FINAL
June 20, 2013

Well Bore Integrity – Final Report

The Wyoming Oil and Gas Conservation Commission (WOGCC or Commission) will develop a report that includes its technical and regulatory analysis along with assumptions and recommendations concerning the integrity of all oil and natural gas exploration and production wells within 1320 feet of the fourteen (14) domestic wells evaluated for water quality and palatability concerns. In developing its report, the WOGCC will solicit additional, relevant data from the WDEQ, SEO, EPA, USGS, BLM, Tribes, and the operator in order to complete its technical and regulatory analysis.

The WOGCC will contract with an expert or experts to review and comment on the Commission's analysis of well bore integrity in those wells. Specifically, the WOGCC will determine if records and test results demonstrate that wellbore construction is adequate to protect those water supply wells within 1320 feet of the oil and natural gas wellbores.

The report will consist of a comprehensive review of the following, if available:

- location (Q/Q, STR);
- distance to water well;
- lease type (fee, tribal);
- API #;
- date completed;
- operator;
- surface casing and cement;
- mud system;
- total depth;
- production casing and cement;
- cement bond log results;
- bradenhead test results;
- mechanical integrity tests;
- gas analysis from bradenhead and tubing;
- subsequent remedial work; and
- other data in the WOGCC records that are deemed pertinent.

Of particular interest is whether the available bradenhead test results for the Pavillion Field confirm hydraulic isolation, consistent with the June 2, 2011 "Pavillion Bradenhead Testing Procedure," approved by WOGCC sundry.

The expert or experts will assist the WOGCC staff in preparation of a final report that summarizes the results of the well bore integrity review and, specifically, includes an evaluation of the available data and addresses compliance with WOGCC regulatory requirements. The WOGCC and expert or experts may identify data gaps, including the need for additional testing and analysis and/or investigation. If the WOGCC and expert or experts identify data gaps, then, to

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the extent feasible and consistent with applicable law, the WOGCC will work with the well operator to obtain the additional information in advance of issuance of the WOGCC's final report. This information and work will be summarized in WOGCC's final report. Any recommended work which cannot be completed in a reasonable timeframe will be identified in the WOGCC's final report, including a scope of work.

WOGCC will consider the following criteria in the selection of expert or experts:

- Expertise in petroleum engineering and hydrogeology.
- Individual(s) with both industry and academic experience.
- Professional Engineer preferable.
- Regional expertise (geologic, etc.).
- No conflicts with (financial or other) with State, EPA or Encana.

WOGCC will solicit and consider candidate expert or experts submitted by the EPA and Encana. EPA and Encana will be provided an opportunity to review the WOGCC's draft final report and provide comment prior to issuing its report. WOGCC plans to finalize this report no later than December 31, 2013.

The WOGCC reserves its rights to require any action consistent with its authorities under existing statutes, rules and regulations.

Pits – Final Report

The WOGCC will develop a report that includes its technical and regulatory analysis along with assumptions and recommendations concerning the status and reclamation of pits in the Pavillion Field. In developing its report, the WOGCC will solicit additional, relevant data from the WDEQ, EPA, BLM, Tribes, and the operator, in order to complete its technical and regulatory analysis. The report will summarize the results of records evaluated, identify historical pit locations, and outline site investigations and/or reclamation of pits conducted to date. The WOGCC will determine if the site investigations and/or reclamation was sufficient to protect those water supply wells within 1320 feet of the pit locations.

The WOGCC will contract with an expert or experts to assist in its review and analysis of the current body of information available for pits in the Pavillion Field. The expert or experts will be selected using the same process and have similar expertise as that identified for the Domestic Water Wells – Final Report and Palatability Study (see below).

WOGCC staff may identify data gaps, including the need for additional testing and analysis and/or site investigations and/or reclamation. If the WOGCC identifies data gaps, then, to the extent feasible and consistent with applicable law, the WOGCC will work with the well operator to obtain the additional information in advance of issuance of the WOGCC's final report. This

information and work will be summarized in WOGCC's final report. Any recommended work which cannot be comple ted in a reasonable timeframe will be identified in the WOGCC's final report, including a scope of work.

EPA and Encana will be provided an opportunity to review the WOGCC's draft final report and provide comment prior to issuing its report. WOGCC plans to finalize this report no later than December 31, 2013.

The WOGCC reserves its rights to require any action consistent with its authorities under existing statutes, rules, and regulations.

