APPENDIX A

AQTESOLV WATER SUPPLY ANALYSES

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Modeling Code

AQTESOLV software (Duffield 2007) was used for predictive analysis of groundwater production potential over a 5-year period. Although the aquifer testing conducted at the Site has allowed estimation of aquifer parameters at many locations across the Site, the data is not sufficient to support a detailed numerical model. For this reason, analytic solutions that assume homogeneous aquifer properties were applied within *AQTESOLV* to estimate groundwater production potential. Aquifer parameters can be input, with future pumping rates projected forward in time. Analytic solutions are applied by the program to predict drawdown over time, from one or more pumping wells. No-flow and recharge boundaries on the aquifer can be specified. *AQTESOLV* places the appropriate image wells necessary to model the effects of all specified no-flow or recharge boundaries. Any boundaries specified must be either parallel or intersect at right angles.

AQTESOLV is limited to a single set of aquifer parameters. In order to include two sets of aquifer parameters (higher transmissivity [T] and storativity [S] in the vicinity of PW-3, and lower T and S in the vicinity of PW-1 and PW-2) two separate models were run, with a no-flow boundary placed between PW-1 and PW-3 (Figure A.1). The sustainable pumping rates from these two models were then summed to estimate the site-wide sustainable pumping rate.

AQTESOLV does not have the capability to dynamically integrate spatially distributed recharge to the aquifer. For this reason, forward modeling in *AQTESOLV* only accounted for the removal of water from storage in the aquifer. Recharge was calculated separately, with a range of estimates presented to account for the unknown inefficiency of removal of recharge by pumping wells at the Site.

Modeling Scenarios

Two modeling scenarios were considered (Figure A.1). Both of these models assumed a no-flow boundary 1,500 ft to the northeast, resulting from the truncation of water bearing formations to the northeast by the salt dome uplift. Scenario 1 assumes an infinite aquifer extent to the southwest. Scenario 2 assumes a second no-flow boundary 3,000 feet to the southwest, corresponding to the alignment of the faulted zone extending to the southwest near the Site. Both scenarios assume a homogeneous aquifer extending infinitely to the northwest with the properties estimated from the PW-3 pumping test, and the properties estimated from the PW-1 and -2 pumping tests extending infinitely to the southeast. Scenario 1 also assumes that these properties extend infinitely to the southwest, on either side of the no-flow boundary between PW-3 and PW-1. To increase potential productivity in both scenarios, two additional production wells were added to the model (PW-4 and PW-5). These wells were located on the private land near PW-3 at a distance of 500 feet to the northwest and southeast of the existing production well. These wells were assumed to be completed in the same aquifer as well PW-3, with the same aquifer parameters estimated from the pumping test at this location.

The chosen maximum sustainable pumping rates are the highest pumping rates that do not dewater the aquifer within 5 years. The dewatering criterion for an unconfined aquifer (PW-3 vicinity) is drawdown greater than 2/3 of the aquifer thickness. For a confined aquifer (PW-1 and PW-2) the dewatering criterion is drawdown below the estimated confining layer. The additional restriction of a maximum pumping rate of 10 gallons per minute (gpm) from PW-2 was imposed. Under some modeling scenarios, it is possible to sustain pumping rates higher than 10 gpm from PW-2 when assuming the aquifer parameters estimated from analysis of observation well drawdown data. Nonetheless, the pumping rate from PW-2 was limited to 10 gpm, the highest rate sustained during the 48-hour pumping test.

