13-1617

Form 3160-5
(August 2007)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

OCD Artesia

FORM APPROVED
OMB NO. 1004-0135
Expires: July 31, 2010

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill or to re-enter an abandoned well. Use form 3160-3 (APD) for such proposals.

SUBMIT IN TRIPLICATE - Other instructions on reverse side.

5. Lease Serial No.
NMLC029435B

6. If Indian, Allottee or Tribe Name

7. If Unit or CA/Agreement, Name and/or No.

1. Type of Well
☒ Oil Well ☐ Gas Well ☐ Other

8. Well Name and No.
NFE FEDERAL (308724) 16

2. Name of Operator
APACHE CORPORATION
Contact: FATIMA VASQUEZ
E-Mail: fatima.vasquez@apachecorp.com

9. API Well No.
30-015-40551

3a. Address
303 VETERANS AIRPARK LANE STE 3000
MIDLAND, TX 79705

3b. Phone No. (include area code)
Ph: 432-818-1015

10. Field and Pool, or Exploratory
CEDAR LAKE; G-Y (96831)

4. Location of Well *(Footage, Sec., T., R., M., or Survey Description)*
Sec 5 T17S R31E 330FSL 330FEL

11. County or Parish, and State
EDDY COUNTY, NM

12. CHECK APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION			
☒ Notice of Intent	☐ Acidize	☐ Deepen	☐ Production (Start/Resume)	☐ Water Shut-Off
☐ Subsequent Report	☐ Alter Casing	☐ Fracture Treat	☐ Reclamation	☐ Well Integrity
☐ Final Abandonment Notice	☐ Casing Repair	☐ New Construction	☐ Recomplete	☒ Other
	☐ Change Plans	☐ Plug and Abandon	☐ Temporarily Abandon	
	☐ Convert to Injection	☐ Plug Back	☐ Water Disposal	

13. Describe Proposed or Completed Operation (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomplete horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports shall be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, a Form 3160-4 shall be filed once testing has been completed. Final Abandonment Notices shall be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.)

Notice of Intent to do Road Maintenance.

Apache would like to apply RoadLoc on the lease road off of NM County Rd 221 affecting the following:
Tony, Coffee, Lee, NFE, Raven, Roadrunner & Tea leases. The ending point well is the NFE Fed #16 (API# 30-015-40551).

Desert Mountain Corporation, an approved Apache Corporation vendor, will be stabilizing 2.73 miles x 24 ft. of unpaved road located off NM County Rd 221 on August 26, 27, 28, 29, 30. The scheduled product to be applied is RoadLoc (Lignosulfonate. A natural organic tree pulp soil binder.), at an application rate of .5 to 1 gallon per square yard, blade mixed and topically applied in the top 3? of soil. Follow up maintenance applications of .30 to .50 gallons per square yard may be scheduled

Accepted for record
NMOCD
11-4-2014

NM OIL CONSERVATION
ARTESIA DISTRICT
NOV 04 2014
RECEIVED

14. I hereby certify that the foregoing is true and correct.

Electronic Submission #216323 verified by the BLM Well Information System
For APACHE CORPORATION, sent to the Carlsbad
Committed to AFMSS for processing by JOHNNY DICKERSON on 08/09/2013 ()

Name *(Printed/Typed)* FATIMA VASQUEZ — Title REGULATORY TECH

Signature (Electronic Submission) — Date 08/07/2013

THIS SPACE FOR FEDERAL OR STATE OFFICE USE

Approved By James A. Amos for — Title FIELD MANAGER — Date 10-24-14

Conditions of approval, if any, are attached. Approval of this notice does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.

Office CARLSBAD FIELD OFFICE

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

**** OPERATOR-SUBMITTED ** OPERATOR-SUBMITTED ** OPERATOR-SUBMITTED ****

Additional data for EC transaction #216323 that would not fit on the form

32. Additional remarks, continued

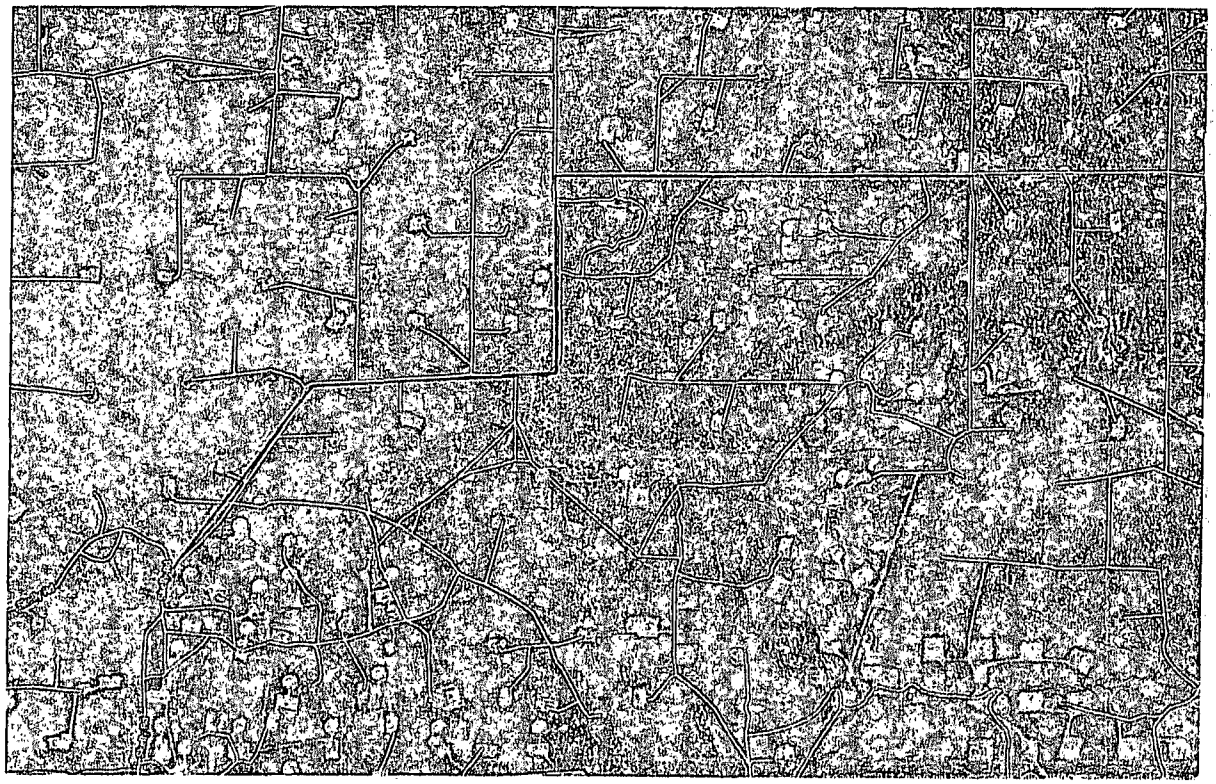
annually or as needed to retain proper stabilization.

Attached is the road map as well as a document on Environmental Effects of Applying Lignosulfonate to Roads.

If you need any additional information or have any questions, please contact Chris Lanning at (432)818-1878.

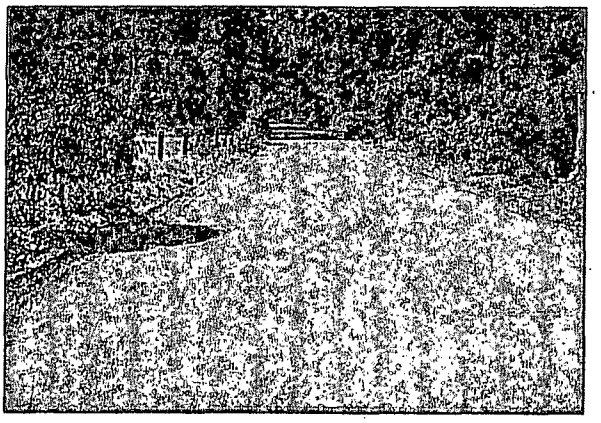
From: Maxwell, Craig
To: Vasquez, Fatima
Cc: Maxwell, Craig
Subject: Road Loc
Date: Monday, July 22, 2013 11:29:40 AM
Attachments: image001.png
image002.png

This is the road that we are wanting to use the road loc on. 2.73 miles



Apache
Craig Maxwell
575-441-2568

ENVIRONMENTAL EFFECTS OF APPLYING LIGNOSULFONATE TO ROADS



By

JAMES W ADAMS

DAISHOWA CHEMICALS INC
Research & Development

February - 1988

ENVIRONMENTAL EFFECTS OF APPLYING LIGNOSULFONATE TO ROADS

SUMMARY:

The overall impact on the environment from applying lignosulfonates to roads is negligible. They are safer to use for stabilisation and dust control than any competing class of chemicals.

