STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
AZTEC DISTRICT OFFICE

1000 RIO BRAZOS ROAD
AZTEC, NEW MEXICO 87410
(505) 334-6178

David Catanach

OIL CONSERVATION DIVISION
BOX 2088
SANTA FE, NEW MEXICO 87501

DATE 5/2/84

RE: Proposed MC _____
Proposed DHC _____
Proposed NSL _____
Proposed SWD X
Proposed WFX _____
Proposed PMX _____

Case 9401

Gentlemen:

I have examined the application dated 4/27/84

for the Northwest P.L. Corp. Rosa Unit #94 K-16 31N-5W
Operator Lease and Well No. Unit, S-T-R

and my recommendations are as follows:

Approve. Because of the injection being in a zone which is productive nearby we may want to build in language saying to assure that an adjacent zone testing structure is not "drowned".

Yours truly,

WJL

ENERGY AND MINERALS DEPARTMENT

OIL CONSERVATION DIVISION
POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501

FORM C-108
Revised 7-1-81

Case 9401

APPLICATION FOR AUTHORIZATION TO INJECT

I. Purpose: ☐ Secondary Recovery ☐ Pressure Maintenance ☒ Disposal ☐ Storage
Application qualifies for administrative approval? ☒ yes ☐ no

II. Operator: Northwest Pipline Corporation

Address: 3539 E. 30th St. Farmington, New Mexico 87401

Contact party: Paul Thompson Phone: 505/327-5351

III. Well data: Complete the data required on the reverse side of this form for each well proposed for injection. Additional sheets may be attached if necessary. (Attachment I)

IV. Is this an expansion of an existing project? ☐ yes ☒ no
If yes, give the Division order number authorizing the project _____.

V. Attach a map that identifies all wells and leases within two miles of any proposed injection well with a one-half mile radius circle drawn around each proposed injection well. This circle identifies the well's area of review. Attachment II

* VI. Attach a tabulation of data on all wells of public record within the area of review which penetrate the proposed injection zone. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of completion, and a schematic of any plugged well illustrating all plugging detail. Attachment III

VII. Attach data on the proposed operation, including:

1. Proposed average and maximum daily rate and volume of fluids to be injected;
2. Whether the system is open or closed;
3. Proposed average and maximum injection pressure;
4. Sources and an appropriate analysis of injection fluid and compatibility with the receiving formation if other than reinjected produced water; and
5. If injection is for disposal purposes into a zone not productive of oil or gas at or within one mile of the proposed well, attach a chemical analysis of the disposal zone formation water (may be measured or inferred from existing literature, studies, nearby wells, etc.). Attachment IV

*VIII. Attach appropriate geological data on the injection zone including appropriate lithologic detail, geological name, thickness, and depth. Give the geologic name, and depth to bottom of all underground sources of drinking water (aquifers containing waters with total dissolved solids concentrations of 10,000 mg/l or less) overlying the proposed injection zone as well as any such source known to be immediately underlying the injection interval. Attachment V

IX. Describe the proposed stimulation program, if any.

* X. Attach appropriate logging and test data on the well. (If well logs have been filed with the Division they need not be resubmitted.)

* XI. Attach a chemical analysis of fresh water from two or more fresh water wells (if available and producing) within one mile of any injection or disposal well showing location of wells and dates samples were taken.

XII. Applicants for disposal wells must make an affirmative statement that they have examined available geologic and engineering data and find no evidence of open faults or any other hydrologic connection between the disposal zone and any underground source of drinking water. Attachment VI

XIII. Applicants must complete the "Proof of Notice" section on the reverse side of this form. Attachment VII

XIV. Certification

I hereby certify that the information submitted with this application is true and correct to the best of my knowledge and belief.

