MT50913-0005

95395 - R8 FRED

Release in Full

unable to do data entry — Could not find place for document to be recorded.

-C

no activities

add last doc

MT50913-0005

204-079 PRIV

205a(1)

UIC - MT50913-0005 - PERMIT

BIERE #1-22A THRU BIERE #1-22D

2

0

4

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
Denver, CO 80202-1129
Phone 800-227-8917
www.epa.gov/region8

DEC 22 2017

Ref: 8WP-SUI

Michael Jacobs, P.G.
Corporate Remediation Advisor
Pioneer Natural Resources
2011 N. CR 1140
Midland, Texas 79705

Re: Area Permit Expiration, MT50913-00000

Dear Mr. Jacobs:

This letter is to notify you that your U.S. Environmental Protection Agency Region 8 Underground Injection Control (UIC) Area Permit MT50913-00000 has expired under the terms of its Permit conditions. We have received documentation that the following wells under the area Permit have been plugged and abandoned and no longer operate as UIC wells:

MT50913-04621, Biere 1-22B
MT50913-04622, Biere 1-22C
MT50913-04623, Biere 1-22D

The following well under the area Permit was never drilled:

MT50913-04620, Biere 1-22A

Please contact Benjamin D'Innocenzo regarding the release of financial assurance at dinnocenzo.benjamin@epa.gov or at (303) 312-6342.

If you have any questions or comments about the above action, please contact Wendy Cheung by email at cheung.wendy@epa.gov or by telephone at (303) 312-6242. You may also send written comments to the letterhead address, citing "Attention: Wendy Cheung, Mail Code 8WP-SUI."

Sincerely,

Darcy O'Connor
Assistant Regional Administrator
Office of Water Protection

cc: Deb Madison
Environmental Program Manager
Ft. Peck, Sioux and Assiniboine Tribes

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
Denver, CO 80202-1129
Phone 800-227-8917
www.epa.gov/region8

Concurrence Copy

DEC 22 2017

Ref: 8WP-SUI

Michael Jacobs, P.G.
Corporate Remediation Advisor
Pioneer Natural Resources
2011 N. CR 1140
Midland, Texas 79705

Re: Area Permit Expiration, MT50913-00000

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MT50913-04621, Biere 1-22B
MT50913-04622, Biere 1-22C
MT50913-04623, Biere 1-22D

The following well under the area Permit was never drilled:

MT50913-04620, Biere 1-22A

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Sincerely,

Darcy O'Connor
Assistant Regional Administrator
Office of Water Protection

CONCUR	Author + ext.	First initial + last name	C-Cline					
	B G	Office code	8WP-SUI	8WP-SUI		8WP-S	8WP-S	
	6455	Date	12/15/17	12/18/17		12/19/17	12/19/17	

cc: Deb Madison
Environmental Program Manager
Ft. Peck, Sioux and Assiniboine Tribes

bcc:

8ENF-W-SDW, Gary Wang
8ENF-RC, Benjamin D'Innocenzo

Form Approved UMB No 2040-0042

EPA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

PLUGGING RECORD

NAME AND ADDRESS OF PERMITTEE: Pioneer Natural Resources USA Inc, 1401 17th St. Ste. 1200 Denver CO 80202

NAME AND ADDRESS OF CEMENTING COMPANY: Basic Energy Serv. 3451 LeTourneau Gillette WY 82718

STATE	COUNTY	PERMIT NUMBER
MT	Roosevelt	MT50913-00000

LOCATE WELL AND OUTLINE UNIT ON SECTION PLAT — 640 ACRES

N / W / E / S

SURFACE LOCATION DESCRIPTION
___ 1/4 of C 1/4 of NW 1/4 of SW 1/4 of Section 22 Township 28N Range 51E

LOCATE WELL IN TWO DIRECTIONS FROM NEAREST LINES OF QUARTER SECTION AND DRILLING UNIT
Surface Location 1873 ft. from (N/S) S Line of quarter section
and 644 ft. from (E/W) W Line of quarter section

TYPE OF AUTHORIZATION
- ☒ Individual Permit
- ☐ Area Permit
- ☐ Rule

Number of Wells 1

Lease Name Biere 1-22C

Describe in detail the manner in which the fluid was placed and the method used in introducing it into the hole
Set cast iron Bridge Plug @ 662' Run tubing & tag CIBP. Set balanced cement plug twice, once on top of BP and once at well mid-depth. Cement extends from CIBP to surface

CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT(LB/FT)	TO BE PUT IN WELL(FT)	TO BE LEFT IN WELL(FT)	HOLE SIZE
13 3/8	54.5	59	59	17.5
9 5/8	36	241	241	12.25
5 1/2	15.5	679	679	7 7/8

METHOD OF EMPLACEMENT OF CEMENT PLUGS
- ☐ CLASS I
- ☐ CLASS II
  - ☐ Brine Disposal
  - ☐ Enhanced Recovery
  - ☐ Hydrocarbon Storage
- ☐ CLASS III
- ☒ The Balance Method
- ☐ The Dump Bailer Method
- ☐ The Two-Plug Method
- ☒ Other Class IV

CEMENTING TO PLUG AND ABANDONED DATA	PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6	PLUG #7
Size of Hole or Pipe in which Plug Will Be Placed (inches)	5 1/2						
Depth to Bottom of Tubing or Drill Pipe (ft.)	662	Bridge Plug setting depth					
Sacks of Cement To Be Used (each plug)	100	} mixed excess to pit and top off					
Slurry Volume To Be Pumped (cu. ft.)	20.5						
Calculated Top of Plug (ft.)	0						
Measured Top of Plug (if tagged ft.)	0						
Slurry Wt. (Lb./Gal.)	15.8						
Type cement or other material (Class III)	Class G						

U2 Entered
Date 11/3/15
Initial DB

LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS

From	To	From	To
679	844		

TAB	GREEN	BLUE	CBI
		✓	

Signature of Cementer or Authorized Representative

Signature of EPA Representative

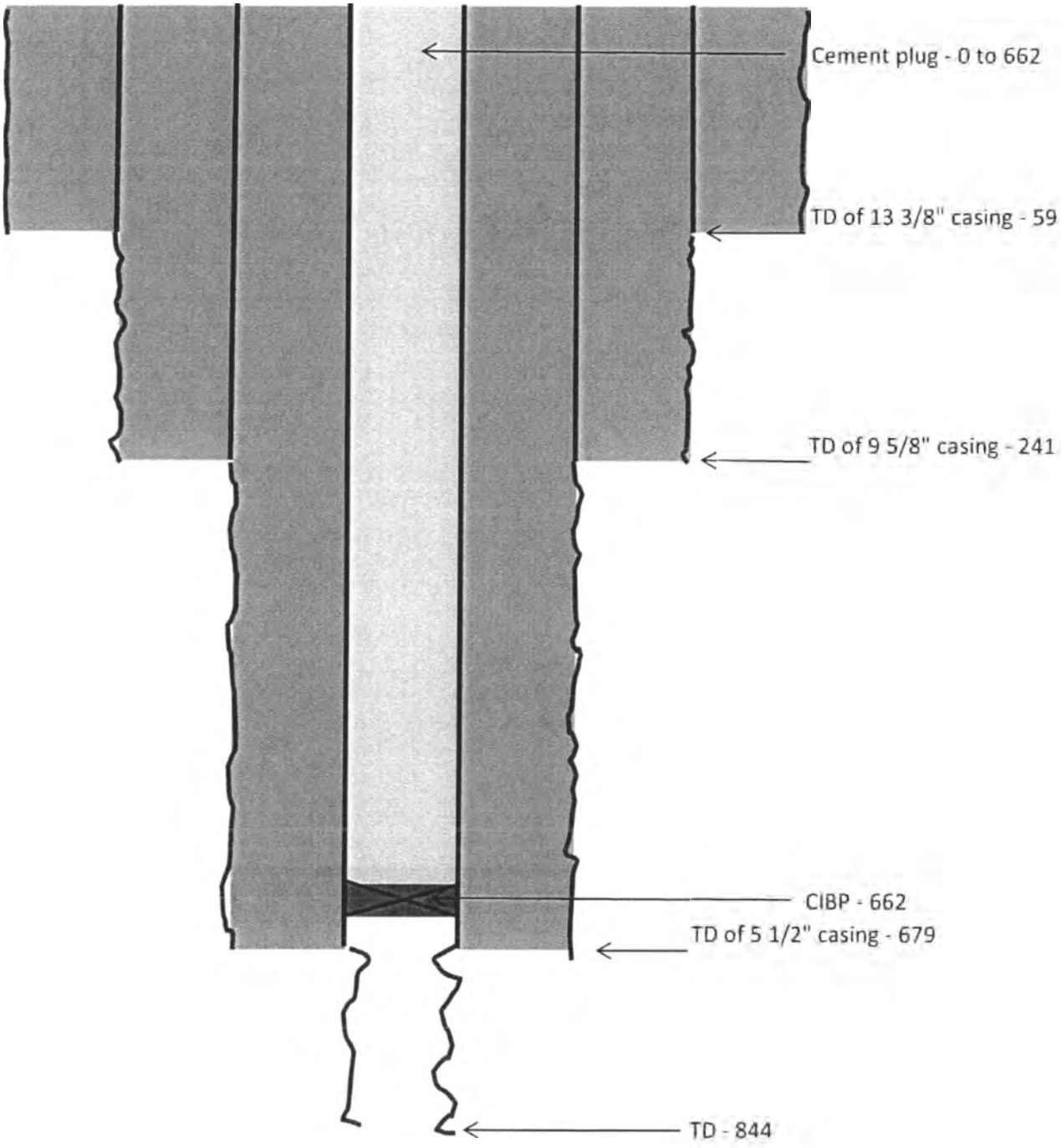
CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. (REF. 40 CFR 122.22)

NAME AND OFFICIAL TITLE (Please type or print)	SIGNATURE	DATE SIGNED
Donald Wirth, Staff Ops Eng	Donald Wirth	6-30-15

EPA Form 7520-13 (1-84)

Biere 1-22C Post P&A Wellbore Schematic



BASIC ENERGY SERVICES

3451 LeTourneau
Gillette, WY 82718
307-682-5258

Cementing Ticket **No. 1719** 18993 **A**

Date	Customer Order No.		Sect.	Twp.	Range	Truck Called Out	On Location	Job Began	Job Completed
6-25-15		NW	22	28	51	7:00 A	8:00 A	10:00 A	7:00 P

Owner	Contractor	Charge To
Pioneer Natural Res	Basic Energy	Pioneer Natural Res

Mailing Address	City	State
~~Biere 1-22C~~		

Well No. & Form	Place	County	State
Biere 1-22C	Wolf Point	Roosevelt	Mt

Depth of Well	Depth of Job	Casing	Size	Weight	Size of Hole	Amt. and Kind of Cement	Cement Left in casing by	Request Necessity
	~~620~~ 6621	New / Used	5 1/2	15.5		Class G		feet

Kind of Job	Drillpipe / Tubing	Rotary / Cable	Truck No
P + A	2 7/8		28984

Price Reference No. _____
Price of Job 1586.42
Second Stage _____
Pump Truck Mileage _____
P.U. Mileage 255.00
Other Charges _____
Total Charges 1841.42

Remarks Safety meeting — Water ahead 5bbl
Mix 50SK Class G Cemt — Shutdown Lay down
10 Jts of Tubing
Mix 50SK class G Cemt to Surf. Lay down
rest of Tubing — Top out 1-22C

Cementer Jim Lead Yield 1.15 Lead Wt 15.8 Lead Water 4.99 SV 20.5
Helper Dan Juan Tail Yield _____ Tail Wt. _____ Lead Water _____ SV _____
District Gillette State Wy

The above job was done under supervision of the owner, operator, or his agent whose signature appears below

Donald Wirth
Agent of contractor or operator

Sales Ticket for Materials Only

QUANTITY SACKS	BRAND AND TYPE	PRICE	TOTAL
100	Class G	19.80	1980.00
3	Crew Subsistance (per man)	200.00	600.00
Plugs			

Equipment #	HRS				
28984	2	100	Handling & Dumping	2.44	244.00
84125	1	4.7	Mileage 100	1.95	916.50
			Sub Total		5581.92
			Discount		
			Sales Tax Not	included	
			Total		

Signature of operator Jim Hayter

BAKER HUGHES

JOB LOG

Total Operation Hours

Date: June 25, 2015

Operating Company: Pioneer Natural Resources Represented by: Don Wirth

Well Name: Biere Well Number: 1-22C Field: 0 State: North Dakota

SST# 7344623 BOT Rep: Oleg Anderson District: Williston (CHC) - 3747

DETAIL THE JOB - THIS FORM USED TO REPORT WHAT ACTUALLY TOOK PLACE - FILL OUT COMPLETELY

Date	Time	Operations & Remarks
		RELEASE MODEL "J-LOK" CASING PACKER, RUN IN W/2AA CICR ON K-1
6/25/15	15:00	Move over from the Biere 1-22D
		RU workover rig
	16:15	RC lunch break, JSA
	16:30	At N:~5K, release packer w/RH torque held while coming up slowly. Felt pop @~10K
		PU 10' then come down past setting depth to verify tool is released
	16:45	RU workfloor, NU washington head
	17:15	Start TOOH w/J-LOK casing packer and tubing
	17:30	POOH w/packer and tubing
	17:50	MU BHA: 2AA CIBP, K-1 setting tool (SN:ZRR1047), 2-7/8Eu x 2-3/8Eu x-o, 2-7/8 Perf sub
		Start TIH w/BHA and 2-7/8" 6.5# Eu L-80 tubing
		NEXT PAGE ———>

CUSTOMER SATISFACTION EVALUATION

This Section is completed by the Customer Representative upon completion of each job. Your comments are very important to us

Did BOT meet Job/Performance expectations? (Yes/No) _____ Would you use BOT again? (Yes/No) _____

Did BOT equipment arrive on time? (Yes/No) _____ Did BOT personnel arrive on time? (Yes/No) _____

HOW CAN BAKER OIL TOOLS IMPROVE?

Customer Representative Signature: _____ Date: _____

Baker Representative Signature: Oleg Anderson Date: 6-25-15

JOURNEY MANAGEMENT LOG (FOR INTERNAL BHI USE ONLY)

*This is mandatory for all outbound or inbound trips including from one location to another. At the time of call in you may ask for the call ID number before hanging up or this number can be found in the confirmation text message sent immediately after calling in.

*Date	*Time	*Call/Text ID #	NOTE	*Date	*Time		NOTE

BAKER HUGHES

JOB LOG

Page 2 of

Date: June 25, 2015

Operating Company: Pioneer Natural Resources Represented by: Don Wirth

Well Name: Biere Well Number: 1-22C Field: 0 State: North Dakota

SST# 7344623 BOT Rep: Oleg Anderson District: Williston (CHC) - 3747

DETAIL THE JOB - THIS FORM USED TO REPORT WHAT ACTUALLY TOOK PLACE - FILL OUT COMPLETELY

Date	Time	Operations & Remarks
6/25/15	18:30	At setting depth of 662', come up 3' and rotate tubing 10 turns to the right to unscrew control nut and releas
		upper slips, come down 3' to setting depth, perform P/P of 30K over, stack out x3
		At Neutral, rotate tbing to the right, shear screw and continue with 6 more RH rotations
	18:35	PU out of CIBP, MU iron, start pumping 4.5bbls cement
	18:45	Stop pumping cement, break out iron, LD 10 joints of tubing
		MU iron, pump 5.5 bbls of cement
	19:00	Stop pumping cement, break out iron, LD 11 joints and BHA
	19:15	POOH w/BHA, LD tools, RD work floor
		Top off Biere 1-22D,C wells with cement
		Clean up setting tool of cement, load up tools, finish pw
	20:00	Leave location
	22:00	Arrive at shop, clean out tools, finalize paperwork
		NEXT PAGE --------->

JL 1.2 Rev (New)

Form Approved UMB No 2040-0042

EPA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

PLUGGING RECORD

NAME AND ADDRESS OF PERMITTEE: Pioneer Natural Resources USA Inc, 1401 17th St. Ste 1200 Denver CO 80202

NAME AND ADDRESS OF CEMENTING COMPANY: Basic Energy Serv. 3451 LeTourneau Gillette WY 82718

LOCATE WELL AND OUTLINE UNIT ON SECTION PLAT — 640 ACRES

N / W / E / S

STATE	COUNTY	PERMIT NUMBER
MT	Roosevelt	MT5D913-00000

SURFACE LOCATION DESCRIPTION
___ 1/4 of C 1/4 of NW 1/4 of SW 1/4 of Section 22 Township 28N Range 51E

LOCATE WELL IN TWO DIRECTIONS FROM NEAREST LINES OF QUARTER SECTION AND DRILLING UNIT
Surface Location 1984 ft. from (N/S) S Line of quarter section
and 634 ft. from (E/W) W Line of quarter section

TYPE OF AUTHORIZATION
- ■ Individual Permit
- □ Area Permit
- □ Rule

Number of Wells 1

Lease Name Biere 1-22D

Describe in detail the manner in which the fluid was placed and the method used in introducing it into the hole
Set cast iron bridge plug @ 663' Run tubing & tag CIBP. Set balanced cement plug twice, once on top of bridge plug and once at well mid depth. Cement extends from CIBP to surface.

CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT(LB/FT)	TO BE PUT IN WELL(FT)	TO BE LEFT IN WELL(FT)	HOLE SIZE
13 3/8	54.5	50	50	17.5
9 5/8	36	244	244	12.25
5 1/2	15.5	697	697	7 7/8

METHOD OF EMPLACEMENT OF CEMENT PLUGS
- □ CLASS I
- □ CLASS II
  - □ Brine Disposal
  - □ Enhanced Recovery
  - □ Hydrocarbon Storage
- □ CLASS III
- ■ The Balance Method
- □ The Dump Bailer Method
- □ The Two-Plug Method
- ■ Other Class IV

CEMENTING TO PLUG AND ABANDONED DATA	PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6	PLUG #7
Size of Hole or Pipe in which Plug Will Be Placed (inches)	5 1/2						
Depth to Bottom of Tubing or Drill Pipe (ft.)	663	Bridge Plug setting depth					
Sacks of Cement To Be Used (each plug)	100	} mixed - excess to pit and top off					
Slurry Volume To Be Pumped (cu. ft.)	20.4						
Calculated Top of Plug (ft.)	0						
Measured Top of Plug (if tagged ft.)	0						
Slurry Wt. (Lb./Gal.)	15.8						
Type cement or other material (Class III)	Class G						

LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS

From	To	From	To
697	729		

U2 Entered
Date 11/3/15
Initial JB

	GREEN	BLUE	CBI
TAB		2	

Signature of Cementer or Authorized Representative

Signature of EPA Representative

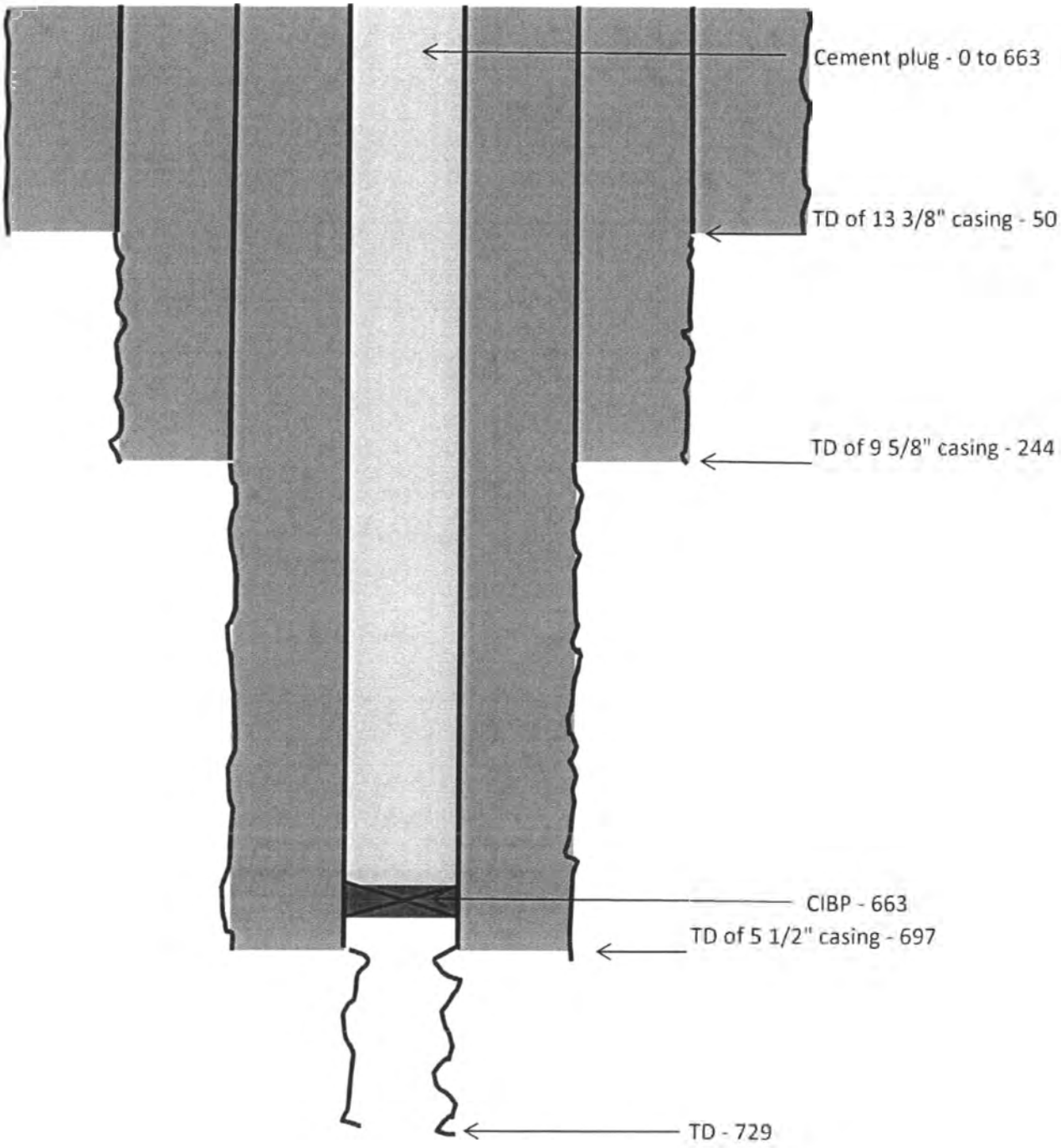
CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. (REF. 40 CFR 122.22)

NAME AND OFFICIAL TITLE (Please type or print)	SIGNATURE	DATE SIGNED
Donald Wirth, Staff Ops Eng	Donald Wirth	6-30-15

EPA Form 7520-13 (1-84)

Biere 1-22D Post P&A Wellbore Schematic



BASIC ENERGY SERVICES

3451 LeTourneau
Gillette, WY 82718
307-682-5258

Cementing Ticket **No. 1719** 18992 **A**

Date	Customer Order No.	N/W / SW	Sect.	Twp.	Range	Truck Called Out	On Location	Job Began	Job Completed
6-25-15			22	28 N/W	3 SW	700A	8:00 A	12:00 p	1:00 p

Owner	Contractor	Charge To
Pioneer Natural Res.	Basic Energy	Pioneer Natural Res.
Mailing Address	City	State

Well No. & Form	Place	County	State
Biere 1-22 D	Wolf Point	Roosevelt	Mt

Depth of Well	Depth of Job	Casing (New / Used)	Size / Weight	Size of Hole / Amt. and Kind of Cement	(Cement Left / in casing by)	Request / Necessity	feet
	~~647~~ 663'		5 1/2 / 15.5	Class G			

Kind of Job	Drillpipe / Tubing	(Rotary / Cable)	Truck No.
P + A	2 7/8		28984

Price Reference No. _____
Price of Job 1618.20
Second Stage _____
Pump Truck Mileage _____
P.U. Mileage 255.00
Other Charges _____
Total Charges 1873.20

Remarks Safety meeting - water ahead - 5bbl
Mix 45 sk Class G. follow with 1/2bbl
Water - Shutdown Lay down 10 Jts Tubing
Mix 55 SK Class G Cemt to Surf - Shutdown
Lay down Tubing - Top out 1-22B + 1-22
D. Wells

Cementer Jim Lead Yield 1.15 Lead Wt 15.8 Lead Water 4.99 SV 20.4
Helper Dan - Juan Tail Yield _____ Tail Wt. _____ Lead Water _____ SV _____
District Gillette State W4

The above job was done under supervision of the owner, operator, or his agent whose signature appears below.

Donald Wirth
Agent of contractor or operator

Sales Ticket for Materials Only

QUANTITY SACKS	BRAND AND TYPE	PRICE	TOTAL
100	Class G Cemt.	19.80	1980.00
3	Crew Subsistance (per man)	200.00	600.00
Plugs			

Equipment #	HRS				
		100	Handling & Dumping	2.44	244.00
28984		4.7	Mileage 100	1.95	916.50
84125			Sub Total		5613.70
			Discount		
			Sales Tax	Not Included	
Signature of operator Jim Hayter			Total		

BAKER HUGHES

JOB LOG

Total Operation Hours

Date: June 25, 2015

Operating Company: Pioneer Natural Resources Represented by: Don Wirth

Well Name: Biere Well Number: 1-22D Field: 0 State: North Dakota

SST# 7344624 BOT Rep: Oleg Anderson District: Williston (CHC) - 3747

DETAIL THE JOB - THIS FORM USED TO REPORT WHAT ACTUALLY TOOK PLACE - FILL OUT COMPLETELY

Date	Time	Operations & Remarks
		RELEASE MODEL "J-LOK" CASING PACKER, RUN IN W/2AA CICR ON K-1
6/25/15	7:00	Leave shop
	9:00	Arrive on location, Meet w/CM for well info and operations, Bleeding off well
		Well head cap is siezed up, trying to break loose, JSA
	10:30	At N:~5K, release packer with right hand torque held and slowly coming up, felt pop at ~12K
	10:45	RU workfloor
	11:15	Start TOOH w/J-LOK casing packer
	11:40	POOH w/BHA
		Tally pulled tbg: 21jts= 665'
		MU BHA: 2AA CIBP, K-1 setting tool(SN: 11931383), 2-7/8Eu x 2-3/8Eu x-o, 2-7/8 Perf sub
	12:15	Start TIH w/BHA and 2-7/8" 6.5# Eu L-80 tbg
	13:00	At setting depth of 663', PU 3', rotate tubing to the right 10 turns to release control nut and free the upper
		slips, Set down 3' back to setting depth, perform P/P 30K over, slack off, 30K over, slack off, 30K over, sla
		NEXT PAGE ——>

CUSTOMER SATISFACTION EVALUATION

This Section is completed by the Customer Representative upon completion of each job. Your comments are very important to us

Did BOT meet Job/Performance expectations? (Yes/No) _____ Would you use BOT again? (Yes/No) _____

Did BOT equipment arrive on time? (Yes/No) _____ Did BOT personnel arrive on time? (Yes/No) _____

HOW CAN BAKER OIL TOOLS IMPROVE?

Customer Representative Signature: _____ Date: _____

Baker Representative Signature: Oleg Anderson Date: 6-25-15

JOURNEY MANAGEMENT LOG (FOR INTERNAL BHI USE ONLY)

*This is mandatory for all outbound or inbound trips including from one location to another. At the time of call in you may ask for the call ID number before hanging up or this number can be found in the confirmation text message sent immeditately after calling in.

*Date	*Time	*Call/Text ID #	NOTE	*Date	*Time		NOTE

BAKER HUGHES

JOB LOG

Date: June 25, 2015

Operating Company: Pioneer Natural Resources Represented by: Don Wirth

Well Name: Biere Well Number: 1-22D Field: 0 State: North Dakota

SST# 7344624 BOT Rep: Oleg Anderson District: Williston (CHC) - 3747

DETAIL THE JOB - THIS FORM USED TO REPORT WHAT ACTUALLY TOOK PLACE - FILL OUT COMPLETELY

Date	Time	Operations & Remarks
6/25/15		Off to Neutral
	13:05	At Neutral, pull ~500# tension, rotate tubing to the right, felt screw shear, and continue to rotate tubing
		another 6 turns to the right, Pull up and out of the CIBP
	13:10	MU iron, pump ~7bbl cement
	13:25	Stop pumping, break out iron, LD 10 joints
	13:35	MU iron, pump ~9bbl cement
	13:45	Stop pumping, break out iron, LD 11 joints and BHA
	14:00	POOH w/BHA, break out tools, wash up setting tool
		Rig down and move over to the Biere 1-22C well
	15:00	Move rig over to next well
		NEXT PAGE ------->

RECEIVED

JUL 07 2015

Office of Enforcement, Compliance and Environmental Justice

Form Approved UMB No 2040-0042

EPA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

PLUGGING RECORD

NAME AND ADDRESS OF PERMITTEE: Pioneer Natural Resources USA Inc, 1401 17th St. Ste 1200 Denver Colorado 80202

NAME AND ADDRESS OF CEMENTING COMPANY: Basic Energy Serv, 3451 LeTourneau Gillette WY 82718

STATE	COUNTY	PERMIT NUMBER
MT	Roosevelt	MT50913-00000

LOCATE WELL AND OUTLINE UNIT ON SECTION PLAT --- 640 ACRES

N / W / E / S

SURFACE LOCATION DESCRIPTION

___ 1/4 of C 1/4 of NW 1/4 of SW 1/4 of Section 22 Township 28N Range 51E

LOCATE WELL IN TWO DIRECTIONS FROM NEAREST LINES OF QUARTER SECTION AND DRILLING UNIT

Surface Location 1953 ft. from (N/S) S Line of quarter section

and 654 ft. from (E/W) W Line of quarter section

TYPE OF AUTHORIZATION

- [x] Individual Permit
- [ ] Area Permit
- [ ] Rule

Number of Wells 1

Lease Name Biere 1-22B

Describe in detail the manner in which the fluid was placed and the method used in introducing it into the hole

Set cast Iron Bridge Plug @ 655 run tubing and tag CIBP. Set balanced cement plug. Set 2 cement plugs - each covering half of well depth. Cement extends from CIBP to surface

CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT(LB/FT)	TO BE PUT IN WELL(FT)	TO BE LEFT IN WELL(FT)	HOLE SIZE
13 3/8	54.5	71	71	17.5
9 5/8	36	241	241	12.25
5 1/2	15.5	686	686	7 7/8

METHOD OF EMPLACEMENT OF CEMENT PLUGS

- [ ] CLASS I
- [ ] CLASS II
  - [ ] Brine Disposal
  - [ ] Enhanced Recovery
  - [ ] Hydrocarbon Storage
- [ ] CLASS III
- [x] The Balance Method
- [ ] The Dump Bailer Method
- [ ] The Two-Plug Method
- [x] Other Class IV

CEMENTING TO PLUG AND ABANDONED DATA	PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6	PLUG #7
Size of Hole or Pipe in which Plug Will Be Placed (inches)	5 1/2						
Depth to Bottom of Tubing or Drill Pipe (ft.)	655	Bridge Plug setting depth					
Sacks of Cement To Be Used (each plug)	85	} mixed - excess to pit and top off					
Slurry Volume To Be Pumped (cu. ft.)	17.5						
Calculated Top of Plug (ft.)	0						
Measured Top of Plug (if tagged ft.)	0						
Slurry Wt. (Lb./Gal.)	15.8						
Type cement or other material (Class III)	Class G						

SHEEN	BLUE	GBI
	2	

LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS

From	To	From	To
656	729		

U2 Entered

Signature of Cementer or Authorized Representative

Signature of EPA Representative

Date 11/3/15

Initial DB

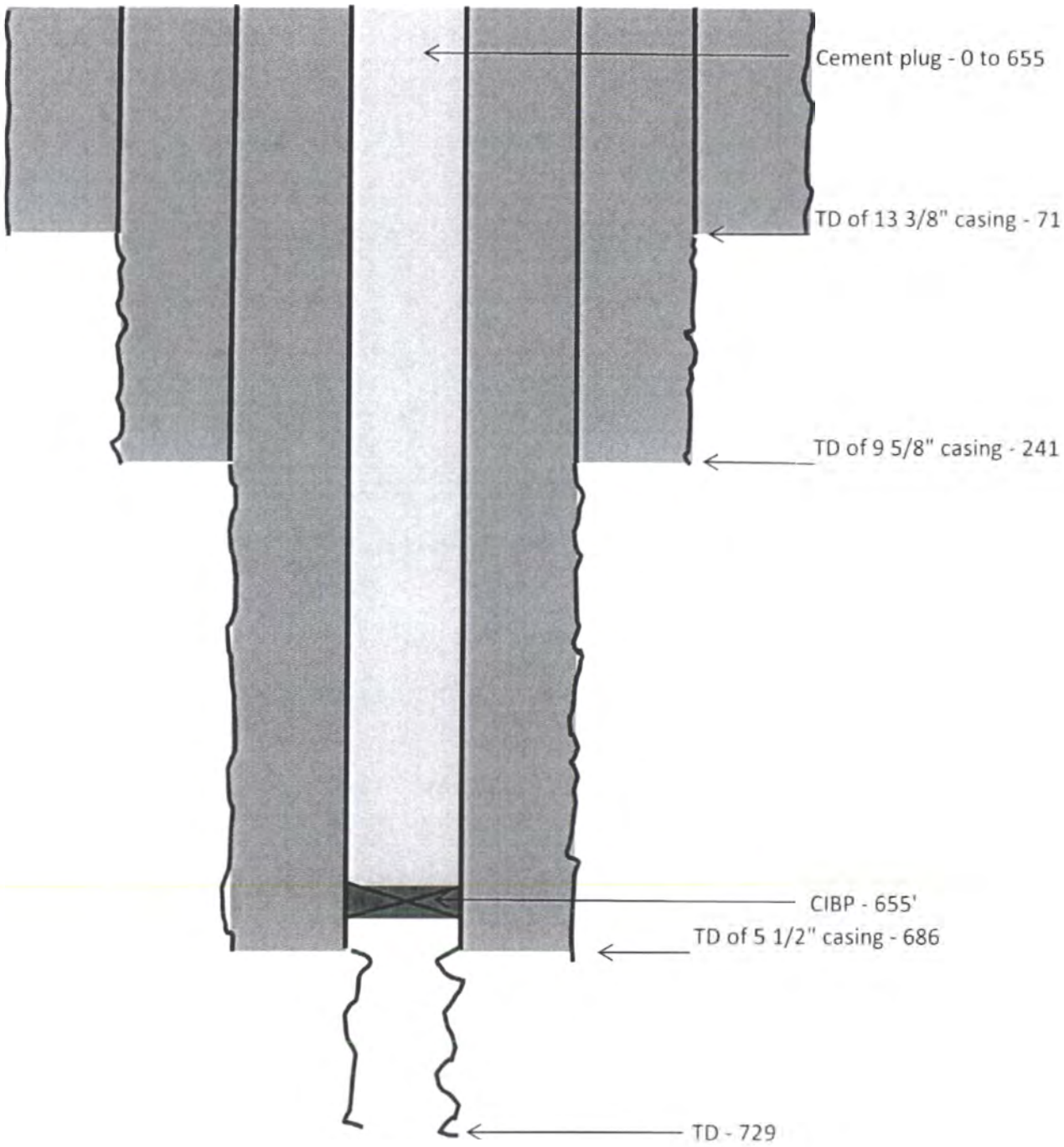
CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. (REF. 40 CFR 122.22)

NAME AND OFFICIAL TITLE (Please type or print)	SIGNATURE	DATE SIGNED
Donald Wirth, Staff Ops Eng	Donald Wirth	6-30-15

EPA Form 7520-13 (1-84)

Biere 1-22B Post P&A Wellbore Schematic



BASIC ENERGY SERVICES

3451 LeTourneau
Gillette, WY 82718
307-682-5258

Cementing Ticket **No. 1719** 18991 **A**

Date	Customer Order No.		Sect.	Twp.	Range	Truck Called Out	On Location	Job Began	Job Completed
6-24-15		N/W SW	22	28	51	300 A	10:00 A	4:45 P	7:00 P

Owner	Contractor	Charge To
Pioneer Natural Res.	Basic Energy	Pioneer Natural Res.
Mailing Address	City	State

Well No. & Form	Place	County	State
Diere 1-22 B		Roosevelt	Mt.