The manufacture of lignin involves evaporation; the evaporation process drives off any volatile contaminants such as acetic acid. Corrosion and toxicity towards plants can be readily minimised by pH control and lignosulfonates are non-toxic to animals.

Lignosulfonates have been applied to roads, used in animal feeds and converted into human foods for more than 30 years without problem. This comes as no surprise after learning that the products have the following properties:

- No dioxins present. No other organics present at hazardous levels
- Toxic trace minerals are below EP Toxicity limits *
- Low order of toxicity towards fish
- Non-toxic orally and non-irritating to the skin or eyes of animals
- No human health problems attributed to exposure
- Very low toxicity towards plants
- Residuals are resistant to decay

When spread on land, there is no risk of contaminating ground water. Published data indicate that at less than 10 kgs per square meter, no problems arise. This is much above the 1 kgm/square meter required for stabilisation and 0.3 kgm used for dust control.

The non-hazardous features and abundant supply of lignosulfonate make it a good material for treating roads (1). It is widely used in Sweden and California – two of the world's most environment-conscious areas.

PRODUCTION:

In the sulfite pulping of wood, lignin – nature's binder – becomes soluble and is separated from the pulp fibers as spent liquor (SSL). This liquor also contains the naturally occurring wood sugars.

Dilute SSL at 12% solids is treated and concentrated to 50 – 60% solids by evaporating water. Starting from this base material, a family of chemicals has been developed. They are known as lignins or lignosulfonates. They are used in the following applications:

Water Treatment Chemicals	Oil Well Drilling Mud Additives
Components of Adhesives	Textile Dye Dispersants
Animal Feed Pellet Binders	Gypsum Dispersants for Wallboard
Concrete Additives	Leather Tanning Agents
Road Binders	Dispersants for Brick Clay
Feed Molasses Additives	Battery Plate Expanders

** As set by the U.S. Environmental Protection Agency*

Of the 1.32 million tons of lignosulfonate sold worldwide, 150,000 tons are sold for application to roadways – 80,000 tons in North America and 70,000 tons in Europe and Australia. The product used on roads is the base product that has not been chemically modified and may be the calcium,

sodium or ammonium form depending on the pulp mill (36). Complex lignofsulfonates are sophisticated, high technological content chemicals, showing all the chemical complexity of the naturally occurring lignin from which they were derived.

SUGARS:

The types of sugars present in lignofsulfonate will change depending on the kind of wood pulped. Wood from needle-bearing trees yield predominantly the hexoses-mannose, glucose and galactose. Wood from leaf-bearing trees yield predominantly the pentoses-xylose and arabinose. We do not pulp maples!

ENVIRONMENTAL EFFECTS:

(a) Dioxins:

During the evaporation of spent liquor, SO_2 and any volatile components are removed. However, with attention recently focused (38) on the presence of dioxins in paper mill effluents, the U.S. Environmental Protection Agency approved laboratory – Enseco Inc., was contracted to determine the dioxin content of SSL roadbinder. Results from analysing a 7-day composite of Lignosol B, (a calcium lignofsulfonate) (37) show that it contains no detectable amounts of 2, 3, 7, 8 – tetrachloro dibenzofuran or 2,3 7, 8 – tetrachloro dibenzo-p-dioxin. This is not surprising as chlorinated organic contaminants require the presence of substantial chlorine concentrations. This can come from:

- Using chlorinated biocides after bleaching
- Bleaching fibers with chlorine, hypochlorite or chlorine dioxide

But the Quebec mill (REED) does not bleach. Mills that do bleach only do so after the lignosulfonate has been separated and removed from the system.

(b) Trace Elements:

Lignosulfonates are wood extracts that contain the mineral elements naturally present in trees. Depending on the tree type and soil on which it was grown, the wood contains different kinds and amounts of minerals. Element analysis of tree barks that are typical for plant residues were published by Harder and Einspahr (12).

The U.S. Environmental Protection Agency (EPA) has recently defined the maximum concentration of elements to establish EP Toxicity (5). Limits are shown in Table 1.

TABLE I.

MAXIMUM CONCENTRATION OF CONTAMINANTS FOR CHARACTERISTIC OF EP TOXICITY

EPA Hazardous Waste No.	Contaminant	Maximum Concentration, ppm
D004	Arsenic	**5.0**
D005	Barium	**100.0**
D006	Cadmium	**1.0**
D007	Chromium	**5.0**
D008	Lead	**5.0**
D009	Mercury	**0.2**
D010	Selenium	**1.0**
D011	Silver	**5.0**

REED's lignosulfonate products are submitted periodically for Proton Induced X-ray Emission analyses. The testing procedures can detect all eight of the EP Toxicity contaminants plus 67 others. Results on REED products (7) are reported in Table II. Note that barium, cadmium, mercury, selenium and silver could not be detected. The other EP Toxic elements are present at levels below the maximum concentration.

TABLE II.

TRACE ELEMENTS IN LIGNOSULFONATES

Reed Calcium Lignosulfonate

	Concentrate	Neutralized Concentrate
	ppm in solids	
Titanium	5.6	-
Aluminum	-	-
Silicon	105	241
Phosphorus	540	516
Manganese	118	155
Iron	207	869
Cobalt	1.8	6.6
Nickel	0.9	1.4
Copper	2	1.2
Zinc	25	31
Gallium	0.3	-
Bromine	0.7	0
Rubidium	3.7	2.5
Strontium	32.5	34
Zirconium	1.8	1.6
Molybdenum	0	2.5
Arsenic	0.1	-
Barium	-	-
Cadmium	-	-
Chromium	-	2.7
Lead	-	0.3
Mercury	-	-
Selenium	-	-
Silver	-	-

Neutralisation adds some trace minerals as they are contributed by the naturally occurring limestone that is used in the neutralising process.

ACUTE ANIMAL TOXICITY:

During the past 22 years, many of REED LIGNIN'S products have been examined. All of them proved to be non-toxic. Table III shows the results for 18 widely used products. The basic lignin used on roads would be even more innocuous (22).

To assess health risks involved in handling a new chemical, it is tested for acute toxicity in white rates and skin and eye irritation on rabbits. If all 10 rats in a test survive a one-time feeding dose of five grams/kilogram of body weight, the product is considered non-toxic according to the Occupational Safety and Health Administration (OSHA) rule, printed in the U.S. Code of Federal Regulations 29 CFR 1910.1200 (4). If rats do not survive the five gram/kilogram feeding level, testing is conducted to find the dose that kills 50% of the rats (LD_{50}).

Emperical scores are used to report results for skin and eye irritation tests with a skin irritation score of less than five needed to rate a material non-irritating to the skin. Testing for eye irritation is done following instructions in the Code of Federal Regulations 16 CFR 1500.42. The Hazelton Laboratory report on testing the lignin product, Additive-A Type 3, (10), is typical for doing this kind of work.

TABLE III

ACUTE TOXICITY OF LIGNIN PRODUCTS
TYPICAL REED PRODUCTS

PRODUCT	TEST LAB	DATE	ORAL TOXICITY ON WHITE RATS, LD_{50} g/kg	RABBIT SKIN IRRITATION INDEX	RABBIT EYE IRRITATION SCORE		
					24 hrs	48 hrs	72 hrs
Maracell XE	WARF	1977	> 5	0	0.33	0	0
Marasperse N-22	WARF	1975		0	0	0	0
Marasperse CB	WARF	1975		0	0	0	0
Marasperse CE-22	WARF	1977	> 5	0.17	2.0	0	0
Marasperse B-22	WARF	1975		0	0	0	0
Marasperse OS	Raltech	1978	> 5	0	0	0	0
Marasperse N-3	Raltech	1978	> 5	0	0	0	0
Marasperse CBOs-3	WARF	1977	> 5				
Marasperse CR-23-7	WARF	1977	> 5	0.21	0.67	0	0
Marasperse XCB-2	WARF	1977		0.17	0.67	0	0
Norlig 41	WARF	1975		0	0	0	0
Norlig 41d	WARF	1975		0	0	0	0
Norlig 41N	WARF	1976	> 5	0	0	0	0
Norlig 412	Raltech	1978	> 5	0.2	0	0	0
Additive-A, Type 3	Hazelton	1985	> 5	1.5	0	0	0
Americo SD-1	Raltech	1978	> 5	0	0	0	0
Kelig 32	WARF	1977		0	0	0	0
Kelig 32-2	Raltech	1978	> 5	0.1	0	0	0

Reed's roadbinder is among the Norlig 41 class of products.

