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Conducting a 3D Converted Shear Wave Project to reduce exploration risk at Wister, CA

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Ormat Nevada Inc.

Innovative Technologies

Wister Seismic Overview

- Timeline
  - Project start October 2009
  - Project end date Q2 2011
  - Percent complete ~5%
- Budget
  - Total project funding $8,525,515
  - DOE share $4,475,015,
  - Ormat share $4,050,500
  - Funding for FY10 ~$8,400,000
- Barriers
  - Permit:

    In case necessary, acquiring BLM drilling permits might effect the proposed timetable
- Partners
  - ExplorTech LLC

Project's Objectives

The primary objective of this project is to conduct a 3C 3D (converted shear wave) seismic survey to reduce exploration risk by characterizing fault and fracture geometrics at Wister, CA.

The intent of the proposed program is to use a 3D seismic survey with converted shear waves combined with other available data to site and drill production wells at Wister, a blind geothermal resource.

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Ormat-DOE joint project

- Principal Investigator

  Skip Matlick (Ormat Nevada, Inc.)

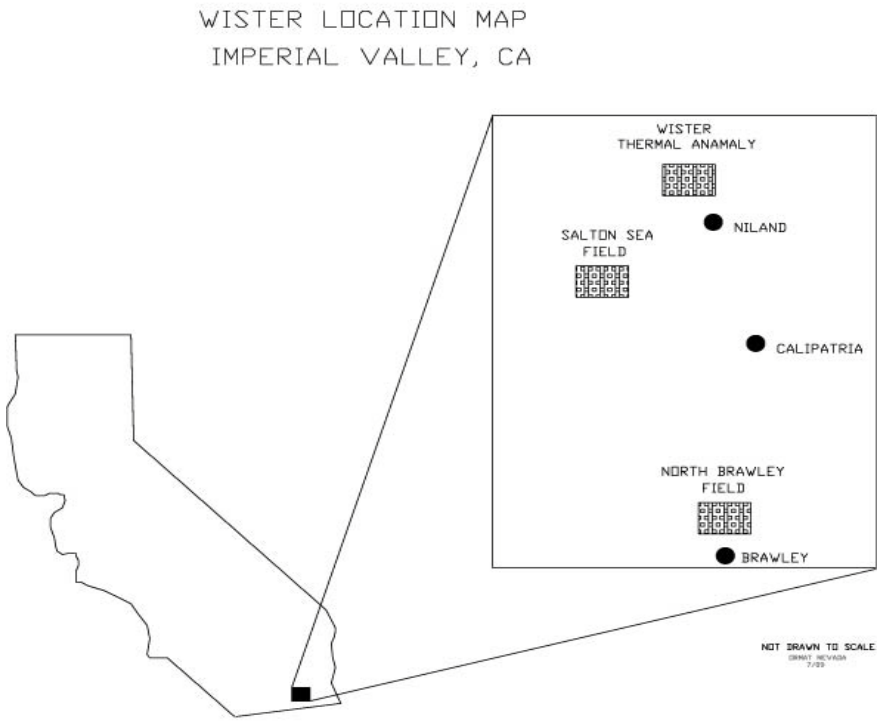
- Co-investigator
  - John Arestad (ExplorTech LLC)

- DOE
  - GTP - DOE Golden Office

Timeline

- Grant Awarded October 2009
- Design Survey January 2010 (Complete)
- Sign acquisition and processing 3C 3D seismic survey contracts (Complete)
- Forward Modeling (Complete)
- BLM Permits (In process)
- Phase I: Seismic Survey scheduled to start on Q2, 2010
- Phase II & III: Well Drilling and Testing scheduled to start on Q4, 2010
- Project completed Q2, 2011

Wister Location Map



Early Exploration History

- Farming activity has destroyed surface geological features.
- Approximately 30 temperature gradient holes defined a 8ºF/100 ft anomaly covering 2.5 square miles.
- In 1988, UNOCAL drill Well 88-1 to 3942 ft where the well bore collapsed after intersecting a large fracture.
- Attempts to salvage the well failed and UNOCAL converted the well to a Temperature Observation hole.
- Temperature measurements show that 88-1 has a conductive gradient to 3926 ft where is 342ºF is measured.