Depth of Well	Depth of Job	Casing (New / Used)	Size / Weight	Size of Hole / Amt. and Kind of Cement	Cement Left in casing by	Request Necessity
	~~6~~ 21'		5 1/2 / 15.5	Class G		feet

Kind of Job: P + A 6551' QW

Drillpipe / Tubing: 2 7/8 (Rotary / Cable) Truck No. 28984

Price Reference No.
Price of Job 1587.60
Second Stage
Pump Truck Mileage 700.00
P.U. Mileage 425.00
Other Charges
Total Charges 2712.60

Remarks: Safety meeting - Water ahead 5661
Mix 35 SK Class G Cemt.
Shutdown Pull Tubing - 9 Jts
Mix 50 SK to Surf - shutdown - Pull Tubing

Cementer: Jim Lead Yield 1.15 Lead Wt 15.8 Lead Water 4.99 SV 17.5
Helper: Dan - Juan Tail Yield Tail Wt Lead Water SV
District: Gillette State: Wy

The above job was done under supervision of the owner, operator, or his agent whose signature appears below.

Donald Wirth
Agent of contractor or operator

Sales Ticket for Materials Only

QUANTITY SACKS	BRAND AND TYPE	PRICE	TOTAL
85	G Cemt	19.80	1683.00
1	4 hr additional hr.	1036.60	1036.60
3	Crew Subsistence (per man)	200.00	600.00
Plugs			

Equipment #	HRS				
28984	2	85	Handling & Dumping	2.44	207.40
84125	1/2	3.995	Mileage 100	1.95	779.03
			Sub Total		7018.63
			Discount		
			Sales Tax	No TAX included	
			Total		

Signature of operator: Jim Hayter

BAKER HUGHES

JOB LOG

Total Operation Hours

Date: June 24, 2015

Operating Company: Pioneer Natural Resources Represented by: Don Wirth

Well Name: Biere Well Number: 1-22B Field: 0 State: North Dakota

SST# 7344609 BOT Rep: Oleg Anderson District: Williston (CHC) - 3747

DETAIL THE JOB - THIS FORM USED TO REPORT WHAT ACTUALLY TOOK PLACE - FILL OUT COMPLETELY

Date	Time	Operations & Remarks
		RELEASE MODEL "J-LOK" CASING PACKER, RUN IN W/2AA CICR ON K-1
6/24/15	10:00	Leave shop
	12:00	Arrive on location, Meet w/CM for well info and operations
		RC rigging up rig, Bleed off well pressure, Spot in cementers
	13:30	Pump down tubing to establish injection rate, pressure immediately increased to 200psi, shut down
		Well not taking any fluid
	14:30	CM looking for flange,BOP's, Washington head for well control
		MU kelly hose to tubing and let flow to frac tank, no fluid coming out, well bled off
	15:00	CM decided to pull tubing when packer is released
	15:15	Latch on to tubing, make up TI
	15:30	At N:5K, torque tubing to the right and come up slowly to release packer. Felt pop @~ 10K packer free.
		PU 10' to stretch out tool
	15:40	Come back down to top of collar @ slips, MU 8' pup joint and go down past set depth to verify packer is fre
		NEXT PAGE --------->

CUSTOMER SATISFACTION EVALUATION

This Section is completed by the Customer Representative upon completion of each job. Your comments are very important to us

Did BOT meet Job/Performance expectations? (Yes/No) _____ Would you use BOT again? (Yes/No) _____

Did BOT equipment arrive on time? (Yes/No) _____ Did BOT personnel arrive on time? (Yes/No) _____

HOW CAN BAKER OIL TOOLS IMPROVE?

Customer Representative Signature: _____ Date: _____

Baker Representative Signature: Oleg Anderson Date: 6-24-15

JOURNEY MANAGEMENT LOG (FOR INTERNAL BHI USE ONLY)

*This is mandatory for all outbound or inbound trips including from one location to another. At the time of call in you may ask for the call ID number before hanging up or this number can be found in the confirmation text message sent immediately after calling in.

*Date	*Time	*Call/Text ID #	NOTE	*Date	*Time		NOTE

BAKER HUGHES

JOB LOG

Page 2 of

Date: June 24, 2015

Operating Company: Pioneer Natural Resources Represented by: Don Wirth

Well Name: Biere Well Number: 1-22B Field: 0 State: North Dakota

SST# 7344609 BOT Rep: Oleg Anderson District: Williston (CHC) - 3747

DETAIL THE JOB - THIS FORM USED TO REPORT WHAT ACTUALLY TOOK PLACE - FILL OUT COMPLETELY

Date	Time	Operations & Remarks
6/24/15	15:45	RU workfloor
	16:40	Start TOOH w/PKR
	17:00	POOH w/ x-nipple, 6' pup joint, and 45 Model "J-LOK" casing packer
	17:30	MU BHA: 2AA CICR, K-1 setting tool (SN: 11931383), 6' pup joint, x-nipple, 1-jt of tbg, and run in hole
		MU 8',10',8',10',6' pup joints to work string - 6557ft.
		Run in hole w/ 18 stands of tubing, apply 1LH turn half way in the hole to keep tool from setting
	18:15	Stop at setting depth, PU 3', rotate tbg 10RH turns to release control nut and upper slips of CICR
		Come down 3' to setting depth, PU, catch over pull, felt lower slips break, P/P of 30K up, stack out, 30K up
		Stack out, 30K up, come down to 1K over pull and rotate tubing to the right to release setting tool from pkr
		MU Iron, No BS test
	18:40	Pump .5bbl head spacer, 7bbl cement
	18:50	Breakout Iron, LD 10-jts
	19:00	MU iron, pump 7bbl cement untill we see returns in pit
	19:10	Stop pumping cement, breakout iron, LD rest of the tbg and pup joints
		Start TOOH, LD 8jts, 6 subs, 1 joint, x-nipple, 6' pup joint, and setting tool
	19:35	POOH w/ x-nipple, 6' pup joint, K-1 setting tool, clean tools off load up
		CM said to be on location for next well @ 9:00
	20:00	Leave location
	22:00	Arrive @ shop, unload, redress K-1 setting tool, MU 2AA CIBP to K-1 and load up another 2AA CIBP on K-
		NEXT PAGE ——>

Gallant, William

From: Cheung, Wendy
Sent: Tuesday, December 19, 2017 7:36 AM
To: Gallant, William
Subject: FW: Bond for injection wells.... (Pioneer Nat Resources Biere 1-22 (A-D) injection wells)
Attachments: UIC_Wendy.xlsx

From: DInnocenzo, Benjamin
Sent: Tuesday, December 12, 2017 10:00 AM
To: Cheung, Wendy <Cheung.Wendy@epa.gov>
Subject: RE: Bond for injection wells.... (Pioneer Nat Resources Biere 1-22 (A-D) injection wells)

Ok sounds good Wendy. I can give you that now.

From: Cheung, Wendy
Sent: Tuesday, December 12, 2017 9:58 AM
To: DInnocenzo, Benjamin <Dinnocenzo.Benjamin@epa.gov>
Subject: RE: Bond for injection wells.... (Pioneer Nat Resources Biere 1-22 (A-D) injection wells)

What I'm referring to as the FR template (probably not the best word choice, I think of it as the template to build the database) is the spreadsheet that you use to keep track of whether or not we have FR. We're going to be sending a bunch of files to archives and before doing so I want to make sure that we don't have a bond in house.

From: DInnocenzo, Benjamin
Sent: Tuesday, December 12, 2017 9:52 AM
To: Cheung, Wendy <Cheung.Wendy@epa.gov>
Subject: RE: Bond for injection wells.... (Pioneer Nat Resources Biere 1-22 (A-D) injection wells)

Morning Wendy – the bonds are still active in our file for the below mentioned wells. Due to resource constraints, I haven't been proactively returning bonds to operators until I receive a request from the operator directly. This has actually served the team well during this heightened period of well transfers/sales.

I apologize for the delay in getting back FR designs. Things have been busy, but I will work to get something back to you asap.

By FR template, do you mean the well inventory?

Thanks!

Ben

From: Cheung, Wendy
Sent: Tuesday, December 12, 2017 9:29 AM
To: DInnocenzo, Benjamin <Dinnocenzo.Benjamin@epa.gov>
Subject: FW: Bond for injection wells.... (Pioneer Nat Resources Biere 1-22 (A-D) injection wells)

Ben,

Were the bonds ever released for these wells?

Also, how's the FR design coming? I'd like to get that started. Please also send me your FR template so that we can clear out these files that we think are closed out. Alternatively, I can send you the list and you can let us know if we still have their FR.

Thanks, Wendy

From: Wiser, Nathan
Sent: Thursday, December 7, 2017 7:41 AM
To: Cheung, Wendy <Cheung.Wendy@epa.gov>
Cc: Wang, Gary <wang.gary@epa.gov>; Breffle, Don <Breffle.Don@epa.gov>; DInnocenzo, Benjamin <Dinnocenzo.Benjamin@epa.gov>
Subject: FW: Bond for injection wells.... (Pioneer Nat Resources Biere 1-22 (A-D) injection wells)

Hi Wendy,

You were asking about proof that the three injection wells surrounding the leaking Biere 1-22 oil well on the Fort Peck Reservation (Biere 1-22B, 1-22C, and 1-22D) were actually plugged. It does appear they were plugged in June 2015, during which time I was still with ORD (I returned to R8 in Dec 2016). This email chain shows that in Feb 2016 Pioneer Natural Resources was looking to EPA to return their financial mechanism to P&A or at least stop paying for it.

Don, did you receive the actual plugging and abandonment records?

Also, Wendy you correct that the Biere 1-22A (the original fourth planned injection well) was never constructed. All four of these injection wells were originally planned to be drilled within about 50 feet of the leaking Biere 1-22 oil well and were to be used to inject Injectrol-U, a liquid substance that hardens in the presence of heat. Only three were ever drilled, in 2001 I believe, but there were used to inject the Injectrol-U back in 2001-02(?) which Pioneer thinks aided the flowing hot oil/water mixture which then allowed them to drill out and replug the leaking Biere 1-22 oil well.

If none of us has the actual P&A records, we can ask Pioneer to supply them.

Here is my understanding of these four injection wells:

1. Biere 1-22A never drilled
2. Biere 1-22B drilled 2001, used once for injection and many times for temp logging, plugged June 2015
3. Biere 1-22C drilled 2001, used once for injection and many times for temp logging, plugged June 2015
4. Biere 1-22D drilled 2001, used once for injection and many times for temp logging, plugged June 2015

Nathan Wiser
Environmental Scientist
U.S. Environmental Protection Agency, Region 8
Office of Enforcement, Compliance and Environmental Justice
Safe Drinking Water Act Enforcement Unit

Mailing address:
1595 Wynkoop Street (Mail code 8ENF-W-SDW)
Denver, CO 80202

(303) 312-6211 direct
wiser.nathan@epa.gov

From: Pardue-Welch, Kimberly
Sent: Wednesday, February 24, 2016 1:24 PM
To: Wiser, Nathan <Wiser.Nathan@epa.gov>; Wang, Gary <wang.gary@epa.gov>
Cc: Swanson, Amy <Swanson.Amy@epa.gov>
Subject: RE: Bond for injection wells....

No worries, I think we've got it. Thanks Nathan.

From: Wiser, Nathan
Sent: Wednesday, February 24, 2016 1:23 PM
To: Pardue-Welch, Kimberly <Pardue-Welch.Kimberly@epa.gov>; Wang, Gary <wang.gary@epa.gov>
Cc: Swanson, Amy <Swanson.Amy@epa.gov>
Subject: FW: Bond for injection wells....

Hey Kimberly and Gary,

I'll not be back in the office until Friday at the earliest. Maybe Monday. The release of bonds for UIC wells is something that Ben D'Innocenzo and/or Gary would be involved with. Also, Don may know something about the plugging of these wells. I doubt I will have time to weigh in on this matter.

--Nathan Wiser
Environmental Scientist
U.S. Environmental Protection Agency
Office of Research and Development, Office of Science Policy

Mailing address:
1595 Wynkoop Street (Mail code 8ENF-UFO)
Denver, CO 80202

(303) 312-6211 direct
wiser.nathan@epa.gov

From: Swanson, Amy
Sent: Wednesday, February 24, 2016 1:18 PM
To: Wiser, Nathan <Wiser.Nathan@epa.gov>; Wang, Gary <wang.gary@epa.gov>
Cc: Pardue-Welch, Kimberly <Pardue-Welch.Kimberly@epa.gov>
Subject: FW: Bond for injection wells....

Nathan and Gary. Below is a bond-related question that I received today from Mike Jacobs regarding Pioneer's wells in the East Poplar Oilfield. Please email Mike directly if you can answer his question; copying Sarah and myself on your response. Sarah and I have a call scheduled with Pioneer and their legal counsel on March 8th regarding the ongoing Biere Well remediation and status of the AOC. If you cannot respond to Mike before then, we should talk so Sarah and I can address the bond issue during our call. Thank you,

Amy Swanson | Senior Attorney
Legal Enforcement Program | USEPA Region 8 | 8ENF-L
303.312.6906 | swanson.amy@epa.gov

From: Jacobs, Michael [mailto:Michael.Jacobs@pxd.com]
Sent: Wednesday, February 24, 2016 12:17 PM
To: Swanson, Amy <Swanson.Amy@epa.gov>; Teschner, Sarah <Teschner.Sarah@epa.gov>; sleifer@bakerbotts.com; thomas.jackson@bakerbotts.com
Subject: Bond for injection wells....

Sarah and Amy....

I received a question today about this bond. This bond was issued in 2003 and it mentions the injection wells....which I believe must be for those three injection wells we plugged around June of last year. So my question is do we need the USEPA's "approval" to get this bond released or can we just not renew this and thereby release the bond ourselves????

Thanks,

Mike

Michael Jacobs, P.G.
Corporate Remediation Advisor
Pioneer Natural Resources
2011 N. CR 1140
Midland, Texas 79705
Direct: 432-571-2927
Mobile: 432-528-8046
michael.jacobs@pxd.com

Statement of Confidentiality:
This message may contain information that is privileged or confidential. If you receive this transmission in error, please notify the sender by reply e-mail and delete the message and any attachments.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
Denver, CO 80202-1129
Phone 800-227-8917
www.epa.gov/region08

MAY 2 7 2015

Ref: 8ENF-UFO

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Don Wirth, Staff Operations Engineer
Pioneer Natural Resources
1401 17th Street, Suite 1200
Denver, Colorado 80202

Re: Underground Injection Control (UIC), Approval of P&A Amendment
Biere 1-22B; Biere 1-22C; Biere 1-22D Monitoring Wells
EPA Well Nos. MT50913-04621; MT50913-04622; MT50913-04623
EPA Permit No. MT50913-00000
API Nos. 25-085-21659; 25-085-21660; 25-085-21661
Roosevelt County, Montana

Dear Mr. Wirth:

On May 13, 2015, the Environmental Protection Agency (EPA) received the proposed plugging and abandonment (P&A) plan amendments for the three above-referenced Class V wells. We have reviewed the P&A amendments and the EPA approves of the amendments to leave the tubing in the well. Per the P&A amendment plans, the EPA concurs that Option I's injection of fresh water and cement through the tubing is to be attempted first before performing Option II's injection of only the cement.

Within sixty (60) days of plugging the wells, please complete and submit to the EPA plugging records as required by UIC regulations at Title 40 of the Code of Regulations (40 CFR) § 144.28(k).

If you have any questions concerning this letter, you may contact Gary Wang of my staff at (303) 312-6469. Please direct all correspondence to the attention of Gary Wang at Mail Code 8ENF-UFO.

Sincerely,

Arturo Palomares, Director
Water Technical Enforcement Program
Office of Enforcement, Compliance
and Environmental Justice

cc: The Honorable A.T. Stafne, Chairman, Assiniboine & Sioux Tribes
Deb Madison, Environmental Director, Fort Peck Environmental Program
George Hudak, Montana Board of Oil & Gas Conservation

7008 3230 0003 0724 6225

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Sent To

Don Wirth, Staff Operation Engineer
Pioneer Natural Resources
1401 17th St., Suite 1200
Denver, CO 80202

Street, Apt. No. or PO Box No.

City, State, ZIP+4

PS Form 3800, August 2006 — See Reverse for Instructions

SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

MAY 29 2015

Don Wirth, Staff Operation Engineer
Pioneer Natural Resources
1401 17th St., Suite 1200
Denver, CO 80202

B

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X Don ☐ Agent ☐ Addressee

B. Received by *(Printed Name)* Elyse Siegel — C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

DOWNTOWN STATION DENVER CO 80202 USPS

3. Service Type
☐ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? *(Extra Fee)* ☐ Yes

2. Article Number *(Transfer from service label)* 7008 3230 0003 0724 6225

PS Form 3811, February 2004 — Domestic Return Receipt — 102595-02-M-1540

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
Denver, CO 80202-1129
Phone 800-227-8917
www.epa.gov/region08

Ref: 8ENF-UFO

CONCURRING COPY

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Don Wirth, Staff Operations Engineer
Pioneer Natural Resources
1401 17th Street, Suite 1200
Denver, Colorado 80202

Re: Underground Injection Control (UIC), Approval of P&A Amendment
Biere 1-22B; Biere 1-22C; Biere 1-22D Monitoring Wells
EPA Well Nos. MT50913-04621; MT50913-04622; MT50913-04623
EPA Permit No. MT50913-00000
API Nos. 25-085-21659; 25-085-21660; 25-085-21661
Roosevelt County, Montana

Dear Mr. Wirth:

On May 13, 2015, the Environmental Protection Agency (EPA) received the proposed plugging and abandonment (P&A) plan amendments for the three above-referenced Class V wells. We have reviewed the P&A amendments and the EPA approves of the amendments to leave the tubing the well. Per the P&A amendment plans, the EPA concurs that Option I's injection of fresh water and cement through the tubing is to be attempted first before performing Option II's injection of only the cement.

Within sixty (60) days of plugging the wells, please complete and submit to the EPA plugging records as required by UIC regulations at Title 40 of the Code of Regulations (40 CFR) § 144.28(k).

If you have any questions concerning this letter, you may contact Gary Wang of my staff at (303) 312-6469. Please direct all correspondence to the attention of Gary Wang at Mail Code 8ENF-UFO.

Sincerely,

Arturo Palomares, Director
Water Technical Enforcement Program
Office of Enforcement, Compliance
and Environmental Justice

cc: The Honorable A.T. Stafne, Chairman, Assiniboine & Sioux Tribes
Deb Madison, Environmental Director, Fort Peck Environmental Program
George Hudak, Montana Board of Oil & Gas Conservation

5/15/15 5/21/2015

bcc: Diana Hammer (8MO)
Kimberly Pardue-Welch (8ENF-W)

Cc addresses:

The Honorable A.T. Stafne, Chairman
Assiniboine & Sioux Tribes
P.O. Box 1027
Poplar, Montana 59255-1027

Deb Madison, Environmental Director
Fort Peck Environmental Program
P.O. Box 1027
Poplar, Montana 59255-1027

George Hudak
Montana Board of Oil & Gas Conservation
2535 St. John's Avenue
Billings, Montana 59102

UIC ENFORCEMENT ROUTING AND TRANSMITTAL SLIP: MT50913 Pioneer Natural Resources P&A Plan Approval

		Mailcode	Initials	Date
Gary Wang *(Writer, UIC Enforcement)*	*Phone: 303-312-6469*	8ENF-UFO	[illegible]	5/15/15
Joan Detty *(Administrative)* correction	*Proof*		JD	5/21/15
Kimberly Pardue Welch *(UIC Enforcement, Team Leader)*		8ENF-UFO	KPW	5/21/15
Art Palomares *(Director, Water Technical Enforcement Program)*	***Signature***	8ENF	AP	5/22/15
Joan Detty *(Administrative)*	*- (Mail & Fax) -*		JD	5/27/15
Writer	*file documents*	8P-R		

☐ Action	☐ File	☐ Note and Return
☐ Approval	☐ For Clearance	☐ Per Conversation
☐ As Requested	☐ For Correction	☐ Prepare Reply
☐ Circulate	☐ For Your Information	☐ See Me
☐ Comment	☐ Investigate	☒ Signature
☐ Coordination	☐ Justify	

REMARKS

Pioneer Natural Resources has submitted plugging & abandonment amendments on the Biere 1-22B, 1-22C & 1-22D monitoring wells.. EPA has reviewed and is approving the P&A plans for the wells.

G:\UFO\UIC\UIC VITAL RECORDS\UIC CORRESPONDENCE\FY15\Pioneer\MT50913 - (2015.05.15) P&A Amendment Approval.docx

Before signature by the appropriate official, this enforcement matter requires confirmation by TEP and/or LEP staff that either: 1) it contains no information claimed to be Confidential Business Information (CBI); or 2) any such information has been redacted from any version of the document which may be distributed to anyone other than U.S. government personnel or the party claiming the information to be CBI. In addition, if there is a CBI claim, that fact must be noted prominently on the first page of the document. Initialing the slip above constitutes such confirmation by the ECEJ staff assigned to this matter.

RECEIVED

APR 22 2015

Office of Enforcement, Compliance and Environmental Justice

OMB No. 2040-0042 Approval Expires 11/30/2014

EPA

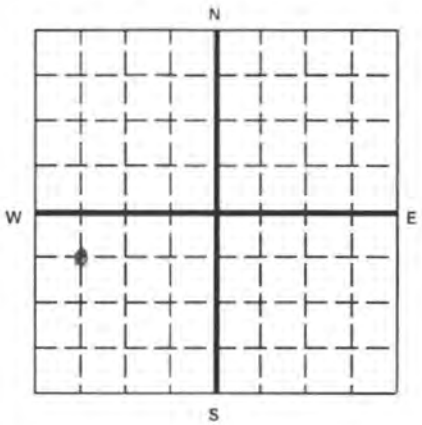
United States Environmental Protection Agency
Washington, DC 20460

PLUGGING AND ABANDONMENT PLAN

Name and Address of Facility
Biere 1-22B Monitor Well - Biere 1-22 Remediation Project

Name and Address of Owner/Operator
Pioneer Natural Resources USA, Inc.
1401 17th St. Ste. 1200, Denver CO, 80202

Locate Well and Outline Unit on Section Plat - 640 Acres



State	County	Permit Number
Montana	Roosevelt	

Surface Location Description
___ 1/4 of c 1/4 of nw 1/4 of sw 1/4 of Section 22 Township 28n Range 51e

Locate well in two directions from nearest lines of quarter section and drilling unit

Surface Location ___ ft. frm (N/S) S Line of quarter section 1953 FSL
and ___ ft. from (E/W) W Line of quarter section. 654 FWL

TYPE OF AUTHORIZATION
- [x] Individual Permit
- [ ] Area Permit
- [ ] Rule

Number of Wells 1

Lease Name Biere

WELL ACTIVITY
- [ ] CLASS I
- [ ] CLASS II
  - [ ] Brine Disposal
  - [ ] Enhanced Recovery
  - [ ] Hydrocarbon Storage
- [ ] CLASS III [x] Class IV

Well Number 1-22B

CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT (LB/FT)	TO BE PUT IN WELL (FT)	TO BE LEFT IN WELL (FT)	HOLE SIZE
13 3/8	54.5	71	71	17.5
9 5/8	36	241	241	12.25
5 1/2	15.5	686	686	7 7/8

METHOD OF EMPLACEMENT OF CEMENT PLUGS
- [x] The Balance Method
- [ ] The Dump Bailer Method
- [ ] The Two-Plug Method
- [ ] Other

CEMENTING TO PLUG AND ABANDON DATA:	PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6	PLUG #7
Size of Hole or Pipe in which Plug Will Be Placed (inche	5 1/2	5 1/2					
Depth to Bottom of Tubing or Drill Pipe (ft.	670	100					
Sacks of Cement To Be Used (each plug)	12	12					
Slurry Volume To Be Pumped (cu. ft.)	2.46	2.46					
Calculated Top of Plug (ft.)	570	0					
Measured Top of Plug (if tagged ft.)							
Slurry Wt. (Lb./Gal.)	15.8	15.8					
Type Cement or Other Material (Class III)	G	G					

LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS AND INTERVALS WHERE CASING WILL BE VARIED (if any)

From	To	From	To
686	729		

Estimated Cost to Plug Wells
$25,000

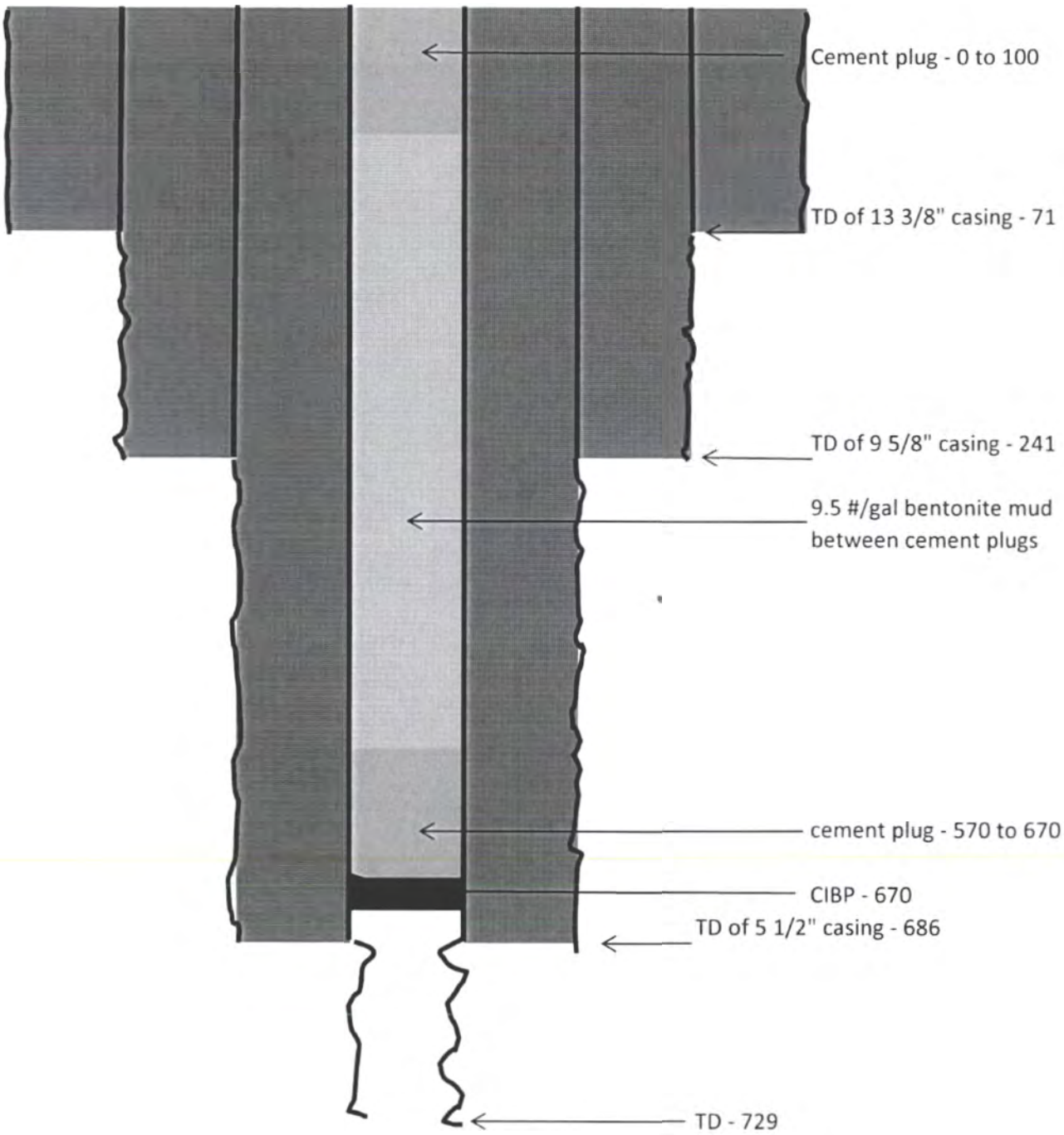
Certification

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. (Ref. 40 CFR 144.32)

Name and Official Title *(Please type or print)*	Signature	Date Signed
Donald Wirth Staff Ops Eng	Donald Wirth	4-14-15

EPA Form 7520-14 (Rev. 12-11)

Biere 1-22B Post P&A Wellbore Schematic



FORM NO. 2 R 10/09

ARM 36.22.307, 601, 605, 1003, 1004, 1011, 1013, 1103, 1222, 1240, 1301, 1306, 1309, and 1417

Submit In Quadruplicate To:

MONTANA BOARD OF OIL AND GAS CONSERVATION
2535 ST. JOHNS AVENUE
BILLINGS, MONTANA 59102

SUNDRY NOTICES AND REPORT OF WELLS

Operator Pioneer Natural Resources USA Inc.

Address 1401 17th St. Ste. 1200

City Denver State CO Zip Code 80202-1268

Telephone 303-298-8100 Fax 303-298-7800

Lease Name: Biere 1-22B

Type (Private/State/Federal/Tribal/Allotted): Private

Well Number: 1-22B

Location of well (1/4-1/4 section and footage measurements): NW/SW 1983 FSL, 654 FWL

Unit Agreement Name:

Field Name or Wildcat: Poplar, East

Township, Range, and Section: T28N R51E Sec 22

API Number: 25 | 085 | 21659 (State County Well)

Well Type (oil, gas, injection, other): other - monitor well

County: Roosevelt

Indicate below with an X the nature of this notice, report, or other data:

Notice of Intention to Change Plans	☐	Subsequent Report of Mechanical Integrity Test	☐
Notice of Intention to Run Mechanical Integrity Test	☐	Subsequent Report of Stimulation or Treatment	☐
Notice of Intention to Stimulate or to Chemically Treat	☐	Subsequent Report of Perforation or Cementing	☐
Notice of Intention to Perforate or to Cement	☐	Subsequent Report of Well Abandonment	☐
Notice of Intention to Abandon Well	✓	Subsequent Report of Pulled or Altered Casing	☐
Notice of Intention to Pull or Alter Casing	☐	Subsequent Report of Drilling Waste Disposal	☐
Notice of Intention to Change Well Status	☐	Subsequent Report of Production Waste Disposal	☐
Supplemental Well History	☐	Subsequent Report of Change in Well Status	☐
Other (specify) _____	☐	Subsequent Report of Gas Analysis (ARM 36.22.1222)	☐

Describe Proposed or Completed Operations:

Describe planned or completed work in detail. Attach maps, well-bore configuration diagrams, analyses, or other information as necessary. Indicate the intended starting date for proposed operations or the completion date for completed operations.

See attached EPA abandonment plan and schematic. Expect to commence work in May 2015. To summarize that plan:

1. Set CIBP at 670 feet.
2. Set balanced cement plug from 570' to 670'. WOC and tag plug.
3. Fill casing between last plug and next plug w/9.5 #/gal bentonite water.
4. Set balanced cement plug from 0' to 100'.
5. After cutting off casing. Top off annulus w/50' of cement if necessary.

BOARD USE ONLY

Approved _____ Date

Name Title

The undersigned hereby certifies that the information contained on this application is true and correct:

4-14-15 Donald Wirth

Date Signed (Agent)

Donald Wirth, Staff Ops Eng

Print Name and Title

Telephone: 303-675-2669

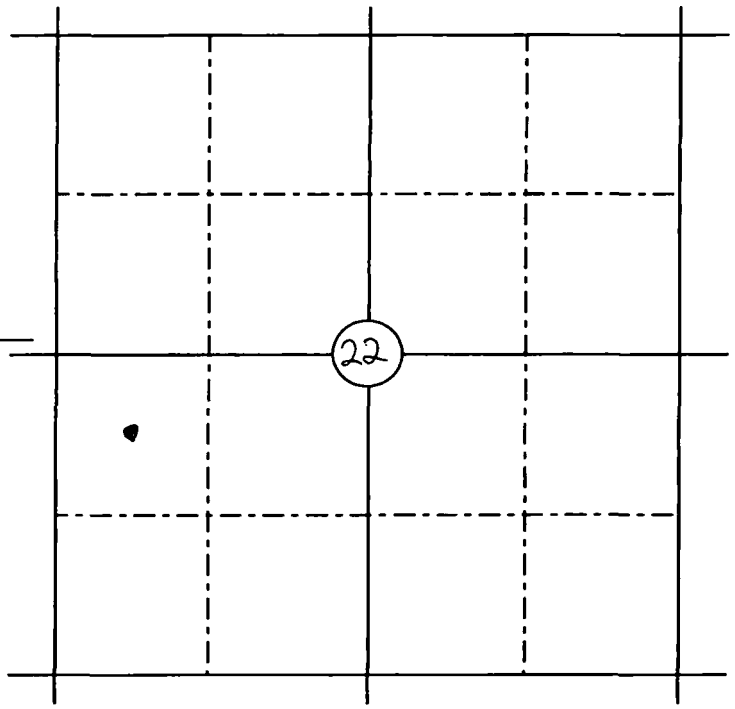
SUPPLEMENTAL INFORMATION

NOTE: Additional information or attachments may be required by Rule or by special request.

Plot the location of the well or site that is the subject of this notice or report.

Range 51E

Township 28N



BOARD USE ONLY	CONDITIONS OF APPROVAL

The operator must comply with the following condition(s) of approval:

Failure to comply with the conditions of approval may void this permit.