SUBACUTE TOXICITY:

In 1960, American Cyanamid, Hercules Powder, NOPCO Chemical and Socony Mobil Oil Companies sponsored a study at the Industrial Bio-Test Laboratories to Determine the 90-day subacute oral toxicity of a REED sodium lignosfulfonate, Marasperse N.

Seven groups of 14 white rats were fed chow containing 0, 0, .01, .05, .20, 1.0 and 5.0% Marasperse N for 90 days. Results were reported by Kay and Calandra (15).

- None of the five dietary levels of Marasperse N had adverse effects on the growth of rats
- Only small differences were found for food consumption and food utilisation
- No dose-correlated trends were apparent in mortality data
- No significant abnormal behaviour was noted among animals of any group
- Periodic blood studies disclosed no adverse findings
- Urine analysis revealed no significant abnormalities
- No significant gross pathological findings were noted at autopsy of sacrificed animals

CHRONIC TOXICITY:

For effects of long-term exposure there are the good health records for those who have worked with reacting and spray drying this material. Over a period of 40 years to date, no human health problem has been attributed to exposure to lignosulfonate.

Before using lignosulfonate in poultry and animal feeds, calcium, sodium and ammonium forms of SSL were scrutinised very carefully for long-term health effects. Results of studies conducted to get approval to use the SSL products in animal feeds were obtained from the U.S. Department of Health & Human Services under the Freedom of Information Act (25). After reviewing data filed with Food Additive Petitions No. 706 and 1239, the Commissioner of the Food & Drug Administration ruled on August 15, 1962 that:

> ".....The Division of Food concludes that the product is reproducible, of uniform composition, and that it accomplishes its intended technical effect of pellet binding. An analytical method is available for regulatory purposes.
>
> The Division of Pharmacology concludes that use of the additive in animal feed under the proposed conditions of use in animal feed is safe.
>
> The Division of Veterinary Medicine concludes that the additive is safe for use in animal feeds and effective as a pelleting aid.
>
> Mr Philbeck, Meat Inspection Division, ARS, U.S.D.A., offers no adverse comment to this order."

Today, 30 years after lignins were introduced into animal feeds, no chronic toxicity problems have arisen. This is not surprising, after all – hay, grain and forage contain 20% lignin.

FISH TOXICITY:

Because a lot of water is needed for transporting, processing and pulping wood, paper mills locate near oceans, lakes and rivers. Many studies have been conducted to measure the water polluting effects of the following:

- Wood transport
- Debarking
- Pulping
- Fiber washing
- Fiber bleaching
- Paper making (6, 20, 21, 31, 32)

But, most of the studies have been concerned with spent liquor prior to evaporation, whereas lignosulfonate products, sold for road dedusting are SSL concentrates. When removing water in evaporators sulfur dioxide, acetic and formic acids are distilled off leaving liquors that are less toxic than the raw material. Published information about various lignosulfonates are summarised in Table IV along with reference toxicity values for familiar products.

Evaporating water and volatiles from dilute calcium and sodium SSL substantially reduces toxicity to the point where fish can tolerate 3,000 rather than 1,000 mg/l of solids. With purified lignosulfonates the tolerance is increased to 7,000 mg/l (27). The common salts calcium chloride, sodium chloride and sodium sulfate have LC_{50} 96-hour values in the 5,000 – 10,000 range (8). In reference books (18,28) the cutoff point for LC_{50} 96-hour values is 1,000 mg/l. Compounds with values greater than this are given a value of >1,000 and are considered to have a low order of toxicity. Calcium and sodium lignosulfonates, calcium chloride, sodium chloride and sodium sulfate all are in this category. By contrast, the popular laundry detergent **Tide** and surfactants used in making such products are very toxic toward fish (14). Values ranging from 4 – 50mg/l are reported for these materials in Table IV.

TABLE IV

TOXICITY OF WATER SOLUBLE MATERIALS TOWARD FISH

REFERENCE	FISH	LIGNOSULFONATE TESTED	LC_{50} – 96 hours mg solids/litre
Wilson	Rainbow Trout	Lignosol BD (Quebec)	3,700
Stapanian	Rainbow Trout	Lignosite (West Coast)	2,125
Wilson	Rainbow Trout	Lignosol XD	3,500
Roald	Rainbow Trout	Purified Na Lignosulfonate	7,300
Canada	Various	Calcium Chloride	5,000
Jones	Various	Sodium Chloride	6,000
Jones	Fathead Minnows	Sodium Sulfate	9,000
Jones	Fathead Minnows	**Tide** Laundry Detergent	50
Jones	Fathead Minnows	Sodium Dodecylbenzene Sulfonate	4
Jones	Fathead Minnows	Sodium Lauryl Sulfate	5

PLANTS:

With any liquid material that is applied to roadways, there is concern about harming plants that grow near the roads. Treating dirt roads with lignosulfonate to stabilise them for carrying vehicle traffic requires mixing 15 tons of solid per mile in the top six inches of soil on a 24-foot wide road. To do this, lignosulfonates are diluted with water. After spraying on the roadway, a road grader or scarifier is used to mix the binder with soil. Compacting with a roller is done soon after mixing.

For dust control, only 2.5 tons of solids per mile are sprayed on premoistened dirt roads. This total amount is usually applied in two applications.

In recent years both techniques have been used in Europe and North America. They account for the sale of 150,000 short tons of lignosulfonate solids that are used to treat 20,000 miles of roadway. No complaint of plant damage has been reported from this wide exposure (30). This is not a surprise after reading details of a very bold experiment that Stapanian and Shea (29) conducted. They applied Lignosite, a 50% solids calcium lignosulfonate, directly to the ground cover of Douglas Fir plantations in the state of Washington. Very high application rates of 21, 42 and 63 tons of solids per acre were applied to twelve 5 x 10m (16 x 33 feet) plots of forest land. Four plots received the same treatment. These treating levels are way above the 5 and 1.3 tons of solids per acre applications used for stabilising and dedusting roads.

Observations made periodically up to 12 weeks after the Lignosite was applied, indicated that the woody vegetation was not affected. The biomass of herbaceous plants was significantly decreased only at the two highest application rates. The growth of Douglas Fir trees was not significantly affected.

In another study Gast and Early (9) reported on the phytotoxicity of three commercial lignosulfonates toward garden crops, cotton and tobacco. This work was done with ingredients used for pesticide formulations. Of the 77 products tested, Marasperse C, Marasperse CB and Marasperse N were the least toxic. Pertinent results are reproduced in Table V. Lignosulfonates are now widely used in herbicide and pesticide formulations.

Chlorides are not expensive in California and, like lignins, are often used for dust abatement. However, at relatively low dosage chlorides can kill vines and care is suggested when applying them (19).

TABLE V

PHYTOTOXICITY RATINGS
Plant Injury

0 = None, 1 = Slight, 2 = Moderate, 3 = Heavy, 4 = Severe

Plant	Conc in Water Applied %	Marasperse C (Calcium Lignosulfonate)	Marasperse CB (Sodium Lignosulfonate)	Marasperse N (Sodium Lignosulfonate)
LEAVES				
Bean	1.0	0	1	0
	0.1	0	0	0
Corn	1.0	0	0	0
	0.1	0	0	0
Cotton	1.0	0	0	0
	0.1	0	0	0
Cucumber	1.0	0	0	0
	0.1	0	0	0
Tobacco	1.0	0	0	0
	0.1	0	0	0
Tomato	1.0	0.5	0.3	0
	0.1	0	0	0
ROOTS				
Tomato	1.0	4	1	4
	0.1	0	0	0
	0.01	0	0	0
	0.001	0	0	0
Tobacco	1.0	0	0	0
	0.1	0	0	0

GROUNDWATER:

The effect of lignosulfonate on groundwater is related to concentration. Applying 4,000 tons of dissolved solids each year to the same acre of porous soil will drive the liquor down into the groundwater with no time for destruction by fermentation. Results from ponding studies are vivid demonstrations. With much more modest one-time applications of 20 – 60 tons / acre Stapanian (29) indicates slow movement and time for fermentation which should pose no threat to contaminating groundwater. With no serious groundwater contamination expected at 50 tons/acre, applying 5 and 1.3 tons/acre for road paving and dust control would not be a serious matter.

