

STATE OF ALASKA
ALASKA OIL AND GAS CONSERVATION COMMISSION
333 West 7th Avenue, Suite 100
Anchorage, Alaska 99501

Re: THE REQUEST OF Marathon) Aquifer Exemption Order No. 9
OIL COMPANY for an Aquifer)
Exemption Order for the Sterling Unit) Sterling Formation
43-9 well, Sec.9, T5N, R10W, Seward) Sterling Unit
Meridian, Kenai Peninsula .) Well 43-9

April 3, 2003

IT APPEARING THAT:

1. Marathon Oil Company (“Marathon”) submitted an application, dated October 17, 2002, requesting that the Alaska Oil and Gas Conservation Commission (“Commission”) issue an aquifer exemption for aquifers below a depth of 1750 feet for purposes of Class II disposal in the Sterling Unit 43-9 Well. Additional information requested by the Commission was received on January 24, 2003.
2. Notice of opportunity for a public hearing was published in the Anchorage Daily News on February 7, 2003 in accordance with 20 AAC 25.540.
3. The Commission did not receive any protest or request for a public hearing.
4. The Commission has jurisdiction in this matter under AS 31.05.030(h), 20 AAC 25.440, and 40 CFR 147, Subpart C - Alaska.
5. The Commission submitted a copy of Marathon’s Aquifer Exemption application to the U.S. Environmental Protection Agency, Region 10, (“EPA Region 10”) on February 25, 2003, in accordance with Section 14 of the November 22, 1991 Memorandum of Agreement between EPA Region 10 and the Commission.
6. In correspondence dated March 10, the Commission was advised that EPA Region 10 did not object to the proposed aquifer exemption order for the Sterling Unit and that the exemption is considered a minor modification of the Commission’s program for the regulation of Class II injection wells under Section 1425 of the Safe Drinking Water Act as defined by Underground Injection Control (UIC) Program Guidance 34 and 40 CFR 145.32.

FINDINGS:

1. Well Location and Facility Description

The Sterling Gas Field Unit (“SGFU”) is located on the Kenai Peninsula approximately six miles east of the city of Kenai and three miles north of the city of Soldotna. The 3,600-acre SGFU has produced gas from five completions since its discovery in 1961. In addition, a 268 foot deep water well exists in the SGFU to support drilling operations.

Current production operations occur only at the Sterling Unit 43-9 Pad, which represents approximately 4.1 acres of the 3600-acre unit, or just over 0.1 percent of the area defined by the SGFU. Beginning in October 2000, gas production became intermittent due to the inability of wells to unload and dispose of water. Table 1 summarizes the current status of the SGFU.

Table 1. Sterling Gas Field Unit									
Well	First Prod. Date	Final Prod. Date	Perforated Interval MD	Perforated Interval SSTVD	12/2001 Cum Gas MMCF G	12/2001 Cum Water MBO	Current Status	Current Rate MMCFG PD	
SU 32-9	March 1999	Active	Sterling B-4 (5,679' - 5,686')	Sterling B-4 (5,013' - 5,019')	407	0.13	Active	1.0	
SU 43-9	Oct. 1966	Feb. 1998	Sterling B-4 (5,262' - 5,272')	Sterling B-4 (5,026' - 5,036')	2,165	2.75	SI due to water	0	
SU 23-15	May 1962	Oct. 1966	Sterling B-4 (5,250' - 5,254')	Sterling B-4 (5,028' - 5,032')	379	NA	Suspend	0	
SU 41-15S	April 1999	Active	Beluga (9,440' - 10,026')	Beluga (7,678' - 8,099')	53	0.37	Active	0.2	
SU 41-15L	April 1999	April 2001	Tyonek (10,942' - 11,331')	Tyonek (8,828' - 9,164')	145	0.62	SI due to water	0	

2. Geology and Groundwater Hydrology

The geologic column on the Kenai Peninsula includes clastic rocks of Quaternary through Tertiary ages that lie unconformably on top of Mesozoic Age basement rocks. Glacial Pleistocene shallow sand and gravel reservoirs serve as underground

