

Standard for Baseline Water-Well Testing for Coalbed Methane / Natural Gas in Coal Operations

March 2014

Effective March 29, 2014, the Alberta Energy Regulator (AER) has taken over jurisdictional responsibility for water and the environment with respect to energy resource activities in Alberta from Alberta Environment and Sustainable Resource Development.

As part of this jurisdictional transfer, the title page of this guide now carries the AER logo and a new publication date. However, no other changes have been made.

For more information, contact the AER Customer Contact Centre at 1-855-297-8311 or inquiries@aer.ca.

**Standard for Baseline Water-Well Testing for
Coalbed Methane/Natural Gas in Coal Operations**

April 2006

STANDARD FOR BASELINE WATER-WELL TESTING FOR COALBED METHANE /NATURAL GAS IN COAL OPERATIONS

INTRODUCTION

Coalbed Methane (CBM)¹, also known as Natural Gas in Coal, is in the early stages of development in Alberta and has significant growth potential. With this potential for development, it is necessary to obtain consistent baseline data on groundwater to ensure the protection of groundwater resources and the environment. While many oil and gas companies have adopted the practice of gathering baseline water quantity and quality data from nearby water wells prior to drilling energy wells, this testing has been voluntary. Broader application of groundwater testing will also support Alberta Environment's (AENV) goal of mapping all groundwater resources in Alberta. To ensure all CBM developers collect representative baseline data prior to CBM development, AENV has introduced the *Standard for Baseline Water-well Testing for Coalbed Methane/Natural Gas in Coal Operations* to make baseline testing a mandatory regulatory requirement. Data collected will be submitted to AENV and will be made publicly available.

This Standard was developed by AENV and is in addition to *Alberta Environment Guidelines for Groundwater Diversion for Coalbed Methane/Natural Gas in Coal Development* (April 2004)². The Standard will be implemented and enforced by the Energy and Utilities Board (EUB).

OUTCOMES

As part of AENV's integrated policy framework to ensure that CBM development is balanced with environmental protection, the *Standard for Baseline Water-Well Testing for CBM Operations* will contribute to achieving the following outcomes:

- Continued protection of provincial groundwater resources and Albertans' groundwater supplies,
- Facilitation of responsible CBM development, and
- Consistency with the government's *Water for Life* strategy.

The *Standard for Baseline Water-well Testing for CBM Operations* provides:

- Consistent protocols for testing, sampling and analyzing groundwater,
- Scientific information to support achievement of the outcomes, and
- A regulatory basis for water well testing and baseline data collection prior to CBM development.

REVIEW OF THE BASELINE TESTING DATA

Data collected from baseline water-well testing will be submitted to AENV and the landowner/occupant. Six months after the effective date, AENV will conduct a preliminary review of all data collected, followed by a comprehensive review after 12 months. AENV will review the data to determine if the outcomes listed above are achieved, and will prepare a report within 18 months summarizing the results, and conclusions and recommendations from the review. The data will also be used to determine the need to improve the Standard.

WATER WELL COMPLAINTS

If a landowner/occupant perceives a change in well water quantity or quality after CBM development, then CBM developers must retest the water well. The retesting program should be designed to address the landowner/occupant's concerns. The landowner/occupant must register his/her complaint with AENV at 1-800-222-6514 prior to retesting.

¹ For the purpose of this Standard, CBM is used as the acronym for Coalbed Methane or Natural Gas in Coal

² www.gov.ab.ca/env/water/Legislation/Guidelines/groundwaterdiversionguidelines-methgasnatgasincoal.pdf

STANDARD FOR BASELINE WATER-WELL TESTING FOR COALBED METHANE /NATURAL GAS IN COAL OPERATIONS

Effective May 1, 2006:

- Coalbed Methane (CBM) developers must test all active water wells either flowing or equipped with a pump, and observation wells in the provincial Groundwater Observation Network³ within a minimum 600 metre radius of a proposed CBM well prior to drilling a new CBM well or re-completing an existing well for CBM production where the completion will be at a depth above the Base of Groundwater Protection.
- If no water wells are found within the 600 metre radius, testing must be conducted at the nearest water well within a 600-800 meter radius.
- AENV and the EUB expect industry to identify those situations where unique geological or topographical conditions, or landowner concern warrant testing at greater distances or more than one well in the 600-800 metre radius.
- Testing procedures must comply with the requirements in Attachment A.
- If the water well has been tested within the previous two years, and if the landowner/occupant or AENV can provide a copy of the test to the CBM company representative, and the testing conforms to the described protocols in Attachment A, testing is not required unless requested by the landowner.
- Landowner/occupant's permission must be obtained prior to testing. If permission is refused, testing is not required at that well.
- If a landowner/occupant does not want his/her water well tested, the company must obtain written confirmation from the landowner/occupant that testing is not required. If written confirmation is refused, a company representative must diarize landowner/occupant's refusal and the CBM developer must deliver to the landowner/occupant, and retain a copy of, a notice describing this protocol.
- CBM developers must retest water wells after drilling is completed, if requested by the landowner/occupant in response to any changes in quantity or quality of water observed by the landowner/occupant. The landowner/occupant must register his/her complaint with AENV at 1-800-222-6514 prior to retesting. The retesting program should be designed to address the landowner/occupant's concerns.
- CBM developers are responsible for the water-well testing, and for submission of all testing data and analyses to AENV within 2 months of sampling.
- CBM developers must provide AENV and the landowner/occupant with copies of all tests and analysis within 2 months of testing. If the information cannot be provided within 2 months, the CBM developer must advise the landowner/occupant of the reason for the delay.

³ Information on and locations of wells in the provincial Groundwater Observation Well Network can be found at <http://www.gov.ab.ca/env/water/gwsw/quantity/waterdata/gwdatafront.asp>

ATTACHMENT A: TESTING REQUIREMENTS

This testing protocol was developed for use in collecting representative baseline quantity and quality data from water wells. The testing methods should be used for collecting data prior to, and following (if necessary), the drilling and completion of CBM wells to ensure the results are comparable.

This program must be carried out under the direction of a professional registered with APEGGA.

Available information regarding the age, depth, completion, well use, expected yield, and condition of the water well should be recorded prior to commencement of any testing. Collection of additional information about the water well, such as well maintenance/service events, landowner/occupant's testimonials, and historic groundwater analytical information is encouraged.

Modifications to the recommended water quantity testing procedures may be warranted in older or small diameter wells to avoid damage to the water well. The landowner/occupant or AENV's Groundwater Information Centre may have a record of the water well drilling report, available on the web at www3.gov.ab.ca/env/water/groundwater/index.html or phone (780) 427-2770.

If testing or sampling methodology differs from this protocol, due to case-specific circumstances, appropriate supporting documentation justifying the change(s) must be submitted to Alberta Environment with the test results.

All monitoring, purging and sampling methods, as well as testing equipment must be selected based on the parameters being monitored, and the expected yield of the water well being tested. All equipment (e.g. water level sounder, pump, tubing, etc.) must be cleaned to prevent introducing contaminants into the well.

CBM developers are responsible for ensuring a copy of all test data are provided to the landowner and to:

Alberta Environment
Monitoring and Evaluation Branch
11th Floor, 9820 106 Street
Edmonton, Alberta T5K 2J6
Fax: (780) 427-1214.

CBM developers must also retain a copy of all testing and sampling data, in addition to any supporting documentation to address future concerns.

Water Well Capacity

A yield test must be performed to determine the capacity of the well. During the test, water must be discharged from the well without going through the pressure system unless there is no practical alternative possible. If the test is run through the pressure system, water should not be used during the test. The yield test must be performed using the following procedure:

1. Measure the non-pumping water level (npwl) prior to the start of the test. This level should be recorded after the water level in the well has been allowed to fully recover, and before the pump is turned on. It may be necessary for the well to remain unused for a period of time prior to the test in order to obtain a true npwl. If testing a large-diameter bored or dug well, also measure the total depth of the well.
2. The pumping rate for the yield test must reflect the capability of the well without drawing the water level down to the pump intake too quickly. The pumping rate should be determined in consultation with the landowner and be consistent with the recommended pumping rate on the water well drilling report form, if available. If a safe pumping rate cannot be established using these methods, then it should be established by conducting a step drawdown test.
3. The pump should be disconnected from the distribution system while conducting the yield test, to ensure the pumping rate is held constant during the test and to prevent any unwanted fluctuations in the drawdown of the water in the well.
4. Pump the well at a constant rate (+/- 5%) for two hours and measure the drawdown of the water level at the following time intervals: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, 30, 35, 40, 50, 60, 70, 80, 90, 100 and 120 minutes. If pumping cannot be sustained, provide an explanation, allow the water level to recover to the non-pumping level and repeat the test at a lower pumping rate. If testing a large diameter bored or dug well, carefully monitor the drawdown of the water level during pumping to ensure it is not drawn down so far as to leave the landowner with insufficient water. Bear in mind that recovery rates in large diameter bored or dug wells can be extremely slow.
5. After pumping is completed, measure the recovery of the water level at the same time intervals as described for the pumping portion of the test, or until the water level recovers to at least 90% of the non-pumping water level.
6. Record the following information upon completion of the yield test:
 - a. Name, address, and qualification of person conducting the test
 - b. Date and time of test
 - c. Details of well construction such as age, diameter, total depth, screen interval, well ID number
 - d. Description of test equipment used
 - e. Non-pumping, static water level
 - f. Pumping rate during test
 - g. Reference point from where water level measurements were taken (e.g. from top of casing (TOC) and distance from TOC to ground level)
 - h. Drawdown and recovery measurements of the water level
 - i. Any general observations of the water being discharged during the test, such as the presence of silt, colour, odour, sheen or gas.

Water Quality Data

Water quality data is to be collected to evaluate the water quality prior to the CBM drilling and operation.

If possible water and gas samples must be collected at a location prior to the pressure system. The sampling point must be recorded. Samples must be preserved and filtered as required. Water samples must be stored at 4 °C, gas samples must be stored and transported to an accredited laboratory according to laboratory specifications within appropriate sample holding times. A documented chain of custody must be maintained for all samples.

Water quality samples can be collected during the yield test. Water quality samples must be collected when the field parameters have stabilized, indicating the well is producing formation water.

Water and gas samples collected from water wells must be delivered to a laboratory accredited for the following analyses:

1. Routine Potability

Analysis for common water quality parameters, including major ionic constituents and water quality standards, which must include the following parameters:

Bicarbonate (HCO ₃)	Nitrite + Nitrate (NO ₂ + NO ₃)
Calcium (Ca)	pH
Carbonate (CO ₃)	Potassium (K)
Chloride (Cl)	Sodium (Na)
Fluoride (F)	Sulphate (SO ₄)
Iron (Fe) - <i>Dissolved & Total</i> *	Total Dissolved Solids
Magnesium (Mg)	Total Alkalinity
Manganese (Mn)*	Total Hardness

** Note: Accurate iron and manganese analysis requires proper preservation of the sample*

Additional constituents may be analyzed as deemed necessary.

2. Bacteriological Analysis

Analysis for aesthetic and pathogenic bacteriological constituents present in the water supply, which must include the following parameters:

Iron bacteria
Sulphate-reducing bacteria
Total and fecal coliform bacteria

3. Presence and Analysis of Gas

A flow-through cell must be used to evaluate the presence or absence of gas during the yield test. Water must not be heated in the determination of the presence of gas, nor to obtain gas samples. If free gas is present, gas samples must be collected and delivered to a laboratory accredited for compositional analysis. Gas and water samples must be collected from a representative number of wells with free gas and submitted for isotopic analyses. Volume of gas per flow-through volume of water must be recorded. It is recognized that the volume and composition of gas may vary seasonally and with well use.

If free gas becomes present or apparent after offset energy drilling, a sample of the gas must be collected and delivered to a laboratory that is accredited for the analysis, and the situation must be identified to the appropriate AENV Regional Office.