Wang, Gary

From: Wang, Gary
Sent: Tuesday, June 16, 2015 2:56 PM
To: 'Jacobs, Michael'
Cc: 'Donald.Wirth@pxd.com'; Pardue-Welch, Kimberly; Swanson, Amy; 'sleifer@bakerbotts.com'
Subject: FW: 8ENF-UFO P&A plan ammendment to include options
Attachments: P&A plan ammendment.docx; MT50913 - (2015.05.05) P&A Approval.pdf; MT50913 - (2015.05.27) P&A Amendment Approval.pdf

Hi Mike,

Per our discussion today, EPA did approve the amendment of the P&A plans. Just to clear up some confusion, I've provided the following documents:

1. Letter from EPA on May, 5, 2015 Approving the original P&A plans for the Biere wells
2. Letter from Pioneer on May 13, 2015 requesting an amendment of the P&A plans
3. Letter from EPA on May 27, 2015 approving the amendment of the P&A plans.

If the current plans have change since May 13, plans, EPA will need to review those changes. On the other hand, if your current plans are consistent with what's described in the May 13th letter, then you should be good to move forward with the P&A. Hope this clears things up.

Gary Wang
Underground Injection Control Enforcement
U.S. Environmental Protection Agency
1595 Wynkoop St.
Denver, CO 80202
PH: 303-312-6469
FAX: 303-312-6953
EMAIL: wang.gary@epa.gov

From: Wirth, Donald R. [mailto:Donald.Wirth@pxd.com]
Sent: Wednesday, May 13, 2015 4:03 PM
To: Wang, Gary
Subject: 8ENF-UFO P&A plan ammendment to include options

Gary

The attached word document is a letter requesting an amendment to the P&A plan to allow inclusion of options if certain conditions are encountered during operations. Please let me know if this is adequate in meeting the EPAs requirements for such a request.

Thanks

Donald Wirth
Staff Operations Engineer
Pioneer Natural Resources
1401 17th St. Denver CO 80202
P: 303-675-2669

M: 303-638-2627
Email: Donald.Wirth@pxd.com

Statement of Confidentiality:
This message may contain information that is privileged or confidential. If you receive this transmission in error, please notify the sender by reply e-mail and delete the message and any attachments.

Wang, Gary

From: Wirth, Donald R. <Donald.Wirth@pxd.com>
Sent: Wednesday, May 13, 2015 4:03 PM
To: Wang, Gary
Subject: 8ENF-UFO P&A plan ammendment to include options
Attachments: P&A plan ammendment.docx

Gary

The attached word document is a letter requesting an amendment to the P&A plan to allow inclusion of options if certain conditions are encountered during operations. Please let me know if this is adequate in meeting the EPAs requirements for such a request.

Thanks

Donald Wirth
Staff Operations Engineer
Pioneer Natural Resources
1401 17th St. Denver CO 80202
P: 303-675-2669
M: 303-638-2627
Email: Donald.Wirth@pxd.com

Statement of Confidentiality:
This message may contain information that is privileged or confidential. If you receive this transmission in error, please notify the sender by reply e-mail and delete the message and any attachments.

MT50913-00005

To: Gary Wang
Region 8
U.S. Environmental Protection Agnecy
1595 Wynkoop Street
Denver CO 80202-1129

May 13th 2015

From: Don Wirth
Pioneer Natural Resources
1401 17th St. Ste 1200
Denver CO 80202

Sub: 8ENF-UFO - P&A plan for the Biere 1-22B, 1-22C and 1-22D – Request to amend the procedure.

Discussion:

The current plug and abandonment plan for these 3 wells consists of setting CIBPs (Cast Iron Bridge Plug) near the bottom of the 5 ½" casing, placing a 100' cement plug on top of the CIBP and setting another cement plug from surface to 100'. Bentonite mud is placed between the cement plugs. This P&A plan was developed with the assumption that there was no tubing or other equipment in the well and that work would be initiated with the setting of the CIBPs in the casing.

It has been determined that there is tubing in the hole and a packer is attached and set in the casing within 65 feet of total casing depth. It has also been determined that there is pressure in the tubing.

A concern is that the well may flow when attempting to bleed off the pressure. In that event the well would need to be killed with a denser fluid to allow pulling the tubing. Logistically, this complicates the P&A process, increases the cost and time to do the work and potentially introduces an undesirable fluid into the reservoir.

In the event the foregoing occurs, I propose amending the plan to include the following options:

Option I.

1. Try to establish injection in the well with water. If injection can be established at a suitable rate, pump cement down the tubing and displace it below the packer leaving a cement plug between the packer setting depth and casing TD.
2. Unset the packer and pull up hole to ensure cement does not foul the packer.
3. Allow the cement to set
4. Run tubing back in to tag the cement plug. Circulate cement down the tubing and up the annulus to fill both spaces with cement from tag point to surface – on both sides of the tubing. Tubing will be left in the hole and will be abandoned there within the cement plug.

Option II.

1. If injection cannot be established, unseat the packer. Circulate cement down the tubing and up the annulus to fill both spaces with cement from packer setting depth to surface – on both sides of the tubing. Tubing will be left in the hole and will be abandoned there within the cement plug.

Depth information for casing, tubing and packer – Tubing depth includes length of packer

	Biere	1-22B	1-22C	1-22D
Casing TD		686	679	697
Well TD		729	844	729
CIBP setting depth		670	660	680
tubing		621	614	647
packer type		Baker size 45 J-Lok		

Casing size - 5 1/2", 15.5 #/ft, J-55
Surface casing - 9 5/8", 36 #/ft, J-55
tubing - 2 7/8", 6.5 #/ft
Cement - Class 'G' (or equivalent type) 15.8 ppg, 1.15 yield, 5.0 gal/sk
water

MT50913-04623
00000

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
Denver, CO 80202-1129
Phone 800-227-8917
www.epa.gov/region08

MAY 0 5 2015

Ref: 8ENF-UFO

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Don Wirth, Staff Operations Engineer
Pioneer Natural Resources
1401 17th Street, Suite 1200
Denver, Colorado 80202

Re: Underground Injection Control (UIC), Approval of P&A Plan
Biere 1-22B; Biere 1-22C; Biere 1-22D Monitoring Wells
EPA Well Nos. MT50913-04621; MT50913-04622; MT50913-04623
EPA Permit No. MT50913-00000
API Nos. 25-085-21659; 25-085-21660; 25-085-21661
Roosevelt County, Montana

Dear Mr. Wirth:

On April 21, 2015, the Environmental Protection Agency (EPA) received the proposed plugging and abandonment (P&A) plans for the three above-referenced Class V wells. We have reviewed the P&A plans and they are approved.

Within sixty (60) days of plugging the wells, please complete and submit to the EPA plugging records as required by UIC regulations at Title 40 of the Code of Regulations (40 CFR) § 144.28(k). A blank plugging record form is enclosed.

If you have any questions concerning this letter, you may contact Gary Wang of my staff at (303) 312-6469. Please direct all correspondence to the attention of Gary Wang at Mail Code 8ENF-UFO.

Sincerely,

Arturo Palomares, Director
Water Technical Enforcement Program
Office of Enforcement, Compliance
and Environmental Justice

Enclosure

cc: The Honorable A.T. Stafne, Chairman, Assiniboine & Sioux Tribes
Deb Madison, Environmental Director, Fort Peck Environmental Program
George Hudak, Montana Board of Oil & Gas Conservation

	GREEN	BLUE	CBI
TAB		1	

Form Approved UMB No 2040-0042

EPA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

PLUGGING RECORD

NAME AND ADDRESS OF PERMITTEE	NAME AND ADDRESS OF CEMENTING COMPANY

LOCATE WELL AND OUTLINE UNIT ON SECTION PLAT — 640 ACRES

N

W E

S

STATE	COUNTY	PERMIT NUMBER

SURFACE LOCATION DESCRIPTION

____ 1/4 of ____ 1/4 of ____ 1/4 of ____ 1/4 of Section ____ Township ____ Range____

LOCATE WELL IN TWO DIRECTIONS FROM NEAREST LINES OF QUARTER SECTION AND DRILLING UNIT

Surface Location ____ ft. from (N/S) ____ Line of quarter section

and ____ ft. from (E/W) ____ Line of quarter section

TYPE OF AUTHORIZATION

- ☐ Individual Permit
- ☐ Area Permit
- ☐ Rule

Number of Wells ____

Lease Name

Describe in detail the manner in which the fluid was placed and the method used in introducing it into the hole

CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT(LB/FT)	TO BE PUT IN WELL(FT)	TO BE LEFT IN WELL(FT)	HOLE SIZE

METHOD OF EMPLACEMENT OF CEMENT PLUGS

- ☐ CLASS I
- ☐ CLASS II
  - ☐ Brine Disposal
  - ☐ Enhanced Recovery
  - ☐ Hydrocarbon Storage
- ☐ CLASS III

- ☐ The Balance Method
- ☐ The Dump Bailer Method
- ☐ The Two-Plug Method
- ☐ Other

CEMENTING TO PLUG AND ABANDONED DATA	PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6	PLUG #7
Size of Hole or Pipe in which Plug Will Be Placed (inches)							
Depth to Bottom of Tubing or Drill Pipe (ft.)							
Sacks of Cement To Be Used (each plug)							
Slurry Volume To Be Pumped (cu. ft.)							
Calculated Top of Plug (ft.)							
Measured Top of Plug (if tagged ft.)							
Slurry Wt. (Lb./Gal.)							
Type cement or other material (Class III)							

LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS

From	To	From	To

Signature of Cementer or Authorized Representative	Signature of EPA Representative

CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. (REF. 40 CFR 122.22)

NAME AND OFFICIAL TITLE *(Please type or print)*	SIGNATURE	DATE SIGNED

EPA Form 7520-13 (1-84)

7009 3410 0000 2600 7094

U.S. Postal Service™

CERTIFIED MAIL™ RECEIPT

(Domestic Mail Only; No Insurance Coverage Provided)

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OFFICIAL USE

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Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorser	
Total P	

Postmark Here

Sent To

Street, A
or PO Bo

City, State,

Don Wirth, Staff Operations Engineer
Pioneer Natural Resources
1401 17th St., Suite 1200
Denver, CO 80202

PS Form 3800, August 2006

See Reverse for Instructions

UIC ENFORCEMENT ROUTING AND TRANSMITTAL SLIP: MT50913 Pioneer Natural Resources P&A Plan Approval

		Mailcode	Initials	Date
Gary Wang *(Writer, UIC Enforcement)*	*Phone: 303-312-6469*	8ENF-UFO	GW	4/23/15
Joan Detty *(Administrative)*	*Proof*		JD	4/23/15
Breffle, Don *(UIC Enforcement)*		8ENF-UFO	DB	4/23/15
Kimberly Pardue Welch *(UIC Enforcement, Team Leader)*		8ENF-UFO	KPW	4/24/15
Art Palomares *(Director, Water Technical Enforcement Program)*	***Signature***	8ENF	AP	5/5/15
Joan Detty *(Administrative)*	*- (Mail & Fax) -*		JD	5/5/15
Writer	*file documents*	8P-R		

☐ Action	☐ File	☐ Note and Return
☐ Approval	☐ For Clearance	☐ Per Conversation
☐ As Requested	☐ For Correction	☐ Prepare Reply
☐ Circulate	☐ For Your Information	☐ See Me
☐ Comment	☐ Investigate	☒ Signature
☐ Coordination	☐ Justify	

REMARKS

Pioneer Natural Resources has submitted plugging & abandonment plans on the Biere 1-22B, 1-22C & 1-22D monitoring wells.. EPA has reviewed and is approving the P&A plans for the wells.

G:\UFO\UIC\UIC VITAL RECORDS\UIC CORRESPONDENCE\FY15\Pioneer\MT50913 - (2015.04.23) P&A Plan Approval.docx

Before signature by the appropriate official, this enforcement matter requires confirmation by TEP and/or LEP staff that either: 1) it contains no information claimed to be Confidential Business Information (CBI); or 2) any such information has been redacted from any version of the document which may be distributed to anyone other than U.S. government personnel or the party claiming the information to be CBI. In addition, if there is a CBI claim, that fact must be noted prominently on the first page of the document. Initialing the slip above constitutes such confirmation by the ECEJ staff assigned to this matter.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
Denver, CO 80202-1129
Phone 800-227-8917
www.epa.gov/region08

Ref: 8ENF-UFO

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Don Wirth, Staff Operations Engineer
Pioneer Natural Resources
1401 17th Street, Suite 1200
Denver, Colorado 80202

Re: Underground Injection Control (UIC), Approval of P&A Plan
Biere 1-22B; Biere 1-22C; Biere 1-22D Monitoring Wells
EPA Well Nos. MT50913-04621; MT50913-04622; MT50913-04623
EPA Permit No. MT50913-00000
API Nos. 25-085-21659; 25-085-21660; 25-085-21661
Roosevelt County, Montana

Dear Mr. Wirth:

On April 21, 2015, the Environmental Protection Agency (EPA) received the proposed plugging and abandonment (P&A) plans for the three above-referenced Class V wells. We have reviewed the P&A plans and they are approved.

Within sixty (60) days of plugging the wells, please complete and submit to the EPA plugging records as required by UIC regulations at Title 40 of the Code of Regulations (40 CFR) § 144.28(k). A blank plugging record form is enclosed.

If you have any questions concerning this letter, you may contact Gary Wang of my staff at (303) 312-6469. Please direct all correspondence to the attention of Gary Wang at Mail Code 8ENF-UFO.

Sincerely,

Arturo Palomares, Director
Water Technical Enforcement Program
Office of Enforcement, Compliance
and Environmental Justice

Enclosure

cc: The Honorable A.T. Stafne, Chairman, Assiniboine & Sioux Tribes
Deb Madison, Environmental Director, Fort Peck Environmental Program
George Hudak, Montana Board of Oil & Gas Conservation

JD 4/23/15 KPW ENF-W 4/24/15

bcc: Diana Hammer (8MO)
Kimberly Pardue-Welch (8ENF-W)

Cc addresses:

The Honorable A.T. Stafne, Chairman
Assiniboine & Sioux Tribes
P.O. Box 1027
Poplar, Montana 59255-1027

Deb Madison, Environmental Director
Fort Peck Environmental Program
P.O. Box 1027
Poplar, Montana 59255-1027

George Hudak
Montana Board of Oil & Gas Conservation
2535 St. John's Avenue
Billings, Montana 59102

Office of Enforcement, Compliance
and Environmental Justice

OMB No. 2040-0042 Approval Expires 11/30/2014

RECEIVED
APR 22 2015

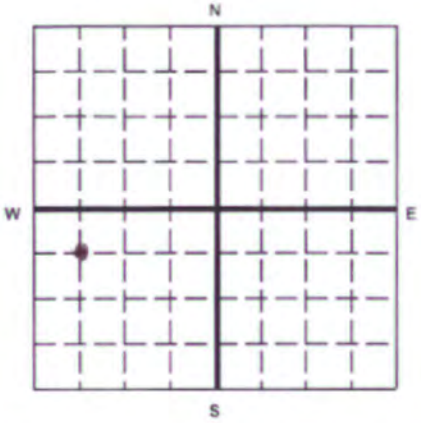
EPA

United States Environmental Protection Agency
Washington, DC 20460

PLUGGING AND ABANDONMENT PLAN

Name and Address of Facility	Name and Address of Owner/Operator
Biere 1-22C Monitor Well - Biere 1-22 Remediation Project	Pioneer Natural Resources USA, Inc. 1401 17th St. Ste. 1200, Denver CO, 80202

Locate Well and Outline Unit on Section Plat - 640 Acres



State	County	Permit Number
Montana	Roosevelt	

Surface Location Description

[ ] 1/4 of [c] 1/4 of [nw] 1/4 of [sw] 1/4 of Section [22] Township [28n] Range [51e]

Locate well in two directions from nearest lines of quarter section and drilling unit

Surface Location [ ] ft. frm (N/S) [S] Line of quarter section 1873 FSL
and [ ] ft. from (E/W) [W] Line of quarter section. 644 FWL

TYPE OF AUTHORIZATION

- [✓] Individual Permit
- [ ] Area Permit
- [ ] Rule

Number of Wells [1]

Lease Name [Biere]

WELL ACTIVITY

- [ ] CLASS I
- [ ] CLASS II
  - [ ] Brine Disposal
  - [ ] Enhanced Recovery
  - [ ] Hydrocarbon Storage
- [ ] CLASS III [☒] Class IV

Well Number [1-22C]

CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT (LB/FT)	TO BE PUT IN WELL (FT)	TO BE LEFT IN WELL (FT)	HOLE SIZE
13 3/8	54.5	59	59	17.5
9 5/8	36	241	241	12.25
5 1/2	15.5	679	679	7 7/8

METHOD OF EMPLACEMENT OF CEMENT PLUGS

- [✓] The Balance Method
- [ ] The Dump Bailer Method
- [ ] The Two-Plug Method
- [ ] Other

CEMENTING TO PLUG AND ABANDON DATA:	PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6	PLUG #7
Size of Hole or Pipe in which Plug Will Be Placed (inche	5 1/2	5 1/2					
Depth to Bottom of Tubing or Drill Pipe (ft.	660	100					
Sacks of Cement To Be Used (each plug)	12	12					
Slurry Volume To Be Pumped (cu. ft.)	2.46	2.46					
Calculated Top of Plug (ft.)	570	0					
Measured Top of Plug (if tagged ft.)							
Slurry Wt. (Lb./Gal.)	15.8	15.8					
Type Cement or Other Material (Class III)	G	G					

LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS AND INTERVALS WHERE CASING WILL BE VARIED (if any)

From	To	From	To
679	844		

Estimated Cost to Plug Wells

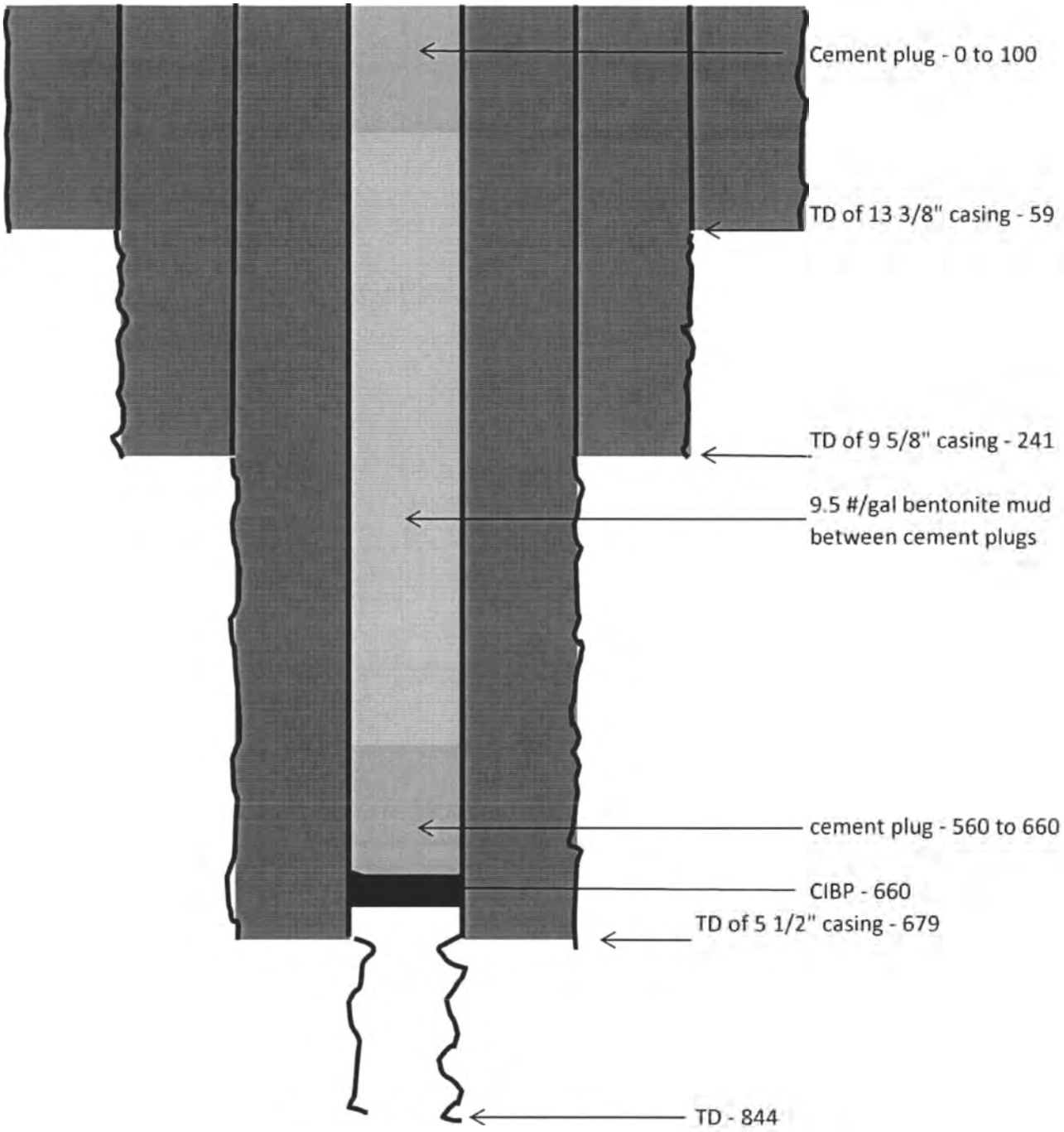
$25,000

Certification

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibliity of fine and imprisonment. (Ref. 40 CFR 144.32)

Name and Official Title *(Please type or print)*	Signature	Date Signed
Staff Ops Eng - Donald Wirth	Donald Wirth	4-14-15

Biere 1-22C Post P&A Wellbore Schematic



FORM NO. 2 R 10/09

ARM 36.22.307, 601, 605, 1003, 1004, 1011, 1013, 1103, 1222, 1240, 1301, 1306, 1309, and 1417

Submit In Quadruplicate To:

MONTANA BOARD OF OIL AND GAS CONSERVATION
2535 ST. JOHNS AVENUE
BILLINGS, MONTANA 59102

SUNDRY NOTICES AND REPORT OF WELLS

Operator Pioneer Natural Resources USA Inc.

Address 1401 17th St. Ste. 1200

City Denver State CO Zip Code 80202-1268

Telephone 303-298-8100 Fax 303-298-7800

Location of well (1/4-1/4 section and footage measurements):
NW/SW 1873 FSL, 644 FWL

Lease Name: Biere

Type (Private/State/Federal/Tribal/Allotted): Private

Well Number: 1-22C

Unit Agreement Name:

Field Name or Wildcat: Poplar, East

Township, Range, and Section: T28N R51E Sec 22

County: Roosevelt

API Number: 25 | 085 | 21660
State County Well

Well Type (oil, gas, injection, other): other - monitor well

Indicate below with an X the nature of this notice, report, or other data:

Notice of Intention to Change Plans	☐	Subsequent Report of Mechanical Integrity Test	☐
Notice of Intention to Run Mechanical Integrity Test	☐	Subsequent Report of Stimulation or Treatment	☐
Notice of Intention to Stimulate or to Chemically Treat	☐	Subsequent Report of Perforation or Cementing	☐
Notice of Intention to Perforate or to Cement	☐	Subsequent Report of Well Abandonment	☐
Notice of Intention to Abandon Well	✓	Subsequent Report of Pulled or Altered Casing	☐
Notice of Intention to Pull or Alter Casing	☐	Subsequent Report of Drilling Waste Disposal	☐
Notice of Intention to Change Well Status	☐	Subsequent Report of Production Waste Disposal	☐
Supplemental Well History	☐	Subsequent Report of Change in Well Status	☐
Other (specify) _____	☐	Subsequent Report of Gas Analysis (ARM 36.22.1222)	☐

Describe Proposed or Completed Operations:

Describe planned or completed work in detail. Attach maps, well-bore configuration diagrams, analyses, or other information as necessary. Indicate the intended starting date for proposed operations or the completion date for completed operations.

See attached EPA abandonment plan and schematic. Expect to commence work in May 2015. To summarize that plan:

1. Set CIBP at 660 feet.
2. Set balanced cement plug from 560' to 660'. WOC and tag plug.
3. Fill casing between last plug and next plug w/9.5 #/gal bentonite water.
4. Set balanced cement plug from 0' to 100'.
5. After cutting off casing. Top off annulus w/50' of cement if necessary.

BOARD USE ONLY

Approved _____
Date

Name Title

The undersigned hereby certifies that the information contained on this application is true and correct:

4-14-15 Donald Wirth
Date Signed (Agent)

Donald Wirth - Staff Ops Eng
Print Name and Title

Telephone: 303-675-2669

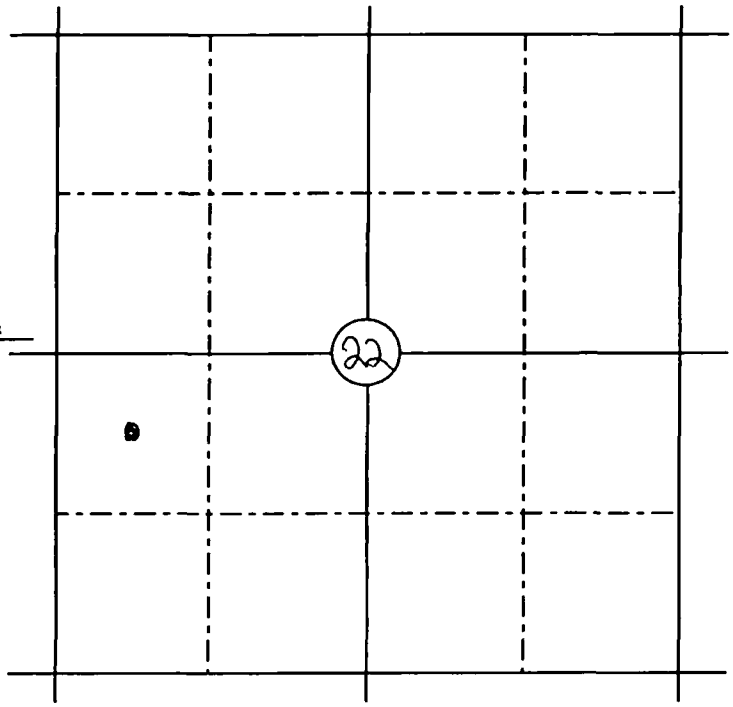
SUPPLEMENTAL INFORMATION

NOTE: Additional information or attachments may be required by Rule or by special request.

Plot the location of the well or site that is the subject of this notice or report.

Range 51E

Township 28N



BOARD USE ONLY	CONDITIONS OF APPROVAL

The operator must comply with the following condition(s) of approval:

Failure to comply with the conditions of approval may void this permit.

RECEIVED

APR 22 2015

Office of Enforcement, Compliance and Environmental Justice

OMB No. 2040-0042 Approval Expires 11/30/2014

EPA

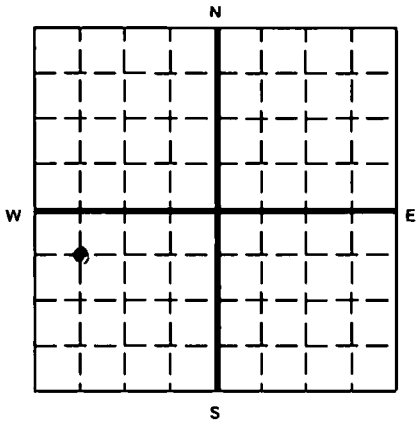
United States Environmental Protection Agency
Washington, DC 20460

PLUGGING AND ABANDONMENT PLAN

Name and Address of Facility
Biere 1-22D Monitor Well - Biere 1-22 Remediation Project

Name and Address of Owner/Operator
Pioneer Natural Resources USA, Inc.
1401 17th St. Ste. 1200, Denver CO, 80202

Locate Well and Outline Unit on Section Plat - 640 Acres



State	County	Permit Number
Montana	Roosevelt	

Surface Location Description
___ 1/4 of c 1/4 of nw 1/4 of sw 1/4 of Section 22 Township 28n Range 51e

Locate well in two directions from nearest lines of quarter section and drilling unit

Surface Location ___ ft. frm (N/S) S Line of quarter section 1984 FSL
and ___ ft. from (E/W) W Line of quarter section. 634 FWL

TYPE OF AUTHORIZATION
- [x] Individual Permit
- [ ] Area Permit
- [ ] Rule

Number of Wells 1

WELL ACTIVITY
- [ ] CLASS I
- [ ] CLASS II
  - [ ] Brine Disposal
  - [ ] Enhanced Recovery
  - [ ] Hydrocarbon Storage
- [ ] CLASS III [x] Class IV

Lease Name Biere

Well Number 1-22D

CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT (LB/FT)	TO BE PUT IN WELL (FT)	TO BE LEFT IN WELL (FT)	HOLE SIZE
13 3/8	54.5	50	50	17.5
9 5/8	36	244	244	12.25
5 1/2	15.5	697	697	7 7/8

METHOD OF EMPLACEMENT OF CEMENT PLUGS
- [x] The Balance Method
- [ ] The Dump Bailer Method
- [ ] The Two-Plug Method
- [ ] Other

CEMENTING TO PLUG AND ABANDON DATA:	PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6	PLUG #7
Size of Hole or Pipe in which Plug Will Be Placed (inches	5 1/2	5 1/2					
Depth to Bottom of Tubing or Drill Pipe (ft.	680	100					
Sacks of Cement To Be Used (each plug)	12	12					
Slurry Volume To Be Pumped (cu. ft.)	2.46	2.46					
Calculated Top of Plug (ft.)	580	0					
Measured Top of Plug (if tagged ft.)							
Slurry Wt. (Lb./Gal.)	15.8	15.8					
Type Cement or Other Material (Class III)	G	G					

LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS AND INTERVALS WHERE CASING WILL BE VARIED (if any)

From	To	From	To
697	729		

Estimated Cost to Plug Wells
$25,000

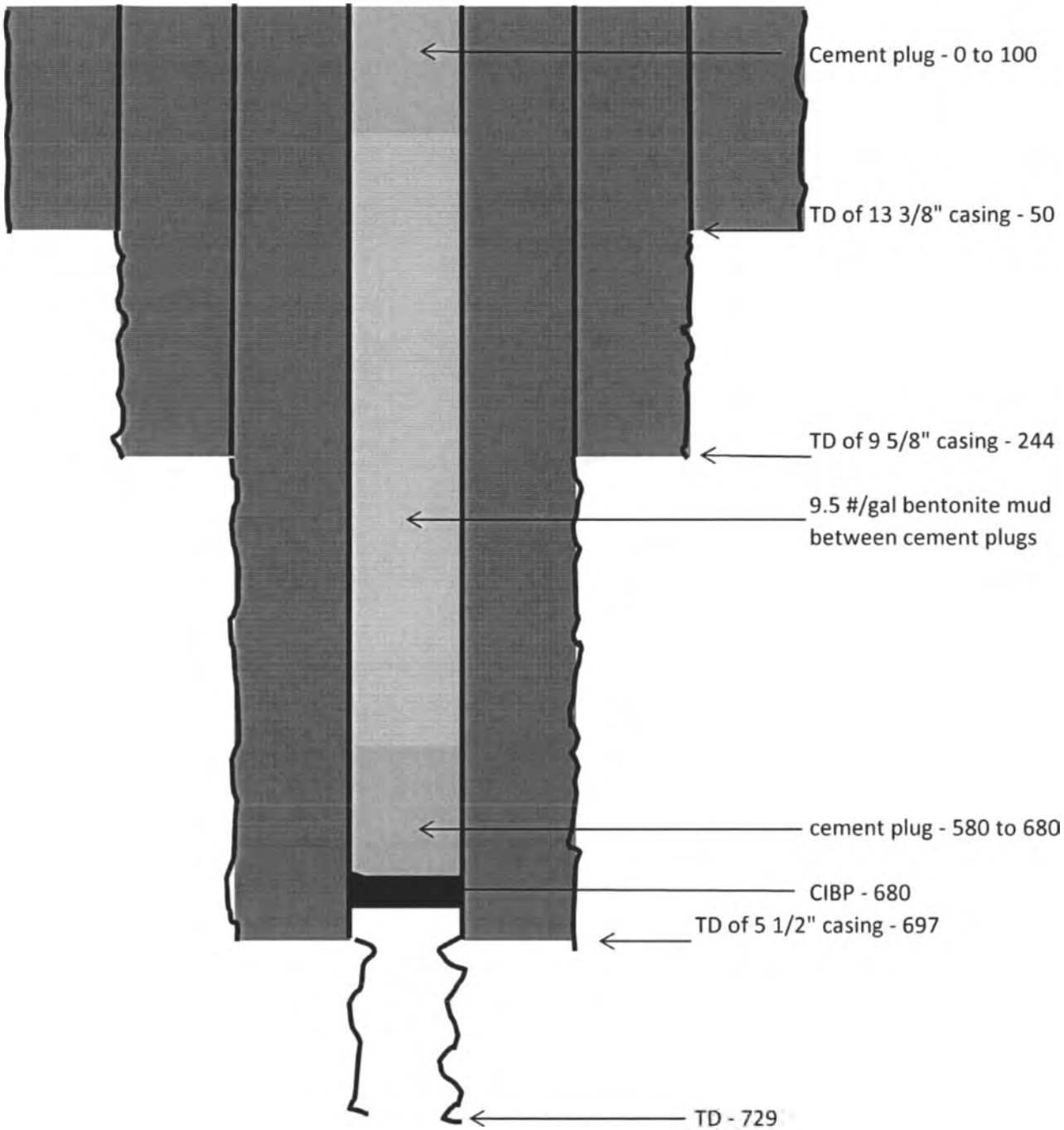
Certification

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. (Ref. 40 CFR 144.32)

Name and Official Title *(Please type or print)*	Signature	Date Signed
Donald Wirth - Staff Ops Eng	Donald Wirth	4-14-15

EPA Form 7520-14 (Rev. 12-11)

Biere 1-22D Post P&A Wellbore Schematic



FORM NO. 2 R 10/09

ARM 36.22.307, 601, 605, 1003, 1004, 1011, 1013, 1103, 1222, 1240, 1301, 1306, 1309, and 1417

Submit In Quadruplicate To:

MONTANA BOARD OF OIL AND GAS CONSERVATION
2535 ST. JOHNS AVENUE
BILLINGS, MONTANA 59102

SUNDRY NOTICES AND REPORT OF WELLS

Operator Pioneer Natural Resources USA Inc.