DECAY / BIOLOGICAL OXYGEN DEMAND:

Sugars and carbohydrates are easily fermented by many different microbes. With as much as 35% of these easily fermented substances present in lignosulfonate, and few toxic materials around, it is no surprise that partial decay occurs quickly. In fact, lignosulfoante is used as a fermentation media for the commercial production of ethyl alcohol, fodder yeast and food-grade yeast.

Because of the wood sugars, lignosulfonates are not added to waterways containing fish and a marginal supply of dissolved oxygen. Microbes will feed on the sugars and consume oxygen in the process.

Results of many tests on basic lignosulfonate indicate that its five-day Biochemical Oxygen Demand (BOD_5) is 0.23 pounds per pound of solids. Microbes acting on 100 pounds of basic lignosulfonate for five days require 23 pounds of oxygen. The 100 pounds of lignin must be mixed with 394,000 gallons (1,500 cubic meters) of water containing 11 ppm dissolved oxygen to wind up after five days with water containing 4 ppm dissolved oxygen. The 4 ppm dissolved oxygen is where fish kill first appears. This means that 30 ppm of SSL solids will allow dissolved oxygen at a safe level. More complex lignosulfonates show lower BOD_5 values.

During the 1960s, much attention was given to laundry detergents that produce voluminous and persistent foam in discharge waterways. The problem was traced to sudsing surfactants that biodegraded very slowly. In developing new sudsing surfactants, River Dieaway was the most popular test used for measuring biodegradation. The test was applied to examine lignosulfonates.

Small amounts of lignosulfonate, dissolved in aerated Wisconsin River water, were held at room temperature for 33 days. Samples removed periodically were tested for organic matter content by oxidising with dichromate to determine the Chemical Oxygen Demand (COD). Data showed that Norlig A, a lignosulfonate roadbinding material, degraded 28% in five days and 43% in 33 days. This closely corresponds to the carbohydrate content of the product, and indicates that pure lignin resists decay. Pure lignin is the last to go in natural decay processes.

The 54% material remaining after 33 days of incubation persists as a roadbinder, and will show as natural lignin colour in waterways. It is a situation much like the brown colour imparted to streams and lakes by humus and humic acids produced in the decay of plants and trees.

CORROSION:

Severe corrosion of automobile underparts is usually associated with the use of salts for de-icing roads during winter months. This is not always so. A study by the Swedish Highway Department (17), indicates that in areas where calcium chloride or magnesium chloride is used for keeping dust down on dirt roads, automobile corrosion from this source is more severe than from salts used for road deicing(16).

Because of the nature of their binding mechanism, lignins absorb onto soils and clays and form cohesive bonds. This is very different from calcium chloride which is loosely concentrated on the surface of the road from where it is easily blown into passing vehicles where it can start its insidious corroding activity.

DISCUSSION:

This survey of lignin and the environment has only touched on the subject. However, a full reference index is attached for those wishing to study the subject in greater depth.

Any open minded analysis of the data will conclude that the use of lignin for dust control and road stabilisation is not only environmentally safe, but is more "environmentally friendly" than any other dust palliatives available.

REFERENCES:

1. U.S. Bureau of Mines Information Circular 7806.

2. Beak, T.W. Consultants Ltd., Anaerobic Contact Filter for Treatment of Waste Sulfite Liquor, CPAR Project Report 103-1, March 31, 1973.

3. Benning, R., Corrosion Rate of Norlig 11 and Norlig 41, American Can Co. memo to R Peiser, September 19, 1972.

4. Code of Federal Regulations, 29 CFR 1910.1200, Revised as of July 1, 1985, p 888.

5. Code of Federal Regulations, 40 CFR 261.24, Revised as of July 1, 1987.

6. Doudoroff, P and Katz, M., Critical Review of Literature on the Toxicity of Industrial Wastes, Sewerage and Industrial Wastes, 22 1432 (1950).

7. Element Analysis Corporation report December 5, 1986 in the Rothschild files under 55 Res. and Consulting Labs.

8. Enviro Technical Information for Problem Spills – Calcium Chloride. Environment Canada – Environmental Protection Service, May 1984.

9. Gast, R and Early, J., Phytotoxicity of Solvents and Emulsifiers used in Insecticide Formulations, Ag. Chem., p 43 (April 1956).

10. Glaza, S. Final Report on Toxicity of Additive A – Type 3, Hazelton. Laboratories Report to J. Adams of Reed Lignin, October 11, 1985.

11. Griffin, J and West, J., Acute Toxicity of Ammonia-Base Neutral Sulfite Pulp Mill Waste Liquor to Rainbow Trout. Bul. of Envir. Contam. and Toxicol. 15 No. 5., 608 (1976).

12. Harder, M., and Einspahr, D., Levels of Some Essential Metals in Bark, Tappi 63 110 (Dec. 1980).

13. J V Belle. Paper mill by-product used for dust abatement. Public Works. July 1971.

14. Jones, J., Fish and River Pollution. Butterworths, Washington (1964) p 122.

15. Kay, J and Calandra, J., Industrial Bio-Test Labs report to the NOPCO Chemical Co., Ninety-Day Subacute Oral Toxicity of Marasperse N, September 19, 1960.

16. Data available from Holmens Bruk AB. 546800 Vargon, Sweden.

17. Lecture 09-03-1987, Logging Roads Maintenance Forestry School Course (Sweden).

18. Lewis, R and Tatken, R., Registry of Toxic Effects of Chemical Substances, 1979 Edition, U.S. Dept of Health and Human Services (Sept, 1980).

19. Private communication. ITT (Rayonier) Wash. U.S.A.

20. Marier, J., The Effects of Pulp and Paper Waste with Particular Attention to Fish and Bioassay Procedures for Assessment of Harmful Effects. National Research Council of Canada Report No. 13501.

21. McKean, W., Pulp and Paper Ind. ch. in Introduction to Environmental Toxicology, Guthrie, F., and Perry, J. Ed. Elsevier, N.Y.

22. See Reed Lignin General Brochure under Toxicology.

23. Details available from Special Mining Services Pty Ltd., Lochinvar, Australia.

24. National Association of Corrosion Engineers Handbook – Fifth Ed. Corrosion data summary – Metals Section.

Progressive Environmental Systems Inc.

