

**OIL AND GAS DOCKET NO. 09-0241077**

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**THE APPLICATION OF GILBOW TANK TRUCK SERVICE, INC., TO DISPOSE OF OIL AND GAS WASTE BY INJECTION INTO A POROUS FORMATION NOT PRODUCTIVE OF OIL OR GAS, GILBOW WELL NO. SWD-1, WISE COUNTY REGULAR FIELD, WISE COUNTY, TEXAS**

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**Heard by:** Margaret Allen, Technical Hearings Examiner  
Marshall Enquist, Legal Examiner

**Procedural history:**

Application received: December 7, 2004  
Hearing held: January 7, 2005  
Proposal for decision issued: February 8, 2005

**Appearances**

	Representing
<u>Applicant</u>	
Jamie Nielson	Gilbow Tank Truck Service, Inc.
Steve Towns	
Jim Gilbow	
Jan Gilbow	
Charlotte Klenk	
Alan Means	
<u>Protestant</u>	
William Osborn	Various Sauder Interest Owners
A. Lane Larance	

**EXAMINERS' REPORT AND PROPOSAL FOR DECISION**

**STATEMENT OF THE CASE**

Gilbow Tank Truck Service, Inc., ("Gilbow") is seeking to drill and use its Gilbow Well No. SWD-1 as a commercial disposal well in Wise County. The application is protested by various Sauder Interest Owners ("Sauder") who are both operators and offset mineral interest owners.

### DISCUSSION OF THE EVIDENCE

#### Applicant's evidence

Gilbow is proposing to drill a new well to use for disposal of produced saltwater. Aruba Petroleum, Inc. ("Aruba") owns the surface and also has the rights to develop the minerals. The proposed disposal interval is the Strawn Formation between 4250' and 4500'. According to the Texas Commission on Environmental Quality ("TCEQ"), usable-quality ground water should be protected to a depth of 20' below the base of the Cretaceous, which is expected to occur at 775' in this area. Gilbow plans to set and cement surface casing to 850', while the long string casing will be cemented from the base of the well at 4800' to the surface.

The applicant originally requested approval to dispose of up to 8000 BWPD at a maximum surface pressure of 2125 psi. Gilbow has amended its request to a maximum volume of 5000 BWPD, due to limitations of the surface equipment it plans to use. The average injection rate is expected to be 4000 BWPD at an average surface pressure of 1500 psi.

The Aruba Petroleum, Inc., Billy J. Maxwell No. 1, approximately 1320' to the east, is the only well within 1/4 mile of the proposed disposal well. The Maxwell No. 1 well had surface casing set and cemented to 852', and production casing cemented from total depth at 8732' up to 6850'. The well has been fracture stimulated in the Barnett Shale but is not yet on production, according to Gilbow.

Gilbow testified that most operators do not cement the production casing above 6000' to avoid breaking down the shallower conglomerates with heavy cement. The Maxwell No. 1 will be equipped with a pressure gauge on the Bradenhead which will provide immediate notice if injected fluid rises above the disposal interval. According to Gilbow, Aruba intends to use the proposed well to dispose of water produced by the Maxwell No. 1 and other wells which it proposes to drill nearby.

The disposal interval is a sandstone, approximately 25' thick, that the applicant expects to find in the interval between 4250' and 4500'. This sandstone is present between 4356' and 4380' in the nearby Maxwell No. 1. Injection will be through 3.5 inch injection tubing set on a packer at 4200'. The applicant created an isopach of the thickness of the Strawn sandstone based on logs from three wells east of the proposed disposal well.

This sandstone was probably deposited as a lenticular bar, according to the applicant. Gilbow believes that this sandstone is particularly suitable as it has several hundred feet of shale above and below. Gilbow did admit that there are other Strawn sandstones, occurring between 2700' and 3500', which could possibly be suitable for disposal. The Strawn is productive of hydrocarbons in some places in Wise County but there are no Strawn wells within two miles of the proposed well.

