

El Paso County Geothermal Project: Innovative Research Technologies Applied to the Geothermal Resource Potential at Fort Bliss

Project Officer: Mark Ziegenbein
Total Project Funding: \$9,812,500

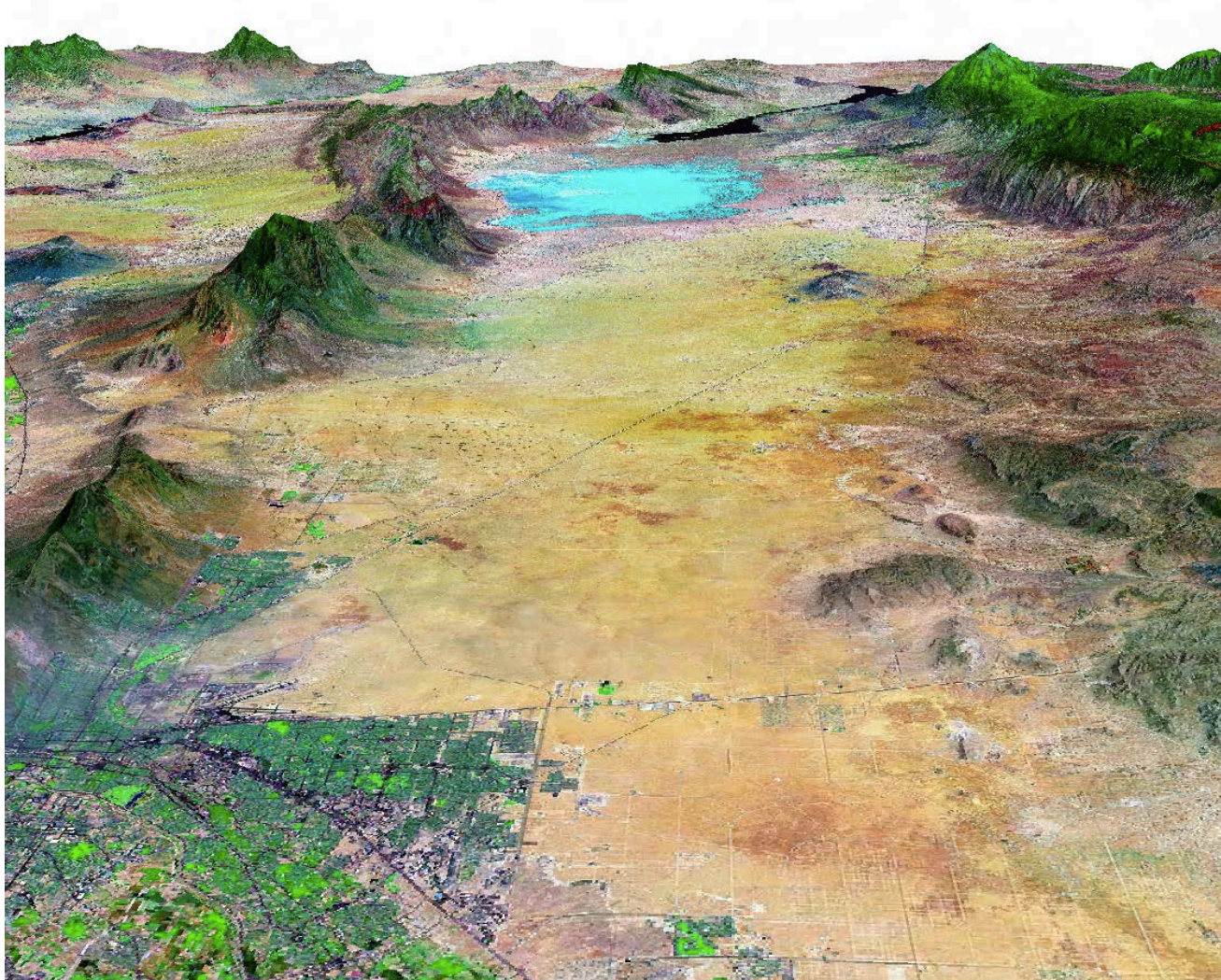
April 23, 2013

Principal Investigator: Jon Lear

Presenter: Ben Barker

Validation of Innovative Exploration Techniques

- Proposal responded to DE-FOA-0000109, Topic Area 1: Validation of Innovative Exploration Technologies
- Key elements of original project
 - Apply a suite of exploration methods usually reserved for larger, higher temperature prospects (EGI)
 - Demonstrate a low-impact rig technology with potential to reduce the cost of drilling temperature gradient wells (Aerospect)
 - Identify best locale within designated area for deep exploration and provide basis for further work by DOD (EGI/Radion)
 - Assist Fort Bliss in responding to DOD critical mission planning and off-grid operations needs (Ruby Mountain)
 - Make full range of information from various techniques available to others via NGDS to reduce uncertainty in choosing tools



NAIP Image of the Tularosa Basin (image by EGI)

- Impact 1: encourage industry development of moderate-to-low temperature resources by making available a comprehensive validated field example for reference
- Impact 2: potentially significant cost reductions
 - Early stage deep gradient holes with low impact
 - Drill cutting analysis allowing decisions during drilling
- Impact 3: Fort Bliss is a critical national defense installation that is in the process of quadrupling in size. This creates a unique need for off-grid (i.e., non-market) power that may make future demonstration projects attractive and cost-effective for DOD.