Ormat Nevada Exploration History

- Over 1000 gravity measurements collected on a 250 m grid where used to calculate complete Bougeur anomaly values.
- Zonge Geosciences, Inc. modeled these data with regional gravity and magnetic data to product complete Bougeur, horizontal gravity gradient, and reduced to pole magnetic maps.

Validation of Innovative Exploration Technologies

- **Phase I –Converted Wave Seismic Project**
  - Prepare forward models to determine probable seismic response.
  - Select contractors to acquire and process seismic data.
  - Obtain required permits.
  - Acquire 13.5 square miles of 3D seismic data using vibratory sources and multicomponent (3C) receivers.
  - Interactive processing of three data sets of 3C 3D three components.
    - Compressional (P-P) wave data
    - Fast (P-S1) converted shear-wave data
    - Slow (P-S2) converted shear-wave data
  - Interpretation of the 3C 3D seismic data.
    - Structural, amplitude, velocity-ratio, and anisotropy analysis
    - Integration with geological and other geophysical data
  - Prepare and present final report

Exploration program

- **Phase II & III– Drilling & Flow Testing**
  - Obtain permits.
  - Drill 2 production wells each ~6500 feet deep
  - Flow test each well
    - Using Ormat's standard testing strategy
    - Record TPS surveys with pressure build up.
  - Reservoir properties (permeability, temperature, productivity, chemistry)

Wister - DOE funding breakdown

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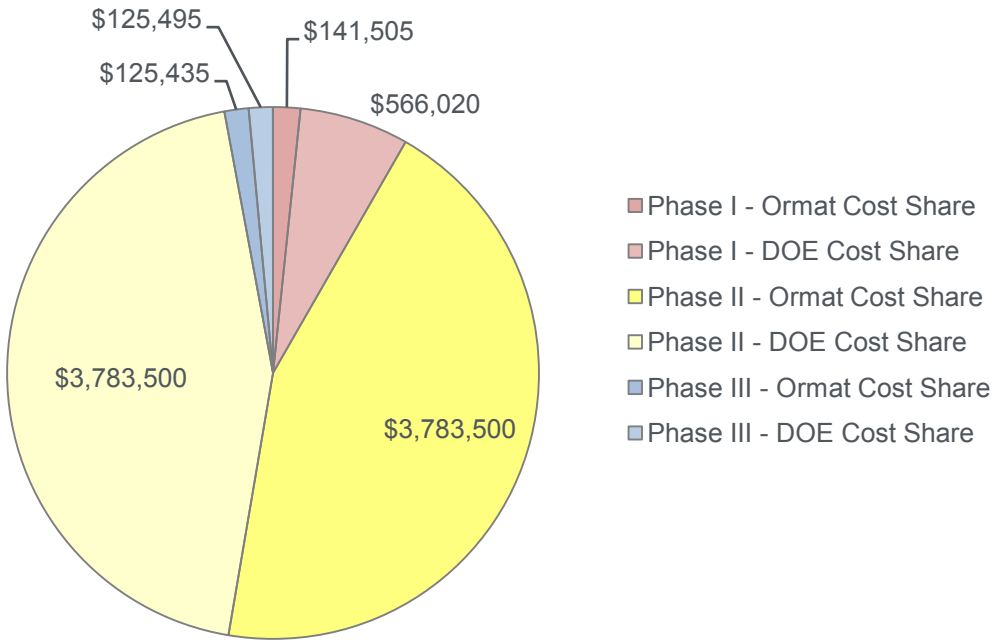
Project Total Budget: $8,525,515
$4,475,015 DOE funding with 47.5% Ormat cost share

	Phase I	Phase II	Phase III	Total
Ormat Cost share	$141,505	$3,783,500	$125,495	$4,050,500
DOE Cost share	$566,020	$3,783,500	$125,495	$4,475,015
Cost Share %	**20.0%**	**50.0%**	**50.0%**	**47.5%**
	$707,525	$7,567,000	$250,990	$8,525,515



Progress

- Designed 3C 3D seismic survey.
- Signed contract with Dawson for acquisition.
- Signed contract with Fairfield for processing
- Generated forward models.
- Obtained land owners permission for data collection.
- Submitted permits applications to BLM.