Pro-Series

Road & Soil Stabilization &

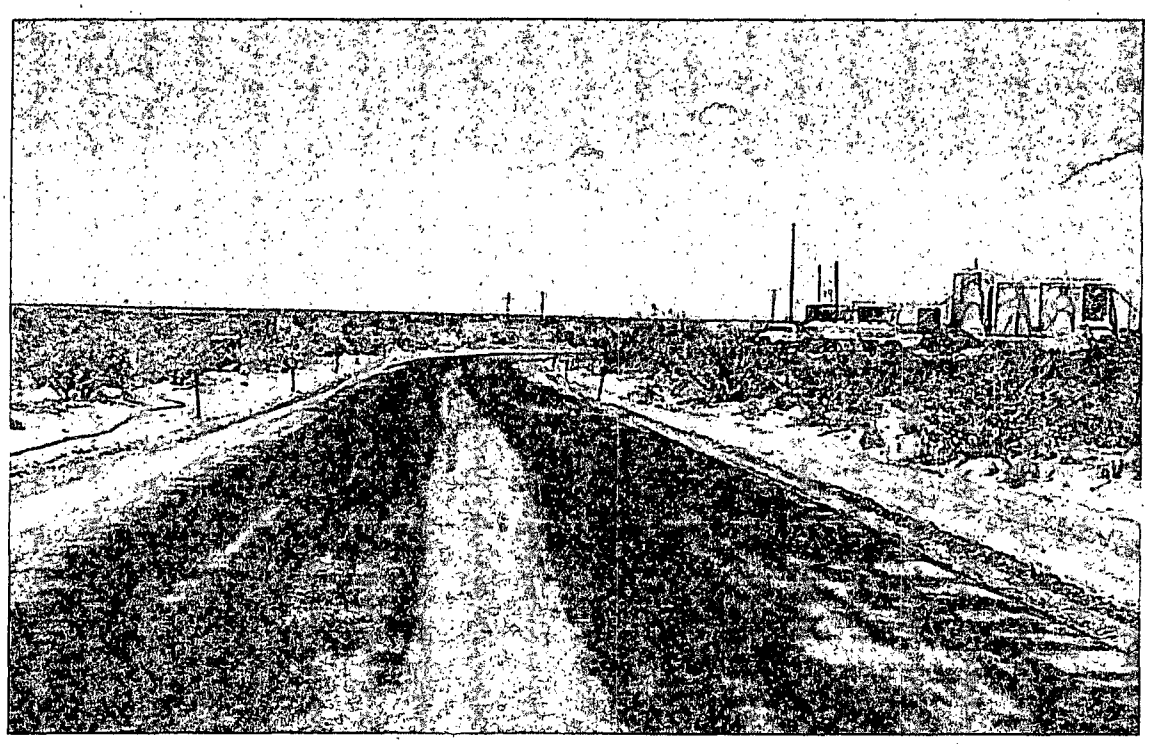
Dust Control Products

Pro-Road

Road-Pro is the base of our product line, it is Lignosulfonate (either ammonium or sodium based) in a solution of approximately 35% solids and 65% water. It is non-hazardous and non-chloride. It does not kill plant life of harm the environment.

Lignosulfonate is a naturally occurring polymer extracted from wood pulp. It was the glue that held the tree together. It does the same thing when incorporated into the road surface. It binds the road base material together into a strong, durable wear surface that becomes insoluble over time due to solar heating. Pro-Road also increases the plasticity of the road base materials. This is extremely important when dealing with the low to no PI materials used in this area.

We recommend processing .75 gallons of Road-Pro per square yard into the top 3 inches of the road surface. It should be mixed thoroughly with water and the in-situ materials using a motor grader or re-claimer. When optimum moisture content is achieved it should be shaped, compacted, fine graded and finish rolled. At intersections, turnarounds, loading areas or other high stress areas, the application rate and depth of treatment may be increased as needed. A topical application of Pro-Mag or Pro-Blend may be utilized where acceptable.



ProRoad

Material Safety Data Sheet

Complies with OSHA's Hazard Communication Standard, 29 CFR 1910.1200.

Product Name:	ProRoad
Product Composition:	Greater than 60% lignosulfunate
	CAS No.: 8061-53-8
	50 to 53% water CAS No.: 7732-18-5
Chemical Family:	Lignin
Chemical Formula	Amorphous polymer

Section I – Company Identification

Manufactured for:	Emergency Telephone Number:
Progressive Environmental Systems, LLC	CHEMTREC: (800) 424-9300
Address:	Telephone Number for Information: (575) 430-3021
PO Box 1067	
Capitan, NM 88316	
Date Prepared: October 1, 2009	Signature of Preparer: RFH

Section II - Hazard Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	%*(optional)*
None known	N/A	N/A	N/A	N/A

Section III - Physical/Chemical Characteristics

Boiling Point:	101 to 103° C	Specific Gravity (H_2O = 1):	1.2 to 1.4

HAZARDOUS POLYMERIZATION	May Occur	CONDITIONS TO AVOID: Avoid strong bases and/or oxidants
	Will Not Occur X	

Section VI - Health Hazard Data

ROUTE(S) OF ENTRY:	Inhalation:	Skin:	Ingestion:
	Possible by mist	Possible	Possible

HEALTH HAZARDS *(ACUTE AND CHRONIC)*:

SKIN CONTACT: May cause skin irritation. Symptoms may include reddening, swelling, scaling or blistering. May cause allergic skin reactions in sensitive individuals following repeated or prolonged use. Symptoms may include itching, dryness, and scaling.

EYE CONTACT: May cause severe eye irritation. Symptoms may include burning, redness, swelling, and tissue damage.

INHALATION: Inhalation of mists may cause severe respiratory tract irritation. Symptoms may include burning, coughing, and difficulty breathing. At high concentrations, may cause chemical pneumonitis and pulmonary edema. Chronic inhalation of mist may cause lung damage. Some individuals may become sensitized to sulfites, with asthma-like symptoms developing upon subsequent exposure.

INGESTION: May cause gastrointestinal irritation. Symptoms may include nausea, vomiting, difficulty swallowing (swelling of throat), diarrhea and abdominal pain. Severe overexposure may cause circulatory disturbance, central nervous system depression, heart failure, unconsciousness and death from respiratory failure.

NTP: Not a carcinogen IARC Monographs: Not a carcinogen OSHA Regulated: No

CHRONIC EFFECTS: None known

SIGNS AND SYMPTOMS OF EXPOSURE: No effects of overexposure to lignosulfonates are known

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: Exposure may aggravate pre-existing skin, eye, and respiratory disorders.

FIRST AID PROCEDURES:

SKIN CONTACT: Remove contaminated clothing, jewelry and shoes immediately. Wash affected area with soap or mild detergent and large amounts of water until no evidence of chemical remains (at least 15-20 minutes). In case of chemical burns, cover area with sterile, dry dressing.

Section VIII - Control Measures

RESPIRATORY PROTECTION *(Specify Type)*:
Use an acid gas respirator if decomposition products are present. Use an ammonia gas respirator if the product is made alkaline.

VENTILATION	Local Exhaust: Provide local exhaust ventilation system.	Special: N/A
	Mechanical *(General)*: N/A	Other: N/A

PROTECTIVE GLOVES:	EYE PROTECTION:
Employee must wear appropriate protective gloves, such as neoprene or butyl gloves or gauntlets, to prevent contact with this substance.	Employee must wear chemical splash goggles or a face shield.

OTHER PROTECTIVE CLOTHING OR EQUIPMENT:

Employee must wear appropriate protective (impervious) clothing and equipment to prevent repeated or prolonged skin contact with this substance.

WORK/HYGIENIC PRACTICES:
Where there is any possibility that an employee's eyes and/or skin may be exposed to this substance, the employer should provide an eye wash fountain and quick-drench shower within the immediate work area for emergency use.