Name: Paul C. Thompson Title Manager Prod & Drlg

Signature: Paul C. Thompson Date: 4-27-88

* If the information required under Sections VI, VIII, X, and XI above has been previously submitted, it need not be duplicated and resubmitted. Please show the date and circumstance of the earlier submittal. _____

DISTRIBUTION: Original and one copy to Santa Fe with one copy to the appropriate Division

III. WELL DATA

A. The following well data must be submitted for each injection well covered by this application. The data must be both in tabular and schematic form and shall include:

(1) Lease name; Well No.; location by Section, Township, and Range; and footage location within the section.

(2) Each casing string used with its size, setting depth, sacks of cement used, hole size, top of cement, and how such top was determined.

(3) A description of the tubing to be used including its size, lining material, and setting depth.

(4) The name, model, and setting depth of the packer used or a description of any other seal system or assembly used.

Division District offices have supplies of Well Data Sheets which may be used or which may be used as models for this purpose. Applicants for several identical wells may submit a "typical data sheet" rather than submitting the data for each well.

B. The following must be submitted for each injection well covered by this application. All items must be addressed for the initial well. Responses for additional wells need be shown only when different. Information shown on schematics need not be repeated.

(1) The name of the injection formation and, if applicable, the field or pool name.

(2) The injection interval and whether it is perforated or open-hole.

(3) State if the well was drilled for injection or, if not, the original purpose of the well.

(4) Give the depths of any other perforated intervals and detail on the sacks of cement or bridge plugs used to seal off such perforations.

(5) Give the depth to and name of the next higher and next lower oil or gas zone in the area of the well, if any.

XIV. PROOF OF NOTICE

All applicants must furnish proof that a copy of the application has been furnished, by certified or registered mail, to the owner of the surface of the land on which the well is to be located and to each leasehold operator within one-half mile of the well location.

Where an application is subject to administrative approval, a proof of publication must be submitted. Such proof shall consist of a copy of the legal advertisement which was published in the county in which the well is located. The contents of such advertisement must include:

(1) The name, address, phone number, and contact party for the applicant;

(2) the intended purpose of the injection well; with the exact location of single wells or the section, township, and range location of multiple wells:

(3) the formation name and depth with expected maximum injection rates and pressures; and

(4) a notation that interested parties must file objections or requests for hearing with the Oil Conservation Division, P. O. Box 2088, Santa Fe, New Mexico 87501 within 15 days.

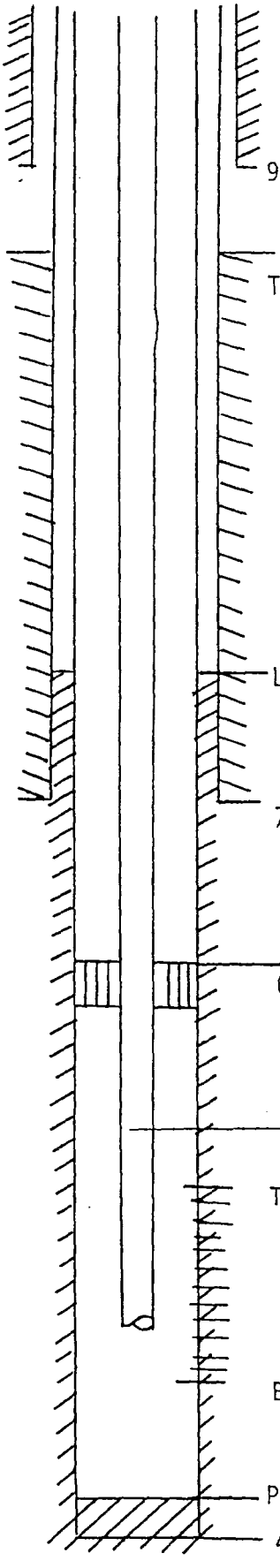
NO ACTION WILL BE TAKEN ON THE APPLICATION UNTIL PROPER PROOF OF NOTICE HAS BEEN SUBMITTED.

NOTICE: Surface owners or offset operators must file any objections or requests for hearing of administrative applications within 15 days from the date this application was mailed to them.

