

## 2.1 FORMATION TESTING PROGRAM

*Describe the proposed formation testing program. For Class I wells the program must be designed to obtain data on fluid pressure, temperature, fracture pressure, other physical, chemical, and radiological characteristics of the injection matrix and physical and chemical characteristics of the formation fluids.*

### RESPONSE

The DW No. 1 is to be installed and tested in the year 2011 according to applicable regulations and permit requirements. Subsequent wells likely will be installed and tested in 2011 or following years. Static pressure of the Minnelusa and Deadwood Formations along with estimates of various injection interval characteristics such as porosity and permeability are to be determined via core and pressure transient testing, while native brine chemistry and characteristics are to be determined based on acquisition of fluid samples. Additional fluid samples and static pressures will be taken from surrounding formations to establish characteristics and water quality. Characteristics of the potential injection intervals are also to be evaluated based on conducting geophysical well logging. Additional details regarding the well logging are presented in Response 2.L, Construction Details. The proposed target injection interval for DW Nos. 1 and 3 is the Minnelusa Formation and the proposed target injection interval for DW Nos. 2 and 4 is the Deadwood and granite wash. As further described in Section 2.L, the DW No. 1 will be drilled to basement to allow testing of both proposed targets then plugged back with cement to above the Madison Formation before being completed with perforations of the cased hole in the Minnelusa.

After the open hole section has been drilled, but prior to conducting any injection testing, injection interval fluid will be produced from the well using a submersible pump, swabbing or wireline testing equipment. Based on fluid loss during drilling and field conditions, target production volumes for obtaining representative samples will be adjusted in the field, based on conditions encountered. Field parameters including pH and conductivity will also be monitored at surface as fluid is recovered to determine when representative sampling is practical. Formation fluid samples generally will be subjected to analysis for the following parameters (Note: not all parameters will be analyzed for all samples):

- Alkalinity, Arsenic, Barium, Bicarbonate, Cadmium, Calcium, Carbonate, Chloride, Chromium, Conductivity, Copper, Hardness, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Nitrate, as (N), pH, Potassium, Uranium, Radium 226, Radium 228, Selenium, Silica as SiO<sub>2</sub>, Sodium, Specific Gravity, Strontium, Sulfur, TDS, TSS, Zinc, BTEX, Oil and Grease

Annual Part I mechanical integrity testing for the Dewey-Burdock wells will include reservoir monitoring as specified in 40 CFR 146.13 (d) in addition to static annulus pressure testing. Powertech (USA), Inc. will provide the agency with a minimum of 30 days notice of annual testing. Notice is to include proposed procedures for testing. Although test procedures or methods may be changed based on approval by Region 8 USEPA staff, the following procedure will be utilized for the first such testing to be performed:

1. Conduct Wellsite Safety Meeting
  - A. Prior to commencement of field activities, conduct safety meeting with contractors and personnel to be involved with field services and MIT testing. Ensure that all safety procedures are understood and review days work activities.

2. Conduct Fall-Off Test

- A. Record data regarding historical test well injection at typical operating conditions (constant rate preferred). Rate, temperature and specific gravity versus time will be sampled and recorded during the injection period. Cumulative volume injected will also be recorded. Continue injection for a minimum of approximately 2 - 6 hours. Additional time may be required depending on the nature of formation characteristics estimated from fluid sampling activities. Note that significant rate variations may yield poor quality data or require more complicated analysis techniques.
- B. Rig-up downhole pressure gauge(s) and run in the well to the testing/recording depth.
- C. Obtain final stabilized injection pressure for a minimum of one hour. Ensure that the gauge temperature readings have also stabilized.
- D. After gauge recordings are stable, cease injection and monitor pressure fall-off. Instantaneous shut-in yields best results. Continue monitoring pressure for a minimum of six hours or until a valid observation of fall-off curve is observed.
- E. Stop test data acquisition, pull gauges from the well, rig-down and release equipment.

3. Annulus Pressure Test

- A. Stabilize well pressure and temperature.
- B. If required, arrangements will be made for a representative from the USEPA to be present to witness this testing.
- C. Install ball valve or similar type "bleed" valve on annulus gate valve. Pressurize annulus to a minimum of 100 psig with liquid and shut-in pump side gate valve. If typical operating annulus pressures are above 100 psi, higher pressures acceptable to the agency and compatible with the well completion configuration will be utilized. Pressure to be used will be detailed in proposed procedures supplied with notification of testing. Install USEPA-certified gauge on "bleed" type valve. The annulus may need to be pressurized and bled off several times to ensure an absence of air. Monitor and record pressure for one hour. Pressure may not fluctuate more than 10 percent during the one-hour test. At the conclusion of the test, lower the annulus pressure to normal operating pressure.

## **2.J STIMULATION PROGRAM**

*Outline any proposed stimulation program.*

### **RESPONSE**

No specific stimulation program is currently scheduled for the proposed Dewey-Burdock Disposal Wells. Injection is utilized elsewhere within the region in the proposed Minnelusa Formation injection interval. Based on typical operations, hydrochloric acid or mud acid (HCl/HF) stimulation or other stimulations of the injection interval may be required as part of the original completion to achieve desired injection capacity or as maintenance during operations. If necessary to maintain desired injectivity, mechanical well clean out or acidization of a similar nature to programs used in other injectors may be conducted to reduce injection pressures. The USEPA will be notified prior to any stimulation activities being conducted in the well.