

**WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER QUALITY DIVISION - UNDERGROUND INJECTION CONTROL
CLASS V INJECTION WELLS**

**Draft Permit 10-498 – South Kitty
Applicant: Patriot Energy Resources
Location: Campbell County, Townships 49 and 50, Range 73
approximately 6 miles southwest of Gillette
(see attached map)**

What is the purpose of the Underground Injection Control Program?

The UIC Program protects potential underground sources of drinking water by regulating the construction and operation of injection wells.

What authority does Wyoming have to implement UIC regulations?

Section 1422 of the Safe Drinking Water Act (SDWA) of 1974 allowed States to implement federal UIC regulations provided that states had regulations as stringent as the federal regulations in place. Wyoming's UIC program was approved and became effective in 1983. Wyoming's UIC statutes and regulations have been incorporated into the federal regulations by reference (Title 40 CFR 147.2550 Subpart ZZ).

What are the different classes of UIC wells and which state agencies are responsible for which types?

Class I - dispose of hazardous and non-hazardous waste below the deepest source of usable water.

Class II - inject fluid produced during oil and gas extraction, fluid for enhanced recovery, or liquid hydrocarbons for storage.

Class III - underground solution mining of salt, uranium, sulfur, and other minerals and for coal gasification.

Class IV - historically disposed of hazardous or radioactive waste into or above potential

sources of drinking water, but are now prohibited.

Class V - all other types of injection facilities including drains, large septic systems, geothermal heat pumps, and any other injection wells which do not fit the other categories.

The responsible agencies are:

- Water Quality Division (DEQ) - I, V.
- Land Quality Division (DEQ) - III.
- Oil & Gas Conservation Commission - II.

What rules apply to obtaining a permit to construct and operate a Class V well in Wyoming?

Water Quality Rules and Regulations, Chapter 16.

How many Class V wells does Wyoming have?

Wyoming currently (May 2011) has 2,034 existing Class V wells that are injecting non-hazardous waste. There are no permitted hazardous waste disposal wells in Wyoming.

What wastes do these wells inject?

The table below quantifies the number of various types of Class V wells that are currently permitted under the UIC Program.

Number of Active Wells	Class V Well Type
70	Air Sparging Facilities
11	Aquifer Recharge Facilities
2	Industrial Drains
1	Brine Disposal
621	Cathodic Protection Wells
423	Coal Bed Methane Produced Water Injection Facilities
22	Floor Drains
75	Groundwater Remediation Facilities
61	Heat Pump Facilities
3	Industrial Process Water and Waste Disposal Facilities
3	Mining, Sand and Backfill Facilities
132	Miscellaneous Injection Wells
517	Septic Systems of various types
23	Small Commercial Disposal Systems
69	Stormwater Drainage Injection Facilities

How are groundwater supplies protected from this waste injection?

- The injectate consists primarily of coal bed methane produced water from the Smith and Wyodak coal seams (roughly 81% Smith, 19% Wyodak), with a very small component of additives designed to enhance microbial methanogenesis. The additives are primarily nutrients, such as those used in laboratories to culture microbes, and a very small amount of a tracer. Since the primary component of the injectate is groundwater, the character of Wyodak formation water in the area of review should not change significantly.
- “Enhancement” through the use of the additives described in the preceding paragraph occurred roughly in 2008 under the auspices of the Wyoming Oil and Gas Conservation Commission (WOGCC). Additives were blended with Smith and Wyodak production waters and injected into a number of coal-bed methane production wells. At this time, the permittee is applying for a UIC permit to recirculate the already-enhanced formation waters in the Wyodak coal seam within the area of review in an attempt to stimulate further microbial methanogenesis.
- Injection pressures for Class V wells are not allowed to exceed the formation fracture pressure.
- The permit contains conditions that require the permittee to offer all landowners with SEO permitted domestic water wells completed in the Fort Union formation within the area of review or within ½ mile (whichever is larger) of an injection or production well covered under the permit the option of having their well tested by an independent EPA certified laboratory. This will provide a baseline characterization of the groundwater quality being utilized by the landowners in the area of review and periodic monitoring over the duration of the permit (5 years).
- The UIC Program will review this data to ensure that no significant changes to the character of the groundwater in these domestic wells occurs.
- Quality of the injectate and the produced water being used as injectate make-up water must be monitored periodically, in part by an independent EPA certified laboratory, for the suite of parameters specified by DEQ. The results must be reported to the UIC program. The UIC program will review the results to

ensure compliance with the conditions of the permit.