Attachment I

WELLBORE DIAGRAM

Rosa Unit #94
Lease No. SF-078769
Sec. 16, T31N, R5W
1820' FWL & 1650' FSL



9 5/8",32# @ 234' in a 13 3/4" hole
Cmt'd w/190 sx.-226 cu.ft.
Circ. 12 brls. to surface

TOC @ 2000' by temp. survey

Liner Top @ 3398'
Circ. 15 brls. cmt. through liner top

7",20# @ 3600' in a 8 3/4" hole
Cmt'd w/180 sx.-319 cu.ft.
TOC @ 2000' by temp. survey

Guiberson Unipacker VI @ 5300'

TUBING STRING
2 7/8", 6.4# @ 5550'

Top perf. @ 5360'

22 .32" holes

Bottom perf. @ 5681'

PBTD @ 5715'

4 1/2", 10.5# @ 5775' in a 6 1/4" hole
Cmt'd w/235 sx.-421 cu.ft. reversed out 15 bbls.

TOPS (Elev.-6268'KB

*2354' Ojo Alamo

*2799' Kirtland

*2987' Fruitland

*3114' Pictured Cliffs

*3403" Lewis

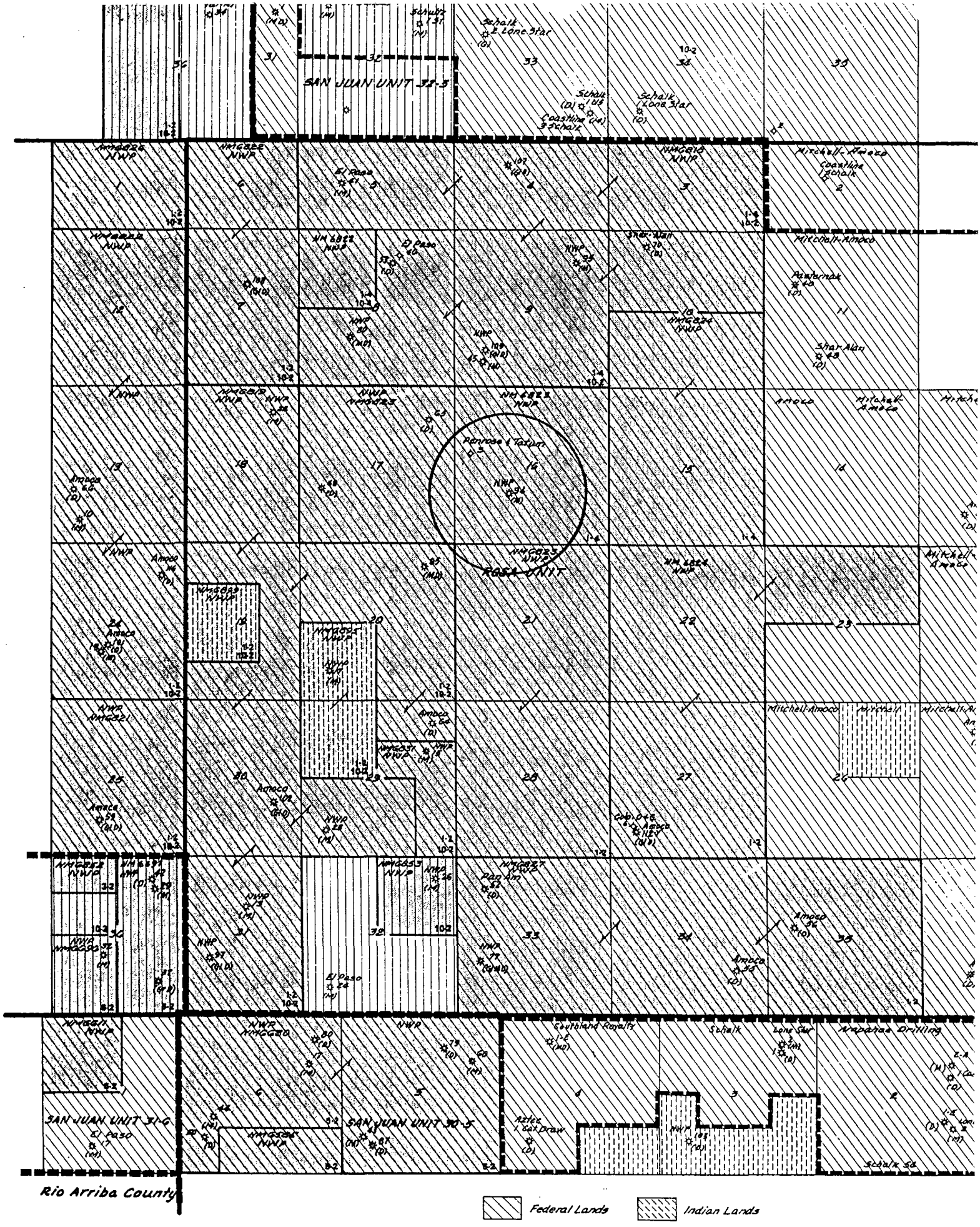
5340' Cliff House

5386' Menefee

5551' Pt. Lookout

5749' Mancos

* Calc. tops



Attachment II

31N-5W

Attachment III

The only well penetrating the Mesa Verde in the "Area of Interest" is the proposed disposal well Rosa Unit #94. The Penrosa-Tatum (Rosa #3) #3 was drilled and tested in the Pictured Cliffs and subsequently plugged and abandoned.

The Rosa Unit #94
1820 FWL & 1650 FSL
Sec. 16, T31N, R5W
Rio Arriba, New Mexico

Drilling:

Spudded well October 4, 1982

13-3/4" hole and set 9-5/8"-32#-H-40 @ 234' KB. Cement with 190 sacks and circulate cement to surface.

8-3/4" hole and set 7"-20#-K-55 @ 3600' KB (200' into Lewis) cement with 180 sacks 319 cu ft TOC at 2000 by temperature survey. Ojo Alamo top at 2354 ft.

6-1/4" hole and set 4-1/2"-10.5#-K-55 from 3398 to 5775' KB. Cement liner with 235 sacks 421 cu ft. Reverse circulated cement to surface.

Stimulation:

