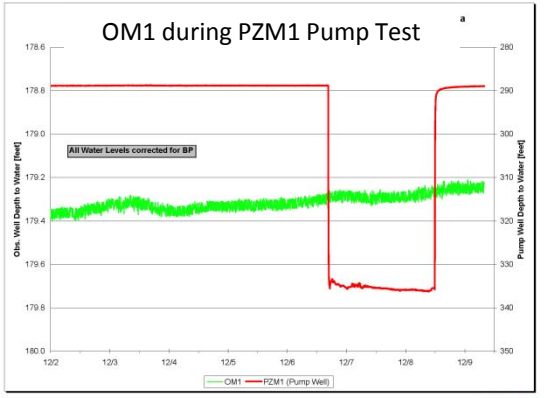
No response observed in the Overlying Aquifer during pumping.









West – Saturated PZA

East – Unsaturated PZA

Summary of Water Levels Observed in Underlying Aquifer During Multi-well Pump Tests

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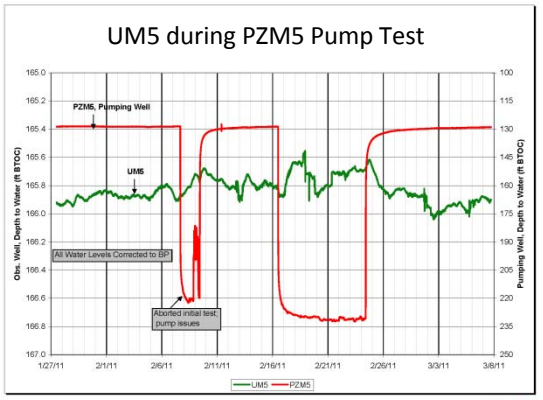
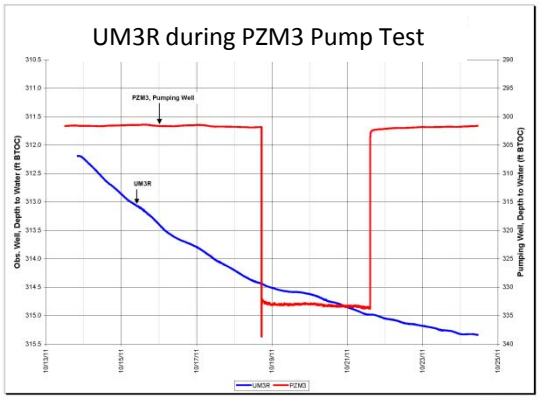
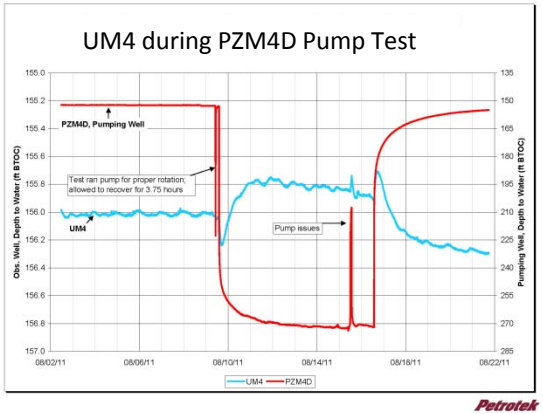
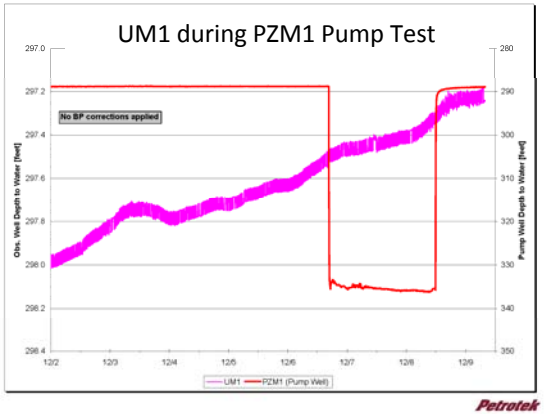
No response observed in the Underlying Aquifer during pumping.









West – Saturated PZA

East – Unsaturated PZA

Summary of Multi-well Pump Tests
Aquifer Properties

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Average aquifer properties for Production Zone Aquifer:

Test	Drawdown			Recovery	
	T (ft^2/d)	K (ft/d)	S	T (ft^2/d)	K (ft/d)
PZM1	560	6.0	2.9E-03	588	6.3
PZM3	914	8.4	3.5E-04	804	7.4
PZM4D	143	1.4	5.0E-04	126	1.3
PZM5	27	0.6	6.5E-05	47	0.7

Results at PZM1, PZM3 and PZM4D are consistent with historical testing performed near those locations, no historical testing was performed near PZM5.

