



## Department of Energy

Washington, DC 20585

October 11, 2011

Mr. Tim Murphy, Chief  
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PATH FORWARD: 2011 SHORT-TERM DATA ACQUISITION PLAN PROJECT SHOAL AREA, SUBSURFACE CORRECTIVE ACTION UNIT 447, NEVADA

Dear Mr. Murphy:

The U.S. Department of Energy (DOE) Office of Legacy Management (LM) is providing this Short-Term Data Acquisition Plan for the Project Shoal Area (Shoal), Subsurface Corrective Action Unit 447, near Fallon, Nevada. This plan is part of the new corrective action strategy that is focused on revising the site conceptual model (SCM) and evaluating the adequacy of the monitoring well network. Aspects of the SCM are currently known; however, two major concerns are the uncertainty in the groundwater flow direction and the cause of the rising water levels in site wells. Water levels have generally been rising at the site since the first wells were installed in 1996. LM continues to monitor water levels as part of the ongoing groundwater monitoring program at the site.

To advance the SCM during this period of water level monitoring, LM is proposing to further evaluate analytical, hydrologic, and geologic data, along with recently acquired geophysical data, to help identify geologic structures that might be influencing groundwater flow at the site. LM expects interpretations obtained from this evaluation to be helpful in identifying data gaps, assessing potential groundwater flow directions, and evaluating the site's monitoring well network. Water levels will need to stabilize before the SCM can be revised and a more effective evaluation of the monitoring well network can be conducted. The following section summarizes the project's background and explains why the data acquisition plan is being implemented.

### **Background**

The original corrective action strategy for the subsurface at Shoal used a groundwater flow and transport model to help evaluate data and select a corrective action alternative. The model results were also used to determine a contaminant boundary and establish a restricted region surrounding the site. The corrective action alternative selected for the site consists of monitoring with Institutional Controls and is presented in the Corrective Action Decision Document/Corrective Action Plan (CADD/CAP). As part of the original strategy, three wells (MV-1, MV-2, and MV-3) were installed in 2006 for the dual purpose of monitoring and evaluating the flow and transport model results (see enclosed Figure 1). The SCM is being reevaluated to address inconsistencies with model predictions and monitoring well data. Concerns with the model stem from two observations: (1) The flow model showed groundwater



Mr. Tim Murphy

-2-

primarily migrating toward the north-northeast, whereas gradients inferred from water levels measured in site wells do not support the modeled flow direction; (2) The model incorrectly assumed that the groundwater flow system is in a steady state; in fact, water levels west of the shear zone at the site are rising at rates that range from approximately 1.2 to 2.4 feet per year. Pursuant to the Federal Facility Agreement and Consent Order (1996, as amended), LM began implementing a new corrective action strategy for the site in 2009.

On November 24, 2009, LM submitted an initial Short-Term Data Acquisition Plan to the Nevada Division of Environmental Protection (NDEP), detailing data collection activities that included a surface geophysical program and enhanced groundwater monitoring. The recently completed geophysical program included seismic and electromagnetic surveys. As part of the evaluation of data obtained from the surveys, a technical exchange meeting was conducted with the geophysicists who performed the surveys (Lee Liberty from Boise State University and Jim Hasbrouck from Hasbrouck Geophysics), Desert Research Institute, and NDEP to discuss the results and potential site conceptual models. During the meeting we agreed that further understanding of the groundwater flow system was needed for the enhancement of potential SCMs and that a new Short-Term Data Acquisition Plan was necessary to outline future activities at the site. The Surface Geophysics Report recommended that geophysical data be evaluated further and compared to existing data to assess and enhance any potential SCMs. The technical exchange and Surface Geophysics Report provided the basis for developing a new Data Acquisition Plan for the site.

### **Data Acquisition Plan**

The 2011 Data Acquisition Plan will include a review of all existing reports for analytical, hydrologic, and geologic data, and the collection of new data as part of the ongoing monitoring program at the site. Assembling the existing data with the recently acquired geophysical data is intended to enhance potential SCMs, identify data gaps, and assist in the evaluation of the site's monitoring well network. The following activities will be conducted as part of the new Data Acquisition Plan.

#### *Evaluation of Information*

The evaluation of information will include reviewing all available reports and assembling a detailed informational resource tool that includes a summary of pertinent technical data. Analytical, hydrologic, and geologic data obtained from the evaluation of historical reports will be reviewed along with existing data and recently collected geophysical data, to help identify geologic structures that might be influencing groundwater flow at the site. The evaluation of information will include the following:

- Identifying and mapping faults, fault compartments, and dikes near surface ground zero. This task will require using available lithologic logs, geologic maps, and fault dip data to obtain hydrologic properties and project geologic structures from surface to depth. The geologic structures will be evaluated, using the recently obtained geophysical, water level, and analytical data, to further investigate the effects on the groundwater flow system. To support the evaluation, data will be assembled for three-dimensional visualization.