- Objective 1:
 - Determine if, and where, commercially viable low temperature geothermal resources exist in the McGregor test area
 - Determine at what location they can best be accessed without compromising the tactical and strategic missions of the base.
- Objective 2:
 - Determine if resources that have adequate temperatures also have a flow rate and volume to justify commercial development at any scale with an eye toward the 20 MW target identified.
- Objective 3: If the resource is adequate
 - Determine where production facilities can be located
 - How such facilities and be used to power the McGregor Range
 - How such power can be returned to the grid for use by Fort Bliss

- Objectives = Phases in original plan
- Phase 1 work recovered locations of four deep TG wells drilled in 1990's by Sandia, thought to have been P&A'd
- Phase 1 review resulted in moving the decision point after tests of the Sandia wells ("Phase 2A")
- Phase 2B redefined from a dual slim-hole program to drilling a single resource confirmation test well
- Well design evolved from large diameter (12-1/4") with spot core to medium diameter (8-3/4") with reverse circulation and fracture image logs
- Working to a May 1, 2013 spud date

Exploration Techniques

- Detailed geologic structural mapping (previous and new work in Phase 1)
- Petrography (TG and new well cuttings)
- ASTER multispectral hydrothermal mapping
- Gravity survey (1997)
- Self-potential surveys (1995)
- Temperature gradient wells (older)
- Temperature gradient wells (this project)
- Soil mercury survey
- Quantitative Electron Microscope Scanning (to be used for new well cuttings)

Summary of Phase 1/2A Accomplishments

- Recovered locations and surveyed four older slim holes for stable temperatures
- Purchased “lost” data from four slim holes for use in structural modeling; will be added to NGDS
- Recovered data reduced need for additional slim holes, allowing the project to progress to confirmation stage
- Completed suite of exploration surveys
- Developed integrated structural model to guide confirmation well siting