The applicant estimates this Strawn sandstone has 20% porosity, and testified that it is a "clean" sandstone. A microlog shows this sandstone has good permeability, according to Gilbow. No disposal wells have been completed at this depth in Wise County and Gilbow believes the sandstone is at original pressure. The applicant assumes the current pressure in the disposal sandstone to be 1480 psi (equal to 8.4 to 8.5 pounds per gallon mud).

The applicant did not consider disposal into the Ellenburger Formation. The Ellenburger is at 8500', twice as deep as the proposed sandstone, which would double the disposal costs. In addition, Gilbow testified that the surface equipment it plans to install would be inadequate to dispose of water at 8500'. Most water produced from the Barnett Shale in Wise County has been disposed of in the Brazos River Conglomerate at depths of 2000' to 3000'. The applicant testified that it researched numerous locations for a disposal well and deliberately sought to use a deeper sandstone because of numerous problems with shallow disposal wells.

There are at least eight other disposal wells in Wise County. According to Gilbow, the closest is the Calhoun SWD-1, operated by Mesquite, which injects at a depth of 2300', four to five miles to the northwest. There is also a Key Denton Creek Farms SWD-1 about 12 miles to the south, along the boundary between Wise and Denton Counties, which Gilbow believes is having problems. There are also shallow disposal wells 20 miles to the west-southwest in the Chico area. Gilbow operates a saltwater hauling business and testified that nearby disposal wells have no excess capacity and it is presently hauling saltwater to the Nocona area, 65 miles to the west.

Gilbow noted that the Environmental Services Section of the Railroad Commission has placed extra conditions on disposal into shallow sands in Wise County because of environmental problems. It also pointed out that Environmental Services testified in other hearings that while wells offsetting a disposal well can be conduits for the upward migration of injected fluid they can also serve to give early warning. Statewide Rule 17 requires an operator properly equip the annulus of a well at the surface and to notify the Commission if pressure develops between two strings of casing. It is unlikely that injected fluid could rise in a wellbore offsetting a disposal well without increasing pressure on the casing annulus at the surface, according to Gilbow.

Gilbow believes use of its proposed facility is in the public interest as this well will allow disposal much closer to the sites where saltwater is produced. This reduces the miles waste-hauling trucks must travel and the resulting expense, encouraging further oil and gas development in the Barnett Shale and other formations. The Barnett Shale is one of the most active plays in the country now, with over 2000 existing wells and several new wells being added weekly. Gilbow testified that Barnett Shale wells require recurrent hydraulic fracture stimulation and the water used in these fracture treatments must be disposed of, preferably by underground injection.

The proposed disposal well will be located on a 15.04 acre tract just south of Cooke County. Most of the Barnett Shale development has been south of this area but activity is moving in this direction, according to the applicant. The proposed disposal well may also inject oil and gas waste produced from formations other than the Barnett Shale. Gilbow testified that it costs 45 to 50 cents per barrel to dispose of oil and gas waste, plus the trucking costs. High trucking costs have raised the price of disposal to \$1.35 to \$1.50 per barrel of water.

The proposed well will be a commercial disposal well and the applicant will comply with all Commission requirements for commercial wells. Prior to beginning operations, collecting and other pits will be permitted separately under the requirements of Statewide Rule 8. A catch basin will be installed to collect waste which may spill as a result of connecting or disconnecting hoses from hauling trucks. All fabricated storage and pretreatment facilities will be constructed of steel, concrete, fiberglass or other approved material and will be maintained to prevent waste discharges. All facilities will be

surrounded by dikes 36 inches high which are capable of containing the maximum holding capacity of all such facilities, and any wastes that do accumulate will be removed within 24 hours. Access to the facility will be secured by a fence with a locked gate when unattended. Each storage tank will be equipped with a device to alert drivers when the tank is within 130 barrels of being full.

#### Protestants' evidence

The protestants own mineral interests as close as 971' to the proposed disposal well. They operate a number of wells on other property and are planning to drill a horizontal well on this site targeting the Barnett Shale. Field rules allow the Sauder well to be as close as 330' to the lease line, placing it less than 1/4 mile from the proposed disposal well.

Sauder has done extensive mapping of the Strawn sandstone that Gilbow proposed to inject into and believes it is not a bar but a channel sandstone extending northwest-southeast. On Sauder's map, this sandstone is not present on logs of wells to the south and west, and extends only about 600' onto Sauder's acreage.