Summary of Single-well Pump Tests
Aquifer Properties

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Aquifer properties for 10 single-well tests:

Well Name	Aquifer	Recovery	
		T (ft^2/d)	K (ft/d)
SM3	Water Table	0.014	0.002
SM5	Water Table	0.26	0.019
OM1	Overlying	39	1.0
OM3	Overlying	0.049	0.005
OM4	Overlying	262	3.2
OM5	Overlying	39.1	3.3
UM1	Underlying	0.10	0.01
UM3R	Underlying	0.074	0.005
UM4	Underlying	0.22	0.013
UM5	Underlying	0.44	0.024

Additional Coal Bed Natural Gas Groundwater Monitoring

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- Regional water level monitoring conducted by BLM to assess changes in water levels within Wasatch Sands overlying the Fort Union Big George Coal;

- Over nine years of water level data collected at the All Night Creek monitor well cluster indicate that the overlying and production zone aquifer at Reno Creek are unaffected by CBNG production within the Big George.

Location of BLM All Night Creek Monitoring Well Cluster

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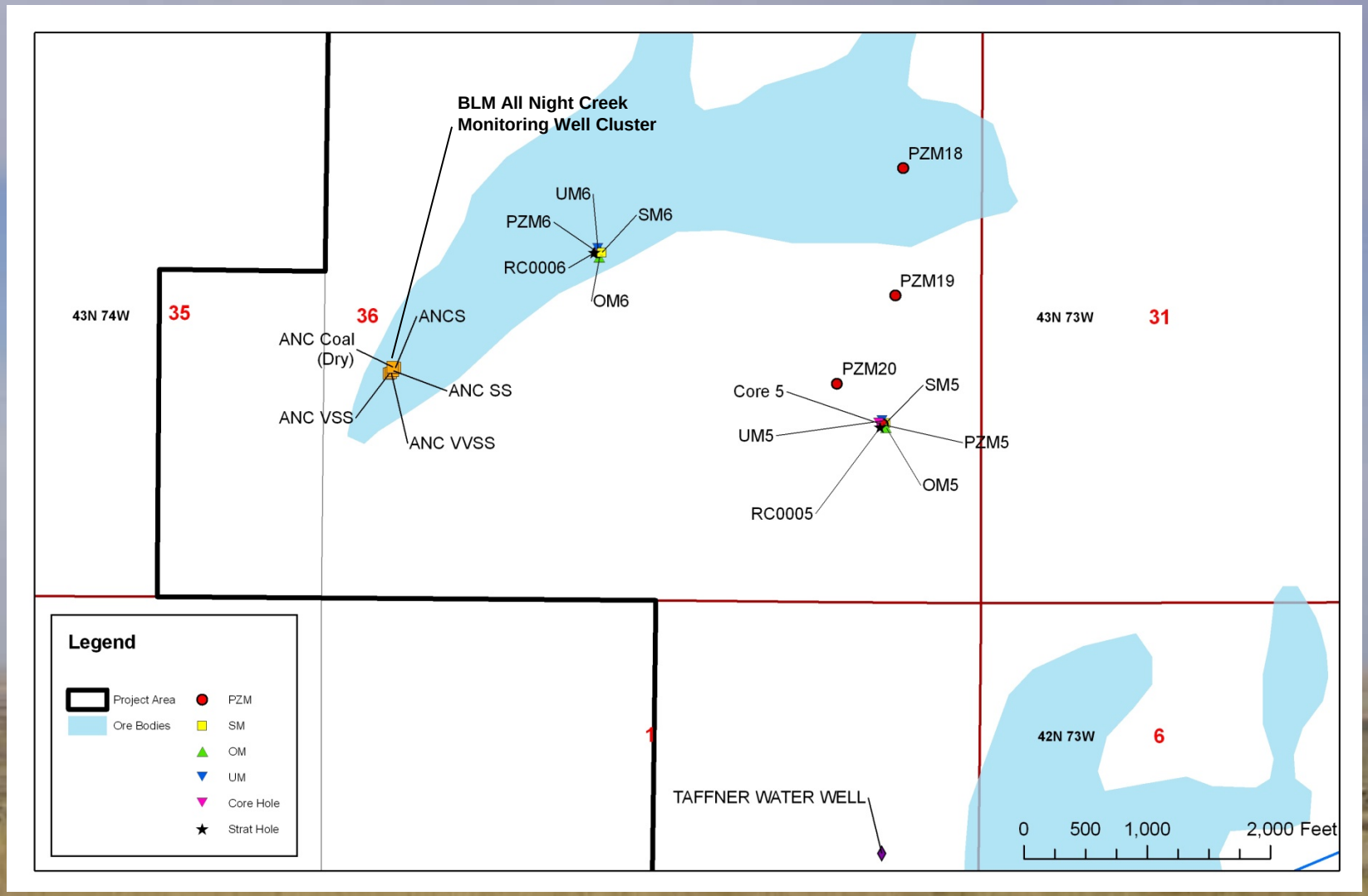