Perforated 22 holes (.37") from (5360' to 5681'.) Sand/water fraced with 80,000# of 20/40 sand. AIR=41 BPM @ 2600#. FSIP=600# in 15 minutes.

Proposed Activities:

Propose to perforate the Mesa Verde at 4 shots/ft for disposal at the same depths as our original perfs to limit the pressure drop due to friction through the perfs. Also to reduce the pressure drop due to friction in the tubing we will replace the existing 2-3/8" tubing with 2-7/8" tubing. This tubing will not have to be lined due to the low corrosivity of the injected fluids. We do plan on treating the produced water with corrosion inhibitor and bacteriacide before it is injected.

History and Anticipated Results from Disposal:

The Rosa Unit #94 was originally drilled to extend the Northeastern edge of the Rosa Unit Mesa Verde participating area. The Rosa Unit #45 (SW 9-31-5) and the Rosa Unit #95 (NE 9-31-6) were also drilled at the same time as the #94. All three wells have been determined to be non-commercial.

After extensive swabbing operations, continuous gas production was never achieved from the #94 or #95 and neither well was ever connected to the pipeline. The #45 produces approximately 12 MCF/D and has produced only 25.8 MMCF since first delivery in 1983.

The log characteristics of these wells are significantly different than the more productive wells to the ~~east~~ west. Using 80% water saturation as a cutoff, the #94 has only 18 feet of net pay, all of which is contained in the Menefee member of the Mesa Verde formation. By contrast, the Rosa #85 (NE 20-31-5) has 140 feet of net pay which includes not only the Menefee, but the Cliff House and Point Lookout members as well.

