USGS ACTION PLAN FOR REDEVELOPING EPA WELL MW-02 SITE AT PAVILLION, WY

The following is the action plan developed by Art Clark (Chief, USGS Central Region Research Drilling Project) in conjunction with the Pavillion Technical Team during April, 2012 for redevelopment activities for deep monitoring well MW-02 at Pavillion, WY. The effort was undertaken to extract the existing pump and to attempt to improve the yield on the monitoring pump. The planned activities are given below (black) with a review of the actual activities and observations (blue).

Monday 4/30/12 planned:

- Drive from Denver to Riverton. Meet with EPA at MW02 at ~ 14:00 to discuss plans and logistics.
- USGS (Denver) brings two new enclosed 500 gallon water tanks for storing Riverton water at site.
- Water truck arrives with 1,000 gallons of Riverton water at 15:00 – transfer water into holding tanks.
- Drill rig and equipment drives from Denver to Riverton.

Monday 4/30/12 actual:

- *Art Clark (Chief, USGS Central Region Research Drilling Project) and Jeff Eman (USGS drill foreman) drove from Denver to Pavillion, WY site MW-02 to meet with EPA, USGS-WY, and WY-state personnel to discuss and finalize site plans and stimulation methods. We delivered two new 550-gallon water storage tanks to hold Riverton drinking water and water removed from well.*
- *Water truck contracted by WY DEQ delivers 1,100 gallons of Riverton water to the site and the holding tanks are filled.*
- *Monitored for CH4 at the wellhead: 14% CH4 inside wellhead and was 0% CH4 outside wellhead.*
- *The drilling rig and associated equipment was driven by the drill crew from Denver to Riverton.*

Tuesday 5/1 planned:

- Mobilize drilling equipment to Pavillion, WY site MW-02
- Set up decon area and steam-clean drill rig and equipment as necessary
- Monitor for CH4 at wellhead and inside 20-in protective well cover
    - Vent accumulated CH4 from inside cover if/as necessary
- Inside protective cover, remove 2-in side bushing from 4-in well casing
- Insert hose in 2-in side opening and pump Riverton water into 4-in casing at 10-20 gpm until full
    - Collect splits of purge water from discharge side during purging activities
    - Monitor vented gas during purge
    - When 4-in casing is filled, let sit for ½ hour and top off with fluid
- Reinsert 2-in bushing, monitor and vent gas from wellhead area if/as necessary, and cut 20-in well cover to ~2-ft height for increased rig accessibility
- Position drill rig over MW-02 and move other equipment onsite as required
    - Install visqueen liner beneath rig
- Attach to 4-in well cover and raise from 4-in well casing
    - Assess discharge pipe, monitor pipe, and pump cable configuration and determine optimum equipment removal methodology

- Remove equipment from well
    - Pipe to be placed on saw horses or designated trailer
    - Pump cable to be coiled on designated spool
    - Pump to be left attached to cable or disconnected and placed on pipe trailer
    - Well head area to be monitored for CH4 throughout pull.

Tuesday 5/1/12 actual:

- *The drill rig was driven from Riverton to MW-02 site and steam-cleaned. The drill rig was also steam-cleaned in Denver prior to leaving as was all equipment used at the site.*
- *Removed the 2-in bushing from side of the wellhead, assembled the pumps and hoses, and slowly pumped Riverton water from one 550-gallon tank into the well. USGS-WY and EPA collect samples of water used to purge well.*
- *Monitored for CH4 vented from the well during purge. The concentration inside wellhead increased from 14% CH4 at start to 100% CH4 towards end of the well purging. Once the water inside well reached land surface, CH4 readings drop to 0%.*
- *Cut the 20-in diameter protective well cover to 2 ft above land surface to allow for better rig access. Set rig over the well and pull the submersible pump assembly (1-in stainless steel discharge pipe, 1-in PVC tagging tube, 4-strand pump wire, and 4-in pump) from well.*
- *Monitor for CH4 during pull – 0% readings.*
- *Based on the removed discharge pipe, the pump intake was set at 964 ft below land surface (bls). Run tagging tape down well and tag bottom at 990 ft bls.*

Wednesday 5/2 planned:

- Run state-owned optical televiewer in well
    - Verify well bottom depth with televiewer or tag line
- Attach 4-in surge block to 1-in drop pipe removed from well and insert to well bottom
    - 1-in ball valve attached to top of pipe will allow for vacuum or venting as desired
- Begin surging activities.