According to the protestants' calculations, the disposal sandstone averages 20' thick, has 19.2% porosity and has a maximum permeability less than 100 md. Sauder assumes current pressure at 4375', the mid-point of this sandstone, to be 1899 psi based on a fresh water gradient of 0.434 psi per foot of depth. The hydrostatic pressure of saltwater at this depth is 2030 psi and if Gilbow uses the maximum permitted surface pressure of 2125 psi, Sauder testified the bottomhole pressure would be 4155 psi (a pressure gradient of 0.9497 psig per foot) if no pressure is lost to friction.

According to Sauder, the normal fracture gradient for reservoirs at this depth is 0.70 psi per foot, which means that surface injection pressures over 1032 psig will exceed the rock's fracture pressure. Even if the bottomhole injection pressure is assumed to be reduced by friction, a surface pressure of 1263 psig would be sufficient to fracture the overlying rock.

After a year of injecting 8000 barrels of saltwater per day, Sauder's calculations show the pressure in the disposal sandstone 1/4 mile from the disposal well would be 3411 psi. If only 4000 barrels were injected per day for a year, the pressure 1/4 mile away would be 2655 psi. Sauder assumed injection rates of 4000 barrels per day, and calculated the reservoir pressure at a regular location on its acreage will be 2659 psi after one year, 2759 psi after two years and 2891 psi after five years (63 psi less if friction losses are included). This would require mud weighing 12.71 pounds per gallon to control.

Sauder believes that when it drills through this overpressured Strawn sandstone, the cost of its well would increase by \$215,000 (approximately 25% of the total cost of a vertical well). It estimated a horizontal well on its property should cost \$1,300,000 to \$1,500,000, though it does not have a firm date for drilling. Sauder agreed that the disposal costs for wells in this area are now \$1.35 to \$1.50 per barrel of saltwater, but still believes that disposal wells for water from the Barnett Shale should be outside the area of Barnett Shale development.

### EXAMINERS' OPINION

The examiners believe that this application should be granted. The proposed disposal well will not harm usable-quality water nor oil and gas resources in the area. The casing and cementing program proposed for this well will ensure that injected waste is confined to the interval between 4250' and 4500'. Usable-quality water appears to be 795' deep or less, and the proposed 850' of surface casing will be adequate to protect fresh water in the Trinity aquifer.

The sandstones in this part of the Strawn Formation appear adequate to accept the requested maximum volume of 5000 barrels of salt water to be injected. The thick shale above these sandstones will form a good seal. The maximum requested surface pressure of 2125 psi will not exceed the fracture pressure of the overlying rock. Use of this sandstone is less likely to cause a problem than disposal into sandstones that have already had pressure increases due to other disposal wells.

Before the well is drilled, the lithostatic and hydrostatic pressure at a depth of 4375' is 1.0 psi per foot of depth or at least 4375 psi. After the wellbore is drilled and the rock removed, a combined hydrostatic and surface injection pressure less than 4375 psi at the bottom of the hole will not cause the surrounding rock to fracture. If this application is approved, the maximum pressure on the injection interval would be 4155 psi (2030 psi due to the weight of a column of saltwater and 2125 psi from surface pressure). The actual bottomhole pressure would be less due to friction losses. A surface injection pressure gradient of 0.5 psi per foot of depth will not fracture a formation, particularly below depths of 3000'.

The applicant has demonstrated that the proposed disposal well is in the public interest because it will reduce trucking costs and thereby encourage the recovery of additional hydrocarbons. Oil and gas production generates waste saltwater and usually the best means of disposing of that waste is injecting it back into the ground as close to the place generated as reasonably possible. Trucking this saltwater to disposal wells more distant from the producing wells will not reduce the environmental risk.

The proposed site is also well-situated with respect to producing wells. The nearest producing well is approximately 1/4 mile away. This well has adequate surface casing and Aruba, the operator of the closest well, is required to monitor its well for pressure increases. Statewide Rule 17(a) states: "All wells shall be equipped with a Bradenhead<sup>1</sup>. Whenever pressure develops between any two strings of casing, the district office shall be notified immediately." The Commission can suspend disposal operations in Gilbow's SWD-1 should increased pressure be detected on the Bradenhead of Aruba's well.