Mr. Tim Murphy

-3-

- Identifying and evaluating all available analytical data with respect to sample location, depth, and proximity to geologic structures. This task will require conducting a geochemical and isotopic evaluation of the groundwater and may require the collection of additional analytical data from on-site wells and from wells and springs in the neighboring valleys. All available analytical data obtained from historical reports will be evaluated for inclusion in the LM database.
- Identifying data gaps and assessing locations for new information and/or monitoring wells. Interpretations from the evaluation of information may prove to be very important in identifying data gaps, assessing potential groundwater flow directions, and evaluating the monitoring well network.

Information obtained from this evaluation will be assembled into an informational resource tool that will evolve with the project and be presented to NDEP in late 2012 for review and comment.

#### Monitoring Program

The monitoring program for the site includes the collection of hydraulic head and analytical data from designated wells and piezometers. Refer to Table 1 for the monitoring parameters of the designated wells and piezometers. The monitoring of hydraulic head includes downloading transducers and measuring water levels semiannually. Data obtained from the semiannual monitoring are compared to historical water levels and evaluated with respect to location, screened interval, and proximity to geologic structures. Additional evaluations may include the following:

- Evaluating water level trends and comparing them to pre-detonation water level data.
- Purging select wells to evaluate effects on nearby wells and piezometers.
- Adding water to the MV-2 piezometer to evaluate the formation's permeability, groundwater gradient, and the piezometer's value for continued monitoring.
- Discharging monitoring well purge water from designated wells on the ground surface to evaluate the effects on water levels in nearby wells and piezometers.

Samples are collected annually from all wells on site (within the land withdrawal) for the analysis of tritium, isotopic uranium, elemental uranium, and gross alpha activity (see Figure 1). Samples are also analyzed for carbon-14 and iodine-129 every 5 years. The next sampling event for carbon-14 and iodine-129 is planned for 2015. Analytical data obtained from the annual monitoring are compared to historical analytical data and evaluated with respect to well location, screened interval, and proximity to geologic structures. Additional evaluations may include the following:

- Increasing or reducing the purging of select wells to determine effects on analytical results and/or the groundwater flow system. (This task may include temporarily removing select wells from the monitoring network to evaluate the effects on water levels in nearby wells and piezometers.)

- Adding piezometers and/or springs to the monitoring network to obtain additional analytical data for the evaluation of results with respect to sample depth.
- Temporarily modifying the analytical suite to include major ions, stable hydrogen and oxygen isotopes, and carbon-14 analysis based on organic carbon.

It should be noted that any changes to the monitoring program, such as an increase or reduction in purging, the addition of piezometers or springs to the monitoring network, and the removal of wells from the monitoring network, will be negotiated and approved by NDEP prior to implementation. Table 1 summarizes the current monitoring program for the Shoal site.

Table 1. Monitoring Program at the Shoal Site

Monitoring Location	Location Type	Distance from SGZ	Monitoring Parameters	
			Water Level Data	Analytical Data
MV-1 PZ	Piezometer	940 feet	Semiannual	None
MV-1	Well	940 feet	Semiannual	Annual
MV-2 PZ	Piezometer	1,030 feet	Semiannual	None
MV-2	Well	1,030 feet	Semiannual	Annual
MV-3 PZ	Piezometer	1,030 feet	Semiannual	None
MV-3	Well	1,030 feet	Semiannual	Annual
HC-1	Well	1,780 feet	Semiannual	Annual
HC-2	Well	1,830 feet	Semiannual	Annual
HC-3	Well	3,100 feet	Semiannual	Annual
HC-4	Well	560 feet	Semiannual	Annual
HC-5	Well	1,265 feet	Semiannual	Annual
HC-6	Well	980 feet	Semiannual	Annual
HC-7	Well	1,125 feet	Semiannual	Annual
HC-8	Well	1,640 feet	Semiannual	Annual
H-2	Well	3.5 miles	Semiannual	None
H-3	Well	2.1 miles	Semiannual	None
HS-1*	Well	3.7 miles	None	None

SGZ = surface ground zero

\* = This well is currently not accessible for obtaining water levels or installing a transducer, due to the well and pump configuration.

### Reporting of Results

LM will continue to provide analytical results and hydraulic head data obtained as part of the monitoring program in the annual groundwater monitoring reports. Information obtained from this evaluation will be assembled into an informational resource tool that will evolve with the project and be presented to NDEP in late 2012 for review and comment. LM will continue to provide teleconference calls and attend meetings in Las Vegas to give updates on the project's status and share any new technical data or interpretations.