Domestic Water Wells – Final Report and Palatabili ty Study

The Wyoming Department of Environmental Quality (WDEQ) will contract with an expert or experts to assist the WDEQ in its review of the current body of information available for the domestic water wells in the Pavillion Field. This review will consist of an evaluation of the data, conclusions and recommendations developed from the well bore integrity and pits final reports and a comparison of currently available analytical results for each domestic water well in the Pavillion Field to U.S. Environmental Protection Agency (EPA) primary maximum contaminant levels (MCLs) and secondary maximum contaminant levels (SMCLs), and WDEQ Water Quality Rules and Regulations, Chapter 8, Quality Standards for Wyoming Groundwaters . These standards and rul es and regulations are provided in Attachment A. The review will evaluate, in particular, the domestic water wells commonly labeled as PGDW05, PGDW14, PGDW20, PGDW21, PGDW23, PGDW30, PGDW32, PGDW33, PGDW41, PGDW42, PGDW44, PGDW45, PGDW49, and LD02. Water quality in these wells exceeds standards for one or more constituents. In its review, the WDEQ will solicit additional, relevant data from the SEO, WOGCC, EPA, USGS, BLM, Tribes, and the operator, in order to complete its evaluation. Based on its review, the WDEQ may identify domestic water wells where additional testing and analysis is necessary. For these wells, WDEQ will undertake two (2) additional round s of water quality sampling (pre- and post- irrigation season within a twelve (12) month period) to determine domestic well water quality and identify other parameters that might cause palatability or toxicity issues. Each domestic well also will be evaluated for well construction and integrity issues (including down-hole video), maintenance history and other proximate and pertinent features (e.g., septic systems).

The following standards and protocols will be used to guide the sampling efforts:

- The domestic well sampling will follow the WDEQ, Water Quality Division, Guideline for Sampling and Testing Well Water Quality (Attachment A) consisting of testing for Tier I, II, and III constituents.
    - The Tier III constituents will include analyzing for "indicator" chemical

compounds, including bacteria, and other microbial activity, as appropriate. Note that some of these indicator type compounds do not have water quality standards, but may be useful in evaluating palatability issues, along with many of the Tier I and II constituents.

- All laboratory analysis will be conducte d by well-respected, appropriately certified (e.g., NELAC) commercial laboratories chosen by WDEQ and in accordance with WDEQ Water Quality Rules and Regulations, Chaper 8, Quality Standards for Wyoming Groundwaters, Section 7 (Attachment A) and in accordance with an approved Quality Assurance Project Plan (QAPP);
- Constituent detection limits used by commercial laboratories will be as specified in the analytical methods utilized and as defined by WDEQ Water Quality Rules and Regulations, Chapter 8, Quality Standards for Wyoming Groundwaters, Section 8 (Attachment A) and as defined by an approved QAPP; and
- Data qualifiers, blank contamination, and other QA/QC related issues will be handled in accordance with established US EPA National Functional Guidelines (2009).

WDEQ and the expert or experts will work with each individual landowner that allows sampling to determine the causes and sources of palatability issues and/or well contamination. In the event that the WDEQ is denied access to a well by the landowner, sampling and palatability consultation will be withdrawn and not included in this study.

- EPA MCLs, SMCLs, and Quality Standards for Wyoming Groundwaters are similar and largely overlap, but all of these standards will be utilized to ensure a comprehensive evaluation. Exceedence of standards, plus other palatability-related data, will be used to guide the investigation as to the palatability issues for that well.
- Oil and natural gas activities will be further investigated as a possible source of domestic water well palatability if oil and gas related volatile/semi-volatile organic constituents, including VOCs and SVOCs in DRO and GRO ranges, exceed MCLs, SMCLs or Quality Standards for Wyoming Groundwaters.
- If domestic well analytical results exceed standards for constituents determined by WDEQ to be associated with sources of contamination other than oil and gas activities or determined to be natural in derivation, then WDEQ will determine next steps with the landowner or as otherwise required in accordance with Wyoming law.

The expert or experts will assist the WDEQ in preparation of a final report that summarizes the analytical results relative to standards and, specifically, include a discussion of impacts on palatability associated with constituents and sources identified and appropriate responses. The WDEQ and expert or experts may identify data gaps, including the need for additional testing and analysis and/or investigation. The WDEQ will determine which wells may benefit from further

evaluation using exceedances of the standards listed above as a trigger for evaluation and testing. Further work may or may not include additional sampling of domestic wells and/or construction of groundwater monitoring wells, as appropriate. Any recommended work will be conducted consistent with WDEQ standard procedures. This information and work will be summarized in WDEQ's final report. Any recommended work which cannot be completed in a reasonable timeframe will be identified in the WDEQ's final report, including a scope of work. In its final report, the WDEQ will summarize its rationale and criteria used in the selection of domestic water wells for further testing and analysis and also include its rationale and criteria for any determinations made regarding additional testing and analysis and/or investigation.

WDEQ will consider the following criteria in the selection of an expert or experts:

- Expertise in hydrogeology, geochemistry, and toxicology.
- Individual(s) with both industry and academic experience.
- Regional expertise (geologic, etc.).
- No conflicts with (financial or other) with State, EPA or Encana.

WDEQ will solicit and consider candidate expert or experts submitted by the EPA and Encana. EPA and Encana will be provided an opportunity to review the WDEQ's draft final report and provide comment prior to issuing its report. WDEQ plans to finalize this report no later than September 30, 2014.

The WDEQ reserves the right to require any action consistent with its authorities under existing statues, rules, and regulations.

Attachment A

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