



RAILROAD COMMISSION OF TEXAS

OFFICE OF GENERAL COUNSEL

OIL & GAS DOCKET NO. 10-0264207

THE APPLICATION OF EOG RESOURCES INC. TO CONSIDER AUTHORITY TO LANDFARM, WITHOUT TILLING, HIGH SALINITY DRILLING WASTE AND WATER-BASED DRILLING MUD FROM THE PEARSON 113 LEASE, WELL NO.1H, GREGG GLASS 100-ACRE TRACT, SECTION 113, BLOCK 13, T. & N. O. SURVEY, OCHILTREE COUNTY, TEXAS

HEARD BY: Andres J. Trevino, Technical Examiner
Mark J. Helmueller, Hearings Examiner

PROCEDURAL HISTORY OF CASE:

Application filed:	June 15, 2009
Request for hearing:	December 16, 2009
Notice of Hearing:	January 20, 2010
Hearing Held:	February 26 & March 11, 2010
PFD Issued:	November 22, 2011

APPEARANCES:

REPRESENTING:

APPLICANT:

K. Steven Roberts
Steven Dowdy
Daniel Kelln
Sam Feagley

EOG Resources Inc.

Texas Agri Life Extension Service

PROTESTANT:

David Cooney
Michael Sims

RRC, Environmental Services

EXAMINERS' REPORT AND PROPOSAL FOR DECISION

STATEMENT OF THE CASE

EOG Resources Inc. requests Land Application Authority to apply high salinity water-based drilling fluid wastes from the Pearson 113, Well No. 1H in Ochiltree County

without the requirement to till the soil after a waste application is made. The proposed site consists of 100 acres owned by Gregg Glass near the community of Canadian, Texas.

The application was administratively denied by the Environmental Permits & Support Section. The transmittal memo from the Environmental Permits & Support Section dated December 15, 2009 indicates that the application was administratively denied because “..The application of high salinity waste without then incorporating the waste into the soil by tilling does not ensure a waste soil mixture with an EC at or below the acceptable limit of 4 mmhos/cm and offers the potential for pollution of surface or subsurface waters.” Staff from the Environmental Permits & Support Section appeared at the hearing and submitted evidence to support its position that applicant should be required to till and mix the soil after the application of drilling fluids. The Staff stated that without tilling, a loading rate could not be determined using the existing soil loading formula, therefore there would be no assurance of what the ending electrical conductivity (EC) of the soil would be.

DISCUSSION OF THE EVIDENCE

Applicant's Evidence

EOG Resources Inc. requests a letter of authority to land apply or landfarm high salinity drilling fluid wastes over a specific tract of land without the requirement to till the soil after the waste has been applied. The current authority request is for the waste from the Pearson 113-1H well to be applied on the Glass tract. The fluid to be land applied is estimated to be 30,000 barrels of 70 EC fluid spread over 100 acres in Section 134, Block 43, of the H. & T. C. Survey in Ochiltree County. The soil loading calculation shows 30,000 barrels of 70 EC liquid waste can be applied over 100 acres of soil with an EC of .27 mmhos/cm which will achieve an ending soil EC concentration of 2.87 mmhos/cm.

The fluid will be land applied by a diffuser or spreader bar being pulled behind a tank truck while driven back and forth covering the entire 100 acre tract. The land application of water-base fluids will be applied in ¼ inch increments to reduce the risk of ponding and off-site waste migration. Land owner approval is required and has been obtained by the applicant. The land application approval is for a one time only application. The applicant will have an independent laboratory sample and test the soil after the waste has been applied to verify the ending electrical conductivity (EC) of the soil will be below the 4 mmhos/cm standard. The ending EC of 4 mmhos/cm is considered a safe and acceptable limit.

EOG argues tilling is not required per Statewide Rule 8, is not necessary and is detrimental to grass lands and farmland. The tract of land in question is farmland, which will be tilled by the landowner at the appropriate time, after harvest of the planted crop has occurred. Although this specific tract of land is farmland other tracts in future applications could be grasslands.

This particular application is the 17th application submitted by EOG's agent, Triman Inc., for authority to land apply wastes for various wells from various operators. Triman has

applied similar high salinity drilling fluid wastes over 16 different tracts of land and has had an independent lab test the sites for compliance afterwards. Triman had not tilled any of the prior approved tracts. Testing results show that none of the previous applications have shown any evidence of exceeding the 4mmho/cm standard. Triman had reduced the waste application rates, below the permitted waste application rate, using the soil loading formula to maintain compliance with the 4mmho/cm standard.