- Class V wells meet stringent well construction requirements.
- Class V wells are continuously monitored and periodically tested to ensure they don't leak.
- This permit is limited to 5 years (most Class V well permits are limited to 10 years.)

➤ **What are the construction requirements?**

- The Class V wells proposed for coverage under this permit are cased and cemented through the confining layer and the discharge zone; the casing is then perforated in the discharge zone.
- Geophysical logs and/or video cameras are used to verify that the cement bond is good and no fluid can move up or down through the borehole-casing annulus.

What are the monitoring requirements for Class V wells?

- Periodic mechanical integrity testing (MIT) of the well must occur as specified in the permit, and the results reported to DEQ. If any well does not pass MIT, injection and/or production must cease until the well can be repaired, and the well cannot be put back into production/injection until the well passes MIT.
- The injection pressure is continuously monitored to ensure it does not exceed permit limits.
- Maximum instantaneous injection rates and monthly injection volumes are measured and reported to DEQ.

- The injectate and produced water from each well are analyzed quarterly for constituents specified by DEQ.

DEQ may also require monitoring wells for measuring formation pressures or collecting water quality samples.

What are the testing requirements for Class V wells?

- The mechanical integrity of the well is tested before injection and every 5 years thereafter, to ensure that the tubing, packer, and casing above the packer do not leak at high pressure.
- Annual pressure fall-off tests measure pressure buildup in the discharge zone, provide updated hydrologic parameters which are used to update the **Area of Review** calculation, and identify changes in near-wellbore conditions, such as plugging of perforations.
- Step-rate injection tests in the first year of operation determine the fracture pressure of the formation and consequently the maximum allowed injection pressure.

What is the permitting process for Class V wells?

1. The permittee submits an application to DEQ.
2. DEQ reviews the application to ensure that regulatory requirements are met, and may request additional information or analysis.
3. If the proposed well and operation meet the requirements in Chapter 16, DEQ prepares a draft permit; otherwise, the permit is denied.
4. A copy of the draft permit is provided to EPA, other federal agencies as appropriate (e.g., BLM, NRC), various state agencies, the county planning office, and the applicant. Public notice of the availability of the draft

permit for public review and comment is published in a local or statewide newspaper.

5. DEQ may hold a public hearing due to a specific request or at its own discretion.
6. DEQ responds to any comments and makes any appropriate changes to the permit.
7. The final permit is issued.

Which agencies review the draft permit?

South Kitty

What will be injected underground at this facility?

Water produced during the course of coal-bed methane gas extraction from the Smith and Wyodak coal seams that has been “enriched” with small amounts of various additives designed to enhance microbial methanogenesis, and a tracer. The additives consist mainly of nutrients like those used in laboratories to culture microbes.

“Enhancement” through the use of the additives described in the preceding paragraph occurred roughly in 2008 under the auspices of the Wyoming Oil and Gas Conservation Commission (WOGCC). Additives were blended with Smith and Wyodak production waters and injected into a number of coal-bed methane production wells. At this time, the permittee is applying for a UIC permit to recirculate the already-enhanced formation waters in the Wyodak coal seam within the area of review in an attempt to stimulate further microbial methanogenesis.

The injectate does not meet the regulatory definition of hazardous waste.

- US EPA
- US BLM (when appropriate)
- Local County Government
- WY Game and Fish Department
- WY Oil and Gas Conservation Commission
- WY State Engineer’s Office
- WY State Historical Preservation Officer

How many wells are included in the UIC permit?

32 Wyodak injector wells
79 Wyodak and Smith production wells

At what depth is the discharge zone?

743-1,083 feet, depending on which portion of the area of review the injection well is located in (the Wyodak coal seam dips generally to the northwest in the area of review).

Which aquifers will receive the waste?