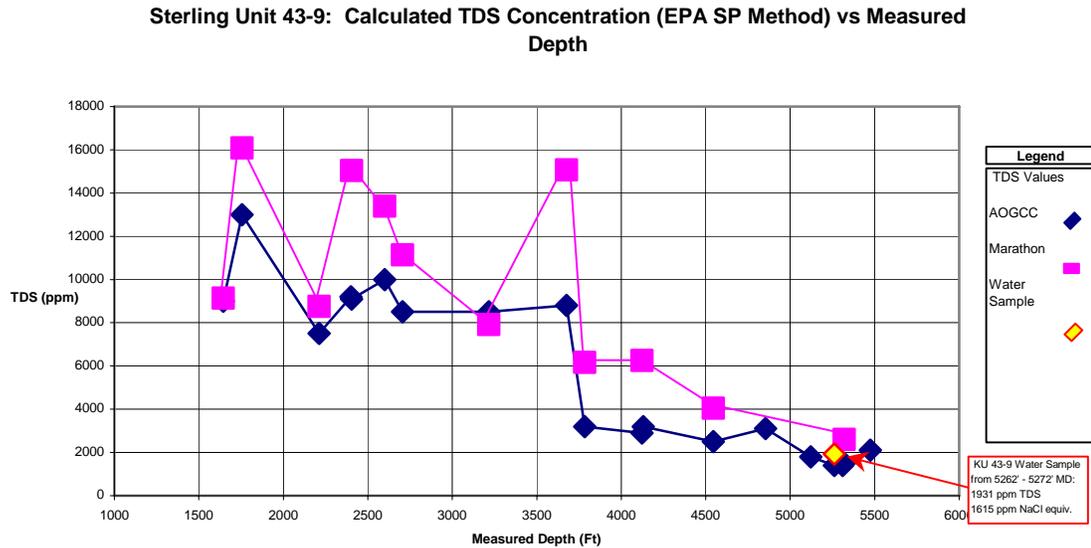
sources of drinking water for much of the Kenai Peninsula and are typically 750 feet thick. These fresh water aquifers are 830 feet thick in the Sterling Unit. The value of this aquifer system has long been recognized and oil and gas exploratory and production wells on the Kenai Peninsula have been cased and cemented across this freshwater zone during drilling operations to avoid any possibility of contamination.

Below the freshwater zone lies the Kenai Group that includes a series of reservoir and non-reservoir lacustrine and fluvial-derived rocks. Regionally, hydrocarbons are produced in commercial quantities from 3,000 feet to 12,500 feet subsea in Kenai Group sandstone reservoirs. Specifically in the SGFU, gas is produced from the Sterling, Beluga, and Tyonek Formations within the Kenai Group between 5,000 and 9,200 feet subsea. Mud logs from SGFU wells demonstrate that non-commercial hydrocarbon gas shows are common throughout the three formations.

3. Formation Water Salinity

The vintage of the data and the log suite acquired in the Sterling Unit 43-9 Well limit the salinity control to SP calculations and a produced water sample. Fortunately the SP curve in the subject well appears to be of good quality.

In evaluating the application, the Commission has calculated salinities using generally more conservative constraints than Marathon. The results are summarized in the graph below. In general the AOGCC estimate will provide a lower bound, but in several spots the two techniques generate equivalent results. These are intervals with blocky responses over more than ten feet and include the water sample interval. Both methods are compatible with instructions on the appropriate methodology to calculate formation water salinities described in EPA guidance document "Survey of Methods to Determine Total Dissolved Solids Concentrations", (KEDA Project No. 30-956).



Salinity trends discussed here will be taken from the more conservative Commission generated values.

The following generalities apply to the Sterling Unit Well No. 43-9 salinities:

- 1) Drinking water in the area comes from glacial sediments that are roughly 750'+ thick in this vicinity.
- 2) The 1750'-3750' measured depth (MD) interval contains intervals with relatively high calculated TDS concentrations generally in the 8,000 to 10,000 ppm range.
- 3) The boundary at 3750' md appears to be sharp and is evident on both sp and resistivity curves.
- 4) The 3,750'-4100' md interval reservoirs contain water with salinities greater than 3,000 ppm.
- 5) From 4,100' md. to 5500' md reservoirs with less than 3,000 ppm can be present.