In support of EOG's request, Dr. Sam Feagley PhD, a licensed soil scientist and professor with the Texas Agri Life Extension Service and the Department of Soil and Crop Sciences of Texas A&M University, testified that tilling is detrimental for native grass lands as it will cause soil erosion. Dr. Feagley stated that the waste fluids will naturally percolate into the soil as deep as 12 inches thereby mixing/dispersing the salt content of the fluids over the 12 inches that the fluids infiltrate. Dr. Feagley stated that tilling is not necessary for mixing chlorides into the soil and is detrimental for native plants. The tilling disrupts root channels, which promote liquid infiltration, kills native plants, promotes erosion, reduces percolation thru soil macro pores. Tilling will cause less percolation as macro pores, which are normally open at the surface, are destroyed causing any rainfall after tilling to runoff. Dr. Feagley testified a rainfall event will more likely infiltrate wastes into the soil in an untilled tract than in a tilled tract. Additionally, many landowners will not permit their native grass lands to be tilled. Dr. Feagley also testified most native plants are salt tolerant.

The applicant submitted numerous letters from soil scientists discussing the issue of tilling, the effects of oil field waste application on native grasses and soil infiltration. In particular a letter dated July 1, 2009 from Dr. Clay Robinson, PhD, a licensed soil scientist with West Texas A&M University, stated in summary, untilled soil will have open macro pores that encourage fluid flow into the soil. On tilled surfaces, precipitation events will more likely result in surface flow and run off, rather than infiltration thereby decreasing leaching of chlorides (salts) into the soil profile. The letter further states the most forage and range grasses are more salt tolerant than crops, thus are less likely to suffer from the application of oilfield drilling fluids. Testing shows that some native grasses can tolerate fluids with an EC up to 64 without damage. Thus the majority of the vegetation on the sites should be tolerant to the salt content and EC resulting from the projected application rates, resulting in little adverse impact on growth.

Applicant submitted a study as Exhibit 52 based on USDA/Natural Resources Conservation Service Web Soil Survey for Ochiltree County which depicts the various lithologic units in the area of the landfarm. This map indicates that the tract contains 50% Darrouzett clay loam, 49% Sunray silty clay loam and 1% Ness clay. The Darrouzett clay loam is described in the literature as being well drained with a moderately-high saturated hydraulic conductivity of 0.48 inches per hour and a permeability rate of 0.2 to 0.63 inches per hour from 0 to 72 inches depth of soil. The Sunray silty clay loam is described as being well drained with a moderately-high saturated hydraulic conductivity of 1.27 inches per hour and a permeability rate of 0.63 to 2.0 inches per hour from 0 to 72 inches depth of soil.

The site of the landfarm slopes less than the maximum 5% limit the Commission's Surface Waste Management Manual recommends. The Darrouzett clay loam and Ness clay (51% of tract) slopes between 0 to 1%. The Sunray silty clay loam (49% of tract) slopes between 0 to 3%. With the low relief in topography, there is less of a chance for

applied waste fluids to migrate off-site.

EOG Resources believes there is a need for the landfarming due to the ongoing horizontal drilling in the Granite Wash, Morrow and other zones previously produced with vertical wells and the use of closed loop drilling system. The closed loop system is more environmentally friendly as it reduces the quantity of wastes generated and eliminates disposal in onsite drilling pits. The ending liquid wastes generated require offsite disposal.

Protestant's - Staff's Position

The subject application was administratively denied by the Environmental Permits & Support Section because "...The application of high salinity waste without then incorporating the waste into the soil by tilling does not ensure a waste soil mixture with an EC at or below the acceptable limit of 4 mmhos/cm and offers the potential for pollution of surface or subsurface waters." The Environmental Permits & Support Section contended that they cannot approve the application because the soil loading formula assumes the wastes are being mixed over one foot of native soil. The formula is used to predict the future or ending EC of the soil by factoring in the EC of the waste, volume of the waste, volume (acres x 1 foot) of the soil and EC of the native soil. The formula assumes even distribution or dilution of the waste over 12 inches of native soil. Staff believes the only way to properly use the soil loading formula is to mix the waste by tilling. Staff contends tilling will achieve a homogeneous mixture. Staff contends using the formula implies mixing of the soil and waste, staff assumed the applicant was tilling the soil. Staff became aware that tilling was not occurring after Commission field staff found no evidence tilling was performed at a site where waste had been applied. Instead a contractor for the applicant was using an aerator to "mix" the soil. Staff does not consider aerating soil as mixing. Staff began to require on June 3, 2009, in writing, tilling as a condition for future permits (letters of authority).