Address 1401 17th St. Ste. 1200

City Denver State CO Zip Code 80202-1268

Telephone 303-298-8100 Fax 303-298-7800

Lease Name: Biere

Type (Private/State/Federal/Tribal/Allotted): Private

Well Number: 1-22D

Location of well (1/4-1/4 section and footage measurements): NW/SW 1984 FSL, 634 FWL

Unit Agreement Name:

Field Name or Wildcat: Poplar, East

Township, Range, and Section: T28N R51E Sec 22

API Number: 25 | 085 | 21661 (State County Well)

Well Type (oil, gas, injection, other): other - monitor well

County: Roosevelt

Indicate below with an X the nature of this notice, report, or other data:

Notice of Intention to Change Plans	☐	Subsequent Report of Mechanical Integrity Test	☐
Notice of Intention to Run Mechanical Integrity Test	☐	Subsequent Report of Stimulation or Treatment	☐
Notice of Intention to Stimulate or to Chemically Treat	☐	Subsequent Report of Perforation or Cementing	☐
Notice of Intention to Perforate or to Cement	☐	Subsequent Report of Well Abandonment	☐
Notice of Intention to Abandon Well	✓	Subsequent Report of Pulled or Altered Casing	☐
Notice of Intention to Pull or Alter Casing	☐	Subsequent Report of Drilling Waste Disposal	☐
Notice of Intention to Change Well Status	☐	Subsequent Report of Production Waste Disposal	☐
Supplemental Well History	☐	Subsequent Report of Change in Well Status	☐
Other (specify) _____	☐	Subsequent Report of Gas Analysis (ARM 36.22.1222)	☐

Describe Proposed or Completed Operations:

Describe planned or completed work in detail. Attach maps, well-bore configuration diagrams, analyses, or other information as necessary. Indicate the intended starting date for proposed operations or the completion date for completed operations.

See attached EPA abandonment plan and schematic. Expect to commence work in May 2015. To summarize that plan:

1. Set CIBP at 680 feet.
2. Set balanced cement plug from 580' to 680'. WOC and tag plug.
3. Fill casing between last plug and next plug w/9.5 #/gal bentonite water.
4. Set balanced cement plug from 0' to 100'.
5. After cutting off casing. Top off annulus w/50' of cement if necessary.

BOARD USE ONLY

Approved _____ Date

Name Title

The undersigned hereby certifies that the information contained on this application is true and correct:

4-14-15 Donald Wirth

Date Signed (Agent)

Donald Wirth - Staff Ops Eng

Print Name and Title

Telephone: 303-675-2669

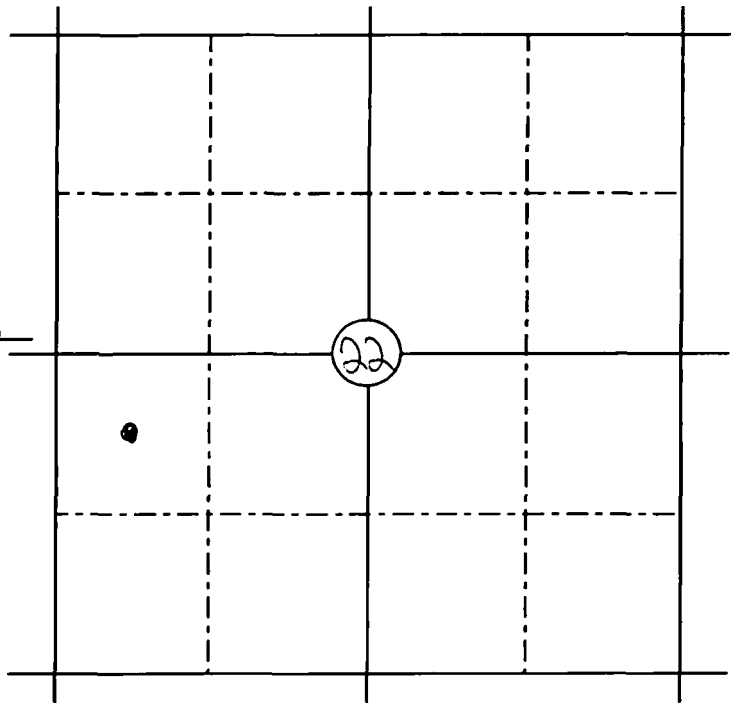
SUPPLEMENTAL INFORMATION

NOTE: Additional information or attachments may be required by Rule or by special request.

Plot the location of the well or site that is the subject of this notice or report.

Range 51 E

Township 28 N



BOARD USE ONLY	CONDITIONS OF APPROVAL

The operator must comply with the following condition(s) of approval:

Failure to comply with the conditions of approval may void this permit.

Pioneer Idea

Condition (Order? Permit?) requires Pioneer to develop Plan to determine when Biere 1-22 fix worked. Submit said Plan to EPA.

Pioneer Permit Applic.

- DEFICIENCIES -

- INJECTION U - still no news about add'l chemicals

Cond. pipe.
13 3/8" csg (48#) 17 1/2 hole Cl H + 2% CaCl2

Surf csg. (Interm.)
9 5/8" csg (32 1/2#) 12 1/4" hole Cl. G cmt

Long String
5 1/2" csg (14#) 7 7/8" hole Cl. G cmt

Have Judy B-W call Laura Clutts with OPID

See Attach. R (Nat. Resources)

PIONEER NATURAL RESOURCES USA, INC.
BIERE 1-22 REMEDIAL PROJECT

BIERE 1-22 REMEDIAL PROJECT
UIC AREA PERMIT NO. MT5913-00000

- Emergency Area Permit w/ Minor Mod
  PN issued after permit 7/31/2001
  expired 10/31/2001 (90 days)
- H2 MT50913 04620
  04621
  04622
  04623 } Class V Aq Rem

  "not constructed status"
- MB060 1-22A abandoned
  1-22B Completed 8/24/01
  1-22C Completed 9/4/01
  1-22D Completed 9/17/01
  monitor/obsv wells
  DT Status 2004
- FR – Don Breggie
  Surety perf bond in file 3/2/2001
  #KC0578 $100,000

*NOTES
FROM
LYNN NEWTON
~MARCH 2015

PIONEER NATURAL RESOURCES USA, INC.
BIERE 1-22 REMEDIAL PROJECT

BIERE 1-22 REMEDIAL PROJECT
UIC AREA PERMIT NO. MT5913-00000

BIERE 1-22 REMEDIAL PROJECT
UIC WELL PERMIT NO. MT5913-04620
WELL NO. 1

BIERE 1-22 REMEDIAL PROJECT
UIC WELL PERMIT NO. MT5913-04621
WELL NO. 2

BIERE 1-22 REMEDIAL PROJECT
UIC WELL PERMIT NO. MT5913-04622
WELL NO. 3

BIERE 1-22 REMEDIAL PROJECT
UIC WELL PERMIT NO. MT5913-04623
WELL NO. 4

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
999 18th STREET - SUITE 300
DENVER, COLORADO 80202-2466

UNDERGROUND INJECTION CONTROL PROGRAM

** EMERGENCY PERMIT **

UIC Permit No. MT5913-00000

Class V Remediation Project for Biere 1-22 Well Area Injection Well Permit

for

Well Names:

Well #1-22A
Well #1-22B
Well #1-22C
Well #1-22D

Well Locations: **East Poplar Oil Field**
NW SW Section 22 T28N R51E
Roosevelt County, Montana

Issued To:

Operator: Pioneer Natural Resources USA, Inc.
5205 North O'Connor Blvd.
1400 Williams Square West
Irving, Texas 75039

Permit Prepared: July, 2001

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PART I. AUTHORIZATION TO CONVERT AND OPERATE

Pursuant to the Underground Injection Control Regulations of the U. S. Environmental Protection Agency codified at Title 40 of the Code of Federal Regulations, Parts 124, 144, 146, and 147,

Pioneer Natural Resources USA, Inc.
5205 North O'Connor Blvd.
1400 Williams Square West
Irving, Texas 75039

is hereby authorized to drill and complete up to four (4) Class V aquifer remediation injection wells. The proposed new injection wells are identified as:

Well #1-22A,
Well #1-22B,
Well #1-22C, and
Well #1-22D,

all proposed to be located between 10 and 25 feet of the existing wellbore of the Biere #1-22 former oil production well, whose coordinates are:

660 feet from the West Line, 1980 feet from the South Line, in the Northwest quarter of the Southwest quarter of Section 22, Township 28 North, Range 51 East, Roosevelt County, Montana.

The area authorized under this permit is limited to a 1/4 mile radius area centered on the Biere 1-22 former oil production well.

Injection shall be for the purpose of abating an imminent and substantial endangerment to human health, by ceasing on-going contamination of the Quaternary deposits aquifer at the location of the Biere #1-22 former oil production well through limited injection of INJECTROL U or cement, and shall be in accordance with conditions set forth herein. The wells are not approved for commercial brine or other fluid disposal.

Injection activities shall not commence until the operator has fulfilled all applicable conditions of this Permit and has received written authorization from the Director. "Prior to Commencing Injection" requirements are set forth in Part II. Section C. 1. of this Permit.

All conditions set forth herein refer to the regulations found at Title 40 of the Code of Federal Regulations, Parts 124, 144, 146, and 147 that are in effect on the date that this Permit becomes effective.

This Permit consists of a total of 77 pages and includes all items listed in the Table of Contents. Further, it is based upon representations made by the applicant and on other information contained in the administrative record.

This Permit is issued for ninety (90) days. After ninety (90) days have passed from the effective date of this Permit, this Permit shall automatically expire, all injection activities must cease and all injection wells authorized under this Permit must be properly plugged and abandoned. The requirements to (1) plug and abandon (see Permit Part II(E) and Attachment C) and (2) conduct groundwater monitoring (see Permit Attachment D) shall survive an expired permit and shall remain fully enforceable. An extended requirement to plug and abandon shall expire when all injection wells have been properly plugged. An extended groundwater monitoring requirement shall expire only upon written notification from the Director. The Permit shall expire upon delegation of primary enforcement responsibility for applicable portions of the Underground Injection Control (UIC) Program to the Assiniboine and Sioux Indian Tribes or the State of Montana unless that Tribe or State has the authority and chooses to adopt and enforce this Permit as a Tribal or State permit.

This Permit is issued pursuant to Title 40 of the Code of Federal Regulations, Section 144.34(a)(1).

Issued this 31st day of July, 2001.

This Permit shall become effective JUL 31 2001.

for Kerrigan G. Clough
Assistant Regional Administrator
Office of Partnerships and
Regulatory Assistance

PART II. SPECIFIC PERMIT CONDITIONS

A. WELL CONSTRUCTION REQUIREMENTS

1. Casing and Cementing. The wells shall be constructed in a manner to prevent movement of fluids into or between underground sources of drinking water. The casing and cement used shall be designed for the life expectancy of each well. Injection between the outermost casing protecting USDWs and the well bore is prohibited. The drilling and completion program proposed in the application is approved and incorporated into this permit as Appendix A, and is described as follows:

Depth	*Hole Diameter*	*Casing Diameter*	*Casing*	*Cement*
0'- 35'	17-1/2"	13-3/8"	New 48# H-40 ST&C	35' to surface; Class "H" cement w/2%$CaCl_2$
0'-240'	12-1/4"	9-5/8"	New 32.5# H-40 ST&C	240' to surface; Class "G" cement
0'- TD (est. 688')	7-7/8"	5-1/2"	New 14# J-55 ST&C	TD to surface; Class "G" cement

Modification of the well construction plan is allowed provided that written approval is obtained prior to actual modification. Remedial cementing may be required if the casing cement is shown to be inadequate by cement bond log or other demonstration of Part II (External) mechanical integrity. If remedial cementing is required, to demonstrate external mechanical integrity, the permittee shall conduct a Temperature Log or Oxygen Activation Log prior to any injection activities but following all remedial cementing.

2. Tubing and Packer. Injection tubing shall be installed from a packer up to the surface. The tubing shall be 2-7/8" or a similar diameter suitable for injection. A packer shall be set no more than 50' above the top injection perforation or open hole depth.

3. Annulus. The annulus between the tubing and the casing shall be filled with fresh water treated with a corrosion inhibitor.

4. Monitoring Devices. The operator shall, at each injection

well, install and maintain in good operating condition:

(a) a "tap" at an conveniently accessible location on the injection line between the pump and the injection well, for collection of a representative sample of injection fluids, and

(b) two (2) one-half (½) inch Female Iron Pipe (FIP) fittings with cut-off valves for attachment of pressure gauges; one attached at the wellhead on the tubing and the other attached to the casing/tubing annulus, and

(c) attached to the injection flow line, a flow meter with a cumulative volume recorder that is certified for 95 percent accuracy or more throughout the range of injection rates allowed by the permit, and

(d) the operator shall always have in possession calibrated gauges for use of the field personnel to monitor injection and casing/tubing annulus pressures.

5. Alterations and Workovers. The operator shall give advance notice to the Director, as soon as possible, of any planned physical alterations or additions to the permitted facility. Such alterations or workovers of the permitted well shall meet all conditions as set forth in this permit. The operator shall provide all records of well workovers, logging, and other test data and results to EPA within sixty (60) days of completion of the activity. Appendix B contains appropriate report forms to be used for reporting.

A demonstration of Part I (Internal) and Part II (External) mechanical integrity shall be performed after completion of all workovers or alterations that affect the casing, tubing or annulus, and prior to resuming injection activities (see current UIC Guidance).

6. Formation Testing/Logging. The following logs and tests shall be required for each injection well. Additional logs or tests may be run at the discretion of the operator. At a minimum, the operator shall:

(1) Obtain and submit a water analysis of water from the injection zone that includes total dissolved solids (TDS),

(2) Determine and submit to the Director the pore pressure (static bottom-hole pressure) of the injection zone prior to commencing injection,

(3) Determine and submit to the Director the reservoir temperature in the injection zone prior to commencing injection, and

(4) Conduct and submit a cement bond log from the bottom-most casing depth up to the surface.

7. Mechanical Integrity Testing. The operator shall demonstrate mechanical integrity in accordance with Part II(C)(1)(c) and (d), and Part II(C)(2).

8. Postponement of Construction. The permittee shall notify the Director if the well is not drilled within 90 days of the effective date of the permit. Authorization to construct and operate shall expire if the well has not been constructed within 90 days of the effective date of the permit unless the permittee has notified the Director and requested an extension prior to expiration. Notification shall be in writing, shall state the reasons for the delay, and provide an estimated construction date and describe steps to be taken by the operator to assure protection of USDWs until construction is complete.

B. CORRECTIVE ACTION REQUIREMENT

The purpose of the injection is associated with corrective action as defined under 40 C.F.R. §144.55. The Biere 1-22 former oil production well, originally plugged in 1984, continues to contaminate the USDW, as of the date this permit is issued. The operator shall perform corrective action that stops this contamination. This Permit authorizes this corrective action.

Corrective action authorized under this Permit includes injection for the purpose of eliminating flowing contaminants at the Biere 1-22 well and groundwater monitoring for the purpose of determining that the Biere 1-22 well was properly sealed.

See also Part II(D)(2) of this Permit: Additional Monitoring.

C. WELL OPERATION REQUIREMENTS

1. Prior to Commencing Injection. Injection shall not commence into any well until the following conditions have been met for each well and the operator has received written notice from the Director that all submitted information is satisfactory and approval for injection is granted. As an alternative to obtaining written authorization, the operator may commence injection if an authorized representative of the Director is present at the well site and, in consultation with the Director, provides verbal authorization to commence injection after all the following has been completed:

(a) Construction work shall be complete and the operator shall submit Well Completion Record Form 7520-12 and a schematic showing details of the well as constructed.

(b) The operator shall complete all Formation Testing/Logging Requirements of Part II(A)(6).

(c) The operator shall demonstrate Part I (Internal) mechanical integrity, no significant leak in the casing, tubing, or packer. The demonstration shall be made by using a casing-tubing pressure test or an approved alternate test method.

(d) The operator shall demonstrate Part II (External) mechanical integrity, no significant fluid movement into a USDW through vertical channels adjacent to the wellbore.

2. **Mechanical Integrity**. The operator shall ensure each injection well maintains mechanical integrity (MI) at all times. The Director, by written notice, may require the operator to comply with a schedule describing when mechanical integrity demonstrations shall be made.

(a) **Mechanical Integrity Test Methods**. Any of several EPA-approved methods may be used to demonstrate mechanical integrity. A current copy of Guidance #34 *Cement Bond Logging Techniques and Interpretation*, dated April 19, 1995, Guidance #37, *Demonstrating Part II (External) Mechanical Integrity*, dated August 9, 1995, and Guidance #39, *Pressure Testing Injection Wells for Part I (Internal) Mechanical Integrity*, dated September 27, 1995, are provided at issuance of this permit. Results of tests shall be submitted on the appropriate EPA form to the Director as soon as possible, but no later than sixty (60) days after a test is complete.

(b) **Frequency of Mechanical Integrity Testing**. The operator shall demonstrate both Part I (Internal) and Part II (External) mechanical integrity prior to commencing injection and at least once every one (1) year during the life of each well, and shall demonstrate Part I (Internal) mechanical integrity, no significant leak in the casing, tubing, or packer after workovers affecting the tubing, packer or casing of each well. The operator shall arrange for and conduct all required mechanical integrity tests.

(c) **Prior Notification of Test**. The Operator shall notify the Director at least two (2) weeks prior to any required mechanical integrity test. The Director may

allow a shorter notification period if it is sufficient to enable the EPA to witness the mechanical integrity test. Notification may be in the form of a yearly or quarterly schedule of planned mechanical integrity tests or it may be on an individual well basis.

(d) Loss of Mechanical Integrity. If a well fails to demonstrate mechanical integrity during a test, or a loss of mechanical integrity as defined by 40 CFR § 146.8 becomes evident during operation, the operator shall notify the Director in accordance with Part III (E)(11) of this permit. Injection activities shall be terminated immediately, and operations shall not be resumed until the operator has taken necessary actions to restore integrity to the well and the Director has given approval to recommence injection.

3. Approved Injection Zone. Injection shall be limited to an interval within the Judith River, between the depths of 688' and 720'. Injection between the outermost casing protecting USDWs and the well bore is prohibited.

4. Injection Pressure Limitation. The maximum allowable surface injection pressure (MAIP) shall not exceed an amount that the Director determines is appropriate to ensure that injection does not initiate new fractures or propagate existing fractures in the confining zone overlying the injection zones. In each well the MAIP shall not exceed 330 psig. [(1.10 - 0.433*1.4)*688 rounded down] A different MAIP may be requested by the operator; such a request shall be accompanied by a step rate test or other approved test of the injection zone.

5. Injection Volume Limitation. The permittee is limited to a cumulative volume of 5,160 barrels [250% of 2064 barrels estimated for the injection purpose] injected into the total number of injection wells under this permit.

6. Approved Injection Fluid. The approved injection fluid shall be limited to either (1) INJECTROL U fluid, or (2) cement, for the specific purpose of sealing the leaking Biere #1-22 former oil production well. Fluids from other sources must be approved by the Director prior to injection. This permit does not authorize any well for use as a commercial brine or other fluid disposal well.

D. MONITORING, RECORD KEEPING, AND REPORTING OF RESULTS

1. Injection Well Monitoring Program. Samples and measurements

shall be representative of the monitored activity. The operator shall utilize the applicable analytical methods described in Table 1 of 40 CFR §136.3 or in Appendix III of 40 CFR Part 261, or in certain circumstances by other methods that have been approved by the Director. The injection well monitoring program shall consist of:

(a) **Analysis of the injection fluid** submitted to the Director:

annually; for Temperature (measured in the field), Specific Gravity, Total Dissolved Solids, pH, Specific Conductivity, Sodium, Total Silica, Total Petroleum Hydrocarbons, Chloride, Urea, Ammonia, Benzene, Toluene, Ethylbenzene, and Total Xylenes.

(b) **Observations of injection pressure, annulus pressure, injection flow rate and cumulative volume**. At least one value for each of the above shall be recorded **at five minutes intervals** during injection, and be representative of readings observed during normal operating conditions for that interval. At least one value for each of the above shall be recorded **at one day intervals** during non-injection periods.

2. **Additional Monitoring**. At least once a day, observation shall be made, for all wells within the area of review that penetrate the injection zone, of pressure in the annular space between the production casing and the injection tubing and other indicators of potential leaks which may endanger a USDW. If casing pressure or other indication of a leak which may endanger a USDW is detected in any well within the area of review, the operator shall notify the Director pursuant to *Twenty four Hour Reporting* requirements of Part III (E)(11), halt injection, and take timely measures necessary to correct the problem prior to receiving approval from the Director to recommence injection, or plug and abandon the problem well. The area of review for this permit includes the entire area covered by the area permit and an additional area extending 1/4-mile around the area covered by the area permit.

3. **Monitoring Information.** Records of any monitoring activity required under this permit shall include:

(a) The date, exact place, the time of sampling or field measurements;

(b) The name of the individual(s) who performed the sampling or measurements;

(c) The exact sampling method(s) used to take samples;

(d) The date(s) laboratory analyses were performed;

(e) The name of the individual(s) who performed the analyses;

(f) The analytical techniques or methods used by laboratory personnel; and

(g) The results of such analyses.

4. Record keeping.

(a) The operator shall retain records concerning:

(i) the nature and composition of all injected fluids until three (3) years after the completion of plugging and abandonment which has been carried out in accordance with the approved Plugging and Abandonment Plan (Attachment C) that is consistent with 40 CFR §146.10, and

(ii) all monitoring information including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation and copies of all reports required by this permit, for a period of at least five (5) years from the date of the sample, measurement or report, throughout the operating life of the well.

(b) The operator shall continue to retain such records after the retention period specified in paragraphs (a)(i) and (a)(ii) above unless he delivers the records to the Director or obtains written approval from the Director to discard the records.

(c) The operator shall maintain copies (or the originals) of all pertinent records at the operator office, presently located at:

Pioneer Natural Resources USA, Inc.
5205 North O'Connor Blvd., Suite 1400
Irving, Texas 75039-3746

5. Quarterly Reporting. The operator shall submit to the Director a Quarterly Report that includes a summary of the results of the monitoring required by Parts II(D)(1)(a) and (b) of this permit, whether the well is injecting or not, and shall include the recordings of injection pressure, annulus pressure, injection flow rate and cumulative volume.

EPA Form 7520-8 shall be submitted with the Quarterly Report.

The Quarterly Report shall be submitted by 15th day of the month following the reporting period. The first Quarterly Report shall cover the period from the effective date of the permit through the end of that quarterly period. Subsequent Quarterly Reports shall cover the quarterly periods from January 1 through March 31, April 1 through June 30, July 1 through September 30, and October 1 through December 31 of the data collection year.

6. **Injectate Analysis**. Whenever there is a change in the source of injection fluids, a comprehensive injection fluid analysis, to include at a minimum those parameters specified at Part II(D)(1)(a) shall be submitted to the Director within thirty (30) days.

E. PLUGGING AND ABANDONMENT

1. **Prior Notice of Plugging and Abandonment**. The operator shall notify the Director at least fifteen (15) days prior to conversion or abandonment of each well.

2 **Plugging and Abandonment Plan**. The operator shall plug and abandon each well in accordance with the approved Plugging and Abandonment Plan, Appendix C of this permit.

The Director may modify the plugging plan and manner in which each well is plugged if that well is modified during its permitted life or if that well is not consistent with EPA requirements for construction and mechanical integrity. The Director may require the operator to update the estimated plugging cost periodically. Such estimates are to be based upon costs incurred by a third party for plugging a well according to the plan.

3. **Plugging and Abandonment Report**. Within sixty (60) days after plugging each well, the operator shall submit a report on Form 7520-13 to the Director. The report shall be certified as accurate by the person who performed the plugging operation and the report shall consist of either:

   (a) a statement that each well was plugged in accordance with the plan; or

   (b) where actual plugging differed from the plan, a statement that specifies the different procedures followed.

4. **Plugging An Inactive Well**. After cessation of injection and prior to this permit's expiration date, the operator shall

plug and abandon the well(s) in accordance with the approved Plugging and Abandonment Plan, unless the operator:

(a) Provides notice to the Director, including a demonstration that the well will be used in the future, and

(b) describes actions or procedures that the operator will take to ensure that the well will not endanger USDWs during the period of inactivity. These actions and procedures shall include continuing Financial Responsibility and mechanical integrity demonstrations and maintaining compliance with permit requirements designed for the protection of USDWs, and

(c) receives written notice by the Director temporarily waiving plugging and abandonment requirements.

F. FINANCIAL RESPONSIBILITY

1. Demonstration of Financial Responsibility. The operator shall maintain continuous financial responsibility and resources to close, plug and abandon the injection well(s) as provided in the plugging and abandonment plan.

   (a) The operator may, upon his own initiative and upon written request to the Director, change the type of financial mechanism or instrument utilized. Any change in the type demonstration of financial responsibility must be approved by the Director.

2. Insolvency of Financial Institution. The operator shall submit an alternate demonstration of financial responsibility acceptable to the Director within sixty (60) days after either of the following events occur:

   (a) The institution issuing the trust or financial instrument files for bankruptcy; or

   (b) The authority of the trustee institution to act as trustee, or the authority of the institution issuing the financial instrument, is suspended or revoked.

3. Cancellation of Demonstration by Financial Institution. If the institution issuing the trust or financial instrument serves, to the Director, a 120-day notice of their intent to cancel the trust or financial instrument, the operator must submit an alternative demonstration of financial responsibility, acceptable to the Director, within sixty (60) days of such notice.

PART III. GENERAL PERMIT CONDITIONS

A. EFFECT OF PERMIT

The operator is allowed to engage in underground injection in accordance with the conditions of this permit.

The operator, as authorized by this permit, shall not construct, operate, maintain, convert, plug, abandon, or conduct any other injection activity in a manner that allows the movement of fluid containing any contaminant into underground sources of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR, Part 142 or otherwise adversely affect the health of persons.

Any underground injection activity not authorized in this permit or otherwise authorized by permit or rule is prohibited. Issuance of this permit does not convey property rights of any sort or any exclusive privilege; nor does it authorize any injury to persons or property, any invasion of other private rights, or any infringement of State or local law or regulations.

Compliance with the terms of this permit does not constitute a defense to any enforcement action brought under the provisions of Section 1431 of the Safe Drinking Water Act (SDWA) or any other law governing protection of public health or the environment for any imminent and substantial endangerment to human health, or the environment, nor does relieve the operator's independent obligation to comply with all UIC regulations.

B. PERMIT ACTIONS

1. **Modifications, Reissuance, or Termination.** The Director may, for cause or upon a request from the operator, modify, revoke and reissue, or terminate this permit in accordance with 40 CFR §§ 124.5, 144.12, 144.39, and 144.40. This permit is subject to minor modifications for cause as specified in 40 CFR § 144.41. The filing of a request for a permit modification, revocation and reissuance, termination, or the notification of planned changes or anticipated noncompliance on the part of the operator does not stay the applicability or enforceability of any permit condition.

2. **Conversions (Non-Class V).** Pursuant to 40 CFR 144.51(n), the permittee shall notify the Director prior to converting the well from a Class V injection well to a non-Class V injection well. Notification shall be made in writing to the Director at least 180 days prior to commencement of conversion operations. Conversion operations may not

proceed until a permit modification describing requirements for the proposed conversion is received by the operator. These requirements may include demonstration of mechanical integrity and other measures to ensure no threat of endangerment to USDWs. This permit remains in effect as issued or modified until all conversion requirements have been fulfilled, conversion is complete, and evidence has been submitted to the Director that the conversion has actually occurred and is complete.

3. Transfers. This permit is not transferrable to any person except after compliance with requirements of 40 CFR §144.38 and notice is provided to the Director. The Director may require modification or revocation and reissuance of the permit to change the name of the operator and incorporate such other requirements as may be necessary under the SDWA.

4. Operator Change of Address. Notice shall be given to the appropriate EPA office upon operator change of address.

5. Termination of Permit. Pursuant to 40 CFR 144.40, the Director may terminate a permit during its term or deny a permit renewal application for non-compliance with any condition of the permit, or for failure to fully disclose all relevant facts during the permit issuance process or misrepresentation of relevant facts at any time, or for a determination that the permitted activity endangers human health and the environment and can only be regulated to acceptable levels by permit modification or termination.

C. SEVERABILITY

The provisions of this permit are severable, and if any provision of this permit or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

D. CONFIDENTIALITY

In accordance with 40 CFR Part 2 and 40 CFR §144.5, any information submitted to EPA pursuant to this permit may be claimed as confidential by the submitter. Any such claim must be asserted at the time of submission by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, EPA may make the information available to the public without further notice. If a claim is asserted, the validity of the claim will be assessed in accordance with the procedures in 40 CFR Part 2 (Public Information). Claims of confidentiality for the

following information will be denied:

- The name and address of the operator, and

- Information which deals with the existence, absence or level of contaminants in drinking water.

E. GENERAL DUTIES AND REQUIREMENTS

1. Duty to Comply. The operator shall comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the SDWA and is grounds for enforcement action, permit termination, revocation and reissuance, or modification. Such noncompliance may also be grounds for enforcement action under the Resource Conservation and Recovery Act (RCRA).

2. Penalties for Violations of Permit Conditions. Any person who violates a permit requirement is subject to civil penalties, fines, and other enforcement action under the SDWA and may be subject to such actions pursuant to the RCRA. Any person who willfully violates permit conditions may be subject to criminal prosecution.

3. Need to Halt or Reduce Activity not a Defense. It shall not be a defense for a operator in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

4. Duty to Mitigate. The operator shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this permit.

5. Proper Operation and Maintenance. The operator shall, at all times, properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the operator to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of this permit.

6. Duty to Provide Information. The operator shall furnish the Director, within a time specified, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this

permit, or to determine compliance with the permit. The operator shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

7. Inspection and Entry. The operator shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

   (a) Enter upon the operator's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

   (b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

   (c) Inspect, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

   (d) Sample or monitor, at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by the SDWA any substances or parameters at any location.

8. Records of Permit Application. The operator shall maintain records of all data required to complete the permit application and any supplemental information submitted for a period of five (5) years from the effective date of this permit. This period may be extended by request of the Director at any time.

9. Signatory Requirements. All reports or other information requested by the Director shall be signed and certified according to 40 CFR §144.32.

10. Reporting of Noncompliance.

   (a) Anticipated Noncompliance. The operator shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

   (b) Compliance Schedules. Reports of compliance or noncompliance with or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than thirty (30) days following each schedule date.

(c) **Written notice** of any noncompliance which may endanger health or the environment shall be provided to the Director within five (5) days of the time the operator becomes aware of the noncompliance. The written notice shall contain a description of the noncompliance and its cause; the period of noncompliance including exact dates and times; if the noncompliance has not been corrected the anticipated time it is expected to continue; and steps taken or planned to prevent or reduce recurrence of the noncompliance.

11. **Twenty Four Hour Noncompliance Reporting. The operator shall report to the Director any noncompliance which may endanger health or the environment.** Information shall be provided orally within twenty-four (24) hours from the time the operator becomes aware of the circumstances by telephoning EPA at **303.312.6211** (during normal business hours) **or 303.293.1788** (for reporting at all other times). The following information shall be included in the verbal report:

    (i) Any monitoring or other information which indicates that any contaminant may cause endangerment to a USDW.

    (ii) Any noncompliance with a permit condition or malfunction of the injection system which may cause fluid migration into or between underground sources of drinking water.

12. **Other Noncompliance.** The operator shall report all other instances of noncompliance not otherwise reported at the time monitoring reports are submitted. The reports shall contain the information listed in Part III(E)(10)(c) of this permit.

13. **Other Information.** Where the operator becomes aware that he failed to submit any relevant facts in the permit application, or submitted incorrect information in a permit application, or in any report to the Director, the operator shall submit such correct facts or information within two (2) weeks of the time such information became known to him.

APPENDIX A

Drilling and Completion Program

Signa Engineering Corp.

DRILLING PROGRAM

(Biere 1-22 Remedial Wells)
Pioneer Natural Resources USA, Inc

ROOSEVELT COUNTY, MONTANA

GENERAL INFORMATION

WELL INFORMATION

Well Name:	Biere 1-22 Remedial Wells
Operator:	Pioneer Natural Resources USA, Inc
Field:	Poplar Field
Permit:	N/A
Well Type:	Remedial, Vertical
County, State:	Roosevelt County, Montana
Objective:	Judith River
Projected Depth:	720' TVD
Location:	22 – T28N – R51E
Elevation:	2,074' GL
BHST:	Estimated BHST = +/- 130°F @ 720' (based on offset information from "relief" well). Possible high temperature point observed at +/- 140').
AFE:	N/A

DRILLING / SQUEEZING OPERATIONS - GOALS & OBJECTIVES

1. Squeeze the Biere 1-22 well through four remedial wells in order to stop and prevent any possible future contamination due to migration of pollutants to the aquifer.
2. Avoid further contamination of the aquifer during the remedial operations.
3. Drill the remedial wells in the most efficient and economical manner.
4. Monitor the squeezing operations to ensure success of operations.
5. Comply with all environmental rules and regulations of the State of Montana.
6. Provide a safe working environment for the personnel during the execution of the procedures presented in this document.
7. Document all stages of the remedial operations for further analysis and consultation.