Because of the favorable mobility ratio between the water and gas, we expect the bank of injection water that radiates from the #94 to displace the gas ahead of it towards the producing wells to the ~~east~~ west. The injection water should also help maintain reservoir pressure and aid in the recovery of the current reserves assigned to the producing wells.

Calculated voidage using a one-half mile radius around the Rosa #94 indicates that 3.8 million barrels of water could be injected into the Mesa Verde before fillup. Northwest has plans to drill three Fruitland coal wells in the Rosa Unit during 1988. Assuming that each well produces approximately 1000 BWPD our initial injection rate into the #94 would be 3000 BWPD. Assuming perfectly cylindrical flow away from the wellbore it would take 3.5 years to fill the one-half mile radius at the initial estimated rate of 3000 BWPD.

Attachment IV

1. The Rosa Unit #94 will be used to dispose of water produced from the Rosa Unit Fruitland coal well. The maximum daily rate of disposal will be determined by the Step Rate Injection Test. As previously discussed, the initial rates are estimated to be 3000 BWPD.

2. The proposed system is closed.

3. The maximum injection pressure will be determined from the Step Rate Injection Test.

4. See attached water analysis from Rosa #94 and Rosa #45. Also water analysis from Fruitland coal water produced in the San Juan 30-6 Unit.

Attachment IV 4

		Report No:	1
		Date:	3/23/88
Company:	NORTHWEST PIPELINE	County:	RIO ARRIBA
Address:		Field:	BLANCO M.V.
		Formation:	MESA VERDE
Attention:	MIKE TURNBAUGH	Lease:	BLANCO
Date Sampled:	3/17/88	Well:	ROSA #94

WATER ANALYSIS

Specific Grav:	1.030	pH:	6.70
Chloride:	26,794 mg/l	Calcium:	994 mg/l
Bicarbonate:	976 mg/l	Magnesium:	65 mg/l
Sulfate:	50 mg/l	Total Iron:	0
Sulfide:	0	Sodium:	16,085 mg/l
Total Hardness (as CaCO3):	2,752 mg/l	Total Dislvd Solids:	45,664 mg/l
Resistivity:	0.24	Ohm Meters @:	60 F
Potassium:	700 mg/l	Carbonate:	N D

Sample Source: FLUID SAMPLE WAS TAKEN FROM TBG. SOURCE.

Remarks: FLUID SAMPLE HAS A HIGH SPECIFIC GRAVITY, AND A LARGE AMOUNT OF T.D.S.

Analyst: JAMES M. SHAW
Smith Representative: MIKE CONREY

Attachment IV 4

		Report No:	1
		Date:	3/24/88
Company:	NORTHWEST PIPELINE	County:	RIO ARRIBA
Address:		Field:	GOBERNADOR
		Formation:	MESA VERDE
Attention:	MIKE TURNBAUGH	Lease:	BLANCO M.V.
Date Sampled:	3/21/88	Well:	ROSA #45

WATER ANALYSIS

Specific Grav:	1.025	pH:	9.00
Chloride:	18,996 mg/l	Calcium:	794 mg/l
Bicarbonate:	201 mg/l	Magnesium:	223 mg/l
Sulfate:	0	Total Iron:	0
Sulfide:	0	Sodium:	10,783 mg/l
Total Hardness (as CaCO3):	2,902 mg/l	Total Dislvd Solids:	31,477 mg/l
Resistivity:	0.25	Ohm Meters @:	60 F
Potassium:	500 mg/l	Carbonate:	N D

Sample Source: FLUID SAMPLE WAS TAKEN FROM WELLHEAD.

Remarks: FROM A PRECIPITANT TEST. THE SAMPLE SHOWED A STRONG SULFIDE PRECIPITANT. THE SAMPLE HAD A HIGH P.H. AND A HIGH SPECIFIC GRAVITY.