The Commission staff provided actual EC results from actual sampling that had taken place at sites where wastes were applied without tilling. The Staff provided only the maximum reading of an EC sample measured at each application site. None of the test results exceeded the 4 mmhos/cm standard. The Staff demonstrated that predicting the maximum EC for any one sample was difficult based on actual volume of waste applied. Staff further demonstrated that waste percolation and dispersal into soil is not uniform to a depth of 12 inches. Environmental Permits & Support Section staff submitted samples retrieved from various depth intervals that show EC readings were not homogenous across the 12" interval but were higher near the surface than at the bottom of the interval.

Environmental Permits & Support Section staff contended that the application should not be approved unless applicant tills the soil after application of the wastes to incorporate the waste homogeneously into the soil.

EXAMINERS' OPINION AND DISCUSSION

The examiners recommend that the application be approved without the requirement of tilling provided the application rate of high salinity drilling fluids will be applied at a reduced rate. The soil loading formula should be used assuming natural percolation will cause soil infiltration of 6 inches or less. Sampling data demonstrates actual waste infiltration is occurring from the surface to between 4 to 6 inches and not 12

inches below the surface. Although small amount of the waste does infiltrate to 12 inches, majority of infiltration is occurring within the top 6 inches of the soil. Using the soil loading formula with reduced infiltration depths will reduce waste application rates in proportion to the 12 inch depth. For example, assuming a 6 inch waste infiltration will reduce the waste application by 50%, a 3 inch infiltration will reduce the waste application by 75%. By the applicant's own admission they were reducing their own loading rates by up to 48% (effective penetration rate of 6.2 inches) to ensure the waste loading was not over applied. The applicant has demonstrated that it can apply waste at a reduced rate without exceeding the 4 mmhos/cm standard. Although it is difficult to predict the maximum EC concentration at any given point, the average EC concentration of the sampling events were accurately predicted using the soil loading formula.

The applicant's evidence shows that the operation of the proposed land application of waste without tilling would not harm groundwater resources, as required by Statewide Rule 8. Rule 8 (d) (6) states as follows:

"A permit to dispose of oil and gas wastes by any method, including disposal into a pit, may only be issued if the Commission determines that the disposal will not result in the waste of oil, gas, or geothermal resources or the pollution of surface or subsurface water."

It is undisputed that past applications without tilling has resulted in uncontaminated sites. By requiring tilling, grasslands and farmland would not be available for landfarming which would reduce the availability of disposal sites and increase disposal costs.

Based on the foregoing, the examiners believe that applicant presented sufficient evidence to show that operation of the proposed land application at reduced waste application rates, without tilling, would not harm groundwater or surface water resources, as required by Statewide Rule 8. Accordingly, the examiners recommend that the application to not till the soil after wastes have been applied with reduced waste application rates be approved. The applicant shall be allowed to propose a waste application rate based on soil and waste parameters so that ending EC shall not exceed the 4 mmhos/cm standard. The Environmental Permits & Support Section staff shall issue a permit (letter of authority) to land apply high salinity drilling waste fluids without the requirement to till the soil afterwards at the applied for site in Ochiltree County.

FINDINGS OF FACT

1. Notice of this hearing was given to all affected persons at least ten days prior to the date of hearing.
2. EOG Resources has applied for a Letter of Authority to landfarm water-based drilling waste, without post application tilling, in Ochiltree County, pursuant to Statewide Rule 8. The authorization is for a one time application of the waste on the tract.
3. Operators in the Panhandle Area are drilling horizontal wells in the Granite Wash, Morrow and other horizons previously produced with vertical wells.
4. Many operators use a closed loop system to drill horizontal wells. The closed

loop system is more environmentally friendly as it reduces the quantity of wastes generated and eliminates onsite disposal in drilling pits. The ending liquid wastes generated require offsite disposal.