Wednesday 5/2/12 actual:

- *Monitored for CH4 at wellhead – 0%.*
- *Set up and ran WY state-owned and operated down-hole camera in well to bottom. Saw that the screen was intact but some mud/sediment was noted along screen surface. Impossible to tell whether screen was plugged because only the inner-surface of the screen slots can be seen.*
- *Removed camera, attached 4-in surge block to cleaned 1-in stainless steel discharge pipe and installed it to 924 ft bls. Note: Did not run block inside well screen as the screen's internal ribs would have cut the rubber block rendering it useless and leaving rubber material in the bottom of the well.*
- *Spent 3 hours surging the well between 904 ft and 924 ft bls using 1-in ball-valve attached to the top of the pipe to alternatively create under- and over-pressure conditions at the well screen.*
- *Removed surge block from the well while monitoring for CH4 – 0%. Well water was not pulled to surface during the removal of the surge block as anticipated. Therefore, no additional Riverton water was added to the well.*
- *Attempted to run 3-in diameter bailer down hole to remove sediment and collect water sample from well bottom for observation purposes only. Bailer wedged in well at approximately 200 ft bls and could not be*

worked past this point.

- *Removed 3-in bailer and installed a 2-in PVC bailer. Made five runs with bailer to well bottom, removing moderate amount of sediment and approximately 15 gallons total fluid. Fluid removed was very dark and had a strong odor.*
- *Tag water level in well at day's end at approximately 235 ft bls.*

Thursday 5/3 planned:

- Continue surging activities
  - Surge slowly thru screened interval
  - Monitor at wellhead for CH4 during surging activities
- Remove surge block from well and tag well bottom
  - Collect and store purged water (between 4-in and 1-in pipe) in emptied 500 gallon tank.
  - Add Riverton water in top of 1-in pipe every 20 ft to keep well area below surge block fluid filled
- Use bailer to remove sediment from well bottom if/as necessary

Thursday 5/3/12 actual:

- *Monitored for CH4 in wellhead – 0%. Tag water level at ~234 ft bls.*
- *Set up and ran downhole camera in well to bottom. However, the fluid in the well was too turbid to view anything.*
- *Removed camera and bailed well from bottom for 4.5 hrs then begin bailing from top of fluid. Fluid removed from well bottom became slightly less turbid, but continued to have a strong odor. Fluid from the top is turbid but odor-free. All removed fluid is captured and held in emptied 550 gallon water tank.*
- *Bailed well for 2.5 hrs from top of fluid.*
- *Tag water level at day's end at ~503 ft bls. CH4 reading at day's end is 0%.*

Friday 5/4 planned:

- Run downhole camera in well
- Install downhole equipment or purge water from well as directed.
  - Collect purge water in 500 gallon tanks
  - Monitor for methane gas during water purge

Friday 5/4/12 actual:

- *Monitor for CH4 in wellhead – 0%. Tag water level at ~498 ft bls and begin bailing.*
- *Collected one bail from well bottom then bailed ~9 hrs from fluid surface to within ~40 ft of well bottom. Water continued to be turbid and water from well bottom continued to have a strong odor.*
- *Discontinued bailing and tagged water level at ~950 ft bls.*
- *Water truck arrived to transport well fluid for disposal. Pumped water from holding tank into truck.*
- *Dropped water storage tanks, pipe, and 4-in submersible pump and cable in rancher's yard. Packed equipment.*
- *Reattached 20-in protective well cover and drove equipment from Pavillion site to Riverton.*

Saturday 5/5 planned:

- Monitor for methane gas and install lockable well cover
  - If no methane at surface, weld removed 20-in well pipe and cover onto well.
  - If methane is present (no torch or welder can be used), install prefabricated lockable 4-in well cover to well.

- Water truck arrives to collect and dispose of purged water.
- Remove rig and equipment from site
- Steam-clean rig and/or other equipment before leaving location if/as necessary
- Drive rig and equipment to Riverton

Saturday 5/5/12 actual:

Drove drilling equipment from Riverton to Denver.

Sunday 5/6

- Transport equipment from Riverton to Denver.