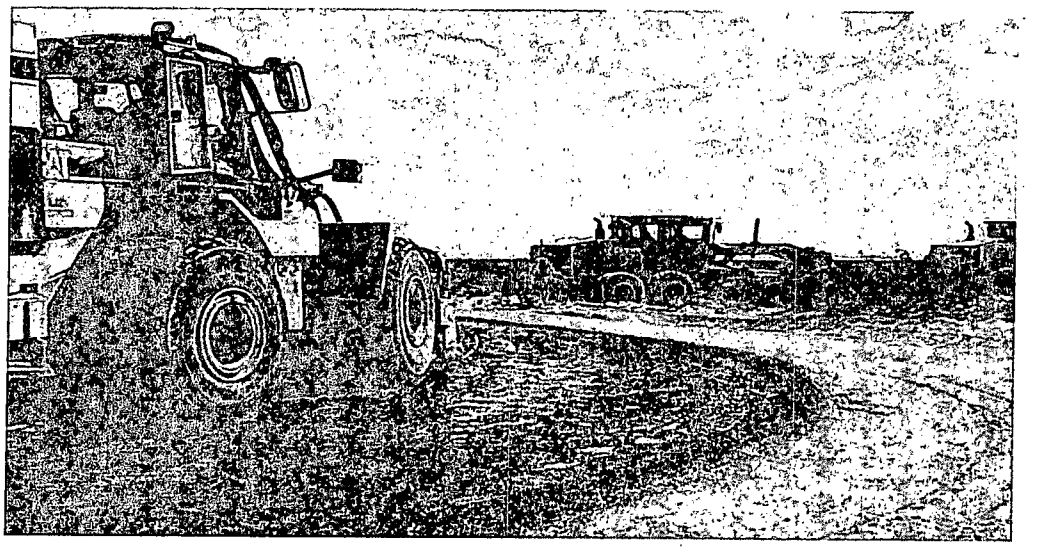
Section IX – Transportation Information

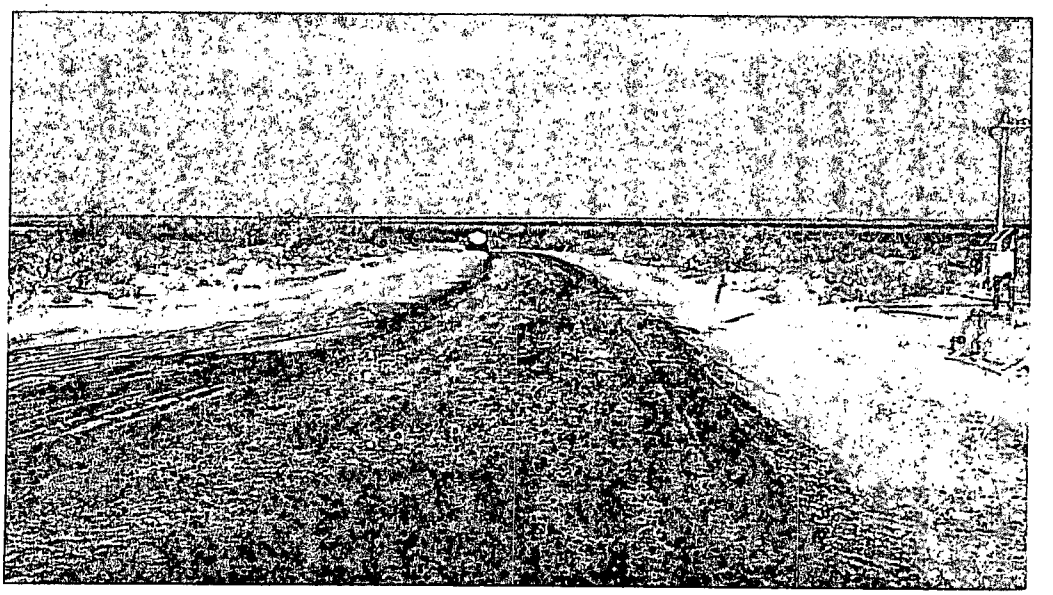
NMFC:

The information provided is for domestic highway transportation only. This product may be regulated differently when shipped in other types of containers or by modes other than that

Pro-Mag

Pro-mag liquid magnesium chloride is naturally hydroscopic, meaning it attracts moisture from the air, keeping the ground surface moist to control dust and prevent wind erosion. It also has an ionic attraction to plastic materials in the soil. Because of these properties, it enhances the durability and effectiveness of Lignosulfonate (Pro-Road) as well as being an independent, low cost road and soil stabilizer and dust control agent. It is applied to a well graded road surface immediately following an application of water. It will penetrate 1-1.5 inches into the surface. The road surface may be rolled with a smooth drum roller when surface moisture dissipates.





Compass Minerals

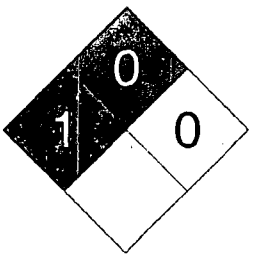
MATERIAL SAFETY DATA SHEET

1. Product and Company Identification

Product Name	**Magnesium Chloride Aqueous Solution**
CAS #	Mixture
Product use	Dust supression, deicing, general industrial, and speciality uses.
Manufacturer	Great Salt Lake Minerals Corporation A Compass Minerals Company 9900 West 109th Street, Suite 600 Overland Park, KS 66210 US Phone: 913-344-9200
CHEMTREC	1-800-424-9300
CANUTEC	1-613-996-6666

LEGEND HMIS/NFPA	
Severe	4
Serious	3
Moderate	2
Slight	1
Minimal	0

Health	1
Flammability	0
Physical Hazard	0
Personal Protection	B



2. Hazards Identification

Emergency overview	CAUTION MAY CAUSE EYE IRRITATION.
Potential short term health effects	
Routes of exposure	Eye, Skin contact, Inhalation, Ingestion.
Eyes	May cause irritation.
Skin	Non-irritating to the skin.
Inhalation	May cause respiratory tract irritation.
Ingestion	May cause stomach distress, nausea or vomiting.
Target organs	Eyes. Respiratory system.
Chronic effects	None known.
Signs and symptoms	Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.

3. Composition / Information on Ingredients

Ingredient(s)	CAS #	Percent
Water	7732-18-5	40 - 70
Magnesium chloride, hexahydrate	7791-18-6	15 - 40

4. First Aid Measures

First aid procedures	
Eye contact	Flush with cool water. Remove contact lenses, if applicable, and continue flushing. Obtain medical attention if irritation persists.
Skin contact	Flush with cool water. Wash with soap and water. Obtain medical attention if irritation persists.
Inhalation	If symptoms develop move victim to fresh air. If symptoms persist, obtain medical attention.
Ingestion	Do not induce vomiting. Rinse mouth with water, then drink one or two glasses of water. Obtain medical attention. Never give anything by mouth if victim is unconscious, or is convulsing.

Engineering controls	TWA PEL: No specific limits have been established for magnesium chloride (a soluble substance). As a guideline, OSHA (United States) has established the following limits which are generally recognized for inert or nuisance dust. Particulates Not Otherwise Regulated (PNOR): 5mg/cu.m. Respirable Dust 8-Hour TWA PEL, 15mg/cu.m. Total Dust 8-Hour TWA PEL. TWA TLV: No specific limits have been established for magnesium chloride (a soluble substance). As a guideline, ACGIH (United States) has established the following limits which are generally recognized for inert or nuisance dust. Particulates (insolubles) Not Otherwise Classified (PNOC): 10mg/cu.m. Inhalable Particulate 8-Hours TWA TLV, 3mg/cu.m. Respirable Particulate TWA TLV. Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. General ventilation normally adequate.
Personal protective equipment	
Eye / face protection	Safety glasses or goggles.
Hand protection	Rubber gloves. Confirm with a reputable supplier first.
Skin and body protection	As required by employer code.
Respiratory protection	Where exposure guideline levels may be exceeded, use an approved NIOSH respirator or NIOSH-approved filtering facepiece.
General hygiene considerations	Handle in accordance with good industrial hygiene and safety practice. When using do not eat or drink. Wash hands before breaks and immediately after handling the product.

9. Physical & Chemical Properties

Appearance	Liquid
Color	Colourless to light amber.
Form	Liquid
Odor	Odorless
Odor threshold	Not available
Physical state	Liquid
pH	7 - 9 (5% solution)
Melting point	Not available
Freezing point	-18.33 °C (-1 °F) (30% solution, periodically mixed to ensure homogeneity)
Boiling point	107.22 °C (224.99 °F)
Flash point	None
Evaporation rate	Not available
Flammability limits in air, lower, % by volume	Not applicable
Flammability limits in air, upper, % by volume	Not applicable
Vapor pressure	Not available
Vapor density	Not available
Specific gravity	1.24 - 1.34 (H2O = 1)
Octanol/water coefficient	Not available
Solubility (H2O)	Easily soluble in cold water, hot water, methanol, acetone.
Auto-ignition temperature	Not available
Percent volatile	Not available

10. Chemical Stability & Reactivity Information

Chemical stability	Stable under recommended storage conditions.
Conditions to avoid	Do not mix with other chemicals.
Incompatible materials	Oxidizing agents. Acids.
Hazardous decomposition products	May include and are not limited to: Halogenated compounds. Hydrogen chloride.
Possibility of hazardous reactions	Hazardous polymerization does not occur.

US Federal regulations	This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200. All components are on the U.S. EPA TSCA Inventory List. CERCLA/SARA Hazardous Substances - Not applicable.