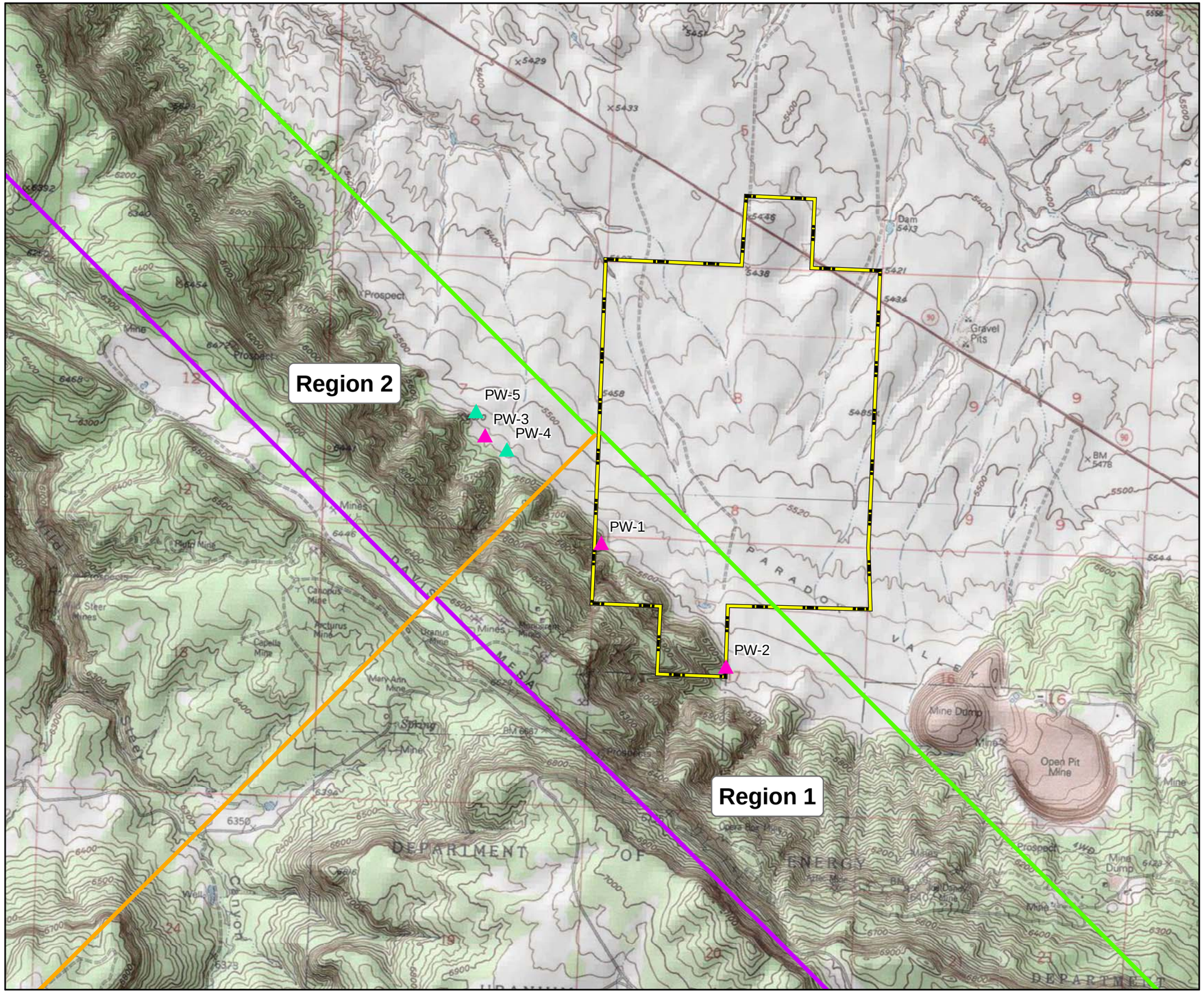
Modeling Results

In the case of only one boundary limiting aquifer productivity (Scenario 1) the estimated cumulative maximum pumping rate that can be sustained by removal of water from storage is

135 gpm (Figures A.2 and A.3). When a second no-flow boundary is added to the system 3,000 ft to the southwest (Scenario 2) this rate is reduced to 64 gpm (Figures A.4 and A.5). These two model scenarios demonstrate the sensitivity of predicted sustainable pumping rates to the existence and location of boundaries on the aquifer at the Site.

References

Duffield, G.M., 2007. AQTESOLV for Windows Version 4.0 Professional, HydroSOLVE, Inc.



LEGEND

- Production Well
- Proposed Well
- Division Between Regions 1 and 2
- No-Flow Boundary Scenarios 1 and 2
- No-Flow Boundary Scenario 2
- Site Boundary

REFERENCES

USGS. Various dates. Topo Quad (7.5') drawn from National Geographic TOPO! 4.0 [software] 2005:
Projection: StatePlane, Colorado Central, NAD83, Feet.

2,000 1,000 0 2,000 FEET

SCALE 1:24,000 1 INCH EQUALS 2,000 FEET
WHEN PRODUCED AT SIZE 11X17IN

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PROJECT

ENERGY FUELS RESOURCES CORPORATION
PIÑON RIDGE
MONTROSE COUNTY, COLORADO

TITLE

AQUIFER BOUNDARIES FOR PREDICTIVE MODELING SCENARIOS 1 AND 2

Golder Associates
Denver, Colorado

PROJECT No.		073-81694	FILE No.	NoFlowScenerio.mxd
DESIGN	AR	09/28/2008	SCALE AS SHOWN	REV 0
GIS	AR	09/28/2008		
CHECK	NDM	10/02/2008		
REVIEW	KFM	10/03/2008		

FIGURE A.1

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