Analyst: JAMES M. SHAW
Smith Representative: MIKE CONREY

Fld.: Produced water - S.J. 30-6 Unit

Attachment IV 4

WATER ANALYSIS

SPECIFIC GRAVITY:	1.045	pH:	7.84
CHLORIDES:	855 mg/l	MAGNESIUM:	31.6 mg/l
BICARBONATES:	11700 mg/l	TOTAL IORN:	0 mg/l
SULFATES:	0 mg/l	SODIUM:	4800 mg/l
SULFIDES	0 mg/l	TOTAL DISOLVED SOLIDS:	17500 mg/l
POTASSIUM:	0 mg/l	CARBONATES:	0 mg/l
RESISTIVITY:	7.2 ohm meters		
TOTAL HARDNESS:	90.2 mg/l		

SAMPLE SOURCE : TUBING

WELLNAME: SAN JUAN 30-6 UNIT FRT.

LOCATION: NE/4, T30N, R7W, RIO ARRIBA COUNTY

APPLICATION FOR AUTHORIZATION TO INJECT

ATTACHMENT V

Geologic Data

The injection zone in the Rosa No. 94 well will be the lower Cliffhouse Sandstone, the Menefee Formation, and the Point Lookout Sandstone. All three formations are part of the Mesaverde Group of Upper Cretaceous age. The top of the Cliffhouse occurs at a depth of 5121 feet. The top of the Menefee is at 5386 feet, and the top of the Point Lookout is at 5550 feet. The proposed injection zone is from 5360 feet to 5681 feet. The total thickness of the Mesaverde Group in this area (from the top of the Cliffhouse Sandstone to the top of the Mancos Shale) is approximately 800 feet.

The lithology of the Cliffhouse Sandstone consists primarily of gray, micaceous siltstone interbedded with very fine-grained gray, well-sorted, calcareous, argillaceous transgressive marine sandstone. The Menefee Formation includes interbedded sandstones, shales, and thin coals deposited in a continental (swamp, floodplain) environment. The sandstones are gray to tan, fine-grained, medium sorted, micaceous, and dolomitic. The shales are dark gray, fissle, argillaceous, and coaly. The coal is blocky and shaly. The Point Lookout Sandstone is a tan to gray, very fine-grained to fine-grained, well-sorted, slightly calcareous, slightly argillaceous regressive marine sandstone interbedded with gray, argillaceous siltstone. Sandstones of the Cliffhouse and Point Lookout exhibit a greater degree of continuity as compared to sandstones of the Menefee Formation.

Surface geologic maps and subsurface structure maps of several horizons indicate no evidence of open faults between the injection zone and overlying or underlying aquifers. No other types of hydrologic connections between the injection zone and aquifers are known to exist. The confining layer will be the Lewis Shale, which is approximately 1750 feet thick.

Underground aquifers overlying the proposed injection zone include the San Jose, the Nacimiento, and the Ojo Alamo formations (Lyford, 1979). The top and bottom of each aquifer are as follows: San Jose - surface to 1520 feet; Nacimiento - 1520 feet to 2370 feet; Ojo Alamo - 2370 feet to 2573 feet. No water wells are known to exist in the area of review. On the basis of water samples taken from the Ojo Alamo Formation from a well in the San Juan 30-6 Unit operated by Meridian Oil, total dissolved solids in the Ojo Alamo are expected to be greater than 10,000 mg/l. Water samples taken from the Mesaverde Group in the Rosa No. 94 show total dissolved solids to be 45,664 mg/l. The water resistivity catalog published by Petroleum Information Corporation (1986) indicates the total dissolved solids of the Mesaverde Group to be greater than 10,000 mg/l in the general area.

There are no aquifers immediately underlying the injection zone.

References: Lyford, F. P., 1979, Ground Water in the San Juan Basin, New Mexico and Colorado: U. S. Geological Survey Water-Resources Investigations 79-73.

Denver Well Logging Society, 1986, 1985 Rocky Mountain Formation Water Resistivities: Petroleum Information Corporation, Denver, Colorado.