GENERAL WELL PLAN[2]

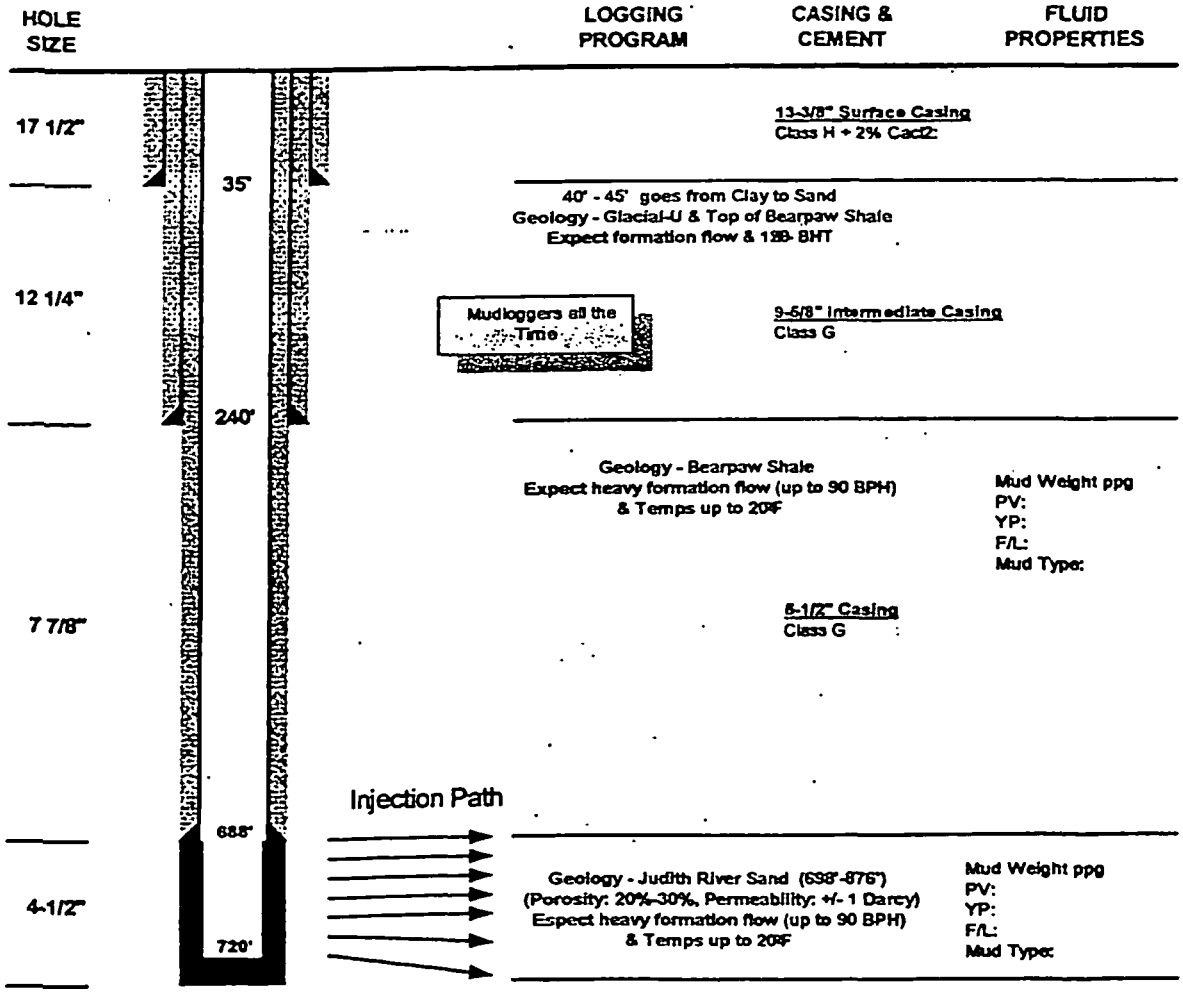
1. Prepare location for drilling rig.
2. Clean cellar for relief well. Build cellars for 3 new wells.
3. Drill water well. ? (RISKY IN THIS AREA – LIMITED VOLUME – MAYBE TRUCK)
4. Move in and rig up rat-hole machine and drill three 17-1/2" holes at the specified locations, down to 35'. Run & cement 13-3/8" casing to bottom. Rig down and move out rat-hole machine.
5. Move in and rig up drilling rig and related equipment.
6. Drill 12-1/4"hole down to 240'. Run and cement 9-5/8" casing.
7. Drill 7-7/8" hole to ±688' (10' above the Top of the Judith Sandstone). Run 5-1/2" casing to bottom and cement to surface.
8. Drill 4-1/2" hole to ±720' (leaving 10' of the Bearpaw Shale and 22' of the Top of the Judith Sandstone exposed). POOH.
9. RIH with 2 7/8" tubing to +/- 678'. Install tubing head and prepare well for injection.
10. Repeat steps 5 through 9 in the next two wells.
11. Move in and rig up drilling rig and related equipment to "old" relief well.
12. Remove wellhead/cap (wellhead cap - 3'-4' BGL). RIH with 4 ½" bit. Drill cement plugs. Circulate and condition hole down to top of cement at +/- 800 feet. POOH.
13. RIH with 2 7/8" tubing. Hang same from wellhead. Install pressure gauge to monitor pressures while injection operations take place.
14. Squeeze 3 wells with remedial fluid and observe behavior through monitoring old "relief" well.
15. As returns of remedial fluid are observed in the old "relief" well, stop injection in the other 3 wells.
16. Proceed to inject remedial fluid through the old "relief" well, to complete squeezing operations.
17. Allow fluid to set.
18. Observe wells.

[2] Detailed and intermediate steps are provided in the Detailed Drilling Procedure.

WELLBORE SCHEMATIC

DRILLING PROGNOSIS
"Pioneer Natural Resources USA Inc."

WELL	:	Biere Remedial Well	
FIELD	:	Poplar	
CATEGORY	:	Remedial / Vertical	
COUNTY	:	Roosevelt	STATE: Montana
LOCATION	:	22 - T28N - R51E	
OBJECTIVE	:	Top of Judith River	
ELEVATION	:	2,074 GL	



PREPARED BY: _____ DATE: _____

APPROVED BY: _____ DATE: _____

TELEPHONE LIST

Service	Contact	Company	Phone #'s	
DRILLING				
Drilling Manager	Steve Mamerow	Pioneer	(972) 444-9001	mamerows@pioneernrc.com
Manager Oper. Services	Wilbur Dover	Pioneer	(972) 444-9001	doverw@pioneernrc.com
Project Engineer:	Harold McGowen	Signa Engr. Corp.	(281) 774-1000	mmcgowen@signa.net
		Mobil/Pager	(713) 824 4560	-
Drilling Engineer:	R.Gonzalez	Signa Engr. Corp.	(281) 774-1000	rgonzalez@signa.net
		Pager	(800) 210 9684	

SERVICE COMPANIES

Rig Contractor:
Drilling Fluids
Cementer
Bit Supplier
Wellhead
Tubular Supply
Completion Tools
Turbolators

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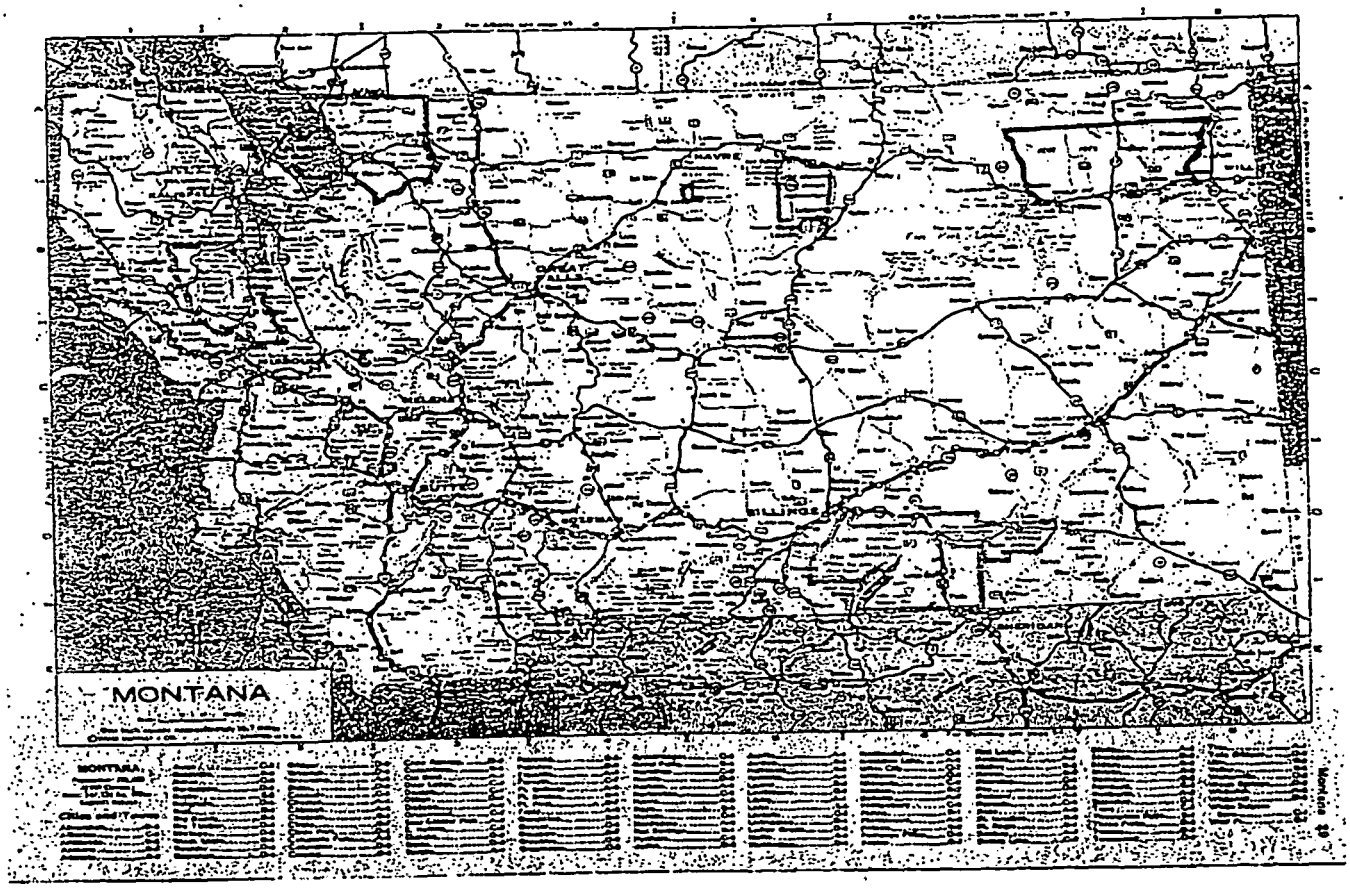
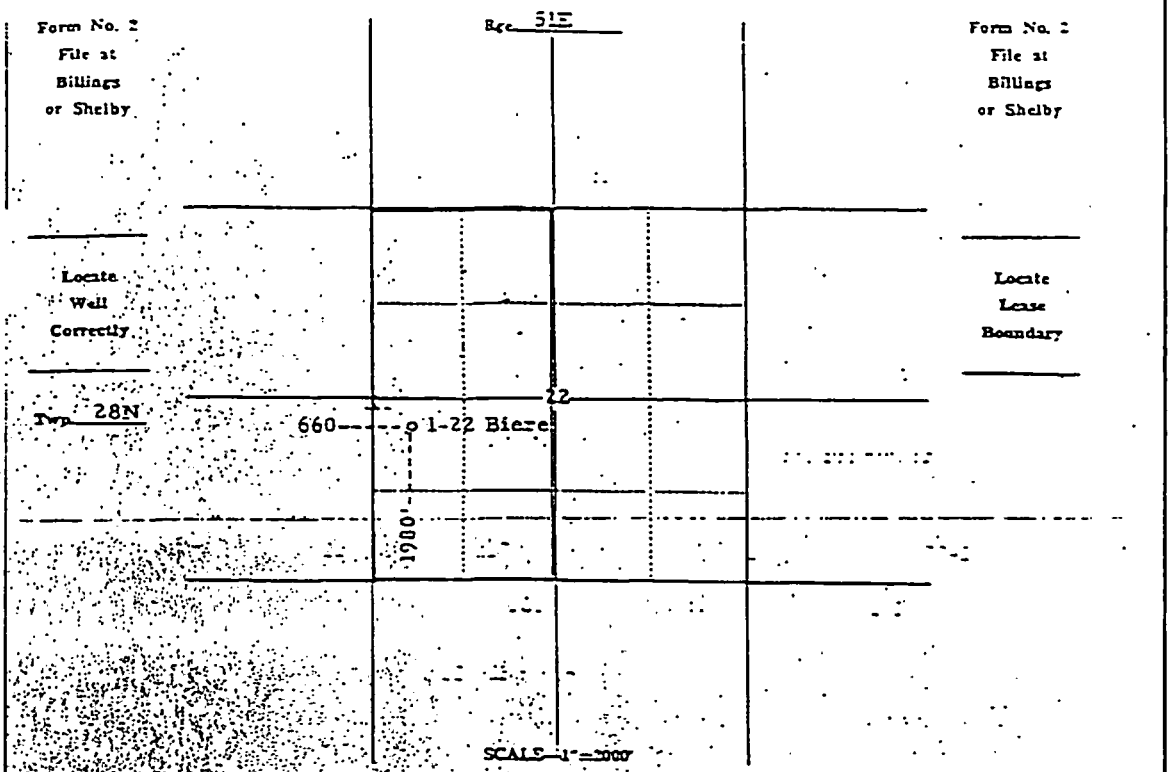
To view the actual hard copy, contact the Region VIII Records Center at (303) 312-6473.

MONTANA MAP



LOCATION PLAT

Locate well by footage measurement from legal subdivision line, lease or property line and nearest drilling or producible well, if any.



THE NOTICE OF INTENTION TO DRILL THIS WELL IS APPROVED SUBJECT TO THE FOLLOWING CONDITIONS:

1. Any person, before commencing the drilling of any oil or gas well, shall secure from the commission a drilling permit and shall pay to the commission therefor for the following amounts: for each well whose estimated depth is thirty-five hundred (3,500) feet or less, twenty-five dollars ($25.00); from thirty-five hundred and one (3,501) feet to seven thousand (7,000) feet, seventy-five dollars ($75.00); seven thousand (7,000) feet and deeper, one hundred fifty dollars ($150.00).
2. No well is to be spudded in unless the proper survey drilling bond has been posted and approved by the Oil and Gas Conservation Commission of the State of Montana.
3. Cable tool operators must construct an adequate sump to contain all mud and water bailed from the hole.
4. Surface or conductor casing must be properly cemented by an approved method to act as a tie in case an unexpected flow of oil, gas, or water should be encountered, unless special permission has been granted for formation shut-off.
5. Any contemplated change in status of a well such as to plug and abandon, deepen, plug back, redrill, alter casing, etc., must be presented on Sundry Notices and Report of Wells form for approval by agent prior to commencement of work.
6. All substantial showings of oil or gas must be tested for commercial possibilities before drilling ahead. Each such showing must be adequately protected by casing, mud or cement, as drilling progresses.
7. The production string must be cemented unless a formation shut-off or packer is approved by the agent. Sufficient cement must be used to protect the casing and possible productive formation exposed in the process of drilling not otherwise protected.
8. All production strings or casing must be tested by bailing or pressure to determine if there is a tight bond with the formation or possible leaks in the casing. The results of the test must be reported on Sundry Notices and Report of Wells form, said report to include the size, weight, thread and length of casing, amount of cement used, and date work is done. If test shows failure, the defect must be corrected before any drilling operations are resumed.
9. A satisfactory drilling record must be kept for each tour, showing top and thickness of each and all formations drilled and all other information of value, one copy of which is to be kept at the rig while drilling is in progress for examination when an agent visits the well.
10. All producing wells must be marked with name of the operator, number of the well, and location, using reasonable precautions to preserve these markings at all times.
11. Copies of all directional surveys, electrical logs, or tops from electrical log if electric survey is run, formation tops, and cementing record, as furnished by the cementing company, etc., must be filed with the State Inspector of the district together with four copies of the log, upon completion of the well.
12. All work must be done in conformity with the regulations of the Oil & Gas Conservation Commission of the State of Montana, as contained in "General Rules and Regulations," and amendments thereto, as well as regulations prescribed in lieu thereof.

3 GEOLOGY & MAPS

WELL & GEOLOGY SUMMARY

LOCATE WELL CORRECTLY

660' 1980'

(SUBMIT IN TRIPLICATE)
TO
OIL AND GAS CONSERVATION COMMISSION
OF THE STATE OF MONTANA
BILLINGS OR SHELBY

JUL 1970 RECEIVED

Form No. (Geo. Date 1963 & 1

LOG OF WELL

12

Company Mesa Petroleum Co. Lease Biere Well No. 1-22

Address Box 2009, Amarillo, Texas Field (or Area) Poplar

The well is located 1980 ft. from (S) line and 660 ft. from (W) line of Sec. 22

Sec. 22 T. 28N R. 51E County Roosevelt Elevation 2086 KB 2074 GL (D.F., R.B. or G.L.)

Commenced drilling 5-6-70 19__ Completed ~~XXXXX~~ 6-8-70 19__

The information given herewith is a complete and correct record of the well. The summary on this page is for the condition of the well at the above date.

Completed as oil (oil well, gas well, dry hole)

Signed [signature]

Title Production Superintendent

Date July 7, 1970

IMPORTANT ZONES OF POROSITY
(denote oil by O, gas by G, water by W, state formation if known)

From 698	to 876	Judith River	W	From 5516	to 5543	Charles "A"	W
From 3200	to 3570	Dakota	W	From 5635	to 5678	Charles "B"	W
From 4840	to 4992	Tyler	W	From 5788	to 5805	Charles "C"	O & W
From 5155	to 5288	Kibbey Sa.	W	From	to		

CASING RECORD

Size Casing	Weight Per Ft.	Grade	Thread	Casing Set	From	To	Sacks of Cement	Cut and Pulled from
8 5/8	24	J	8	741			465	none
5 1/2	15	J	8	5845	TOC @ 2660		675	none

TUBING RECORD

Size Tubing	Weight Per Ft.	Grade	Thread	Amount	Perforations
2 7/8	6.7	J	8	5767	5791

COMPLETION RECORD

Rotary tools were used from 0 to 5845

Cable tools were used from to

Total depth 5845 ft.; Plugged back to 5803 T.D.; Open hole from to

PERFORATIONS Interval From	To	Number and Size and Type	ACIDIZED, SHOT, SAND-FRACED, CEMENTED Interval From	To	Amount of Material Used	Pressure
5791		Hydro-jet	5791		2000 gals 7 1/2% HCL	

(If PAA show plugs above)

INITIAL PRODUCTION

Well is producing from Charles "C" zone (pool) formation.

I.P. 516 barrels of oil per 24 hours flowing (pumping or flowing)

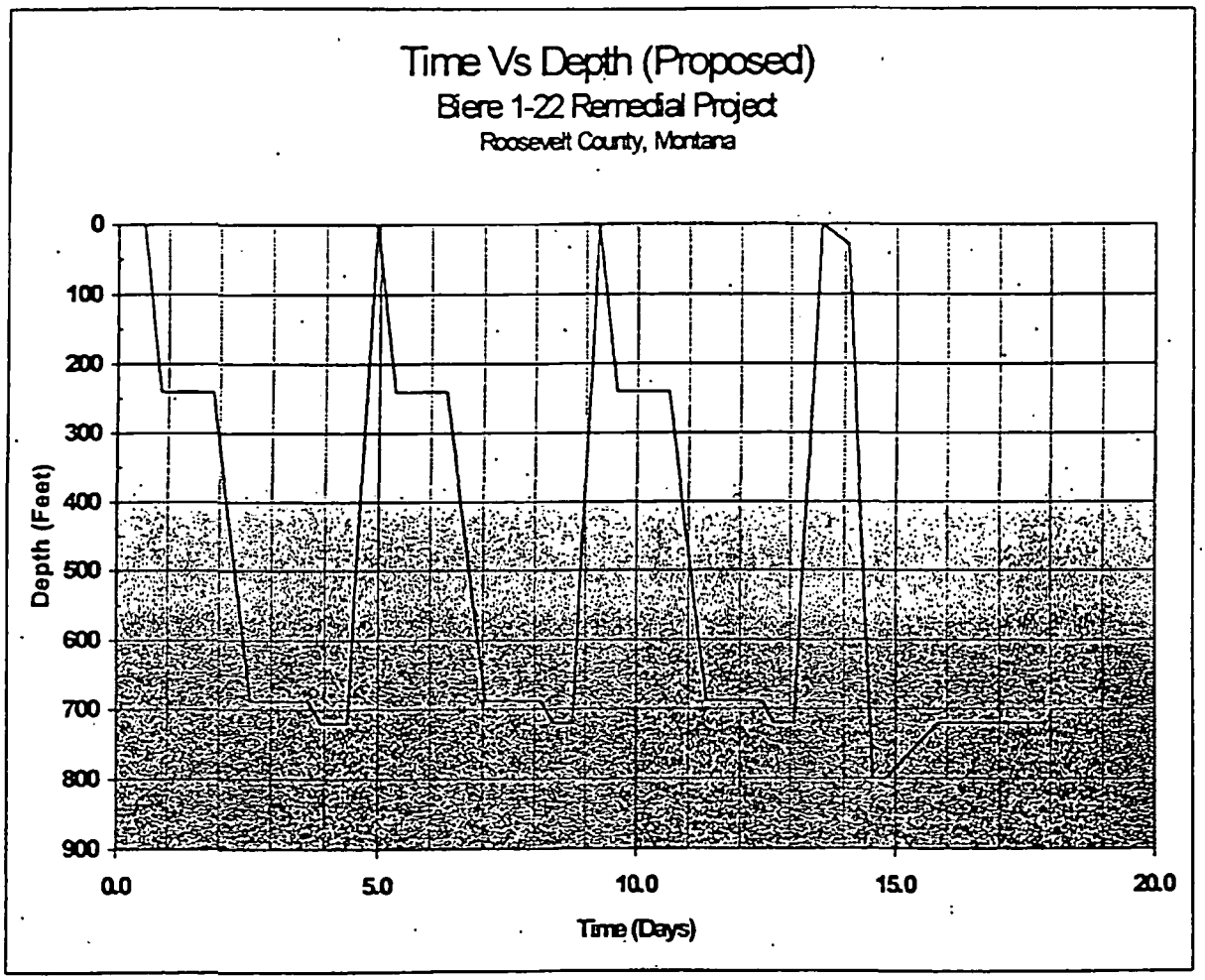
150 Mcf of gas per 24 hours

966 barrels of water per 24 hours, or 65 % W.C.

(OVER)

EPA Emergency Permit No. MT5913-00000

DEPTH VERSUS DAYS CURVE



TIME VS DEPTH TABLE

Time Vs Depth (Proposed)

Biere 1-22 Remedial Project
Roosevelt County, Montana

Hrs.	Days	Total Days	Depth	Details
0.0	0.0	0.0	0	[illegible]
12.0	0.5	0.5	0	MI & RU Equipment - Test Hydril
8.5	0.4	0.9	240	Drill from 35' to 240' - Circulate and clean hole - Wiper trip
6.0	0.3	1.1	240	Run and Cmt 9 5/8" casing
12.0	0.5	1.6	240	WOC
6.0	0.3	1.9	240	Run CBL & N/U
18.0	0.8	2.6	688	Drill from 240' to 688' - Circ & cond hole
8.0	0.3	2.9	688	Run and Cmt 5 1/2" casing
12.0	0.5	3.4	688	WOC
6.0	0.3	3.7	688	Run CBL & N/U
6.0	0.3	3.9	720	P/U BHA - Test shoe - Drill to 720
6.0	0.3	4.2	720	Circ & Cond - Perform Leak-Off Test to establish Frac Gradient - POOH
6.0	0.3	4.4	720	RIH with 2 7/8" tubing and hang same - Prepare well for injection
12.0	0.5	4.9	0	MI & RU Equipment - Test Hydril
[illegible]	[illegible]	[illegible]	240	Drill from 35' to 240' - Circulate and clean hole - Wiper trip
[illegible]	[illegible]	[illegible]	240	Run and Cmt 9 5/8" casing
[illegible]	[illegible]	[illegible]	240	WOC
6.0	0.3	6.3	240	Run CBL & N/U
18.0	0.8	7.0	688	Drill from 240' to 688' - Circ & cond hole
[illegible]	[illegible]	[illegible]	688	Run and Cmt 5 1/2" casing
[illegible]	[illegible]	[illegible]	688	WOC
[illegible]	[illegible]	[illegible]	688	Run CBL & N/U
[illegible]	[illegible]	[illegible]	720	P/U BHA - Test shoe - Drill to 720
[illegible]	[illegible]	[illegible]	720	Circ & Cond - POOH
[illegible]	[illegible]	[illegible]	720	RIH with 2 7/8" tubing and hang same - Prepare well for injection
12.0	0.5	9.3	0	MI & RU Equipment - Test Hydril
8.5	0.4	9.6	240	Drill from 35' to 240' - Circulate and clean hole - Wiper trip
6.0	0.3	9.9	240	Run and Cmt 9 5/8" casing
12.0	0.5	10.4	240	WOC
6.0	0.3	10.7	240	Run CBL & N/U
18.0	0.8	11.4	688	Drill from 240' to 688' - Circ & cond hole
8.0	0.3	11.7	688	Run and Cmt 5 1/2" casing
12.0	0.5	12.2	688	WOC
6.0	0.3	12.4	688	Run CBL & N/U
6.0	0.3	12.7	720	P/U BHA - Test shoe - Drill to 720
6.0	0.3	12.9	720	RIH with 2 7/8" tubing and hang same - Prepare well for injection
3.0	0.1	13.1	720	Circ & Cond - POOH
12.0	0.5	13.6	0	MI & RU Equipment - Test Hydril
12.0	0.5	14.1	30	RIH & drill 30' of cement plug - Circ & cond hole
[illegible]	[illegible]	[illegible]	[illegible]	RIH to 688' - Drig 50' of cement - RIH to bottom - Circ & cond hole
[illegible]	[illegible]	[illegible]	[illegible]	RIH with 2 7/8" tubing and hang same - Prepare well for injection
12.0	0.5	15.8	720	R/U Halliburton Injection Equipment
12.0	0.5	16.3	720	Perform Injection
24.0	1.0	17.3	720	Waiting on fluid to set - Monitor wells
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

5 DETAILED OPERATIONS PROCEDURES

NOTE: THE DETAILED PROCEDURE HIGHLIGHTS THE BASIC WELL PLAN. THE OTHER SECTIONS GIVING MORE COMPLETE DETAILS ARE UNDERLINED AND IN PARENTHESIS, WHERE APPROPRIATE.

LOCATION CONSTRUCTION & RIG UP

1. Check the roads to the location and stabilize as needed to bring in required equipment.
2. Clean and level location. Prepare same to bring in equipment.
3. Drill water well.
4. Clean cellars of the Biere 1-22 and Biere 1-22 Relief Well.
5. Construct three 8' by 6' cellar with corrugated metal ring (make sure cellar size complies with rig requirements).
6. Move in and rig up Rathole Machine. Drill 17-1/2" hole down to ~~35'~~ 60'-65'. Run and cement 13 3/8" conductor pipe to bottom. If cement does not circulate to surface, top out casing with 1" tubing and fill to surface with standard cement + 2% CaCl2. WOC. Have 13-3/8" SOW Bell Nipple on location in the event unable to space out conductor properly.
7. Drill mouse hole and set conductor. Drill rat hole.
8. Repeat steps 6 and 7 two times (for a total of three conductor pipes for the drilling of the new relief wells).
9. Rig down and move out Rathole Machine.

DRILLING PROCEDURE

1. Move in and rig up drilling rig.
2. Position rig over the conductor of the first relief well to be drilled and level substructure accordingly. Pull test all deadman anchors for stability. Replace any anchors that are doubtful.
3. Notify the Montana Board of Oil and Gas Conservation and advise them of the spud date and time.
4. Install a 13 3/8" X 9 5/8" Larkin Casing Head (screw-on type), 13 3/8" Casing Btm X 9 5/8" Slip & Seal Assembly. Install screw-on type drilling flange / BOP Adapter for 13 3/8" Larkin Head X 13 5/8" 3M Flange, on top of casing head to be ready to nipple up BOP stack on top.

5. Pick up and install 13 5/8" 3,000 psi WP BOP Stack, low-pressure rotating head and choke manifold (See Details in BOP Section).
6. Test rams, choke manifold and Hydril to 2,000 psi with test plug. Test rotating head to 350 psi or 70% of full capacity. Run full accumulator test. Report results

7. P/U a 12-1/4" milled tooth bit (see Bit Program) and BHA. RIH and test 13-3/8"casing to 500 psi. Drill out cement and cementing equipment. Drill down to +/- 240' with fresh water (may need some extra footage since a screw-on type head will be used, and spacing may become an issue). If conditions require it, weight up system as needed. Take drift survey at 240'. Circulate and condition hole.
   - Some fluid influx may be observed while drilling this section.
   - Some very high temperatures may be observed in this section (120° - 200°F)
   - Ensure proper X-Over are on location prior to spud.
   - If needed, sweep hole as necessary with gel sweeps

8. Short trip to surface. Circulate & condition hole prior to running casing. Make sure hole is stable and no water influx is observed. POOH. Contact Montana Board of Oil and Gas Conservation and inform them of intent to run and cement casing.

9. Run and cement 9-5/8" casing (see Casing and Cementing Detail Sheet). Note: Thread lock shoe joint.

10. Reciprocate casing during cementing. Cement returns to surface should be monitored and recorded on morning report. If necessary, top out casing with 50 feet of 1" tubing and fill to surface with 50 sx of standard cement + 2% $CaCl_2$.

11. N/D BOP's. Space out and install a 9 5/8" Larkin Casing Head (9 5/8" 8rd Casing bottom X 5 ½" Slip & Seal Assembly) with Drilling Flange Adapter (9 5/8" Larkin Head X 11" 3M Flange). Total time before drill out should be 12 hours.

    - Have one or two joints of extra casing on location to cover for any damaged joints.
    - Run casing at a constant and reasonable speed. Be sure to keep csg. moving as much as possible.
    - Have 9-5/8" SOW Bell Nipple on location in the event unable to space out casing properly.

12. NU BOP's & rotating head.

13. Rig up wireline unit. Run CBL Log and report results to office. Rig down wireline unit.

14. PU 7-7/8" milled tooth bit (see Bit Program) and BHA. RIH and test casing to 1,600 psi. or 70% of burst capacity. Drill float equipment and 10' of formation. Test 9-5/8" casing seat to 9.4 ppg equivalent mud weight. Notify operations engineer if shoe does not test.

15. Drill to ±688' (10' above Judith River Sandstone), with spud mud. Circulate and condition hole. Weight up mud in order to stabilize hole and stop any possible fluid influx. POOH.

    - Some severe flow of fluid may be observed (+/- 80-90 BPH).
    - Take drift survey at 688'.

- Make short trips as required.
- Circulate well and observe clean stabilized hole prior to tripping.

16. Run Temperature Log in open hole. Report results to office. Results will be used to design the injection remedial job.

17. R/U casing crews. Run and cement 5-1/2" casing to ±688' (See Cementing and Tubular Section). Contact Montana Board of Oil and Gas Conservation prior to cementing.

18. N/D BOP's. Space out and install a 3M Larkin Tubing Head (Type R 5 ½" 8rd X 2 7/8" Slip & Seal Assembly) with Drilling Flange / BOP Adapter (5 1/2" Larkin Head X 7 1/16" 3M Flange). Total time before drill out should be 12 hours.

    - Note: Baker lock the shoe joint(s)
    - Wash down as necessary.
    - WOC for 12 hours.

19. N/U rig BOP's (See BOP Section). Test BOP'S, choke manifold and annular preventer to 250 low and 3,000 psi high. Install & test rotating head with test cap to 350 psi. Report results in morning report.

20. Run CBL Log from TOC to surface. Report results to office.

21. PU 4-1/2" milled tooth bit (see Bit Program) and BHA. RIH to TOC. Test casing to 3,000 psi or 70% of burst capacity prior to drilling out. Displace mud with fresh water.

22. Drill out cementing equipment and drill down to +/- 720' (leaving exposed 10' of the Bearpaw Shale and 22' of the Judith River Sandstone). Circulate and condition hole with brine (9 PPG or as required to kill the well).

23. Perform a Leak-off Test to establish actual fracture gradient to be used in injection job. POOH and LD drill string.

24. PU and RIH with 2 7/8" N-80 8rd EUE 6.5 PPF tubing down to +/- 680'. Hang tubing in tubing head and N/U Larkin-type tree in preparation for injection job (see Wellhead Section). Secure well and monitor pressure gauges on annulus of each section daily.

25. Repeat steps 1 through 24 for the drilling of the next two remedial wells. Avoid steps 3, 16 and 23 which will only be performed in the drilling of the first remedial well.

26. Move in and rig up drilling rig to old relief well.

27. Position rig over the conductor of the old relief well and level substructure accordingly. Pull test all deadman anchors for stability. Replace any anchors that are doubtful.

28. Weld on 5-1/2" SOW Bell Nipple. Install a 3,000 psi WP screw-on type casing head. Install screw-on type adapter flange on top of casing head to be ready to nipple up BOP stack on top (5 1/2" Larkin Head X 7 1/16" 3M Flange) and test same.

29. Pick up and install 3,000 psi WP BOP Stack and choke manifold (See Details in BOP Section).

30. P/U 4 1/2" bit and BHA. Drill out surface cement plug (+/- 30 feet). RIH to +/- 686' (approx. TOC of intermediate cement plug).

31. Test 5 1/2" casing integrity to 2,000 psi.

32. Circulate and clean hole with fresh water. Drill +/- 50' of cement. Care must be exercised since some fluid pressure may be accumulated under this cement plug. Circulate and clean hole. RIH to +/- 800' (approx. TOC of third and last cement plug). Circulate and clean hole with brine (9 PPG or as required to kill the well). POOH and LD drill string.

33. PU RIH with 2 7/8" N-80 8rd EUE 6.5 PPF tubing down to +/- 680'. Hang tubing in tubing head and N/U connections to prepare for injection job. Secure well.

34. Rig up and prepare wells for Halliburton injection equipment.

35. Release Rig.

STUCK PIPE PREVENTION METHODS FOR INTERMEDIATE AND PRODUCTION HOLE

While drilling the intermediate and production portions of the well, continue to use the following precautions to minimize chances of sticking the drill string. **MEET WITH ALL DRILLERS AND TOOLPUSHERS TO ENSURE UNDERSTANDING. POST A COPY IN THE DOGHOUSE FOR ALL CREWS.**

(1) Pipe movement:

- Keep pipe moving at all times possible.
  - Rotate the string on all connections and on trips while in open hole.
  - Reciprocate and rotate pipe while circulating.
- Always begin pipe motion in a downward direction while in the vertical section of the hole.
- Ream at least the last three singles to bottom on trips.
- Wipe the hole prior to each connection.

(2) Drill String:

- Use the drill string design described elsewhere in the drilling program.
- Use spiral DCs and spiral HWDP while drilling, if available.

(3) Drilling Fluid/Hole Conditioning:

- Maintain minimum MW necessary to control the well.
- Maintain Annular Velocity at +140 ft./min.
- Maintain circulation as long as possible on connections.

(4) Hole Monitoring:

- Monitor the volume of cuttings over the shakers, noticing any change. Ensure the shakers are clean prior to tripping.
- Monitor torque and drag, and report Pick-Up, Slack-Off and Rotating weight on the morning report. Report depth and magnitude of overpull.
- Watch for indications of swabbing, indicating tight hole.
- Watch for fill on connections and trips.

(5) Stuck Pipe: If pipe becomes differentially stuck while drilling the vertical section of the hole:

- Stop pump (or slow significantly);
- Torque the string;
- Slack off all weight in an attempt to free the string.

6 CASING PROGRAM

CASING SUMMARY

CASING & TUBING REQUIREMENTS*

Biere 1-22 Relief Wells

SECTION	DEPTH FROM	DEPTH TO	OD (in)	ID (in)	DRIFT (in)	JOINT OD	WT. (ppf)	GRADE	CONN.	BURST (psi)	COLLAPSE (psi)	TENSION (lbs)
Surface Casing	0	35	13 3/8	12.72	12.559	14.375	48	H-40	STC	1,730	740	607,000
Intermediate Csg	0	240	9 5/8	9.001	8.845	10.63	32.3	H-40	STC	2,270	1,370	366,000
Production Csg	0	688	5 1/2	5.012	4.887	6.05	14	J-55	STC	4,270	4,120	222,000

SECTION	REASON FOR CASING
Surface Casing	Need to set BOP's. Last point without water influxes (which will benefit the quality of the cement job)
Intermediate Csg	Protect Glacial-U Aquifer
Production Csg	Force injection fluid in the Judith River Sandstone and protect other formations from fracturing

* All casing sizes specified here are minimums required. Different weights and grades may be considered as long as they comply with the minimum ID's required by the next bit or equipment to be used.