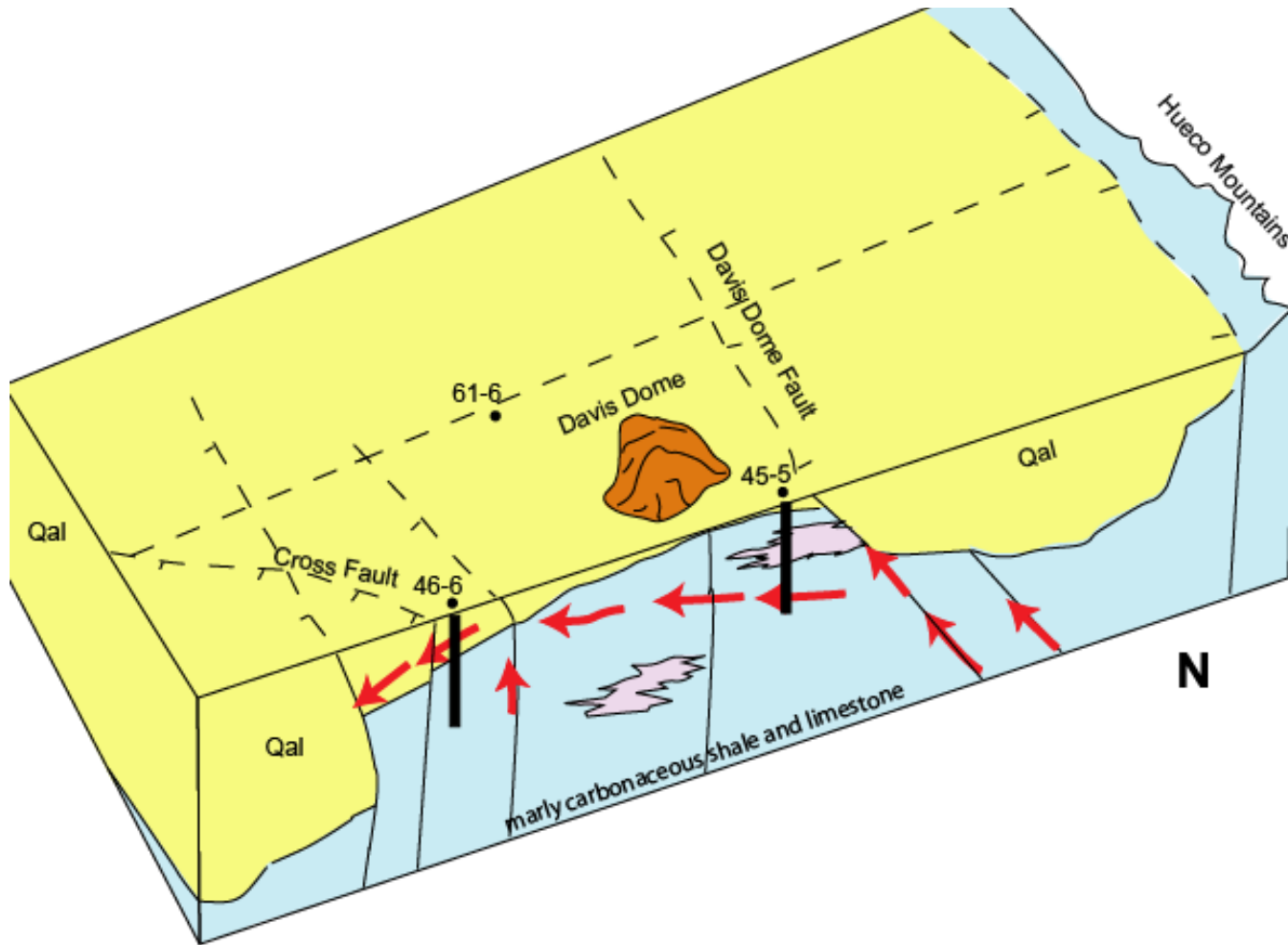
Summary of 2012-13 Accomplishments

- Completed the Heli-lite drill rig testing:
 - Helicopter lift of the rig successfully demonstrated portability.
 - Field testing of the rig demonstrated that the Heli-lite was underpowered for soils in the McGregor and Orogrande ranges. The rig was successful in other soil conditions.
- Worked with Federal and State agencies to reach agreement on a unified drilling permit process for low-temp resource on Federal Military Reservation. Time consuming process delayed project but may serve as a useful precedent.
- Redefined project objectives and developed drilling plan to drill more definitive test well with existing funding.
- Successfully obtained drilling permit from the NM State Engineer to drill a 3,000 foot resource confirmation well at McGregor Range.
- Successfully extended contract to allow confirmation well drilling. El Paso County approval ratified April 15, 2013

Accomplishments, Results and Progress

Original Planned Milestone/ Technical Accomplishment	Actual Milestone/Technical Accomplishment	Date Completed
Milestone #16 – Permit For Resource Confirmation Well from BLM	Milestone #16 – Obtained Fort Bliss, BLM and DOE concurrence that Permit should be Issued By The Office of the State Engineer in New Mexico	06-2012

Geothermal Fluid Flow Conceptual Model



Accomplishments, Results and Progress



Phase/Milestone #	Status /Expected Completion Date
Phase 2-B; #19 Site Access & Coordination; Required Training	Site Access & Coordination Completed; Required Training by 4-30-13
Phase 2-B; #20 Heli-Lite Drilling	Completed in 2012
Phase 2-B; #21 Resource Confirmation Well Drilling	In-Process; Completion Expected by 5-31-13
Phase 2-B; #22 Cuttings/Core Collection & Data Package	Pending; Completion Expected by 5-31-13
Phase 2-B; #23 X-Ray Diffraction & Petrographic Analyses of Cuttings; In-situ Fracture Image Logs	Pending; Completion Expected by 5-31-13
Phase 2-B; #24 Revised Conceptual Model of McGregor Range Resource	Pending; Completion Expected by 6-20-13
Phase 2-B; #25 Data Integration & Reporting of Results	Pending; Completion Expected by 6-30-13
Phase 3; #26 Well Logging: Resistivity, Density & PTS Logs; Televiwer	Pending; Completion Expected by 6-7-13
Phase 3; #27 Water Chemistry	Pending; Completion Expected by 6-20-13
Phase 3; #28 Flow Testing	Pending; Completion Expected by 6-7-13
Phase 3; #29 Evaluation by Subject Matter Expert	Pending; Completion Expected by 7-31-13
Phase 3; #30 Chemostratigraphic-Chronostratigraphic Assessment	Pending; Completion Expected by 8-15-13
Phase 3; #31 Final Project Assessment	Pending; Completion Expected by 9-15-13
Phase 3; #32 Final Reporting & Technology Transfer	Pending; Completion Expected by 9-30-13

Timeline:	Planned Start Date	Planned End Date	Actual Start Date	Current End Date
	1-29-10	1-31-13	1-29-10	9-30-13

Budget:	Federal Share	Cost Share	Planned Expenses to Date	Actual Expenses to Date	Value of Work Completed to Date	Funding needed to Complete Work
	\$5,000,000	\$4,812,500	\$5,000,000	\$2,922,500	\$6,354,697	\$2,077,500

- Summary of management activities :
 - Matching funds targets have been met or exceeded to date; On-budget
 - Project team has been coordinating with Fort Bliss, DoD and DoD Energy Service Contractors on potential end uses for low-temp resource
- Project currently behind schedule due to administrative and permitting issues with the State of NM, El Paso County and the McGregor Training Range
- Expect to sign drilling contract this week and mobilize next week (5/1/13)
- Project completion by 9/30/13 amended schedule