### **FINDINGS OF FACT**

1. Notice of hearing on this application to inject into the proposed well was issued to all interested persons at least ten (10) days prior to the hearing.

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<sup>1</sup> A Bradenhead (also known as casinghead) is a heavy steel fitting attached to the surface casing. It provides a place to install a gauge to detect pressure between the surface and production casing.

- a. Notice of the application (Form W-14) was mailed to operators of all offset wells within 1/2 mile, offset surface owners, and the Wise County Clerk on October 27, 2004.
  - b. Notice of the application was published in *The Wise County Messenger*, a newspaper of general circulation in Wise County, on October 28, 2004.
2. The Gilbow Tank Truck Service, Inc. ("Gilbow"), Gilbow Well No. SWD-1 will be used for disposal of oil and gas waste produced mostly by Barnett Shale wells in this part of Wise County.
3. Gilbow will inject into a Strawn sandstone, expected between 4250' and 4500', that has not been previously used for disposal.
4. The maximum injection volume will be limited to 5000 barrels per day.
5. A maximum surface injection pressure of 2125 psi, added to the hydrostatic pressure on the disposal interval, will not fracture the overlying rock.
  - a. The requested surface injection pressure of 2125 psi will be reduced by friction in the tubing and through the perforations.
  - b. The hydrostatic pressure of the fluid column at the median perforation depth of 4375' is 2030 psi.
  - c. The maximum pressure on the formation at 4375' will be less than 4155 psi (2125 psi added to 2030 psi).
  - d. The lithostatic and hydrostatic pressure on the sandstone around the wellbore is at least 4375 psi.
6. According to the Texas Commission on Environmental Quality, usable-quality water should be protected to a depth of 795'.
7. The Gilbow Well No. SWD-1 will have surface casing cemented from 850' to the surface and long-string casing cemented from 4800' to the surface.
8. The only wellbore within one quarter mile is a producing well that has adequate surface casing.
9. The offsetting wellbore will be equipped to detect any increase in pressure.
10. Use of the proposed disposal well is in the public interest as it will reduce disposal costs, thus encouraging further oil and gas development.
11. There is a need for disposal facilities in northeastern Wise County because of the active development of Barnett Shale wells nearby.

**CONCLUSIONS OF LAW**

1. Proper notice was given to all necessary parties as required by Statewide Rule 9(5) [Tex. R.R. Comm'n, 16 TEX. ADMIN. CODE § 3.9(5)] and other applicable statutory and regulatory provisions.
2. All things necessary to give the Commission jurisdiction to decide this matter have been performed or have occurred.
3. Granting the application to dispose of oil and gas waste into the Gilbow Tank Trucks Well No. SWD-1 under the terms and conditions set forth in the attached Final Order, will not endanger fresh water resources nor endanger oil or gas resources in the area.
4. No existing rights will be impaired by the use the Gilbow Well No. SWD-1 to dispose of up to 5000 barrels of saltwater at a maximum surface pressure of 2125 psi.
5. Granting the application is in the public interest.
6. The application to dispose of oil and gas waste into the Gilbow Well No. SWD-1 meets the requirements for approval pursuant to Statewide Rule 9 and the Texas Water Code §27.051 and §27.073.
7. The terms and conditions set forth in the attached Final Order are reasonably necessary to protect usable-quality water from pollution.

**EXAMINERS' RECOMMENDATION**

Based on the above findings and conclusions, the examiners recommend that the application of Gilbow Tank Truck Service, Inc., to dispose of up to 5,000 barrels of saltwater per day by injection at a maximum surface pressure of 2125 psi, into the interval between 4250' and 4500' in its Well No. SWD-1, in the Wise County Regular Field in Wise County, be **GRANTED**, with the conditions proposed in the attached Final Order.

Respectfully submitted,

Marshall Enquist  
Hearings Examiner

Margaret Allen  
Technical Hearings Examiner