Occupational Safety and Health Administration (OSHA)

29 CFR 1910.1200 hazardous chemical	No

CERCLA (Superfund) reportable quantity

None

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories	Immediate Hazard - No Delayed Hazard - No Fire Hazard - No Pressure Hazard - No Reactivity Hazard - No
Section 302 extremely hazardous substance	No
Section 311 hazardous chemical	No
Clean Air Act (CAA)	Not available
Clean Water Act (CWA)	Not available
Safe Drinking Water Act (SDWA)	Not available
Drug Enforcement Agency (DEA)	Not available
Food and Drug Administration (FDA)	Not available
WHMIS status	Not Controlled
State regulations	WARNING: This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

Inventory name

Country(s) or region	Inventory name	On inventory (yes/no)*
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

16. Other Information

Disclaimer	Information contained herein was obtained from sources considered technically accurate and reliable. While every effort has been made to ensure full disclosure of product hazards, in some cases data is not available and is so stated. Since conditions of actual product use are beyond control of the supplier, it is assumed that users of this material have been fully trained according to the requirements of all applicable legislation and regulatory instruments. No warranty, expressed or implied, is made and supplier will not be liable for any losses, injuries or consequential damages which may result from the use of or reliance on any information contained in this document.
Issue date	18-Feb-2009
Effective date	15-Jan-2009
Expiry date	15-Jan-2012
Prepared by	Dell Tech Laboratories Ltd. (519) 858-5021

PECOS DISTRICT
CONDITIONS OF APPROVAL

OPERATOR'S NAME:	Apache Corporation
LEASE NO.:	NMLC029435B
WELL NAME & NO.:	NFE Federal 16
LOCATION:	Section 5, T.17S., R. 31 E., NMPM
COUNTY:	Eddy County, New Mexico

TABLE OF CONTENTS

Standard Conditions of Approval (COA) apply to this Sundry. If any deviations to these standards exist or special COAs are required, the section with the deviation or requirement will be checked below.

☒ **Noxious Weeds**
☒ **Special Requirements**
Lesser Prairie-Chicken Timing Stipulations
☒ **Construction**
Roads
Dust Abatement
☒ **Road Section Diagram**
☒ **Final Reclamation**

I. NOXIOUS WEEDS

The operator shall be held responsible if noxious weeds become established within the areas of operations. Weed control shall be required on the disturbed land where noxious weeds exist, which includes the roads, pads, associated pipeline corridor, and adjacent land affected by the establishment of weeds due to this action. The operator shall consult with the Authorized Officer for acceptable weed control methods, which include following EPA and BLM requirements and policies.

II. SPECIAL REQUIREMENT(S)

Timing Limitation Stipulation / Condition of Approval for lesser prairie-chicken:

- Oil and gas activities including 3-D geophysical exploration, and drilling will not be allowed in lesser prairie-chicken habitat during the period from March 1st through June 15th annually. During that period, other activities that produce noise or involve human activity, such as the maintenance of oil and gas facilities, pipeline, road, and well pad construction, will be allowed except between 3:00 am and 9:00 am. The 3:00 am to 9:00 am restriction will not apply to normal, around-the-clock operations, such as venting, flaring, or pumping, which do not require a human presence during this period. Additionally, no new drilling will be allowed within up to 200 meters of leks known at the time of permitting. Normal vehicle use on existing roads will not be restricted. Exhaust noise from pump jack engines must be muffled or otherwise controlled so as not to exceed 75 db measured at 30 feet from the source of the noise.

Other Special Requirements

- Cultural monitor will be required for the entirety of the project, plus a 200ft culture clearance will be needed for the proposed action
- BLM representative will be required for the entirety of the project
- Operator will contact Carlsbad BLM Field Office at 575-234-5972 at least 72 before any construction or maintenance of the road
- This is a test location for lignosulfanate within the Carlsbad BLM Field Office, only the proposed action will be permitted.

III. CONSTRUCTION

A. NOTIFICATION

The BLM shall administer compliance and monitor construction of the access road and well pad. Notify the Carlsbad Field Office at (575) 234-5909 at least 3 working days prior to commencing construction of the access road and/or well pad.

B. ON LEASE ACCESS ROADS

Road Width

The access road shall have a driving surface that creates the smallest possible surface disturbance and does not exceed fourteen (14) feet in width. The maximum width of surface disturbance, when constructing the access road, shall not exceed twenty-five (25) feet.

Surfacing
Surfacing material is not required on the new access road driving surface. If the operator elects to surface the new access road or pad, the surfacing material may be required to be removed at the time of reclamation.

Where possible, no improvements should be made on the unsurfaced access road other than to remove vegetation as necessary, road irregularities, safety issues, or to fill low areas that may sustain standing water.

The Authorized Officer reserves the right to require surfacing of any portion of the access road at any time deemed necessary. Surfacing may be required in the event the road deteriorates, erodes, road traffic increases, or it is determined to be beneficial for future field development. The surfacing depth and type of material will be determined at the time of notification.

Crowning
Crowning shall be done on the access road driving surface. The road crown shall have a grade of approximately 2% (i.e., a 1" crown on a 14' wide road). The road shall conform to Figure 1; cross section and plans for typical road construction.

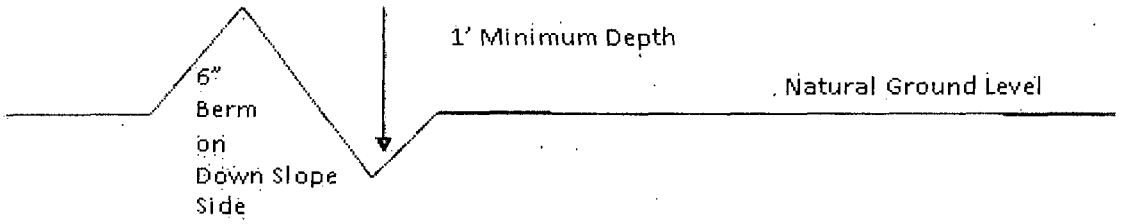
Ditching
Ditching shall be required on both sides of the road.

Turnouts
Vehicle turnouts shall be constructed on the road. Turnouts shall be intervisible with interval spacing distance less than 1000 feet. Turnouts shall conform to Figure 1; cross section and plans for typical road construction.

Drainage
Drainage control systems shall be constructed on the entire length of road (e.g. ditches, sidehill outsloping and insloping, lead-off ditches, culvert installation, and low water crossings).

A typical lead-off ditch has a minimum depth of 1 foot below and a berm of 6 inches above natural ground level. The berm shall be on the down-slope side of the lead-off ditch.

Cross Section of a Typical Lead-off Ditch



All lead-off ditches shall be graded to drain water with a 1 percent minimum to 3 percent maximum ditch slope. The spacing interval are variable for lead-off ditches and shall be determined according to the formula for spacing intervals of lead-off ditches, but may be amended depending upon existing soil types and centerline road slope (in %);

Formula for Spacing Interval of Lead-off Ditches

Example - On a 4% road slope that is 400 feet long, the water flow shall drain water into a lead-off ditch. Spacing interval shall be determined by the following formula:

$$\text{400 foot road with 4\% road slope: } \frac{400'}{4\%} + 100' = 200' \text{ lead-off ditch interval}$$

Cattleguards

An appropriately sized cattleguard sufficient to carry out the project shall be installed and maintained at fence/road crossings. Any existing cattleguards on the access road route shall be repaired or replaced if they are damaged or have deteriorated beyond practical use. The operator shall be responsible for the condition of the existing cattleguards that are in place and are utilized during lease operations.

Fence Requirement

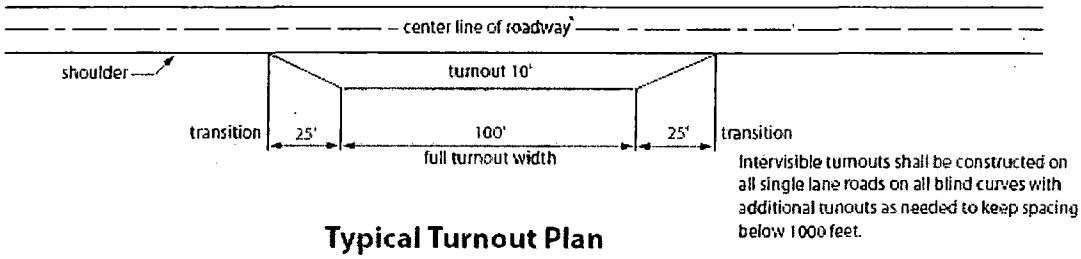
Where entry is granted across a fence line, the fence shall be braced and tied off on both sides of the passageway prior to cutting. The operator shall notify the private surface landowner or the grazing allotment holder prior to crossing any fences.

