Pavillion Groundwater Report Fact Sheet
November 7, 2016

Background

The Pavillion, Wyoming Area Domestic Water Wells Final Report and Palatability Study provides the results of the investigation into drinking water quality issues in the rural area east of the Town of Pavillion, Wyoming. The scientific investigation followed the process outlined in the June 20, 2013 Framework Document which included the collection of water quality and operational data for the water-supply wells (domestic, irrigation and stock), in order to assess water quality and identify parameters or conditions that might cause palatability or toxicity issues. An evaluation of the integrity of nearby oil and gas wells and the historic use of surface pits in the Pavillion Gas Field was also performed.

Key Findings

- Based on the Wyoming Department of Environmental Quality's (WDEQ's) June and August 2014 sampling of the 13 water supply wells, other than a pesticide (beta-BHC) and a phthalate ester [bis (2-ethylhexyl phthalate)], no organic compounds were identified at concentrations exceeding applicable drinking water standards. Phthalate is used as a plasticizer in flexible PVC plastics and is a common laboratory contaminant.

    - Inorganic compounds that were found over applicable drinking water standards are generally associated with naturally occurring salts, metals and radionuclides. Industrial applications may use some of these same compounds (e.g. oil and gas drilling mud contains chloride and potassium).

    - All organic constituents identified in groundwater samples at concentrations less than drinking water standards or comparison values may have originated from a multitude of possible sources, including spills, oil and gas activities, agricultural chemical applications, and other residential and industrial uses.

- Evidence does not indicate that hydraulic fracturing fluids have risen to shallow depths utilized by water-supply wells. Also, based on an evaluation of hydraulic fracturing history, and methods used in the Pavillion Gas Field, it is unlikely that hydraulic fracturing has caused any impacts to the water-supply wells.

- Gas in the upper Wind River Formation appears to have originated mainly from upward migration from deeper commercial gas-bearing zones and evidence suggests that upward gas seepage (or gas charging of shallow sands) was happening naturally before gas well development.

- Some gas wells are experiencing slow gas seepage. The relative contribution of potential gas seepage along gas wells versus natural upward migration of gas is undefined and would be very difficult to quantify.

- Water quality in the intermediate zones is expected to be different than in the shallow water-bearing zones, such as higher dissolved solids concentrations, therefore communication between the two zones could introduce water of poorer quality into the shallow water-bearing zones.

- Sustained bradenhead pressures in several gas wells provide an indication that gas and possibly liquid migration may be happening, however, there is no evidence this migration has caused water quality issues.

- The presence of bacteria in many of the water-supply wells suggests that this may be a cause of taste and odor issues.

  - Geochemical changes associated with the biodegradation of dissolved organic compounds, including naturally occurring organic compounds, likely have produced constituents associated with poor water palatability, and appear to be linked to declining well yields.

- Limited baseline water quality data, predating development of the Pavillion Gas Field hinders reaching firm conclusions on causes and effects of reported water quality changes.

Recommendations for Additional Work

- Expanded evaluation of identified groundwater constituents, including bacteria, which can cause palatability issues.

- Focused assessment of the potential for gas seepage along gas wells versus naturally occurring upward seepage of gas, as well as evaluating conditions that might allow the potential movement of gas and/or liquid from intermediate zones pressurized by gas into shallower water bearing zones.

- Further evaluation of the surface pits and their potential impact on water quality. In addition, hold collaborative discussions between WDEQ and Wyoming Oil and Gas Conservation Commission (WOGCC) to evaluate consistent criteria for the closure of pits impacting groundwater.

- Further evaluation of other potential sources of petroleum hydrocarbons such as drill cuttings disposal sites, petroleum storage tanks and gas production and gathering facilities.

- Perform additional sampling for constituents associated with palatability issues, as well as for specific chemical constituents and other chemicals, as necessary to achieve lower method detection limits.

- Initiate uncompleted recommendations identified in the WOGCC Well Integrity Review Report and perform further evaluation of potential well integrity concerns for select gas

wells. Additionally, the WDEQ concurs with the WOGCC Pit Review Report recommendation that further investigation of numerous closed pits is needed.

- Recommend that the US Environmental Protection Agency (US EPA) plug and abandon the two monitoring wells constructed in 2010 in accordance with Wyoming Water Quality Rules and Regulations Chapter 26, due to the potential hazard they pose in relation to groundwater supplies and physical safety.

Next Steps

- A public meeting will be held in Riverton, Wyoming in early December 2016. This meeting is intended to provide an opportunity for the public and other interested parties to obtain clarification regarding information included in the final report.

- An electronic copy of the final report will be available on WDEQ's website on Thursday, November 10, 2016.

- The WDEQ plans to issue a scope of work for supplemental groundwater investigation activities including the sampling and analysis of water-supply wells within the Pavillion Gas Field. This scope of work will address select data gaps identified in the draft and final reports. It should be noted that the planned activities are not intended to address all recommendations which are made in the final report.

Additional Information

- Legislation has been enacted for the Pavillion East Water Supply Project (Level III) authorizing design and construction services of cistern systems be offered to landowners who expressed an interest in a cistern and met project operating criteria. The cistern project began in January 2014 and concluded in February 2015. To date, a total of 31 cisterns for 28 landowners have been installed. The total amount spent for this project to date is $929,268. For those landowners not participating in the cistern program, a bottled water delivery program was available and has been extended until March 31, 2017. The delivery program is provided to 11 homeowners.

- Twenty-seven surface pits were originally entered into the WDEQ Voluntary Remediation Program (VRP). Nineteen of those pits were subsequently withdrawn from the VRP because they were determined to fall under WOGCC regulatory authority for investigation, eight pits remained in the VRP. Four of the eight pits have been granted a Certificate of Completion. Four pit sites remain in the VRP and are being actively investigated.

- The WDEQ received comments on the draft report from 38 entities including private citizens, industry and governmental organizations. Based on these comments, changes were incorporated into the final report which improved the overall quality of the work product.

- Subsequent to the release of the Draft Report (December 2015), existing Wyoming Drinking Water Equivalent Levels (DWELs) were reviewed and updated using the most current toxicology data published by US EPA as the Regional Screening Levels – Generic Tables (May 2016). Twenty-six WY DWELs were changed, 15 of the DWELs decreased, and 11 of the DWELs increased. DWELs were removed from the tables because corresponding federal Maximum Contaminant Levels and Wyoming Class I Domestic values existed. One-hundred and six newly calculated WY DWELs were added to the tables. In most cases where the WY DWEL was updated, the corresponding chemical was not detected greater than the laboratory reporting limit, and no additional compounds were detected above screening criteria.

- Over 11,700 analytical results were reviewed, only eight (8) of which were rejected due to quality assurance/quality control review guidelines.

- The final report, including lab results, is over 80,000 pages.

- The cost for this current phase of the Pavillion investigation exceeded $900,000.