5. The proposed landfarm tract is situated on 100 acres in Section 134, Block 43, of the H. & T. C. Survey in Ochiltree County owned by Gregg Glass.
6. The application was administratively denied by Environmental Permits & Support Section because “..The application of high salinity waste without then incorporating the waste into the soil by tilling does not ensure a waste soil mixture with an EC at or below the acceptable limit of 4 mmhos/cm and offers the potential for pollution of surface or subsurface waters.”
7. Statewide Rule 8 does not explicitly require tilling and allows disposal by any permitted method. Statewide Rule 8 states”...A permit to dispose of oil and gas wastes by any method, including disposal into a pit, may only be issued if the commission determines that the disposal will not result in the waste of oil, gas, or geothermal resources or the pollution of surface or subsurface water..”.
8. The Environmental Permits & Support Section uses the Soil Loading Formula to determine the ending electrical conductivity (EC) of soil.
 - a. SLF calculates the landfarm area required to safely spread waste based on the volume and EC of the waste, and the EC of the receiving soil.
 - b. Formula assumes waste is mixed with 12" of receiving/existing native soil.
 - c. The formula's parameters including the background volume of soil may be changed to calculate EC based on changing conditions.
9. The proposed tract has suitable land characteristics for landfarming.
 - a. Commission guidelines require application sites have slopes less than 5%.
 - b. The proposed Glass tract has a slope of less than 1% over the majority of the tract and a slope of less than 3% over the remaining tract.
 - c. There are no water features such as creeks, perennial streams or ponds on the Glass tract.
10. Operational practices of the proposed landfarm will minimize migration of fluids from the tract.
 - a. Fluids will be applied by a tractor with a spreader bar at a rate of ¼”

at a time to reduce risk of migration. The Darrouzett clay loam and Sunray silty clay loam (99% of tract land) are well drained and have permeability rates of 0.2 to 2.0 inches per hour.

- b. A buffer zone will be maintained from tract boundaries or any surface waters.
 - c. During the past 16 land applications conducted in the Panhandle area during 2009, no wastes migrated off the tract boundaries.
11. Tilling is not appropriate or necessary for farmland or grass lands.
- a. Most land in the Panhandle area is either native grassland or farmland.
 - b. Tilling interferes with planted crops on farmlands.
 - c. Land application on farmland is limited to when crops are not planted. Alternatively, grassland are used.
 - d. Tilling breaks up soil structure and promotes soil erosion and kills native vegetation.
 - e. Tilling breaks up micro pores in the soil that promotes liquid percolation.
 - f. Most native plants are salt tolerant and some can directly tolerate contact with up to 64 EC waste.
12. Wastes will naturally percolate and “mix” into soil like the soil at the proposed site.
- a. Soil sampling demonstrates some waste will infiltrate soil to a depth of 12 inches.
 - b. The majority of the wastes were concentrated in the upper 6 inches of the soil horizon.
13. Natural liquid percolation into the soil is not as effective as physical mixing or tilling.
- a. Mechanically mixing soils creates a more homogenous mixture based on setting depths of mixing equipment.
 - b. With natural percolation, the majority of the liquids are concentrated in the upper 6 inches of the soil horizon and reach to a depth of 12 inches.
14. Applicant proved that applying wastes at reduced rates without tilling at the

proposed site will result in a waste soil mixture with an EC below the acceptable limit of 4 mmhos/cm and does not offer the potential for pollution of surface or subsurface waters.

- a. The soil loading formula demonstrates acceptable limits are reached when reduced application rates are inputted and shallower penetration depths are used.
- b. Sampling test results from actual waste applications demonstrate past landfarms safe operational practices.
- c. There is no evidence of surface or subsurface pollution occurring on any of the past 16 sites that Triman had land applied wastes without tilling.

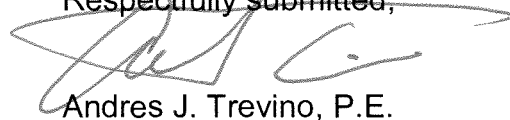
CONCLUSIONS OF LAW

- 1. Proper notice was issued as required by all applicable codes and regulatory statutes.
- 2. All things have occurred and been accomplished to give the Commission jurisdiction to decide this matter.
- 3. EOG Resources Inc submitted sufficient evidence to show that operation of the proposed landfarm at reduced application rates, without tilling would not harm groundwater resources, and therefore meets the requirements of Statewide Rule 8.

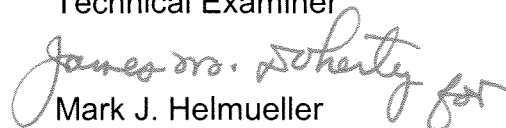
EXAMINERS' RECOMMENDATION

The examiners recommend that the application of EOG Resources Inc to operate a landfarm at reduced waste application rates without tilling at the proposed 100-acre site in Ochiltree County be approved. The applicant will have the authority to select the wastes application rate based on waste and soil parameters so that ending EC of the soil will be within 4 mmhos/cm standard.

Respectfully submitted,



Andres J. Trevino, P.E.
Technical Examiner



Mark J. Helmueller
Hearings Examiner