ANCVVSS (Wasatch Very Very Shallow Sand) Screen Interval = 215 – 235 ft bgs Reno Creek Overlying Aquifer

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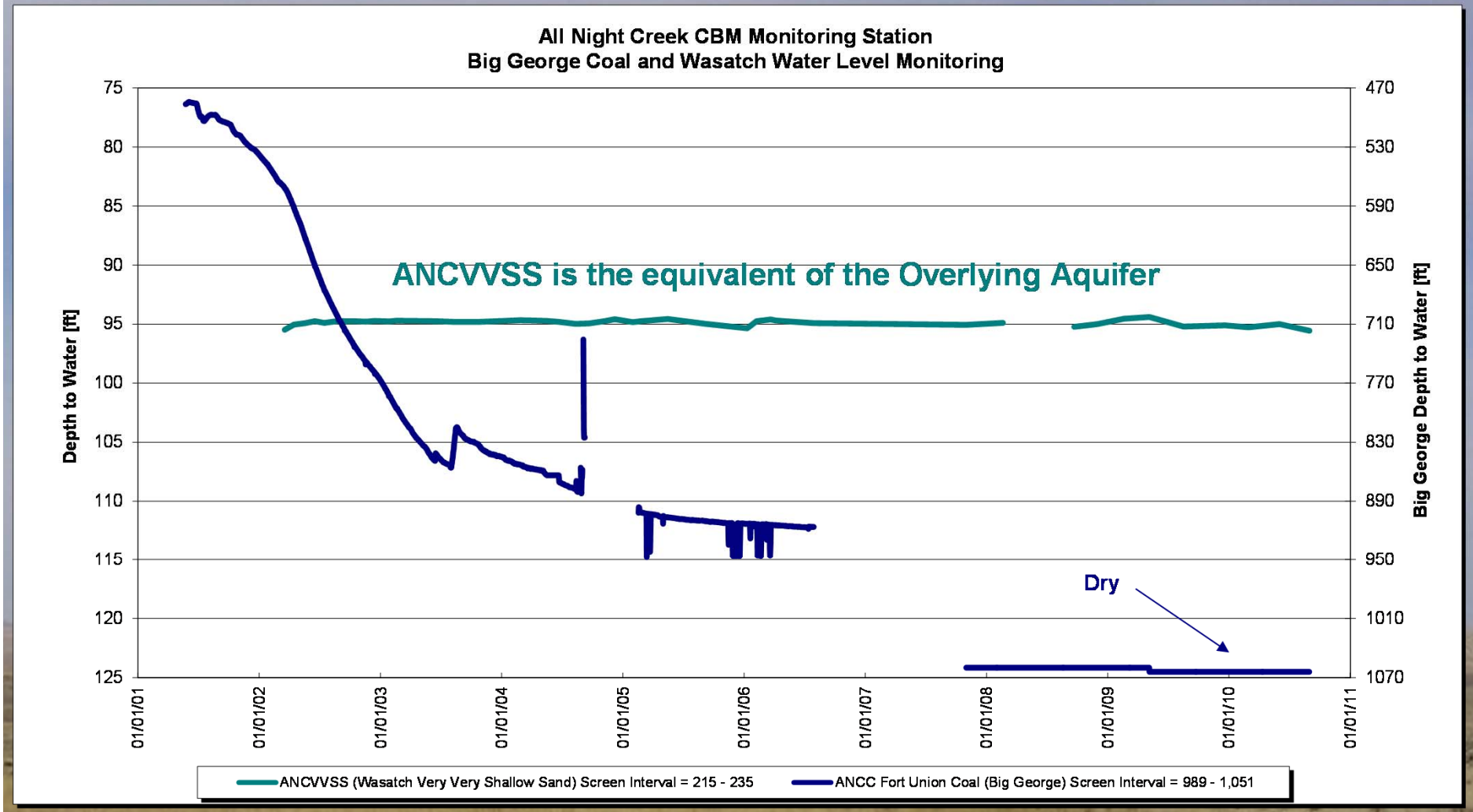

ANCVSS (Wasatch Very Shallow Sand)
Screen Interval = 362 – 462 ft bgs
Reno Creek Production Zone Aquifer