7 DRILLING FLUIDS PROGRAM

DRILLING FLUIDS

Interval	Bit Size, in.	Casing Size, in.	Depth (MD), feet	Mud Type	Mud Weight, lb/gal
I	17 1/2"	13 3/8"	35'	Water	8.34 - 8.34
II	12 1/4"	9 5/8"	240'	Spud Mud	8.34 - 8.6
III	7 7/8"	5 1/2"	688'	Spud Mud + Weighted Material	8.6-9.5
IV	4 1/2"	Open Hole	720'	Fresh Water	8.34

8 CEMENT DESIGN

9-5/8" CASING CEMENT & DETAIL SHEET

Pioneer Natural Resources USA, Inc Casing Cementing and Detail Sheet

WELL: Biere Remedial COUNTY: Roosevelt, Montana FIELD: Poplar DATE: Sept/11/00

BTM (MD/TVD): ,240' / ,240' HOLE SIZE: 12 1/4" CASING SIZE: 9 5/8"

STRING (RUNNING ORDER) MAKE UP TORQUE (FT-LB)

1)	0	-	-	( )	0.00 #/ft	0 0	0
2)	-	-	-	( )	0.00 #/ft	0 0	0
3)	-	-	240	(240')	32.30 #/ft	H-40 STC	4,340

SPACE FLOAT EQUIPMENT AS FOLLOWS:

ITEM	LOCATION:
(1) - STC FLOAT SHOE	BOTTOM OF 1ST JOINT
(1) - 9 5/8" X 12 1/4" BOWSPRING TURBOLIZER w/ STOP RING	6' ABOVE CSG SHOE
(1) - 9 5/8" X 12 1/4" BOWSPRING TURBOLIZER w/ STOP RING	BELOW 1ST COLLAR
(1) - 9 5/8" X 12 1/4" FLOAT COLLAR	BETWEEN 1ST. & 2ND. JOINT
(4) - STC BOWSPRING TURBOLIZERS	EVERY JOINT

CEMENT (MIXING ORDER) CEMENT CO. Halliburton Williston, North Dakota (888) 774-3963

TYPE	ADDITIVES	SKS	WT - ppg	YIELD	GAL/SK
LEAD:	N/A				
N/A	N/A	**	N/A	0.00	0
TAIL:	0.25 lb/sx Lost Circ + 3% KCl +				
Premiun Plus	0.2% Thixotropic	120**	14.5	1.41	6.85

Note: Top of Cement @ ' (240' above Casing Shoe) with 100% Excess in Open Hole.
(Gas block agent will be added to cement - amount to be determined after testing slurries).

CEMENT PROPERTIES:
Tail: 24 hrs Compressive Strength > (N/A) psi. 72 hrs Compressive Strength > (N/A) psi. BHST = 142°F
Tail: No Free Water & Fluid Loss < N/C cc.
Pump Time = 2. hrs.

CEMENTING PROCEDURE:
Cement requires 20 bbls of mix water. Pump 10 bbls of Fresh Water ahead of slurry.
Displace casing with 16 bbls of mud at maximum rate for turbulence. Reciprocate pipe with 20 ft strokes while mixing and displacing cement. WOC 24 hrs before drilling out.

MISCELLANEOUS INFORMATION:
Use torque monitoring equipment (NOT Torque Turn) while making-up casing. Send field casing and cementing detail sheet to office.
Collapse resistance of 32.30# H-40 STC casing is 913 psi with Safety Factor of 1.5.
Estimated Maximum Shut in Pressure = 500 psi. Burst SF of 32.30# H-40 STC casing is 4.54 .
Maximum recommended tension of 32.30# H-40 casing is 170,180,000 # @ 67%.
Buoyant weight of casing with 8.6# mud on the inside and outside of the casing is 7,000 #.
Test casing to 70% of Burst or 1,600#. Test Rams and choke lines to 2,000#. Test Hydril to 2,000
350 psi with test cap.
Note: Use (1) wiper plug(s). Also, Have one extra bottom plug available for emergencies.
Note: Cement company to bring cement out to location in bins prior to cementing for testing field blends pump time, retarder, water loss, compressive strengths etc.
** If available use hole volume determined from caliper log to determine cement volumes (caliper volume plus 100%).

*** CALL Montana Board of Oil and Gas Conservation PRIOR TO CEMENTING ***

Prepared by: Signa Engineering Corp. Approved by: _____

5-1/2" INTERMEDIATE CASING CEMENT & DETAIL SHEET

Pioneer Natural Resources Casing Cementing and Detail Sheet

WELL: Biere Remedial COUNTY: Roosevelt, Montana FIELD: Poplar DATE: Sep/11/00

BTM (MD/TVD): ,688' / ,688' HOLE SIZE: 7 7/8" CASING SIZE: 5 1/2"

STRING (RUNNING ORDER)						MAKE UP TORQUE (FT-LB)
1)	0 -	-	( )	0.00 #/ft	0 0	* 0
2)	- -	-	( )	0.00 #/ft	0 0	* 0
3)	- -	688	(688')	14.00 #/ft	J-55 STC	* 1,720

SPACE FLOAT EQUIPMENT AS FOLLOWS:

ITEM	LOCATION:
(1) - STC FLOAT SHOE	BOTTOM OF 1ST JOINT
(1) - 5 1/2" X 7 7/8" BOWSPRING TURBOLIZER W/ STOP RING	6' ABOVE CSG SHOE
(1) - 5 1/2" X 7 7/8" BOWSPRING TURBOLIZER	BETWEEN 1ST & 2ND JOINT
(1) - 5 1/2" X 7 7/8" BOWSPRING TURBOLIZER W/ STOP RING	MIDDLE OF 2ND JOINT
(1) - STC FLOAT COLLAR	BETWEEN 2ND & 3RD JOINTS
(8) - STC BOWSPRING TURBOLIZER	EVERY SECOND JOINT

CEMENT (MIXING ORDER) CEMENT CO. Halliburton Williston, North Dakota (888) 774-3963

TYPE	ADDITIVES	SKS	WT - ppg	YIELD	GAL/SK
LEAD:					
		**	N/A	0.00	0
TAIL:		95**	13	1.75	9.18
Premium Plus/Pozmix	4% Extender+3% KCl+0.4%Fluid Loss+ 0.25lb/sx Lost Circ+0.2% Thixotropic				

Note: Top of Cement @ Surface with 30% excess.

CEMENT PROPERTIES:
Tail: 24 hrs Compressive Strength > N/A psi. 72 hrs Compressive Strength > N/A psi. BHST = 128°F
Tail: No Free Water & Fluid Loss < N/A cc.
Pump Time = 4 hrs.

CEMENTING PROCEDURE:
Cement requires 21 bbls of mix water. Pump 20 bbls of OB-1 Spacer ahead of slurry.
Displace casing with 15 bbls of mud at maximum rate for turbulence. Reciprocate pipe with 10 ft strokes while mixing and displacing cement. WOC 24 hrs before drilling out.

MISCELLANEOUS INFORMATION:
Use torque monitoring equipment while making-up casing. Send field casing and cementing detail sheet to Pioneer Natural Resources c
##
Estimated Maximum Shut in Pressure = 1,500 psi. Burst SF of 14.00# J-55 STC casing is 2.85.
Maximum reccomended tension of 14.00# J-55 casing is 129,000,000 # @ 75%.
Buoyant weight of casing with 9.5# mud on the inside and outside of the casing is 9,000 #.
Note: Use (1) wiper plug(s).
Note: Cement company to bring cement out to location in bins prior to cementing for testing field blends pump time, retarder, water loss, compressive strengths etc.
** If available use hole-volume determined from caliper log to determine cement volumes (caliper volume plus 30%).

*** CALL Montana Boards of Oil and Gas Conservation PRIOR TO CEMENTING ***

Prepared by: Signa Engineering Corp. Approved by: _____

9 BITS

9.1 BIT PROGRAM

Offsets Used for Comparison
Biere 1-22
Biere 1-22 Relief Well
EPU 116

Proposed Hole and Casing Design		
Hole Size(in)	Casing Size(in)	MD Depth(ft)
17-1/2	13-3/8	35'
12-1/4	9-5/8	240'
7 7/8	5-1/2	688'
4-1/2	Open Hole	720'

7.2 BIT SUMMARY INFORMATION

Hole Section: 17-1/2
Depth: 0'-35'
Bit Type: Retip Milled Tooth
IADC Code: **111**
Footage: 35' Each Well

Drilling Applications
Designed for soft-formation, top-hole drilling in low-strength, unconsolidated clays, sands and silty marine sediments. Typically used as a spud bit.

Design Specifications	
Bearing Type	Open Roller
Journal Angle	32-1/2°
Offset	3/8"
Seal	None
Number of Rows	7
Number of Teeth	75
Bit Connection	6-5/8" Reg.

Hole Section: 12-1/4
Depth: 35'-240'
Bit Type: Retip Milled Tooth
IADC Code: 515X
Footage: 205' Each Well

Drilling Applications

Designed for drilling intervals of very soft, low-compressive strength, unconsolidated formations such as clays, marls, soft shales, sands, halites and gypsums.

Design Specifications

Bearing Type	Spinodal
Journal Angle	32-1/2°
Offset	3/8"
Seal	O-Ring
Number of Rows	7
Number of Teeth	65
Bit Connection	6-5/8" Reg.

Hole Section: 7-7/8
Depth: 240'-688'
Bit Type: New Milled Tooth
IADC Code: 117
Footage: 448' Each Well

Drilling Applications

Designed to drill long intervals of soft to medium-soft, low-compressive strength, unconsolidated formations such as clays, marls, soft shales, unconsolidated sands, halites and gypsums.

Design Specifications

Bearing Type	Spinodal
Journal Angle	32-1/2°
Offset	5/16"
Seal	O-Ring
Number of Rows	7/3
Number of Teeth	54/58
Bit Connection	4-1/2" Reg.

Hole Section:	4-1/2
Depth:	688'-720'
Bit Type:	New Milled Tooth
IADC Code:	111
Footage:	32' Each Well

Drilling Applications

Designed to drill long intervals of soft to medium-soft, low-compressive strength, unconsolidated formations such as clays, maris, soft shales, unconsolidated sands, halites and gypsums.

10 LOGGING PROGRAM

No e-logs are planned at this time. CBL logs will be run to assure the quality of the cement jobs. Two runs will per performed per well (3 wells). This is **ONLY** a proposed program, and may be changed according to the project needs.

1. ***RUN #1***

Depth:	0' - 240' (Cased Hole)
Casing Size:	9 5/8"
Service Company:	N/A
Type of Unit:	N/A
Logs:	CBL
Scales:	As requested by Pioneer Representatives

2. ***RUN #2 (ONLY IN 1st. WELL)***

Depth:	0' - 688' (Open Hole)
Hole Size:	12 1/4"
Service Company:	N/A
Type of Unit:	N/A
Logs:	Temperature Survey Log
Scales:	As requested by Pioneer Representatives

2. ***RUN #3***

Depth:	0' - 688' (Cased Hole)
Casing Size:	5 1/2"
Service Company:	N/A
Type of Unit:	N/A
Logs:	CBL
Scales:	As requested by Pioneer Representatives

3. ***MUDLOGGERS should be available all the time, at least during the first well.***

11 BLOW OUT PREVENTER & AUXILIARY EQUIPMENT

The BOP stack will be composed of a single 3,000 psi WP shear/blind ram with a 3,000 psi annular preventer and a low-pressure rotating head (500 psi) on top. This equipment should be rigged up after setting the 13 3/8" surface casing. (see wellbore schematic below).

Note: It is important to check the clearance between the BOP stack + rotating control device and the substructure of the drilling rig.

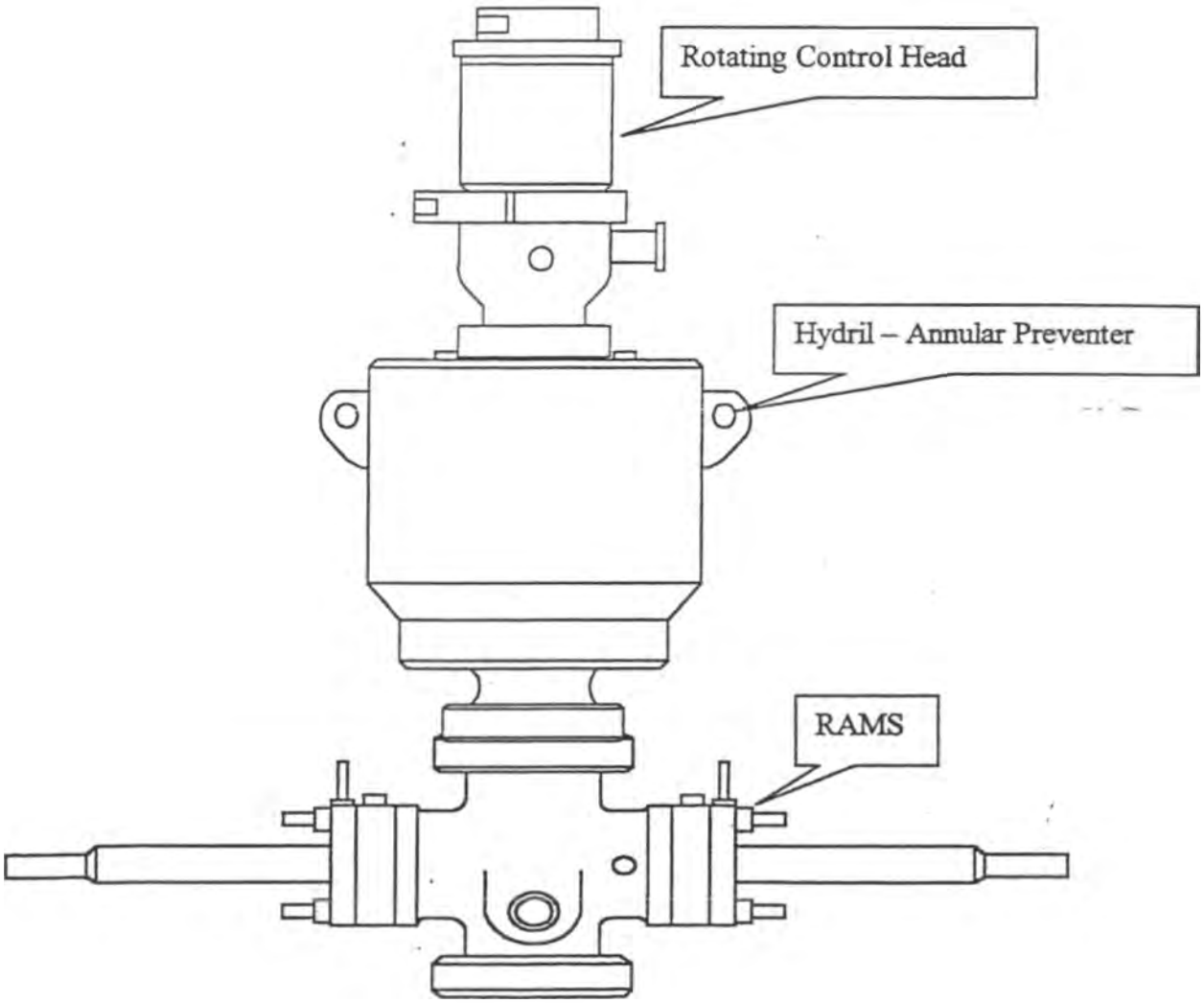
1. All BOP's and the accumulator should be thoroughly serviced and tested on location. Leaking accumulator valves should be replaced before drilling commences.

2. All accumulator bottles should be checked for pre-charge pressures and volume requirements should be affirmed.

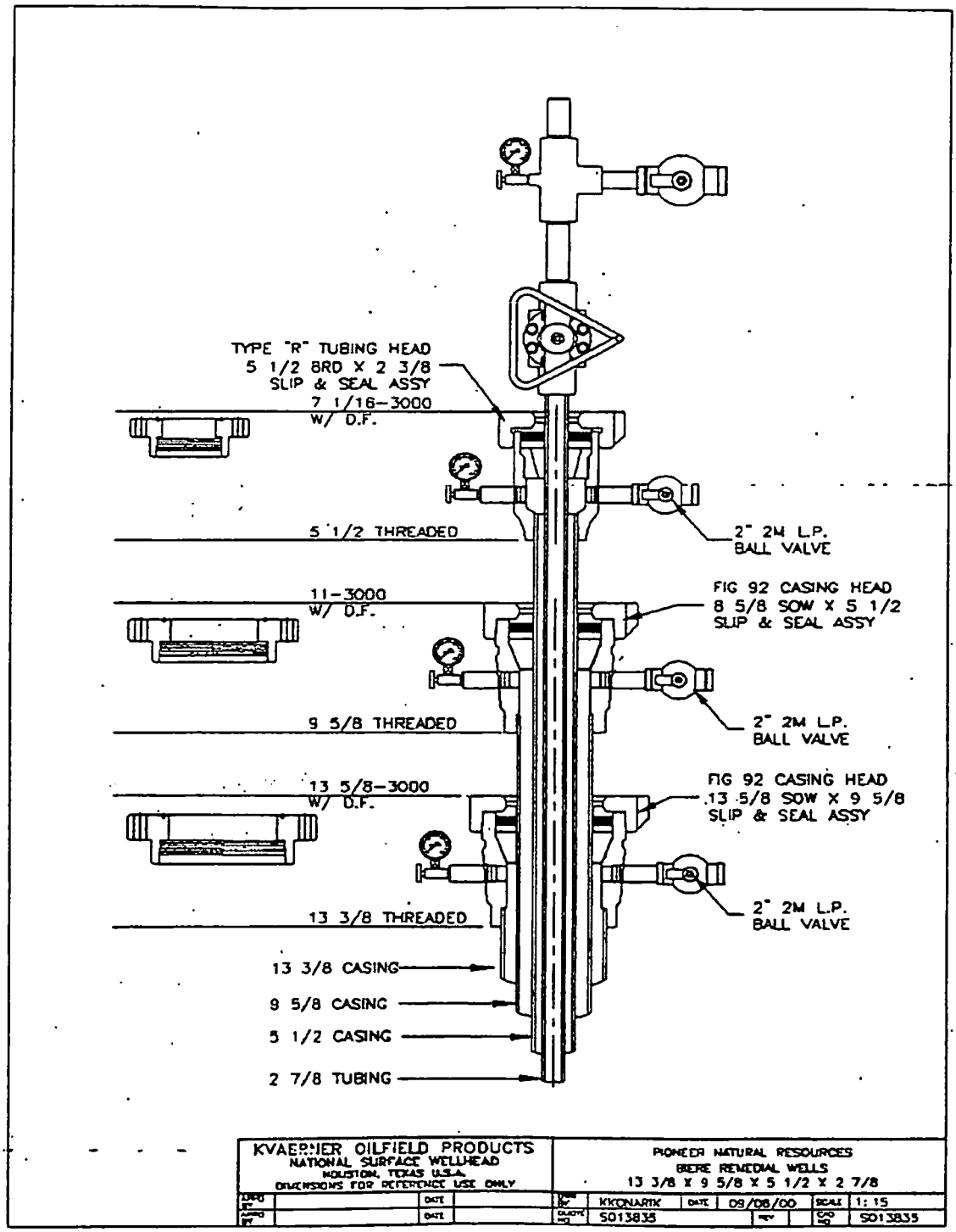
3. A kelly cock to be kept in string at all times.

4. A stabbing valve for the drill string and 2-7/8" tubing with wrenches will be kept on the derrick floor at all times while running pipe.

BOP STACK SCHEMATIC



WELLHEADS & EQUIPMENT



APPENDIX B

Reporting Forms

EPA Form 7520- 7:	Application to Transfer Permit
EPA Form 7520- 8:	Quarterly Well Monitoring Report
EPA Form 7520-10:	Well Completion Report
EPA Form 7520-12:	Well Rework Record
EPA Form 7520-13:	Plugging Record
EPA Form R8:	Mechanical Integrity Pressure Test

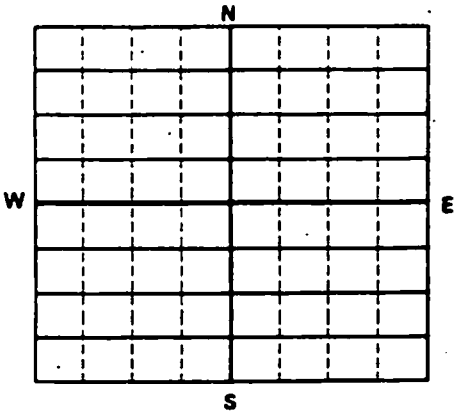
Form Approved. Expires 6-30-98

United States Environmental Protection Agency
Washington, DC 20460

Application To Transfer Permit

Name and Address of Existing Permittee	Name and Address of Surface Owner

Locate Well and Outline Unit on Section Plat- 640 Acres



State	County	Permit Number

Surface Location Description
___ 1/4 of ___ 1/4 of ___ 1/4 of ___ 1/4 of Section___ Township___ Range___

Locate well in two directions from nearest lines of quarter section and drilling unit

Surface
Location_____ft. from (N/S)_____Line of quarter section
and_____ft. from (E/W)_____Line of quarter section.

Well Activity	Well Status	Type of Permit
___Class I	___Operating	___Individual
___Class II	___Modification/Conversion	___Area
___Brine Disposal	___Proposed	Number of Wells___
___Enhanced Recovery		
___Hydrocarbon Storage		
___Class III		
___Other		

Lease Number Well Number

Name(s) and Address(es) of New Owner(s)	Name and Address of New Operator

Attach to this application a written agreement between the existing and new permittee containing a specific date for transfer of permit responsibility, coverage, and liability between them.

The new permittee must show evidence of financial responsibility by the submission of a surety bond, or other adequate assurance, such as financial statements or other materials acceptable to the Director.

Certification

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. (Ref. 40 CFR 144.32)

Name and Official Title *(Please type or print)*	Signature	Date Signed

EPA Form 7520-7 (Rev. 8-91)

Form Approved. Approval Expires 6-30-98

EPA

United States Environmental Protection Agency
Washington, DC 20460

Injection Well Monitoring Report

Year	Month	Month	Month
Injection Pressure (PSI)			
1. Minimum			
2. Average			
3. Maximum			
Injection Rate (Gal/Min)			
1. Minimum			
2. Average			
3. Maximum			
Annular Pressure (PSI)			
1. Minimum			
2. Average			
3. Maximum			
Injection Volume (Gal)			
1. Monthly Total			
2. Yearly Cumulative			
Temperature (F°)			
1. Minimum			
2. Average			
3. Maximum			
pH			
1. Minimum			
2. Average			
3. Maximum			
Other			

Name and Address of Permittee		Permit Number
Name and Official Title *(Please type or print)*	Signature	Date Signed

EPA Form 7520-8 (Rev. 9-91)

Form Approved. OMB No. 2040-0042. Expires 6-30-93

EPA

United States Environmental Protection Agency
Washington, DC 20460

Completion Form For Injection Wells

Administrative Information

1. Permittee

Address *(Permanent Mailing Address) (Street, City, and ZIP Code)*

2. Operator

Address *(Street, City, State and ZIP Code)*

3. Facility Name | Telephone Number

Address *(Street, City, State and ZIP Code)*

4. Surface Location Description of Injection Well (s)

State | County

Surface Location Description

___1/4 of ___1/4 of ___1/4 of ___1/4 of Section ___Township ___Range ___

Locate well in two directions from nearest lines of quarter section and drilling unit

Surface Location_____ft. from (N/S)_____Line of quarter section and_____ft. from E/W _____Line of Quarter section.

Well Activity	Well Status	Type of Permit
____Class I	____Operating	____Individual
____Class II	____Modification/Conversion	____Area: Number of Wells ____
____Brine Disposal	____Proposed	
____Enhances Recovery		
____Hydrocarbon Storage		
____Class III		
____Other		

Lease Number_____ Well Number_____

Submit with this Completion Form the attachments listed in Attachments for Completion Form.

Certification

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. (Ref. 40 CFR 144.32).

Name and Official Title *(Please type or print)*	Signature	Date Signed

EPA Form 7520-9 (Rev. 9-91)

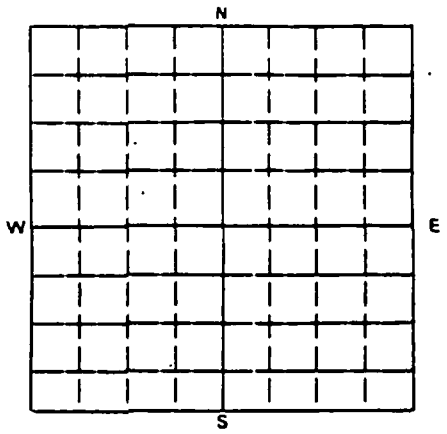
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

EPA

WELL REWORK RECORD

NAME AND ADDRESS OF PERMITTEE	NAME AND ADDRESS OF CONTRACTOR

LOCATE WELL AND OUTLINE UNIT ON SECTION PLAT — 640 ACRES



STATE	COUNTY	PERMIT NUMBER

SURFACE LOCATION DESCRIPTION
___ 1/4 of ___ 1/4 of ___ 1/4 of ___ 1/4 of Section___ Township___ Range___

LOCATE WELL IN TWO DIRECTIONS FROM NEAREST LINES OF QUARTER SECTION AND DRILLING UNIT

Surface Location ____ ft. from (N/S) ____ Line of quarter section

and ____ ft. from (E/W) ____ Line of quarter section

WELL ACTIVITY	Total Depth Before Rework	TYPE OF PERMIT
☐ Brine Disposal ☐ Enhanced Recovery ☐ Hydrocarbon Storage	Total Depth After Rework	☐ Individual ☐ Area Number of Wells ____
Lease Name	Date Rework Commenced	Well Number
	Date Rework Completed	

WELL CASING RECORD — BEFORE REWORK

Casing		Cement		Perforations		Acid or Fracture
Size	Depth	Sacks	Type	From	To	Treatment Record

WELL CASING RECORD — AFTER REWORK *(Indicate Additions and Changes Only)*

Casing		Cement		Perforations		Acid or Fracture
Size	Depth	Sacks	Type	From	To	Treatment Record

DESCRIBE REWORK OPERATIONS IN DETAIL USE ADDITIONAL SHEETS IF NECESSARY	WIRE LINE LOGS, LIST EACH TYPE	
	Log Types	Logged Intervals

CERTIFICATION

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. (Ref. 40 CFR 144.32).

NAME AND OFFICIAL TITLE *(Please type or print)*	SIGNATURE	DATE SIGNED

EPA

PLUGGING RECORD

NAME AND ADDRESS OF PERMITTEE

NAME AND ADDRESS OF CEMENTING COMPANY

LOCATE WELL AND OUTLINE UNIT ON SECTION PLAT — 640 ACRES

N

W E

S

STATE | COUNTY | PERMIT NUMBER

SURFACE LOCATION DESCRIPTION

¼ OF ¼ OF ¼ SECTION TOWNSHIP RANGE

LOCATE WELL IN TWO DIRECTIONS FROM NEAREST LINES OF QUARTER SECTION AND DRILLING UNIT

Surface Location _____ ft. from (N/S) _____ Line of quarter section

and _____ ft. from (E/W) _____ Line of quarter section

TYPE OF AUTHORIZATION

- ☐ Individual Permit
- ☐ Area Permit
- ☐ Rule

Number of Wells _____

Lease Name

Describe in detail the manner in which the fluid was placed and the method used in introducing it into the hole

CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT(LB/FT)	TO BE PUT IN WELL (FT)	TO BE LEFT IN WELL (FT)	HOLE SIZE

WELL ACTIVITY

- ☐ CLASS I
- ☐ CLASS II
  - ☐ Brine Disposal
  - ☐ Enhanced Recovery
  - ☐ Hydrocarbon Storage
- ☐ CLASS III

METHOD OF EMPLACEMENT OF CEMENT PLUGS

- ☐ The Balance Method
- ☐ The Dump Bailer Method
- ☐ The Two-Plug Method
- ☐ Other

CEMENTING TO PLUG AND ABANDON DATA:	PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6	PLUG #7
Size of Hole or Pipe in which Plug Will Be Placed (inches)							
Depth to Bottom of Tubing or Drill Pipe (ft.)							
Sacks of Cement To Be Used (each plug)							
Slurry Volume To Be Pumped (cu. ft.)							
Calculated Top of Plug (ft.)							
Measured Top of Plug (if tagged ft.)							
Slurry Wt. (Lb./Gal.)							
Type Cement or Other Material (Class III)							

LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS

From	To	From	To

Signature of Cementer or Authorized Representative

Signature of EPA Representative

CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. (REF. 40 CFR 122.22)

NAME AND OFFICIAL TITLE *(Please type or print)* | SIGNATURE | DATE SIGNED

APPENDIX C

Plugging and Abandonment Plan

Mechanical Integrity Test
Casing or Annulus Pressure Mechanical Integrity Test

U.S. Environmental Protection Agency
Underground Injection Control Program
999 18th Street, Suite 500 Denver, CO 80202-2466

EPA Witness: _____ Date: ____/____/____
Test conducted by: _____
Others present: _____

Well Name: _____ Type: ER SWD Status: AC TA UC
Field: _____
Location: _____ Sec: ____ T ____ N / S R ____ E / W County: _____ State: ___
Operator: _____
Last MIT: ____/____/____ Maximum Allowable Pressure: _____ PSIG

Is this a regularly scheduled test? [ ] Yes [ ] No
Initial test for permit? [ ] Yes [ ] No
Test after well rework? [ ] Yes [ ] No
Well injecting during test? [ ] Yes [ ] No If Yes, rate: _____ bpd

Pre-test casing/tubing annulus pressure: _____ psig

MIT DATA TABLE	Test #1	Test #2	Test #3
TUBING	*PRESSURE*		
Initial Pressure	psig	psig	psig
End of test pressure	psig	psig	psig
CASING / TUBING	*ANNULUS*	*PRESSURE*	
0 minutes	psig	psig	psig
5 minutes	psig	psig	psig
10 minutes	psig	psig	psig
15 minutes	psig	psig	psig
20 minutes	psig	psig	psig
25 minutes	psig	psig	psig
30 minutes	psig	psig	psig
_____ minutes	psig	psig	psig
_____ minutes	psig	psig	psig
RESULT	[ ] Pass [ ]Fail	[ ] Pass [ ]Fail	[ ] Pass [ ]Fail

Does the annulus pressure build back up after the test ? [ ] Yes [ ] No

MECHANICAL INTEGRITY PRESSURE TEST

Additional comments for mechanical integrity pressure test, such as volume of fluid added to annulus and bled back at end of test, reason for failing test (casing head leak, tubing leak, other), etc.:

_____

Signature of Witness: _____

PLUGGING AND ABANDONMENT PLAN

for the

Biere #1-22A through Biere #1-22D Wells

NW SW Section 22 T28N R51E
Roosevelt County, Montana

UIC Permit No. MT5913-00000

FOR EACH WELL:

Plug #1 Set a cast iron bridge plug in casing above injection zone, at approximately 678'. Place a 100-foot plug from 678' to 578, using at least 12 sacks of 14.5 lb/gal Class C cement. Tag and record top of Plug #1. Fill casing with plugging gel of at least 9.5 lb/gal between plugs.

Plug #2 Place a 100-foot cement plug in casing from approximately 100' to surface with at least 12 sacks of 14.5 lb/gal Class C cement. Record top of Plug #2.