- Wyodak coal seam

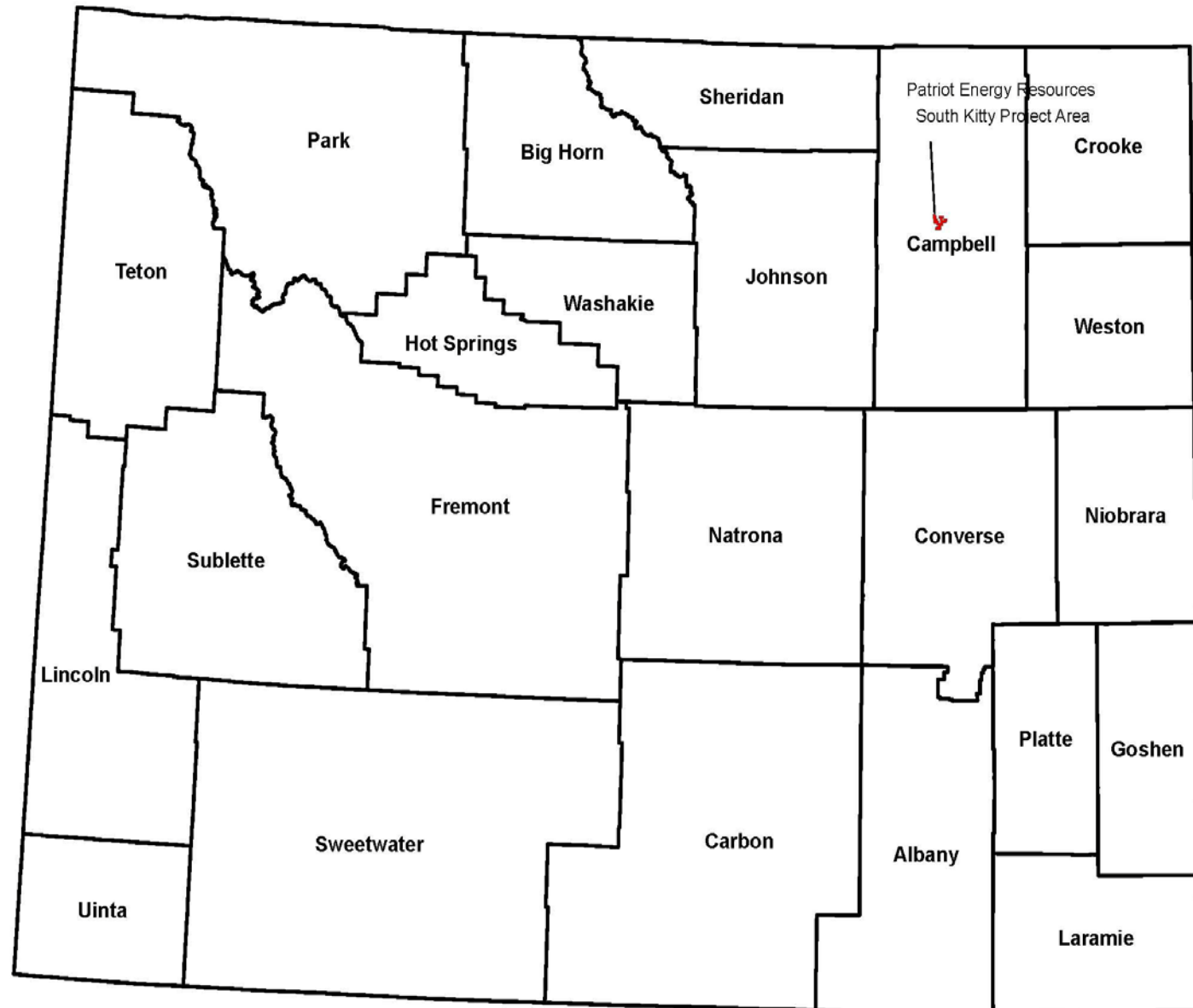
What geologic formation serves as the confining zone?