Public Access

Public access on this road shall not be restricted by the operator without specific written approval granted by the Authorized Officer.

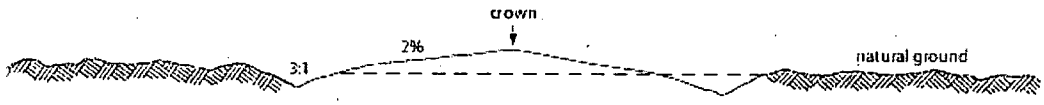
Construction Steps

1. Salvage topsoil
2. Construct road
3. Redistribute topsoil
4. Revegetate slopes

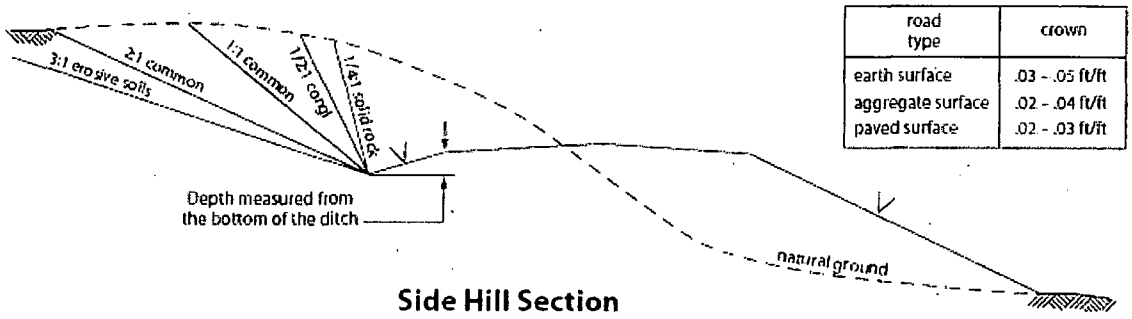


Intervisible turnouts shall be constructed on all single lane roads on all blind curves with additional turnouts as needed to keep spacing below 1000 feet.

Typical Turnout Plan

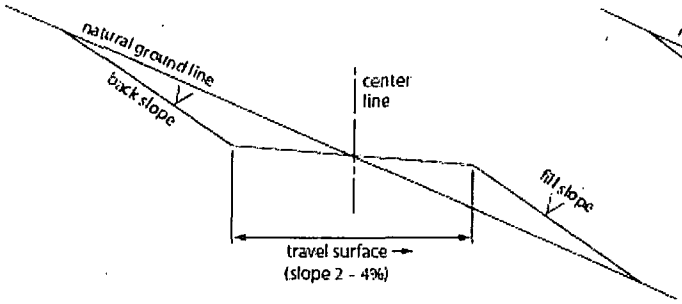


Level Ground Section

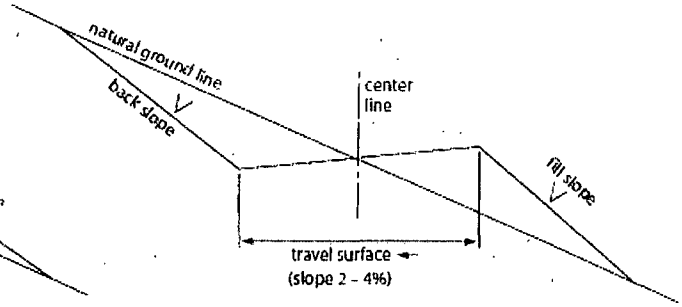


road type	crown
earth surface	.03 - .05 ft/ft
aggregate surface	.02 - .04 ft/ft
paved surface	.02 - .03 ft/ft

Side Hill Section



Typical Outsloped Section



Typical Inslope Section

Figure 1. Cross-sections and plans for typical road sections representative of BLM resource or FS local and higher-class roads.

X. Dust Abatement

In the advent that unforeseen environmental or public safety impacts arise that were not disclosed or analyzed as a part of the NEPA process, the operator will be responsible for mitigating and remediating such impacts, up to and including: removal of the surfacing product impacted materials; proper disposal of removed materials as a waste product; and remediation of impacted waterways and/or environment.

If, during any phase of the construction, operation, maintenance, or termination of the well and associated infrastructure, any oil or other pollutant should be discharged, impacting Federal lands, the control and total removal, disposal, and cleaning up of such oil or other pollutant, wherever found, shall be the responsibility of the holder, regardless of fault. Upon failure of the holder to control, dispose of, or clean up such discharge on or affecting Federal lands, or to repair all damages to Federal lands resulting there from, the BLM Authorized Officer may take such measures as deemed necessary to control and cleanup the discharge and restore the area, including, where appropriate, the aquatic environment and fish and wildlife habitats, at the full expense of the operator/holder. Such action by the BLM Authorized Officer shall not relieve the operator/holder of any liability or responsibility.

In any event, the holder shall comply with the Toxic Substances Control Act of 1976, as amended (15 U.S.C. 2601, et. seq.) with regard to any toxic substances that are used, generated by or stored on sites authorized by approved applications. (See 40 CFR, Part 702-799 and especially, provisions on polychlorinated biphenyls, 40 CFR 761.1-761.193.) Additionally, any release of toxic substances (leaks, spills, etc.) in excess of the reportable quantity established by 40 CFR, Part 117 shall be reported as required by the Comprehensive Environmental Response, Compensation and Liability Act, Section 102b. A copy of any report required or requested by any Federal agency or State government as a result of a reportable release or spill of any toxic substances shall be furnished to the BLM Authorized Officer concurrent with the filing of the reports to the involved Federal agency or State government.

XI. FINAL RECLAMATION

Roadways and other high traffic areas must be sampled prior to abandonment reclamation to ensure that the roadway and associated applied products fall below closure limits for restricted waste under both state and federal regulations. Under the Land Disposal Restrictions regulations (40 CFR, Part 268), a restricted waste identified in 40 CFR 268.40 cannot be land disposed if a TCLP extract of the waste or a TCLP extract of the treatment residue of the waste exceeds the values shown in the table of 40 CFR 268.40 for any hazardous constituent listed in the table for that waste. If the roadway and high traffic areas exceed the allowable values, then the impacted materials will be removed and will be disposed of at an authorized land disposal facility or as hazardous waste as pursuant to the waste profile.

Earthwork for final reclamation must be completed within six (6) months of well plugging. All pads, pits, facility locations and roads must be reclaimed to a satisfactory revegetated, safe, and stable condition, unless an agreement is made with the landowner or BLM to keep the road and/or pad intact.

After all disturbed areas have been satisfactorily prepared, these areas need to be revegetated with the seed mixture provided below. Seeding should be accomplished by drilling on the contour whenever practical or by other approved methods. Seeding may need to be repeated and other reclamation measures taken until revegetation is successful, as determined by the BLM.

Seed Mixture for LPC Sand/Shinnery Sites

The holder shall seed all disturbed areas with the seed mixture listed below. The seed mixture shall be planted in the amounts specified in pounds of pure live seed (PLS)* per acre. There shall be no primary or secondary noxious weeds in the seed mixture. Seed will be tested and the viability testing of seed will be done in accordance with State law(s) and within nine (9) months prior to purchase. Commercial seed will be either certified or registered seed. The seed container will be tagged in accordance with State law(s) and available for inspection by the authorized officer.

Seed will be planted using a drill equipped with a depth regulator to ensure proper depth of planting where drilling is possible. The seed mixture will be evenly and uniformly planted over the disturbed area (smaller/heavier seeds have a tendency to drop the bottom of the drill and are planted first). The holder shall take appropriate measures to ensure this does not occur. Where drilling is not possible, seed will be broadcast and the area shall be raked or chained to cover the seed. When broadcasting the seed, the pounds per acre are to be doubled. The seeding will be repeated until a satisfactory stand is established as determined by the authorized officer. Evaluation of growth will not be made before completion of at least one full growing season after seeding.

Species to be planted in pounds of pure live seed* per acre:

Species	lb/acre
Plains Bristlegrass	5lbs/A
Sand Bluestem	5lbs/A
Little Bluestem	3lbs/A
Big Bluestem	6lbs/A
Plains Coreopsis	2lbs/A
Sand Dropseed	1lbs/A

*Pounds of pure live seed:

Pounds of seed **x** percent purity **x** percent germination = pounds pure live seed