Original

Please Note: 7 30 01 -NW X-6211
This is the only fully printed hard copy of the permit. DO NOT SEND OUT PRIOR TO COPYING

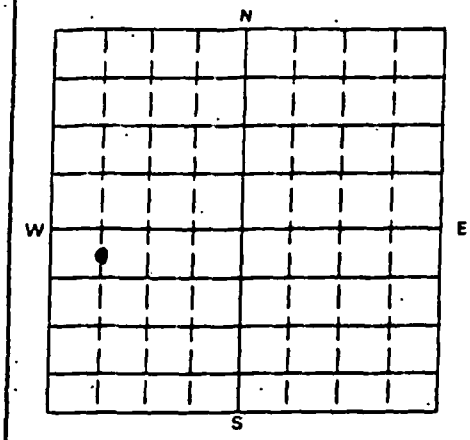
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

EPA

(Proposed) PLUGGING AND ABANDONMENT PLAN

NAME AND ADDRESS OF FACILITY	NAME AND ADDRESS OF OWNER/OPERATOR
Biere 1-22 Remedial Project	Pioneer Natural Resources USA, Inc. 5205 N. O'Connor Blvd, Irving, Tx. 75039-3746

LOCATE WELL AND OUTLINE UNIT ON SECTION PLAT — 640 ACRES



STATE	COUNTY	PERMIT NUMBER
Mont.	Roosevelt	

SURFACE LOCATION DESCRIPTION
___ 1/4 of C 1/4 of NW 1/4 of SW 1/4 of Section 22 Township 28N Range 51E

LOCATE WELL IN TWO DIRECTIONS FROM NEAREST LINES OF QUARTER SECTION AND DRILLING UNIT

Surface Location 1980 ft. from (N/S) S Line of quarter section
and 660 ft. from (E/W) W Line of quarter section

Lat. 48.1631320
Long. 105.1259920

TYPE OF AUTHORIZATION

- ☐ Individual Permit
- ☒ Area Permit
- ☐ Rule

Number of Wells 4

Lease Name Biere Lease

WELL ACTIVITY

- ☐ CLASS I
- ☐ CLASS II
  - ☐ Brine Disposal
  - ☐ Enhanced Recovery
  - ☐ Hydrocarbon Storage
- ☐ CLASS III
- X CLASS IV

Well Number Biere, 1-22A, 1-22B 1-22C & 1-22D

CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT(LB/FT)	TO BE PUT IN WELL (FT)	TO BE LEFT IN WELL (FT)	HOLE SIZE
5 1/2	14#/ft	688'	688'	7 7/8"

METHOD OF EMPLACEMENT OF CEMENT PLUGS

- ☐ The Balance Method
- ☐ The Dump Bailer Method
- ☒ The Two-Plug Method
- ☐ Other

CEMENTING TO PLUG AND ABANDON DATA:	PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6	PLUG #7
Size of Hole or Pipe in which Plug Will Be Placed (inches)	5 1/2"	5 1/2"					
Depth to Bottom of Tubing or Drill Pipe (ft.)	578'	100'					
Sacks of Cement To Be Used (each plug)	12 sxs.	12 sxs.					
Slurry Volume To Be Pumped (cu. ft.)	13.7	13.7					
Calculated Top of Plug (ft.)	578'	0					
Measured Top of Plug (if tagged ft.)	-	-					
Slurry Wt. (Lb./Gal.)	14.5	14.5					
Type Cement or Other Material (Class III)	C	C					

LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS AND INTERVALS WHERE CASING WILL BE VARIED *(if any)*

From	To	From	To
Open Hole 4 1/2"			
688'	720'		

Estimated Cost to Plug Wells
$15,000/Well - 4 Wells - $60,000

CERTIFICATION

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. (Ref. 40 CFR 144.32)

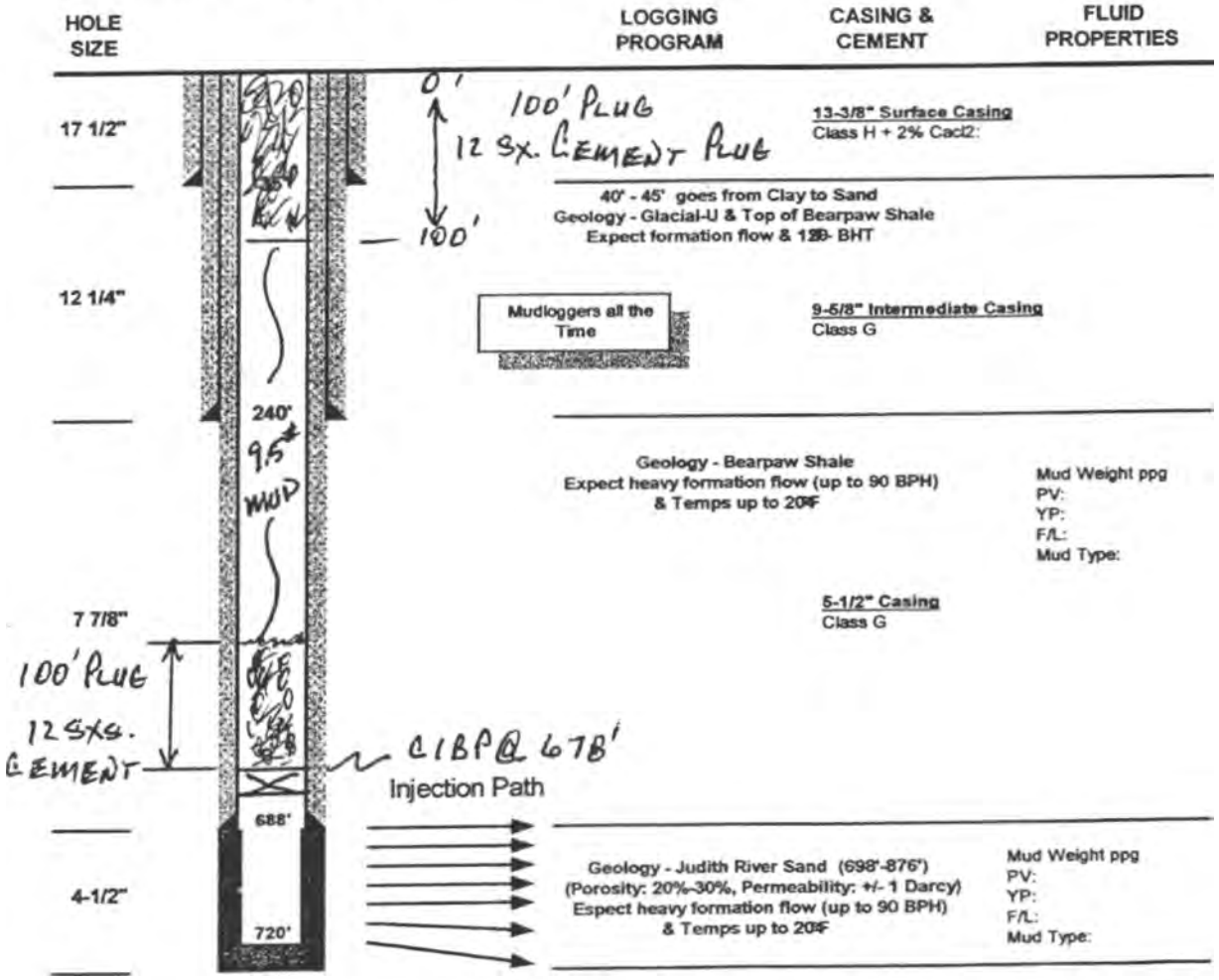
NAME AND OFFICIAL TITLE *(Please type or print)*	SIGNATURE	DATE SIGNED
Wilbur Dover-Mgr.-Operations Serv.	Wilbur Dover	3-6-01

WELLBORE SCHEMATIC

PLUGGING PROPOSAL

DRILLING PROGNOSIS
"Pioneer Natural Resources USA Inc."

WELL	:	**Biere Remedial Well**	
FIELD	:	**Poplar**	
CATEGORY	:	**Remedial / Vertical**	
COUNTY	:	**Roosevelt**	**STATE:** **Montana**
LOCATION	:	**22 - T28N - R51E**	
OBJECTIVE	:	**Top of Judith River**	
ELEVATION	:	**2,074 GL**	



PREPARED BY: Hilbur Dawn **DATE:** 3-6-01

APPROVED BY: _____ **DATE:** _____

APPENDIX D

Ground Water Monitoring Plan

This groundwater monitoring plan was developed by Pioneer Natural Resources USA, Inc. and later slightly modified by EPA prior to its insertion into this permit. An identical version of this groundwater monitoring plan is found as part of EPA's 2001 Emergency Administrative Order upon Consent, issued to Pioneer Natural Resources USA, Inc.

Monitoring Plan for the Shallow Groundwater

Biere Well Response Action Project
Pioneer Natural Resources USA, Inc.

July 2001

INTRODUCTION

History and Background

The Biere well, Figure 1, was drilled in 1972 by Mesa Petroleum. Through subsequent business successions and acquisitions the Biere well is now the responsibility of Pioneer Natural Resources USA, Inc. (Pioneer). In response to indications that the Biere well was allowing thermal brines from oil producing and/or brine injection zones to communicate with and impact the shallow drinking water aquifer, Pioneer conducted a field investigation in the Biere well area, (Field Investigation Report, Biere Well Evaluation, Poplar, Montana (CH2M Hill, August 2000).

In a parallel task, Pioneer evaluated the construction history of the Biere well and prepared a proposed plan to re-seal the well (Proposed Biere # 1-22 Well Response Action Plan, Pioneer Natural Resources, December, 2000). The Response Action Plan, as approved by EPA, provides for the injection of an oil field sealant into the formation in sufficient quantities to seal the formation and the apparently leaking annular seal of the Biere well. The new injection wells will be installed approximately 10 feet from the Biere well on three sides. As presented in the Response Action Plan, the existing Biere relief well will be temporarily re-opened to monitor in-situ conditions during the

placement of the primary sealant in the three temporary injection wells installed around the Biere well. Once the sealant is injected into the wells, the Biere relief well will also be injected with the sealant, as necessary, and abandoned.

This document summarizes the additional site characterization and post-Biere well remediation monitoring to be conducted by Pioneer pursuant to the Emergency Administrative Order on Consent entered into by the U.S. Environmental Protection Agency (EPA) and Pioneer in June 2001.

Hydrogeologic Setting and Water Quality

The conceptual model of the shallow groundwater system in the study area consists of a thin (5 to 20 feet typical thickness) aquifer of Quaternary sand and gravel deposits that are widely present on top of the underlying Cretaceous Bearpaw Shale. The aquifer has highly variable hydraulic properties depending on the thickness of the sand and gravel and the amount of fine-grained materials (silt and clay) included in the aquifer sediments. The aquifer is present between the Bearpaw Shale and overlying till. In the study area the groundwater gradients in the Quaternary aquifer are generally toward the Poplar River to the west-southwest. The shallow aquifer in the study area merges laterally with, and discharges into, the alluvial aquifer present along the current Poplar River drainage which flows generally north to south approximately 2 miles west of the Biere well area.

Sources of recharge to the shallow aquifer beneath the study area are only generally identified. There are five potential sources of recharge:

1. Direct infiltration of precipitation;
2. Lateral inflow of infiltration from highlands to the east;
3. Diffuse and/or localized vertical leakage from underlying saline aquifer(s) through structural weaknesses or zones of higher vertical permeability in the Bearpaw Shale;

4. Point source leakage from deep saline aquifer(s) via well bores; and
5. Direct infiltration of fugitive saline fluids stemming from the production of oil and the subsequent storage, transporting, pumping and disposing of this wastewater.

There is insufficient information available to proportion the recharge between the various sources of water. Some or all of these recharge sources may be active locally across the study area.

The pre-Biere well water quality of the shallow aquifer in the study area is unknown. Using the lowest specific conductivity value reported in the various reports prepared on the area by the U.S. Geological Survey (USGS), and in the Field Investigation (CH2M Hill 2000) conducted by Pioneer, and assuming there were no localized natural sources of saline water leakage, the pre-oil field water quality background probably ranged from 1,500 to 2,500 microsiemens per centimeter (uS/cm), which equates to an approximate total dissolved solids (TDS) concentration of 1,100 to 1,500 milligram per liter (mg/l). The dominant ions in the background water are calcium, magnesium and bicarbonate.

Brines in the bedrock saline aquifers and oil production zones beneath the study area have TDS concentrations of 80,000 to 120,000 mg/l and are predominantly sodium chloride. Leakage of these brines via natural pathways, leaking wells and boreholes or from fugitive water released during current and historic handling of the brines has produced localized areas within the shallow aquifer where the water chemistry has been changed from predominantly calcium-magnesium bicarbonate to predominantly sodium chloride. In addition, organic compounds typically associated with the production of petroleum; benzene, ethyl benzene, toluene and xylene (BTEX) have been detected in the shallow groundwater in the study area.

In the immediate vicinity of the Biere well, groundwater in the shallow aquifer is now a predominantly sodium chloride water with a TDS of about 65,000 mg/l. This fact, and

the observations of elevated temperature and water level (head) near the Biere well, indicates that the Biere well is an active source of brine leakage into the shallow aquifer.

Elevated heads in the shallow aquifer near the Biere well appear to be a localized impact and the thermal signature quickly dissipates with distance away from the Biere well. The sodium chloride dominated shallow water chemistry signature reveals a relatively constrained chloride plume extending to the west from the Biere well. The westward flow component is also supported by the detection of benzene in monitoring well PNR-7 about 2000 feet west-northwest of the Biere well.

It is difficult to track the extension of the chloride plume from the Biere well more than about one-half mile to the west with any certainty. Benzene is not present above detectable limits in more distant wells and sodium chloride concentrations tend to blend in with the general water chemistry of the aquifer. In addition, there are numerous active and historical oil wells, brine injection and brine handling facilities, in and adjoining the study area, any of which may have in the past or be actively contributing sodium chloride and BTEX compounds to the shallow aquifer chemistry. More specifically, data collected by Pioneer Natural Resources during the field investigation suggests the possibility of one or more additional active sources of brine and BTEX compounds south-southeast of the Biere well. In addition, data collected by the USGS and EPA indicates separate area(s) contributing high TDS water and chlorides adjacent to, and probably intermingling with the northwest extension of the chloride plume from the Biere well.

The difficulty in tracking diffuse plume signatures and in assigning or proportioning recharge sources by chemistry impacts is simply that there appears to be no significant characteristic to differentiate between the numerous and various sources of brine. All brine sources impacting the shallow aquifer, whether from specific wells owned by any of the various oil companies, from years of brine handling across the study area by the many well owners, operators and service companies, or from natural leakage, are all

predominantly sodium chloride. Active or recent sources of brine may also carry a BTEX component.

It is within this convoluted mixture of real and potential sources of the same contaminants that the proposed monitoring program must operate to provide meaningful evaluation of the effectiveness of the proposed remedial measures to be implemented on the Biere well.

MONITORING PLAN

Objectives and Approach

The proposed monitoring plan has three primary objectives:

1. Provide additional characterization of the shallow Quaternary aquifer near the Biere well through installation of additional shallow monitoring wells;
2. Determine the effectiveness of implementation of Response Action Plan;
3. Confirmation, by observation of water chemistry changes, of the area impacted by leakage from Biere well.

New Monitoring Wells

Pioneer will install 10 additional monitoring wells in the vicinity of the Biere well at the approximate locations shown on Figure 1. Final well locations are subject to site-specific access and landowner restrictions but Pioneer will strive to locate the wells as close to the proposed locations as possible.

The wells will be installed by hollow stem auger method and completed as 2-inch PVC monitoring wells similar to the previously installed wells (except PNR 4 and PNR 5 which were constructed by mud rotary techniques and are constructed of 2-inch stainless

steel). The wells will be constructed to monitor the Quaternary gravel deposits on top of the underlying Bearpaw Shale. Screen length will vary with the thickness of the gravel but typically 10 feet of screen will be installed. Following installation and development, the wells will be surveyed for horizontal and vertical control.

As the boreholes of the three wells at the corners of the Biere well remediation area (Figure 1), are being advanced, water quality parameters (temperature and conductivity) will be collected at the top of the gravel and every 5 feet until the Bearpaw Shale is encountered. Following installation of these wells, Pioneer and EPA will review the field data and determine if there is an adequate gravel thickness and sufficient water quality differences to justify installation of additional shallow wells at these locations to form well nests. If justified by field observations, nested wells, consisting of two to three, independent wells with short well screens may provide additional definition of brine stratification within the Quaternary gravels.

Proposed Monitoring Well Network

There are a total of 24 wells proposed to be included in this monitoring program as listed below. The proposed monitoring program includes all of the monitoring wells installed by Pioneer:

PNR-4	PNR-5	PNR-6	PNR-7
PNR-8	PNR-9	PNR-10	PNR-11*
PNR-12	PNR-13*	PNR-14*	PNR-15*
PNR-16*	PNR-17*	PNR-18*	PNR-19*
PNR-20*	PNR-21*		

The wells with asterisks denote new wells to be installed as part of this plan.

Assuming long-term access agreements can be obtained from the controlling agencies and private well owners, the following additional wells will be included:

USGS FPB 93-3	USGS FPB 92-12
M-27 (Reddoor)	M-28 (Lockman)
M-31 (Trottier)	Buckles-Whitmer

Existing well M-30 is a private well that is not in the Quaternary aquifer affected by the Biere well and therefore Pioneer is not including M-30 in the monitoring program at this time.

Well PNR-4 is located within the immediate working vicinity of the Biere well and the proposed response actions and as such is at risk from the myriad of equipment and drilling activities that will be employed on this project. Pioneer will take reasonable precautions to protect PNR-4 through the use of concrete barriers, flagging and contractor awareness but complete safety is not assured. It is also possible that the drilling equipment used in the response action will unavoidably have to be set up such that PNR-4 must be disturbed or destroyed. If, in Pioneer's opinion, PNR-4 cannot be protected or must be abandoned, the well will either be temporarily abandoned or plugged and abandoned. Temporary abandonment will be accomplished by filling the screen section with sand and the remainder of the casing with bentonite and the wellhead cut off and sealed at ground level. If the well must be plugged and abandoned, it will be filled with cement grout and cut off 2 feet below ground level.

A shallow well into the Quaternary gravel in the immediate vicinity of the Biere well is critical to the post remedial monitoring to determine the effectiveness of the response actions taken on the Biere well. Consequently, if PNR-4 must be plugged and abandoned, Pioneer will install a replacement well in this area as soon as the drilling equipment used to install the injection wells is removed.

Monitoring Schedule and Duration

The new wells will be installed in the summer 2001 field season. After all new wells are installed and access agreements reached for existing private wells, two complete rounds of samples will be collected as part of the same sampling event. Response action work will follow shortly thereafter, in approximately August 2001. Sampling will be repeated quarterly for 2 years (8 quarterly samples) after the Biere well containment has been completed.

Quarterly sampling will typically be conducted in March, June, September and December. The schedule for winter and spring sampling events will be flexible to avoid inclement weather. To the extent possible the samples will be collected during the same annual time frame to allow seasonal comparison of water chemistry trends.

The results of each sampling event will be submitted to the appropriate regulatory agencies for general information. At the end of the initial 2-year period, the results of the 8 quarterly samples will be combined with the existing available water chemistry data and presented in a written report to the regulatory agencies. This report will provide analysis of the results relative to the objectives of the monitoring program and will provide the basis for discussions with the agencies regarding any modifications to the monitoring program. A logical long term monitoring program consists of more frequent sampling of wells near the Biere well and less frequent sampling at wells distant from the Biere well. Consequently, at the end of the initial 2-year monitoring period, a semi-annual sampling schedule or a combination of quarterly and semi-annual sampling schedules may be adopted.

After 5 years of post-Biere well remediation monitoring, the data will again be compiled into a comprehensive report and discussions with the regulating agencies will be held to establish a long term monitoring program consistent with, and in conjunction with other basin wide remedies and actions stemming from the EPA's basin wide order to address

water quality issues stemming from oil production activities in the East Poplar Oil Field.

Analyses

The proposed monitoring parameters consist of:

Temperature*	Specific Conductivity*
pH*	Total Dissolved Solids
Sodium	Chloride
TPH	BTEX
Total Silica	Ammonia

Asterisks indicate field parameters. Temperature, specific conductivity and pH will be measured in the field as the well is being purged prior to sampling. Specific conductivity and pH will also be determined in the laboratory. Total silica is included initially for all wells because the proposed sealant for the Biere well remediation is a sodium silicate based product. Once a reasonable baseline value for silica is established it will be dropped from the list of quarterly analytes except for the six wells in the immediate vicinity of the Biere well (PNR-4, PNR-5, PNR-14, PNR-15, PNR-17, USGS FPB93-3)

Initially, and on an annual basis thereafter, all wells will be sampled for additional ions to allow water typing, to evaluate changes in other chemistry parameters and for use in establishing water chemistry relationships between wells. The supplementary parameters are:

Calcium	Magnesium
Potassium	Total Hardness
Alkalinity	Bicarbonate
Carbonate	Nitrogen (Nitrate plus Nitrite)
Total Silica	

Sampling Procedures

Water Level Measurements

Within one 24-hour period at the start of each sampling event, water levels will be measured in all wells for which access can be obtained and that are not being actively pumped. Buckles-Whitmer, and possibly M-27, are active wells for which a water level measurement may not be feasible to collect.

Sequence and Methodology

All wells will be sampled in a generally "clean" to "dirty" sequence, based on previous sample data, beginning with the wells most distant from the Biere well and culminating with PNR 4. Sampling will be conducted using industry standards for general environmental investigations and will be sampled using a variety of equipment depending on the physical condition of the well, depth to water, and the existence or availability of existing equipment.

The monitoring wells and wells M-28 and M-31 will be sampled using a portable submersible sampling pump that is flushed and decontaminated between samples. Water level in well PNR 8 is too deep and the well does not make enough water to sample with a pump and therefore a Teflon bailer will be used to sample this well. The Buckles-Whitmer and M-27 domestic wells will be sampled directly from the existing pump discharge from a faucet or tap that is not affected by any water softeners or filters.

Well PNR-4 has an accumulation of oil on the water surface and repeated monitoring of this well under these conditions is problematic. The initial monitoring approach for PNR-4 will be as follows:

The depth to the top of the oil will be measured;

The oil will be pumped or bailed off and contained;

A dedicated, but not permanently installed, sampling pump will be used to purge and sample formation water;

Water levels prior to sampling and following sampling will be monitored to establish a representative direct measurement of formation head without significant interference from accumulated oil or the need to make liquid phase density corrections;

The containerized oil and water will be collected and disposed of by a licensed waste oil hauler.

Depending on the logistical difficulties associated with containment and disposal of the oil and pre-sample purge water, Pioneer may explore various alternative monitoring approaches for this well including, but not limited to, retrofitting the well with a smaller diameter liner open only at the bottom or the use of in-situ probe(s) to measure temperature, head and conductivity. If a suitable pressure transducer, thermistor and conductivity probe is used only periodic confirmation samples and direct measurements will be collected following the procedures outlined above. As of the date of this monitoring plan, dedicated equipment capable of handling the elevated temperature and high conductivity anticipated for this well has not been located and therefore the sampling procedures provided above will be followed.

EPA has expressed concern that the accumulation of oil in PNR-4 may make effective monitoring of this well impossible. As stated previously, a monitoring well at this location is vital to the post response action-monitoring program. If, Pioneer is unable to overcome the effects of the accumulated oil through sampling techniques, installation of a liner, or dedicated probe(s), a replacement well will be installed. If a replacement well is required, the current PNR-4 will be plugged and abandoned as described previously. A replacement well will not be installed until after the injection wells are installed to avoid potential damage to the new well. Pioneer will present EPA with drilling prospectus and proposed well construction plan prior to installation of new well at this location.

Purge Water Handling

Water removed prior to sampling (purge water) will be handled according to the salinity of the water as determined by field conductivity measurements or if BTEX constituents have been previously detected. Water with a conductivity of 5,000 umhos/cm^2 (5.0 millisiemens/cm) or less will be discharged directly on the ground near the wellhead in such a manner as to prevent the water from accumulating near the well. Water with a conductivity greater that 5,000 umhos/cm will be containerized at the wellhead. Containerized purge water will be transported from each well to a central, temporary, storage container to be established on the Biere well work pad. Water with oil and or from wells with known BTEX constituents will be contained separately from water with only high salinity. The specific conductivity of the containerized water will be measured and a sample collected for BTEX and TPH at the end of each sampling event. The results of this sample will be used to determine appropriate disposal of the contained liquid. The final containment and disposal method for the sample purge water has not been identified at this time but will have to be finalized and agreed to prior to sampling. The disposal options that are being considered are discussed in the following paragraphs.

If BTEX constituent concentrations are below their respective Maximum Contaminant Limit (MCL), and arrangements can be reached with either the cities of Poplar or Wolf Point, a contract will be established with a local vacuum truck service to retrieve the water and dispose of it in the sewage treatment system.

If oil is present or if BTEX concentrations are above MCL's, a licensed waste oil hauler will be contracted to retrieve and dispose of the liquids offsite at an approved facility.

Quality Assurance/Quality Control

Chain of Custody and Analytical Methods

All samples will be submitted following standard Chain of Custody (COC) protocols to a state approved, independent laboratory for analysis using the current EPA methods prescribed in SW-846. Laboratory detection and reporting limits will meet or exceed (be less than) the State of Montana or EPA groundwater protection standards for the specific compound or constituent. Laboratory QA/QC procedures for organic analyses, including Reagent Blanks and Surrogate Recovery Reports will be provided by the laboratory with each analytical report.

Field, Equipment and Travel Blanks

One set of field blanks, equipment blanks, and travel blanks will be collected during each sampling event to evaluate whether the organic sample results are being adversely impacted by secondary contaminant sources including cross contamination from equipment, bottle contamination or contaminants introduced during shipping. Because of the higher reporting limits, no QA/QC blanks will be collected for the non-organic constituents and parameters being analyzed for.

Because of the sensitivity of the analysis, BTEX samples will be stored and shipped separately from the other sample containers. Samples with known or suspected BTEX constituents will be stored and shipped separately from other BTEX samples. A travel blank will accompany each BTEX shipping container.

One field blank will be collected during each sampling event. The field blank will be prepared by pouring laboratory grade de-ionized water into a 40 ml vial to simulate ambient conditions at the well head when the actual BTEX sample was collected.

Quality Assurance/Quality Control

Chain of Custody and Analytical Methods

All samples will be submitted following standard Chain of Custody (COC) protocols to a state approved, independent laboratory for analysis using the current EPA methods prescribed in SW-846. Laboratory detection and reporting limits will meet or exceed (be less than) the State of Montana or EPA groundwater protection standards for the specific

A/QC procedures for organic analyses, including

y Reports will be provided by the laboratory with

1. Laura -
for Permit folder

2. Dan E: copy of
Cl. II permit
cover letters
SOB
permit

3. Lisa Johnson
working on
Redstone Cl. V
MT permit

4. Public Notice
Joanne Taylor, or
Judy B-W

nks, and travel blanks will be collected during each

organic sample results are being adversely

urces including cross contamination from

ntaminants introduced during shipping. Because of

blanks will be collected for the non-organic

lyzed for.

sis, BTEX samples will be stored and shipped

ainers. Samples with known or suspected BTEX

d separately from other BTEX samples. A travel

ipping container.

One field blank will be collected during each sampling event. The field blank will be prepared by pouring laboratory grade de-ionized water into a 40 ml vial to simulate ambient conditions at the well head when the actual BTEX sample was collected.

One equipment blank sample will be collected during each sampling event. As with the field blank, the specific well where the sample is collected will vary from event to event at the discretion of the sampling team. The procedure for the equipment blank will vary depending the sampling equipment being used. For bailed wells, if a re-useable bailer is being used, between uses the bailer will be washed and rinsed using soap, de-ionized water, a methanol rinse then followed by a second rinse of de-ionized water. Prior to collecting a sample with the bailer from a well designated to have an equipment blank collected, the bailer will be filled with laboratory grade, de-ionized water, then a 40 ml vial sample bottle will be filled from the bailer and submitted for BTEX analysis.

Equipment blank sample preparation for wells sampled by portable, non-dedicated, sample pumps will vary somewhat depending the type of pump used. To the extent possible, dedicated tubing will be used for each well to avoid cross contamination issues. The general procedure for pump decontamination and collection of equipment blanks is as follows. The pump will be washed and rinsed between uses and between wells by pumping approximately 1 gallon of a soap solution followed by 2 to 3 gallons of rinse water through the pump. If non-dedicated pump discharge hose is used the decontamination solution will be pumped through the tubing. The wash and rinse water will be directed over the pump electrical cable to simultaneously decontaminate the wire. An equipment blank will be prepared by inserting the pump into a source of laboratory grade de-ionized water and collecting a sample in a 40 ml vial following the same procedures as would be followed in collecting a normal sample. The equipment blank sample will be submitted for BTEX analysis.

Duplicate Samples

Periodically, at the discretion of the project team, blind duplicate samples may be collected and submitted for analysis. In general duplicate samples will be used to verify BTEX results in pertinent wells. Blind duplicates will be collected by sequentially filling two sets of 40 ml vials from the sample pump discharge stream. One set will be fully

labeled, including well number, date and time; the duplicate set of vials will be labeled with a simple identifier but will not include date or time. Duplicate samples will be submitted under COC protocols with the normal samples. The specific well(s) from which duplicate samples will be collected, in any, have not been established.

Split Samples

Split samples (duplicate samples sent to two different laboratories) are not anticipated at this time. However, Pioneer may submit split samples for several reasons, including questions or concerns about the accuracy of the laboratory or to provide data for comparison of laboratories. It is also anticipated that interested parties or regulatory agencies may request split samples for submission to their own independent laboratories. Pioneer will attempt to accommodate requests for split samples by providing access to the sample discharge streams during a scheduled sampling event so the requesting party can collect their own samples.

Anticipated Monitoring Response to Biere Well Remediation

The monitoring program described above contains elements to continue the characterization efforts necessary to establish the area of impact and groundwater flow paths transporting oil field brines from the Biere well and surrounding study area, and to provide field and analytical data useful for evaluating and monitoring the effectiveness of the proposed remedial measures at the Biere well.

The underlying and long-term metric for evaluating the effectiveness of the Biere well remediation is that the water chemistry in the Quaternary groundwater system is restored to background levels. However, over the many years of oil field activities in and around the Biere well, a large mass of ions and organic constituents have been released and are present in the soils and groundwater within the impact area. In addition groundwater flux (volumetric flow rate) through the system does not appear to be very high and

consequently it will likely take many years for the groundwater system to reach background levels once the Biere well is sealed.

Although the ultimate evaluation is long-term recovery, it is essential that short-term responses in nearby monitoring wells be used to monitor the effectiveness of the remedial measures at the Biere well. Using organic compounds for monitoring criteria to evaluate remediation success near the Biere well is problematic due to the mass of hydrocarbons present and the highly variable factors that control their concentrations in groundwater. Therefore, the most effective way to gauge success is by monitoring TDS through specific conductivity and specific ions, temperature and head (water levels) in the nearby wells. Using these parameters as indicators, the post remediation monitoring data is anticipated to fall into one of these general categories depending on the following scenarios:

No change, or worse, an increase in these parameters - the remedial measure failed.

Rapid decrease in nearby wells followed by progressive change in more distant wells over time - complete or significant partial success.

Rapid decrease in nearby wells but quickly stabilizing at levels well above background - partial success.

A downward trend in any of the major indices followed by a significant and distinct reversal - a temporary success, i.e. break through.

In the wells nearest the Biere well, a logical progression of the basic monitoring parameters, in order of expected response, indicative of successfully sealing the Biere well is as follows:

A very rapid reduction in pressure or "head" in the aquifer near the Biere well.

Noticeable temperature decrease in the Quaternary aquifer over several monitoring cycles.

A distinct decrease in TDS (as represented by decreases in conductivity, chloride,

etc.) trending toward background but possibly requiring several seasons of advective groundwater flow to be fully apparent. Wells on the up gradient side of the Biere well and those in high flow parts of the aquifer should improve first. It will probably take multiple years to reach background depending on advective flow rates and groundwater flux through the system.

For the purposes of monitoring immediate success of the remediation - those wells near the Biere well will provide the most useful data. Assuming success in sealing the Biere well, with time, sampling data from the distant wells should also provide confirmation that the Biere well was successfully sealed.

Long-term recovery of the impacted groundwater as demonstrated by improving water quality trends in distant wells, may require significant time to develop. However, with increasing distance, and time, from the Biere well, there is also more opportunity for regional impacts and other unknown sources to affect the water chemistry. The summary report and review meetings proposed after two years, and five years of monitoring following the Biere well response action will provide valuable check points to evaluate the effectiveness of the response action and to identify appropriate changes to the monitoring program based on the data collected.

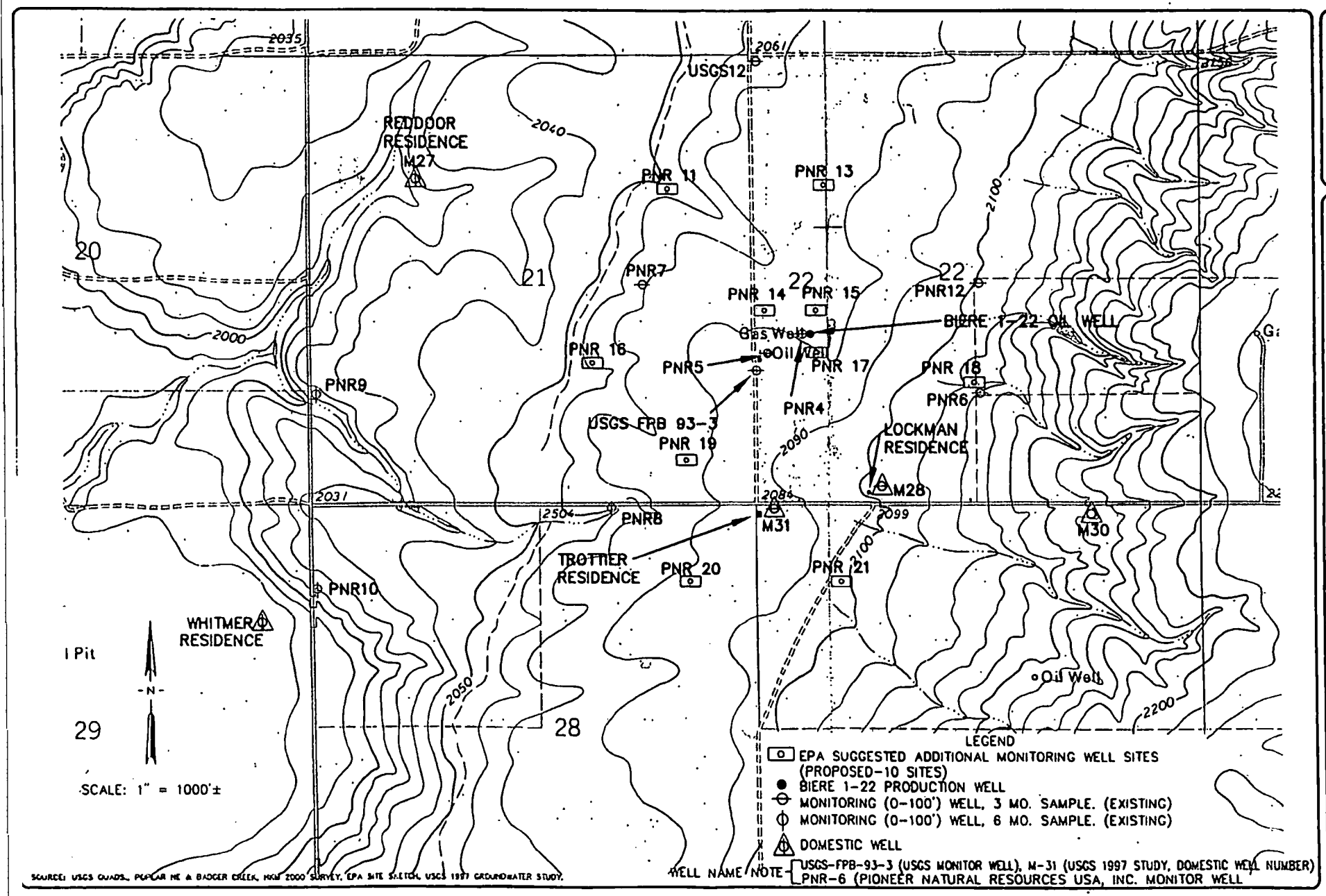


FIGURE 1

HKM ENGINEERING

JUNE 11, 2001

WELL LOCATION MAP
BIERE1-22 OIL WELL
EAST POPLAR OIL FIELD
POPLAR, MONTANA

Underground Injection Control Program

STATEMENT OF BASIS
for

EPA Permit No. MT5913-00000
EMERGENCY PERMIT

Class V
Injection Well Area Permit

Well Names: Biere #1-22A through Biere #1-22D
Well Locations: East Poplar Oil Field
NW SW Section 22 T28N R51E
Roosevelt County, Montana

Owner and Operator: Pioneer Natural Resources USA, Inc.
5205 North O'Connor Blvd.
1400 Williams Square West
Irving, Texas 75039

CONTACT: Nathan M. Wiser, Mail Code 8ENF-T
U. S. Environmental Protection Agency
999 18th Street, Suite 300
Denver, Colorado 80202-2466
Telephone: 303 312-6211

This Statement of Basis (SOB) gives the derivation of the site-specific permit conditions and reasons for them. Referenced sections and conditions correspond to sections and conditions in the Permit. General permit conditions for which content is mandatory and not subject to site-specific differences (reference 40 CFR Parts 144, 146 and 147) are not discussed in this Statement of Basis.

Pioneer Natural Resources USA, Inc. has submitted required information and data necessary to issue **EMERGENCY UIC Area Permit MT5913-00000** in accordance with 40 CFR Parts 144, 146 and 147, particularly 40 CFR §144.34(a)(1). The Permit is issued for 90 days, unless terminated for reasonable cause under 40 CFR 144.39, 144.40 or 144.41.

Permit Considerations (40 CFR 146.24)

General Information and Description of Facility:

On March 8, 2001, Pioneer Natural Resources USA, Inc. (Pioneer), applied with the Region VIII Ground Water Program offices of the Environmental Protection Agency (EPA) for an Underground Injection Control (UIC) Class V aquifer remediation area injection well permit in the East Poplar Oil Field, Roosevelt County, Montana. Additional information was requested from the applicant, and in June 2001, the application was considered complete.