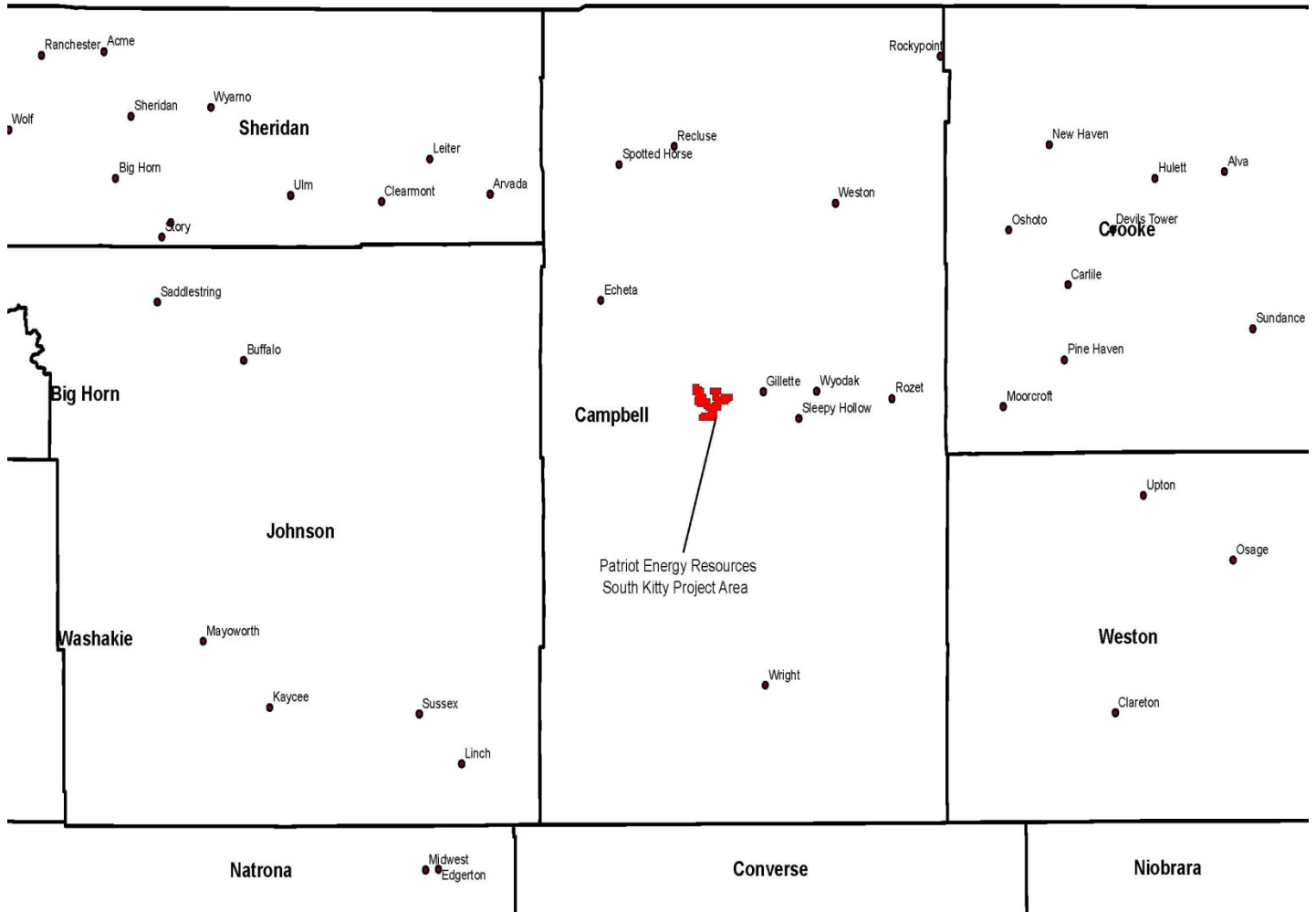
- Fort Union formation

Will injection affect water wells in the area?

Injection is not expected to have an effect on any existing water supply well. However, the DEQ is requiring the permittee to offer all owners of SEO-permitted domestic wells in the area of review or within ½ mile (whichever is larger) of an injection or production well covered under the permit the option of having their wells tested to monitor any potential changes to water quality in the wells.

Patriot Energy Resources South Kitty Project Area Overview Map





Patriot Energy Resources South Kitty Area Overview Map – 2

Patriot Energy Resources South Kitty Project Area