October 11, 2011

Mr. Tim Murphy

-5-

LM intends for this Data Acquisition Plan to advance potential SCMs during this period of water level monitoring. When water levels stabilize, a prevailing groundwater flow direction will be identified. This will allow the SCMs to be revised and a more effective evaluation of the monitoring well network to be completed. Interpretations and/or recommendations associated with the water level data and the plan for the following year will be provided with the monitoring results in the annual groundwater monitoring report. The revised SCMs and any enhancements to the monitoring well network will be discussed with NDEP and provided in an addendum to the CADD/CAP.

Please contact me at (970) 248-6018 if you have any questions or need additional information. Please send any correspondence to:

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Mark Kautsky  
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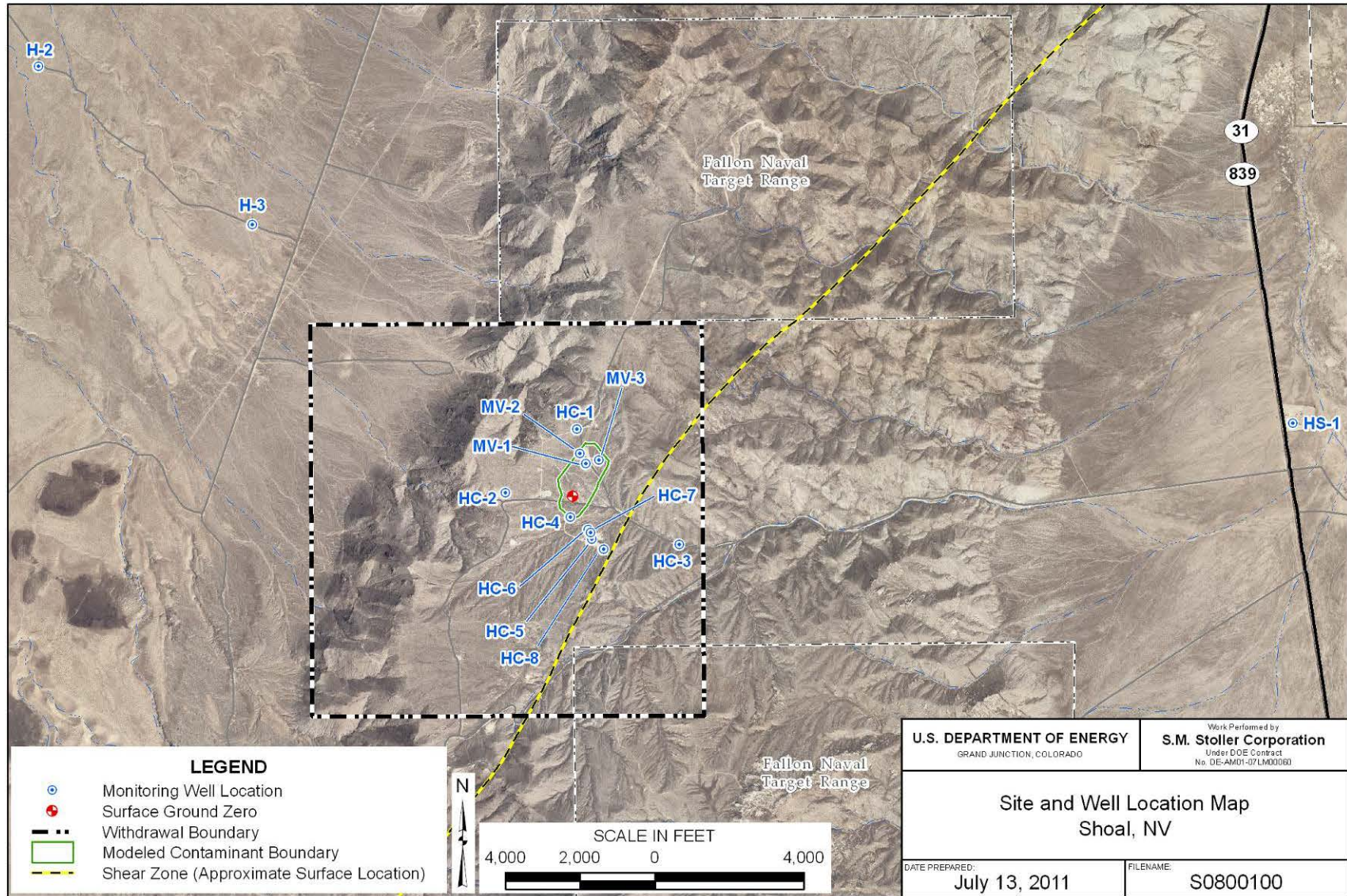
Enclosure  
As stated

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Figure 1. Site and Well Location Map