4. Unsuitability of SGFU Kenai Group Sediments as Aquifers

Regulation 20 AAC 25.440 (a)(1)(B) "Freshwater Aquifer Exemption" provides that the AOGCC can grant a aquifer exemption regardless of salinity if the aquifer "is situated at a depth or location that makes recovery of water for drinking purposes economically or technologically impractical". The formation waters of less than 3,000 ppm TDS in the vicinity of the Sterling Unit 43-9 well, are situated at uneconomic depths.

Aquifers below approximately 1,750 feet in the SGFU are unsuited for use as sources of drinking water for the following reasons. First, the area has plentiful groundwater available from surface to approximately 750 feet depth. Data available on water wells

in the vicinity demonstrate that a majority of water wells are only 100 feet deep and the deepest well in the vicinity (T5N, R10W) is 451 feet.

Table 2. Water Well Depth			
Depth of Well in ft.	Within T5N R10W SM	Within T5N R10W SM, Adjacent to Section 9^c	Within ¼ mile of the SU 43-9 well location (Includes Portions of Sections 9 and 10)
Average	91	94	N/A
Maximum	451	220	268
Minimum	6	21	N/A
No. of Wells ^b	1,026	111	1
^b Only wells with depths greater than zero were included in the statistics. ^c Within T5N R10W SM, Sections 3, 4, 5, 8, 9, 10, 15, 16, 17.			

Second, the groundwater between 1,750 and 4100 feet depth is predominately between 3,000 and 10,000 mg/l TDS. Obviously, given the demonstrated abundance of drinkable water at shallower depths, recovery of drinking water with such quality from below 1,750 feet deep is highly impractical due to drilling and desalination costs. Third, mud logs from wells in the SGFU show that hydrocarbon gas, primarily methane, occurs commonly throughout the Kenai Group in this area. Potentially commercial gas shows appear to be limited to below 5000 feet depth but appreciable volumes of gas are present below the Pleistocene gravels. This gas would add considerably to the difficulty in any attempt to recover drinking water from the Kenai Group in the SGFU.

CONCLUSIONS:

1. Those portions of freshwater aquifers occurring below approximately 750' in the SGFU vicinity do not currently serve as a source of drinking water.
2. Those portions of freshwater aquifers occurring below 1,750' beneath the Sterling Unit contain salinities and hydrocarbon gases, and are situated at a depth that make recovery of these waters for drinking water purposes economically impractical.
3. Those portions of aquifers occurring below 1,750' MD and within one-quarter mile radius of the Sterling Unit 43-9 well cannot reasonably be expected to serve as underground sources of drinking water.
4. Those portions of aquifers occurring within a one-quarter mile radius and below the measured depth of 1,750 feet in the Sterling Unit 43-9 Well qualify as exempt freshwater aquifers under 20 AAC 25.440(a)(1)(A) and 20 AAC 25.440(a)(1)(B).

NOW, THEREFORE, IT IS ORDERED THAT the aquifers occurring within a one-quarter mile radius and below the depth of 1,750' MD in the Sterling Unit 43-9 Well are exempt under 20 AAC 25.440.

DONE at Anchorage, Alaska, and dated April 3, 2003.

Sarah Palin, Chair
Alaska Oil and Gas Conservation Commission

Daniel T. Seamount, Jr., Commissioner
Alaska Oil and Gas Conservation Commission

Randy Ruedrich, Commissioner
Alaska Oil and Gas Conservation Commission

AS 31.05.080 provides that within 20 days after receipt of written notice of the entry of an order, a person affected by it may file with the Commission an application for rehearing. A request for rehearing must be received by 4:30 PM on the 23rd day following the date of the order, or next working day if a holiday or weekend, to be timely filed. The Commission shall grant or refuse the application in whole or in part within 10 days. The Commission can refuse an application by not acting on it within the 10-day period. An affected person has 30 days from the date the Commission refuses the application or mails (or otherwise distributes) an order upon rehearing, both being the final order of the Commission, to appeal the decision to Superior Court. Where a request for rehearing is denied by nonaction of the Commission, the 30-day period for appeal to Superior Court runs from the date on which the request is deemed denied (i.e., 10th day after the application for rehearing was filed).