  Expect permit approval around end of May.

Forward P & PS Offset Models

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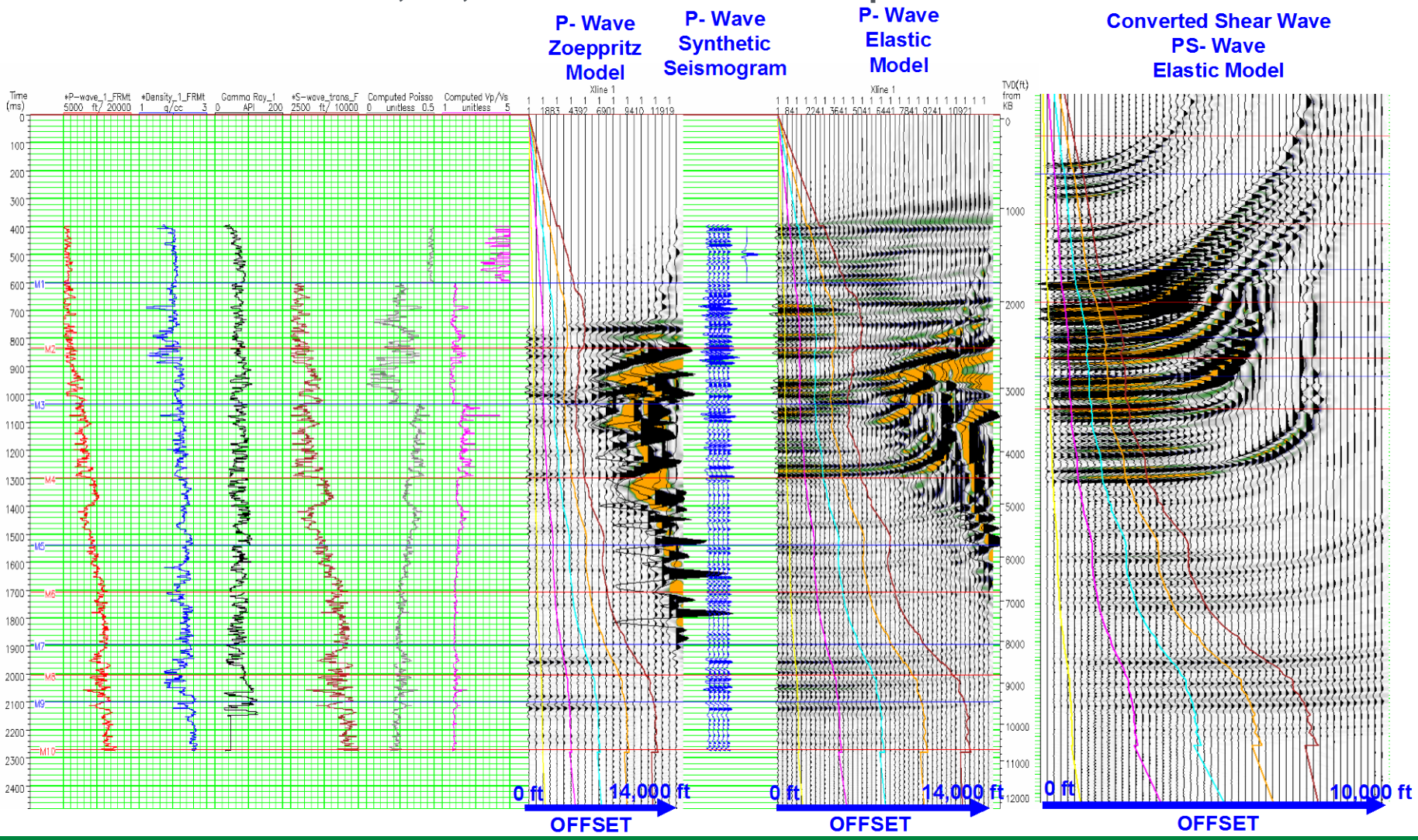
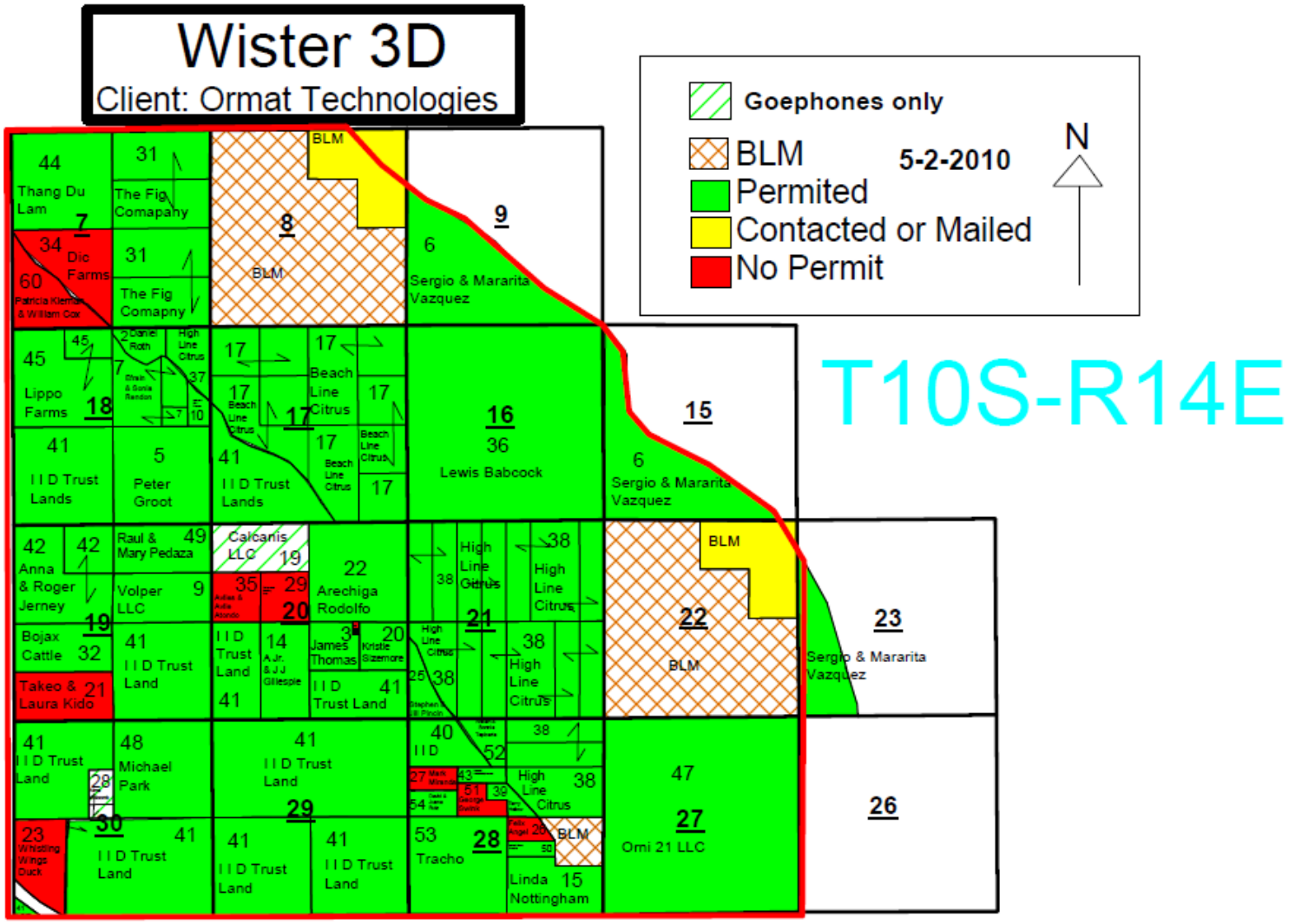
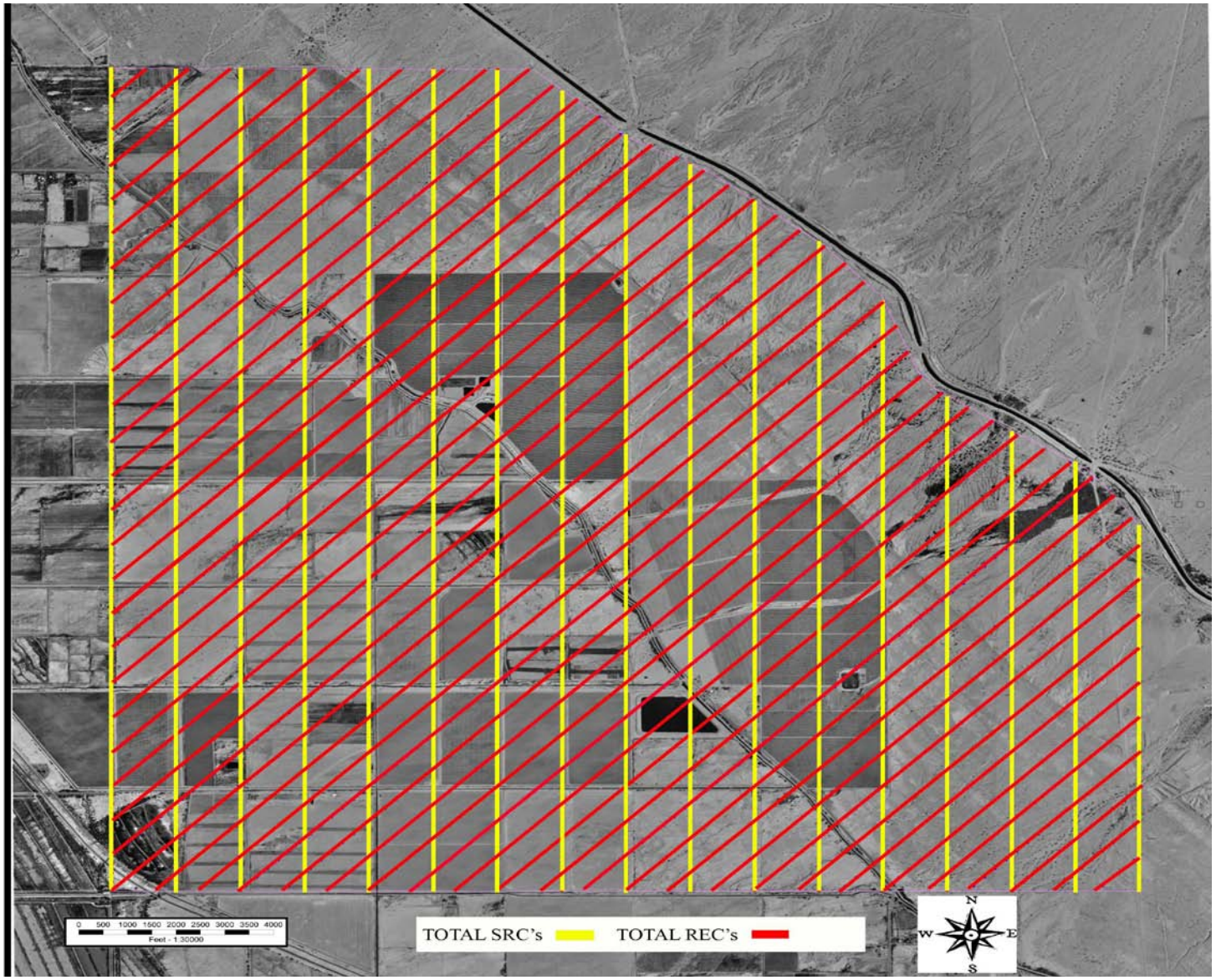
Modeled results indicate that we can expect good P-wave And Converted Shear Wave data to about 10,000, which is below the anticipated reservoir interval



Land Owners Permission Map



Survey Layout



Summary

- DOE Grant Awarded October 2009.
- Seismic Acquisition & Processing Contracts signed.
- Survey Designed.
- Permits submitted to BLM Q2, 2010.
  - Expected BLM approval end of May, 2010
- Forward models generated.
- Seismic acquisition scheduled to start end of May 2010.
- Drilling estimated to spud on Q4 2010.
- Project completed Q2 2011.