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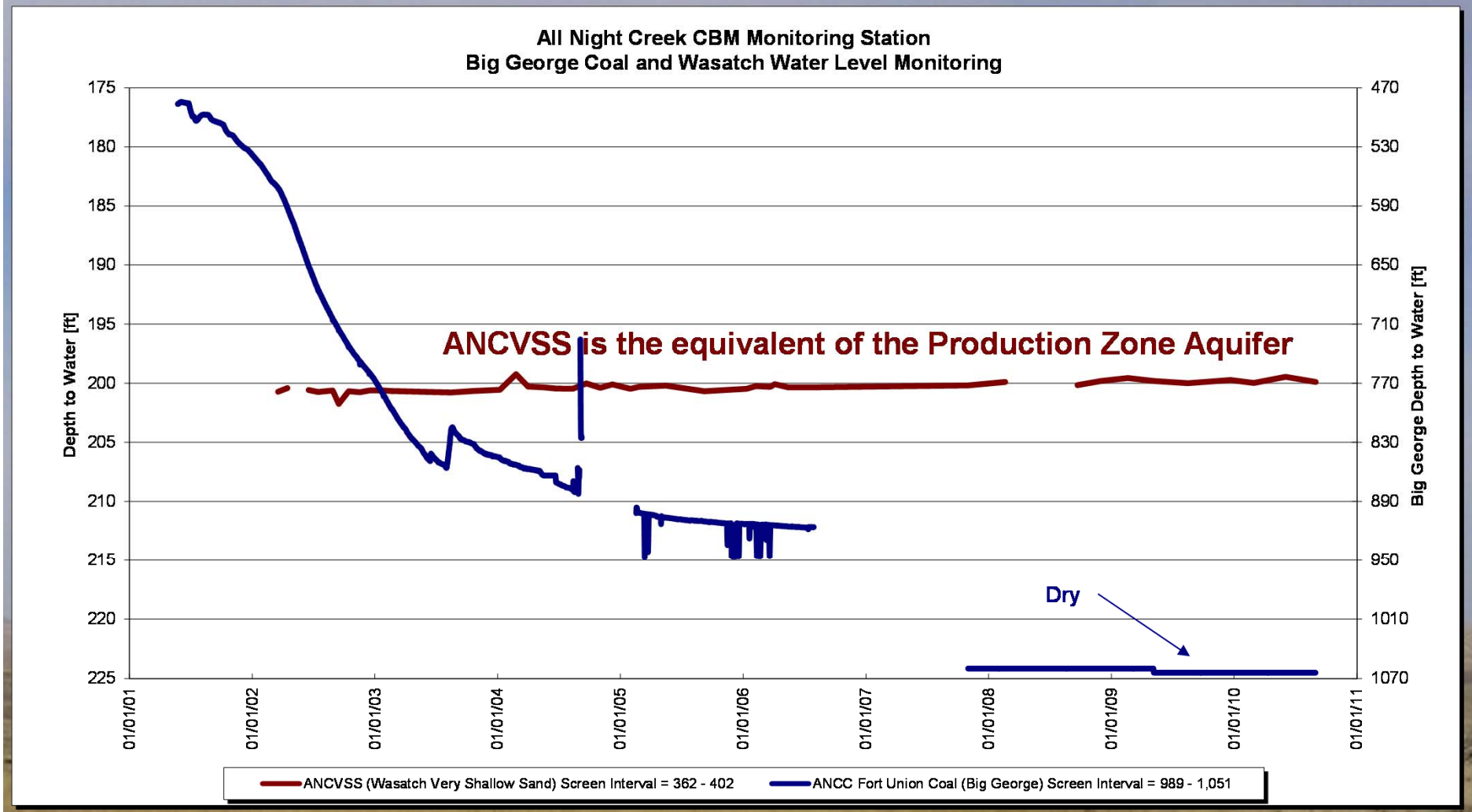

Significant Observations of Hydrogeological Characterization Activities

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- No responses were observed in any over- and underlying aquifer wells during PZA multi-well pump tests;
- Geologic and hydro results demonstrate confinement of the PZA across the entire Reno Creek Project Area;
- Groundwater in the PZA is geologically confined, but occurs under fully saturated to partially saturated conditions;
- Core analyses support results from hydrologic testing;
- No evidence of faulting observed from geologic or hydrogeologic data;

Significant Observations of Hydrogeological Characterization Activities

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- Aquifer properties derived from recent testing indicate that the PZA is amenable for In-situ Uranium Recovery operations;
- Based on the data presented from BLM's All Night Creek well cluster, no cumulative impacts of ISR production and CBM operations are expected in the Reno Creek Project Area;
- Adequate aquifer characterization has been performed per NUREG 1569 to support an NRC Source Material License Application.

Groundwater Modeling

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- Impacts of partially saturated conditions on wellfield operations;
- Drawdown impacts in the PZA during production and restoration activities;
- Excursion control/recovery and perimeter well spacing;
- Excursion control/recovery and perimeter well spacing;
- Water balance, production/restoration.

Groundwater Modeling

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- Model code - MODFLOW2000/SURFACT;
- Single-layer model;
- Steady-state calibration to potentiometric surface;
- Transient calibration to pump test data, as needed;
- Simulate life-of-mine operations.

Thank you!