Attachment VI

I have examined available geologic and engineering data and find no evidence of open faults or any other hydrologic connection between the disposal zone and any underground source of drinking water.

Paul C. Thompson

Paul C. Thompson, P.E.

4/26/88

EXHIBIT VII

Copy of Publication

AFFIDAVIT OF PUBLICATION

No. ~~21715~~

STATE OF NEW MEXICO,
County of San Juan:

Robin S. Hunt being duly

sworn, says: That he is the Legal Typist of

THE FARMINGTON DAILY TIMES, a daily newspaper of general circulation published in English at Farmington, said county and state, and that the

hereto attached legal notice

was published in a regular and entire issue of the said FARMINGTON DAILY TIMES, a daily newspaper duly qualified for the purpose within the meaning of Chapter 167 of the 1937 Session Laws of the State of New Mexico for one ~~XXXXXX~~ consecutive (days) (~~weeks~~) on the same day as follows:

First Publication Friday, April 29, 1988

Second Publication

Third Publication

Fourth Publication

and that payment therefor in the amount of $ 7.95

has been made.

Robin S. Hunt

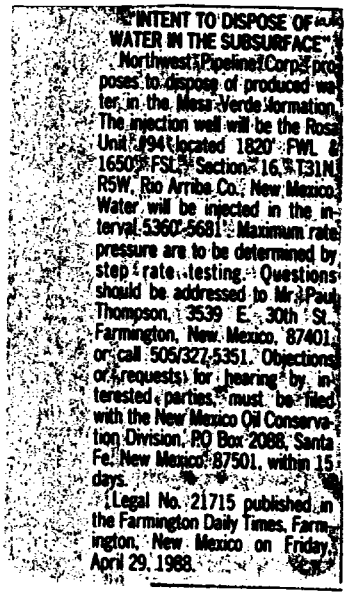
Subscribed and sworn to before me this 29th day

of April, 19 88.

Connie Andrae

NOTARY PUBLIC, SAN JUAN COUNTY, NEW MEXICO

My Commission expires: July 3, 1989



"INTENT TO DISPOSE OF WATER IN THE SUBSURFACE"

Northwest Pipeline Corp. proposes to dispose of produced water in the Mesa Verde formation. The injection well will be the Rosa Unit #94 located 1820' FWL & 1650' FSL, Section 16, T31N, R5W, Rio Arriba Co., New Mexico. Water will be injected in the interval 5360'-5681'. Maximum rate pressure are to be determined by step rate testing. Questions should be addressed to Mr. Paul Thompson, 3539 E. 30th St., Farmington, New Mexico, 87401, or call 505/327-5351. Objections or requests for hearing by interested parties must be filed with the New Mexico Oil Conservation Division, PO Box 2088, Santa Fe, New Mexico 87501, within 15 days.

Legal No. 21715 published in the Farmington Daily Times, Farmington, New Mexico on Friday, April 29, 1988.

NORTHWEST PIPELINE CORPORATION
PRODUCTION & DRILLING
3539 East 30th Street
Farmington, New Mexico 87401

April 29, 1988

CERTIFIED MAIL

U.S. Forest Service
ATTN: Jim Tensfield
Jicarilla Ranger Station
Blanco, New Mexico 87514

RE: Rosa Unit #94 Disposal Well Application

Dear Mr. Tensfield:

As you are aware, Northwest Pipeline plans to convert the Rosa Unit #94 (Sec. 16, T31N, R5W) into a water disposal well. As the surface owner, we are required by NMOCD regulations to notify you by certified mail. Details of our proposal are outlined in the attached "Application for Authorization to Inject". If you object to this proposal you must notify the New Mexico Oil Conservation Division in Aztec within Fifteen days.

If you should have any stipulations other that those you have transmitted to Mike Turnbaugh, or if you have any questions concerning this application please call me at (505) 327-5351.

Sincerely,

Paul C. Thompson

Paul C. Thompson
Manager, Prod & Drlg

PCT/kr