In the application, Pioneer proposes to drill and complete up to four Class V aquifer remediation injection wells to be used to inject fluids anticipated to cease the on-going leaks at the existing plugged and abandoned Biere #1-22 former oil production well, located in Township 28 North, Range 51 East, Section 22. The on-going leaks at the Biere #1-22 former oil production well location pose an imminent and substantial endangerment to the health of persons in its vicinity. The drinking water source in the vicinity, the Quaternary deposits aquifer, have been severely contaminated, threatening the aquifer's ability to provide water for human consumption. The purpose of this UIC permit is to authorize the construction and operation of four remediation wells whose purpose is to stop current contamination of the surface aquifer groundwater in the vicinity of the Biere #1-22 former oil production well.

The area described in the application is located wholly within the exterior boundaries of the Fort Peck Indian Reservation. Notice of the EPA permit decision will be published in a local newspaper and notices sent to the U.S. Bureau of Land Management, Bureau of Indian Affairs, Assinibione and Sioux Tribal Business Council, and the Montana Board of Oil and Gas.

History and Setting

The Biere #1-22 oil well was drilled to a depth of 5845 feet on July 7, 1970, by Mesa Petroleum Company. It was operated as an oil well until it was plugged by Mesa on September 17, 1984. In June 1985, the well was found to be leaking water around its outside casing and an attempt to cement squeeze this leak was made, using an offset injection well located about 25 feet to the NNE of the Biere #1-22 well. This activity appears to have stopped the well from leaking to the surface, but current information from monitoring wells near the Biere #1-22 well indicates that there is now hot brine contamination leaking into the Quaternary deposits aquifer via the Biere #1-22 wellbore.

Area of Review (AOR)

Pioneer submitted information for wells in a one half mile area of review centered around the Biere #1-22 well, which was determined to be adequate considering the low volume of proposed injection fluid to be used in the injection project. At present in the one half mile AOR there exist three wells that penetrate the proposed injection zone, **the TXO-SWD-1 plugged well, the Buckles #A-1 plugged well, and the Biere Production Relief Well.** In addition, there are two wells located just outside the one half mile AOR, **the Juniper #1-21 well and the Amarco Schmidt #1-27 well.**

According to the applicant, there are no surface bodies of water, springs, mines, or quarries within the area of review. There are two known former drinking water supply wells, as well as six groundwater monitoring wells within the one half mile AOR.

The closest population center is the City of Poplar, about four miles southwest of the proposed injection wells' locations.

Geologic Units of Primary Importance

Primary relevant geologic formations in the permit area include the Judith River and Bearpaw Formations, and the near-surface Quaternary-aged glacial and fluvial deposits. The Judith River Formation is an upper Cretaceous-aged light-colored sandstone, with layers of interbedded sandy shale. It is approximately 178 feet thick and will serve as the injection zone. The Judith River Formation is located between approximately 876 and 698 feet depth. Overlying the Judith River Formation is the Bearpaw Formation, an upper Cretaceous-aged dark-gray marine shale and claystone. The Bearpaw Formation is approximately 638 feet thick and will serve as the confining zone over the injection zone. The Bearpaw Formation is located between approximately 698 feet and 60 feet depth. Atop the Bearpaw Formation are surface sediments deposited both by recent glaciation and river activity. These Quaternary-aged deposits are a mixture of gravels, sands, and finer-grained sediments and are erratically arranged. Collectively, these sediments are referred to as the Quaternary deposits. (From Thamke and Craigg, USGS Water Resources Investigations Report 97-4000, 1997)

Underground Sources of Drinking Water (USDWs)

USDWs are aquifers or portions thereof that contain less than 10,000 mg/l total dissolved solids (TDS) and which are being or could be used as a source of drinking water. In the vicinity of the Biere #1-22 well, the groundwater contained in the Quaternary deposits forms an aquifer which is a USDW. The uncontaminated portion of the Quaternary deposits aquifer contains a TDS content ranging between 427 and 2680 mg/l. In the

vicinity of the Biere #1-22 well, brine contamination has caused the aquifer to contain a TDS content as high as 67,000 mg/l.

The Judith River Formation is the next available aquifer underlying the Quaternary deposits aquifer. The Judith River Formation has been used as an injection zone since at least 1957 and continues to be used today for salt water disposal injection. Samples taken between 1954 and 1957 from the Judith River aquifer in the East Poplar Oil Field which appear to have been unaffected by injection, indicate that the Judith River aquifer contained water with a TDS content ranging between 11,475 and 18,624 mg/l. The Judith River aquifer now contains water with much higher TDS values, since highly saline brine has been injected into the aquifer over the past 44 years. The Judith River aquifer, in the vicinity of the Biere #1-22 well, is not a USDW.

A water sample analysis from the injection zone will be required prior to commencing injection in order to confirm the submitted analyses.

Confining Zone and Injection Zone

The Confining Zone is identified by the applicant as the Bearpaw Shale Formation at a depth of **698' - 60'**. The shale is described as a competent shale. The applicant indicates **the confining zone protecting the overlying USDW is approximately 638' thick in this well** with no evidence of lateral discontinuity or faults, and of adequate areal extent beyond the one quarter mile area of review surrounding the quarter mile radius permit area.

The proposed Injection Zone is an interval within the **Judith River Formation and the bottom ten feet of the Bearpaw Shale Formation between the depths of 688' - 720'**.

SECTION A - WELL CONSTRUCTION REQUIREMENTS

Casing and Cementing (40 CFR 146.22) (Condition 1)

All wells will be drilled approximately as follows. A 17-1/2" diameter hole is to be rotary drilled to a depth of 65' and 13-3/8" H-40 48# surface casing set and cemented to surface. A 12-1/4" diameter hole is to be rotary drilled to 240' and 9-5/8" H-40 32-1/2# casing set and cemented to surface. A 7-7/8" diameter hole is to be rotary drilled to 688' and 5-1/2" J-55 14# casing set and cemented to surface. A 4-1/2" hole is to be drilled to total depth at 720' and 2-7/8" tubing set on a packer at 678' depth. This well construction program is acceptable and will be incorporated into the permit as a permit condition. A cement

bond log will be required to confirm placement and adequacy of the cement to prevent fluid migration out of the injection zone.

Tubing, Packer, and Annulus (Condition 2)

Injection tubing: Injection tubing, run from surface and set with a packer is being required. The operator may choose a tubing diameter and length suitable for injection.

Packer: The packer is required to be set at a depth of no more than 50' above the top injection perforation or open hole depth.

Annulus: The casing-tubing annulus is to be filled with fresh water that contains a corrosion inhibitor.

Monitoring Devices (Condition 3)

In order to fulfill monitoring requirements and allow inspections of the well, the operator is to install and maintain: a ½" fittings with a cut-off valve on the injection tubing at the wellhead and on the casing/tubing annulus; a calibrated flow meter to be used to measure cumulative volumes of injected fluid; and a sampling tap on the supply line to the injection well. Accurate pressure gauges are to be available to company field staff at all times to be used for monitoring the injection and annulus fluid pressures.

Injection Formation Testing (Condition 6)

The operator must determine and submit the injection zone fluid pore pressure (static bottom-hole pressure) in order to record pre-injection reservoir conditions. A cement bond log from total depth to near surface will be required in order to evaluate the adequacy of the cement. An analysis of the injection zone water will be required in order to confirm the determination that the injection zone contains water of greater than 10,000 mg/l total dissolved solids.

SECTION B - CORRECTIVE ACTION REQUIREMENTS

The very purpose of the injection activity is to address corrective action needs at the Biere #1-22 former oil production well (now plugged). Other wells in the AOR were determined to be constructed or plugged and abandoned in a manner considered adequate to prevent uphole migration of fluid from this Class V injection activity, and no extra corrective action is required at those well locations. However, if a leak is detected in any AOR well, the operator will be required to halt injection and take timely corrective measures necessary to correct the leak.

SECTION C - WELL OPERATION REQUIREMENTS (40 CFR 146.23)

Prior to Commencing Injection Requirements (Condition 1)

Conversion work and corrective action must be satisfactorily completed, *EPA Form 7520-12 Well Rework Record* with a schematic showing details of the well as constructed or converted must be submitted, the injection zone fluid pore pressure (static bottom-hole pressure) must be determined, and the mechanical integrity of the well, both Part I (Internal) and Part II (External), must be satisfactorily demonstrated according to current EPA Guidance.

Demonstrating Mechanical Integrity (Condition 2)

There are several approved methods for demonstrating mechanical integrity. Part I (Internal) MI may be shown using a standard tubing/casing annulus pressure test, and if a test other than a cement bond log is used to demonstrate Part II (External) MI, the Part II test may also be required to be repeated every five years. Part I (Internal) MI also must be demonstrated within thirty (30) days of completion of any workover and/or alterations affecting the casing, tubing or packer, and prior to resuming injection activities.

Injection Zone (Condition 3)

The approved Injection Zone in this well will be limited to the Judith River Formation interval between 688' and 720'.

Determination of Injection Pressure Limitation (Condition 4)

A Maximum Allowable Surface Injection Pressure (MAIP) of 330 **pounds per square inch (psi) is the approved MAIP.** The applicant stipulated that the fracture gradient for this well is 1.10 psi/ft.

The following formula based on information provided in the application was used to determine the initial MAIP.

$$MAIP = [FG - (S_g * 0.433)] * h$$

Where:
MAIP = Maximum Allowable Surface Injection Pressure (PSIG)
FG = fracture gradient
h = depth to top of perforations
S_g = specific gravity of injected fluid

$$MAIP = [1.10 - (1.4 * 0.433)] * 688 = \underline{330\ PSIG}$$

Where:
FG = 1.10 PSIG/ft
h = 688 feet
S_g = 1.4

Injection Fluid Limitation (Condition 5)

The approved injection fluid will be limited to either INJECTROL U or cement. INJECTROL U is a sodium silicate fluid

manufactured by Halliburton and is purported to form into a rock-hard substance at elevated temperatures. Its injection into the Judith River Formation, upon encountering elevated temperatures, should result in a physical barrier precluding the continued vertical migration of contaminant fluids from the Biere #1-22 former oil production well. Cement is also approved for injection for the same purpose. The well is not approved for use as a commercial brine disposal well, and waste fluids from other fluid sources must be approved prior to injection.

Injected Volume Limitation

The injection volume is limited to 5,160 barrels of fluid. This limitation is 250% of the total volume of fluid estimated by the permittee to accomplish the emplacement of the physical barrier. The extra amount authorized allows for additional volume in the event that some unforeseen problem arises that would necessitate additional injection volume.

Section D - WELL MONITORING AND REPORTING REQUIREMENTS

The operator is to **report quarterly the Specific Gravity, Total Dissolved Solids (TDS) concentration in milligrams per liter (mg/l), Specific Conductivity, pH, Sodium, Total Silica, Total Petroleum Hydrocarbons, Chloride, Urea, Ammonia, Benzene, Toluene, Ethylbenzene and Total Xylenes** in the injection stream. A new analysis is to be submitted any time there is a change in the source of injection fluid.

Observations and recordings of flow rate, cumulative volume, injection pressure and annulus pressure are required on 5-minute intervals during injection periods, and one-day intervals during non-injection periods. These recorded observations must be reported to EPA each quarter.

Copies (or originals) of all pertinent records are to be maintained at company offices, presently in Irving, Texas.

Section E PLUGGING AND ABANDONMENT REQUIREMENTS (40 CFR 146.24)

Plugging and Abandonment (Condition 2)

The plugging and abandonment plan submitted by the applicant for each injection well is approved. The details of the plugging and abandonment plan is found below.

Plug #1 Set a cast iron bridge plug in casing above injection zone, at approximately 678'. Place a 100-foot plug from 678' to 578, using at least 12 sacks of 14.5

lb/gal Class C cement. Tag and record top of Plug #1. Fill casing with plugging gel of at least 9.5 lb/gal between plugs.

Plug #2 Place a 100-foot cement plug in casing from approximately 100' to surface with at least 12 sacks of 14.5 lb/gal Class C cement. Record top of Plug #2.

All injection wells governed by this Permit must be properly plugged and abandoned within the 90-day permit duration period.

The applicant has provided an estimate of the total well plugging cost of $60,000 (4 wells at $15,000 each).

Section F FINANCIAL RESPONSIBILITY

Demonstration of Financial Responsibility (Condition 1)

Pioneer has submitted a demonstration of financial responsibility in the form of a surety performance bond in the amount of $150,000.00 to cover the cost of plugging all injection wells covered by this area permit. Further, Pioneer must maintain said financial responsibility **at least the amount of $60,000.00 U.S. dollars** to cover the present estimated cost of plugging and abandoning the injection wells under this Permit.

Underground Injection Control (UIC) Program

Injection Well ~~Draft~~ Emergency Permit Notification

Date of Notification: 7-31-01.

This document notifies the Tribal Assistance Program (TAP) of a ~~proposed~~ Emergency UIC injection well Permit action on Tribal Lands, and records TAP verification of Tribal notification. Attached for TAP records is a copy of the Public Notice and cover letter to the applicant. ~~There is a 30 day public comment period on this proposed action.~~ Contact Nathan M. Wiser at x-6211 regarding technical questions.

Please sign and continue routing of this UIC Permit action by ASAP ! **(date). Thank you.**

* Deb Madison is aware of this permit and has stated that the Tribal environmental office can act as a repository for the permit and supporting materials.

Statement of Verification by the Tribal Assistance Program

The **appropriate Tribal Notification** **is assured** based on the list of Courtesy Copy (cc) recipients listed on the cover letter to the applicant which accompanies this draft permit or permit modification.

for Tribal Assistance Program — date

OR

The **appropriate Tribal Notification** **will be assured with the following changes** to the list of Courtesy Copy (cc) recipients listed on the cover letter to the applicant which accompanies this draft permit or permit modification.

for Tribal Assistance Program — date

Technical Review Checklist

UIC Injection Well Permit

Operator Pioneer Natural Resources USA Inc. OPID _____
Well East Poplar Permit No. MT5913-00000
Field Biere #1-22 (Remediation) API No. _____
Location: (QTR/QTR) NW SW Sec: 22 T 28 (N)/S R 51 (E)/W County Roosevelt State MT

AREA OF REVIEW

Number of wells in AOR _____ Number Needing Corrective Action _____
1/4 mile or Other (& method) _____

GEOLOGY

USDW Name _____ Top _____ Bottom _____ TDS _____
USDW Name _____ Top _____ Bottom _____ TDS _____
USDW Name _____ Top _____ Bottom _____ TDS _____
USDW Name _____ Top _____ Bottom _____ TDS _____
USDW Name _____ Top _____ Bottom _____ TDS _____

Confining Zone Name _____ Top _____ Bottom _____
Injection Zone Name _____ Top _____ Bottom _____ TDS _____

WELL CONSTRUCTION

Total Depth _____ Surface Casing Depth _____ Packer _____ TOP Perf _____
Top of adequate (80%) cement _____ Top of Cement _____
☐ CBL or ☐ Calculated

OPERATION

Maximum Injection Pressure _____ PSIG
Injection Fluid: Type _____ TDS _____

FINANCIAL RESPONSIBILITY

Amount: $ _____ Type of Instrument: _____

The following items must be addressed:

No Tech Review Necessary - The changes are being made to the construction program to allow permitee to make small modifications in the completion of each injection well.

Permit Writer Joshua M. Wor

Technical Review Checklist

UIC Injection Well Permit (Emergency Area Class V)

Operator Pioneer Natural Resources USA Inc. OPID _____
Well Biere #1-22A thru D Permit No. MT5913-00000
Field East Poplar oil Field API No. _____
Location: (QTR/QTR) NW SW Sec: 22 T 28 N/S R 51 E/W County Roosevelt State MT

AREA OF REVIEW

Number of wells in AOR 3 Number Needing Corrective Action Ø
1/4 mile or Other (& method) (1/4 mile around the 1/4-mile diam. area permit)

GEOLOGY

USDW Name Quaternary deposits Top 0' Bottom 60' TDS 427 - 2680 (uncontam.)
USDW Name _____ Top _____ Bottom _____ TDS _____
USDW Name _____ Top _____ Bottom _____ TDS _____
USDW Name _____ Top _____ Bottom _____ TDS _____
USDW Name _____ Top _____ Bottom _____ TDS _____

Confining Zone Name Bear Paw Shale Top 60' Bottom 698'

Injection Zone Name Judith River Top 698 Bottom 878' TDS >10,000 ppm

WELL CONSTRUCTION

Total Depth 720' Surface Casing Depth 240' Packer 670' TOP ~~Perf~~ open hole 688' - 720'
Top of adequate (80%) cement To be determined Top of Cement To be determined
☒ CBL or ☐ Calculated

OPERATION

Maximum Injection Pressure 330 PSIG
Injection Fluid: Type INJECTROL U or CEMENT TDS NA

FINANCIAL RESPONSIBILITY

Amount: $ 150,000.00 Type of Instrument: SURETY PERFORMANCE BOND
The following items must be addressed:

_____
_____
_____
_____

Permit Writer Nathan M. Wiser

UICMENU Data Entry FORM 3

Permit Operating Conditions *(Please Fill in ALL information)*

Authorization ID No: 5913 **Well ID:** MT 00000

Well Name: Biere #1-22 A thru D Owner/Operator: Pioneer Natural Resources USA Inc.

Operating Status: **NC** **NS** (UC) **AC** ***EFFECTIVE DATE:***

Injection Formation(s)	USGS Code	**TDS**	**Top**	**Bottom**	**Fracture Gradient**
Judith River	Kjr	> 10,000 ppm	698'	878'	1.10

Authorization for: 90 days ~~Years~~ or **LOW** (Life Of Well)

MIT's: (P) =pressure and (O) =other (RATS, Temperature, etc) Interval every: once, prior to injection ~~Years~~

Maximum Injection Pressure 330 Psig

Maximum Volume(s): Total 5,160 BBL **Rate** N/A BBL/day

Injection Fluid Source (list wells and/or sources) *entered into UICMENU memo field (unlimited size)*

1. INJECTROL U
2. CEMENT

TDS of Injected Fluid NA Mg/l TDS

Fluid Analysis Reporting Interval: **A** =Annual **S** =Semiannual (Q) =Quarterly

Monitoring Frequency: Recording (1) Every 5 minutes during injection (2) Every 1 day during non-injection. ~~/month~~

Monitoring Reporting Frequency: Reporting 4 /year

First Monitoring Report Due: 15th of month following Quarter

Comments to be entered into UIC Menu:

Emergency permit issued in conjunction with an imminent and substantial endangerment enforcement action under SDWA §1431.

UICMENU: OPERATING CONDITIONS DATA ENTRY SCREEN

Data entered into UICMENU Date: ***Initials:***

UICMENU Data Entry FORM 4

FINAL OPERATING CONDITIONS *Please Fill in ALL information*

Authorization ID No: 5913 Well ID: MT 00000

Well Name: Biere #1-22A thru D Owner/Operator: Pioneer Natural Resources USA, Inc.

Final Permit Decision: I I=Issued **D**=Denied **W**=Withdrawn

Date of Final Permit Decision: / /

Change "OPERSTATUS" to "AC"

Effective Date: / /

note only CHANGES from Draft Permit Operating Conditions: (this is an emergency permit - there was no draft permit)

Injection Formation Name	Judith River
Life Of Permit	90 days
Type of MIT	Part I and Part II (40 CFR §§ 146.8(a)(1) and (2))
Frequency of MIT	Once - prior to injection
Maximum Injection Pressure	330 PSIG
Maximum Injection ~~Rate~~/ Volume	5,160 Bbl total into all four wells
Injection Fluid TDS	N/A - Injecting INJECTROL U or Cement
Fluid Analysis Report Frequency	Annual Semi-Annual (Quarterly) Other
Monitoring Report Frequency	Annual Semi-Annual (Quarterly) Other
Monitoring Report Due Date	~~February 15th~~ or: 15th day following each Quarter

Comments to be entered into UIC Menu:

Emergency Permit Issued in conjunction with an imminent and substantial endangerment enforcement action under SDWA § 1431.

UICMENU: FINAL PERMIT INFORMATION DATA ENTRY SCREEN

Data entered into UICMENU Date: _____ *Initials:* _____

UIC Permit Routing Slip

Date: July 30, 2001

Action: ~~FINAL NEW~~ UIC PERMIT

EMERGENCY

	To:		Mailcode	Initials	Date
1.	Permit Writer	Nathan M. Wiser 8ENF-T	~~8P-W-GW~~	NW	7-30-01
2.	Technical Review	❑ DWJ ❑ PSO ❑ CT	8P-W-GW	DWJ	7/31/01
3.	L. Clutts	proof read	8P-W-GW	LC	7/31/01
4.	D. Hogle	concurrence	8P-W-GW	DH	7/31/01
~~5.~~	~~L. Johnson~~	~~proof read~~	~~8P-W~~	KA	~~7/31/01~~
6.	~~S. Tuber~~	concurrence	8P-W	ST	7/31
7.	~~Kerrigan Clough~~	**SIGNATURE** (DO NOT DATE)	8P-ARA	ST for	7/31
8.	L. Clutts	date stamp & mail documents	8P-W-GW	LC	8/01/01
9.	Permit Writer	make copies (at Printing)	8P-W-GW	LC	8/01/01
10.	L. Clutts	mail copies	8P-W-GW	LC	8/02/01
11.	Permit Writer	File	8P-W-GW		

Well Name: Biere #1-22A thru D **Reservation:** Ft. Peck

UIC Permit Number: MT5913-00000 **Applicant:** Pioneer Natural Resources USA, Inc.

Contents of routing package for: FINAL NEW UIC PERMIT

LEFT SIDE

- ✓ ➤ **Concurrence copy** of Cover Letter
- ✓ ➤ **Reading File copy** of Cover Letter
- ✓ ➤ **Technical Review Checklist**
- ➤ ~~**Prior To Beginning Injection Checklist**~~ (NA)
- ✓ ➤ **FORM 3**
- ➤ **Tribal Assistance Program Notification Form and Mailing List** (To be done separately)
- ➤ ~~**Applicant Request Letter** and Supporting Documentation~~ (NA)

RIGHT SIDE

- ✓ ➤ **Cover Letter (*Signature*)**
- ✓ ➤ **FINAL Permit ~~[and Exemption]~~ (*Signature*)**
- ✓ ➤ **FINAL Statement of Basis**
- ➤ ~~**Response To Comments**~~ (NA)

COMMENTS THIS IS AN EMERGENCY UIC AREA CLASS V Permit ISSUED IN CONJUNCTION WITH AN IMMINENT and SUBSTANTIAL ENDANGERMENT ENFORCEMENT ACTION UNDER SDWA §1431.

Permit Writer: Nathan M. Wiser

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
999 18TH STREET - SUITE 300
DENVER, CO 80202-2466
http://www.epa.gov/region08

JUL 31 2001

Ref: 8P-W-GW

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Wilbur Dover
Manager, Operations Services
Pioneer Natural Resources USA, Inc.
1400 Williams Square West
5202 North O'Connor Boulevard
Irving, Texas 75039-3746

RE: FINAL Emergency UIC Permit
EPA Permit No. MT5913-00000
Biere #1-22A - D Wells
East Poplar Field
Roosevelt County, Montana

Dear Mr. Dover:

Enclosed is a copy of a FINAL Emergency Area Permit for up to four Underground Injection Control (UIC) Program Class V non-commercial aquifer remediation injection wells, UIC Permit No. MT5913-00000, for the Biere #1-22A through #1-22D wells, NW SW Section 22 T28N R%1E, Roosevelt County, Montana. A Statement of Basis that discusses development of conditions of the Permit also is enclosed.

There was no public comment period, since this is an emergency permit issued under the authority found at Title 40 of the Code of Federal Regulations, Section 144.34(a)(1), although EPA will issue a public notice of its decision. Therefore, the Final Permit becomes effective on the date of issuance. All conditions set forth herein refer to Title 40 Parts 124, 144, 146, and 147 of the Code of Federal Regulations (CFR) and are regulations that are in effect on the date that this permit becomes effective.

Printed on Recycled Paper

Please note that under the terms of the Final Permit, Pioneer Natural Resources USA, Inc. is authorized only to drill and construct the proposed injection wells, and must fulfill the "Prior to Commencing Injection" requirements of the Permit, Part II Section C Subpart 1 and obtain written or verbal Authorization To Inject prior to commencing injection.

It is the responsibility of the operator to be familiar with and to comply with all provisions of the Emergency Permit.

The permit and the authorization to inject are issued for 90 days unless modified, revoked and reissued, or terminated.

If you have any questions on the enclosed Emergency Permit or the Statement of Basis, please call Nathan M. Wiser at (303) 312-6211.

Sincerely,

for Kerrigan G. Clough
Assistant Regional Administrator
Office of Partnerships and
Regulatory Assistance

Enclosures: Emergency Permit
Statement of Basis
EPA Region 8 Guidances #34, #37, #39

cc: copy of letter only
Mr. Arlyn Headdress, Chairman
Fort Peck Tribal Executive Board
P.O. Box 1027
Poplar, MT 59255

Mr. George Hudak
Montana Board of Oil and Gas
2535 St. Johns Avenue
Billings, MT 59102

Aden Seidlitz, Field Manager
United States Department of the Interior
Bureau of Land Management, Miles City Field Office
111 Garryowen Road
Miles City, MT 59301-0940

cc: complete copy including all enclosures

Mr. Steven Leifer
Baker & Botts LLP
The Warner
1299 Pennsylvania Avenue NW
Washington, DC 20004-2400

Ms. Deb Madison, Manager
Environmental Programs
Assiniboine and Sioux Tribes
P.O. Box 1027
Poplar, MT 59255

bcc: complete copy including all enclosures

Jim Boyter (8MO)

bcc: copy of letter only

John Wardell (8MO)
Barbara Burkland (8MO)

2. Permit & Mods

UIC Permit Routing Slip

Date: August 31, 2001

Action: MINOR MODIFICATION

	To:		Mailcode	Initials	Date
1.	Permit Writer Nathan Wiser	(8ENF-T)	~~8P-W-GW~~	NW	8/31/01
2.	Technical Review	❑ DWJ ❑ PSO ❑ CT	8P-W-GW		
3.	L. Clutts	proof read	8P-W-GW		
for 4.	D. Hogle	concurrence (Tinsley)	8P-W-GW	RT	8/31/01
5.	~~L. Johnson~~	proof read	8P-W		9/5/01
6.	~~S. Tuber~~	concurrence	8P-W	ST	9/5
7.	~~Kerrigan Clough~~	**SIGNATURE** (DO NOT DATE)	8P-ARA		9/5
8.	L. Clutts	date stamp & mail documents	8P-W-GW	LC	9/07/01
9.	Permit Writer	make copies	8P-W-GW	LC	9/07/01
10.	L. Clutts	mail copies	8P-W-GW	LC	9/07/01
11.	Permit Writer	File	8P-W-GW		

Well Name: Biere #1-22 (Remediation) **Reservation:** Ft Peck

UIC Permit Number: MT5913-00000 **Applicant:** Pioneer Natural Resources USA, Inc.

Contents of routing package for: MINOR MODIFICATION

LEFT SIDE

- **Concurrence copy** of Cover Letter
- **Reading File copy** of Cover Letter
- **Technical Review Checklist**
- **FORM 5**
- **Applicant Request Letter** and Supporting Documentation
- **Mailing List**

RIGHT SIDE

- **Cover Letter *(Signature)***
- **Modification(s) to Permit *(Signature)***
- Supplemental Statement of Basis

COMMENTS Note: This is an Emergency Class V Area permit to address contamination of the Quaternary deposits aquifer. This permit was issued under 40 CFR §144.34 and is being modified under 40 CFR §144.41(f), due to construction changes needed to effectively construct the needed UIC Cl. V remediation injection wells.

Permit Writer: Nathan M. Wiser

UICMENU Data Entry FORM 5

UIC Permit MINOR MODIFICATION *Please Fill in ALL information*

Date Modification Request Received:

Authorization ID: MT5913

Well Name: Biere #1-22 (Remediation)

Field East Poplar

Well ID: 00000 (area permit)

Owner/Operator: Pioneer Natural Resources USA Inc.

Class and Type: **1H 1NH 2D 2R 3** (V)

Commercial Disposal (2D) Well? **Y** or (N)

Operating Status: **NC NS** (UC) **AC** ***EFFECTIVE DATE:*** _____

LOCATION:

County Roosevelt Indian Land? (Y) or **N** Reservation: Ft. Peck

Quarter/Quarter: NW SW Section: 22 Township: 28 S / (N) Range: 51 (E) / W

Modification(s) *(mark all that apply)*

(I) _____ **Require <u>more frequent</u> monitoring** or reporting by the permittee

Fluid Analysis Reporting Interval: **A** =Annual **S** =Semiannual **Q** =Quarterly

Monitoring Frequency..... Recording_____/month

Monitoring Reporting Frequency..... Reporting_____/year

Monitoring Report Due: _____

(II) _____ **Change an interim compliance date**

(III) _____ Allow for **change of ownership** or operational control where no other change in the permit is necessary provided a specific date for transfer of responsibility from current to new permittee has been submitted

(IV) _____ **Change quantities or types of fluids injected** which would not change well class

Original fluid limit: _____ **Modified fluid limit**:_____

Original MSIP: _____ **Modified MSIP**: _____

(V) ✓ **Change construction requirements** during well construction

(VI) _____ **Amend an updated P&A plan** for a well TA'd over two years under 144.52(a)(6).

(VII) _____ **Correct typographical error(s)** - see below:

_____

_____

_____

UICMENU: OPERATING CONDITIONS DATA ENTRY SCREEN

Data entered into UICMENU Date: _____ *Initials:* _____

UICMENU Data Entry FORM 1

Permit Application / Permit Modification *Please Fill in ALL information*

Date Application Received: 3/8/2001

Operator PIONEER NATURAL RESOURCES, INC. OPID _____

Authorization ID Number MT5913 Well ID Number MT04620

Well Name BIERE 1-22 REMEDIAL PROJECT WELL NO 1 API No: _____

Field TULE CREEK Class and Type: **1H 1NH 2D 2R 3** (CLASS 5)

Commercial Disposal (2D) Well? **Y** or (**N**)

Operating Status: (**NC**) **NS UC AC** ***EFFECTIVE DATE:*** _____

LOCATION

County ROOSEVELT Indian Land? (**Y**) or **N** Reservation: FT. PECK RESERVATION

Quarter/Quarter: _____ Section: 22 Township: _____ **S / N** Range: _____ **E / W** ?

Number of Wells in application: 4

New Well, Existing Well, or Conversion: (**N**) **E C**

Aquifer Exemption Requested? **Y N** ?

Application assigned to: _____

Comments to be entered into UIC Menu:

_____

_____

_____

UICMENU: UIC WELL INVENTORY DATA ENTRY SCREEN
PERMIT APPLICATION DATA ENTRY SCREEN

Data entered into UICMENU Date: _____ *Initials:* _____

UICMENU Data Entry FORM 1

Permit Application / Permit Modification *Please Fill in ALL information*

Date Application Received: 3/08/2001

Operator PIONEER NATURAL RESOURCES USA, INC OPID _____ ?

Authorization ID Number MT5913 Well ID Number MT04621

Well Name BIERE 1-22 REMEDIAL PROJECT WELL No. 2 API No: _____ ?

Field TULE CREEK Class and Type: **1H 1NH 2D 2R 3** CLASS 5

Commercial Disposal (2D) Well? **Y** or **N**

Operating Status: **NC** **NS** **UC** **AC** ***EFFECTIVE DATE:*** _____

LOCATION

County ROOSEVELT Indian Land? **Y** or **N** Reservation: FT. PECK RESERVATION

Quarter/Quarter: _____ Section: 22 Township: _____ **S / N** Range: _____ **E / W**

Number of Wells in application: 4

New Well, Existing Well, or Conversion: **N** **E** **C**

Aquifer Exemption Requested? **Y** **N** ?

Application assigned to: _____

Comments to be entered into UIC Menu:

_____

_____

_____

UICMENU: UIC WELL INVENTORY DATA ENTRY SCREEN
PERMIT APPLICATION DATA ENTRY SCREEN

Data entered into UICMENU Date: _____ *Initials:* _____

UICMENU Data Entry FORM 1

Permit Application / Permit Modification *Please Fill in ALL information*

Date Application Received: 3/08/2001

Operator PIONEER NATURAL RESOURCES USA, INC. OPID _____ ?

Authorization ID Number MT 5913 Well ID Number MT 04622

Well Name BIERE 1-22 REMEDIAL PROJECT WELL NO. 3 API No: _____ ?

Field TULE CREEK Class and Type: **1H 1NH 2D 2R 3** CLASS 5

Commercial Disposal (2D) Well? **Y** or **N**

Operating Status: **NC** **NS** **UC** **AC** ***EFFECTIVE DATE:*** _____

LOCATION

County ROOSEVELT Indian Land? **Y** or **N** Reservation: FT. PECK RESERVATION

Quarter/Quarter: _____ Section: 22 Township: _____ **S / N** Range: _____ **E / W**

Number of Wells in application: 4

New Well, Existing Well, or Conversion: **N** **E** **C**

Aquifer Exemption Requested? **Y** **N** ?

Application assigned to: _____

Comments to be entered into UIC Menu:

_____

_____

_____

UICMENU: UIC WELL INVENTORY DATA ENTRY SCREEN
PERMIT APPLICATION DATA ENTRY SCREEN

Data entered into UICMENU Date: _____ *Initials:* _____

UICMENU Data Entry FORM 1

Permit Application / Permit Modification *Please Fill in ALL information*

Date Application Received: 3/08/2001

Operator PIONEER NATURAL RESOURCES USA, INC. OPID ?

Authorization ID Number MT5913 Well ID Number MT04623

Well Name BIERE 1-22 REMEDIAL PROJECT WELL NO. 4 API No: ?

Field TULE CREEK Class and Type: **1H 1NH 2D 2R 3** CLASS 5

Commercial Disposal (2D) Well? **Y** or **N**

Operating Status: **NC** **NS** **UC** **AC** ***EFFECTIVE DATE:***

LOCATION

County ROOSEVELT Indian Land? **Y** or **N** Reservation: FT. PECK RESERVATION

Quarter/Quarter: Section: 22 Township: S / N Range: E / W

Number of Wells in application: 4

New Well, Existing Well, or Conversion: **N** **E** **C**

Aquifer Exemption Requested? **Y** **N** ?

Application assigned to:

Comments to be entered into UIC Menu:

UICMENU: UIC WELL INVENTORY DATA ENTRY SCREEN
PERMIT APPLICATION DATA ENTRY SCREEN

Data entered into UICMENU Date: *Initials:*

UICMENU Data Entry FORM 1

Permit Application / Permit Modification *Please Fill in ALL information*

Date Application Received: 3/08/2001

Operator PIONEER NATURAL RESOURCES USA, INC OPID ?

AREA PERMIT NUMBER

Authorization ID Number MT5913-00000 Well ID Number WELL NO. 1 - MT04620 WELL NO. 2 - MT04621 WELL NO. 3 - MT04622 WELL NO. 4 - MT04623

BIERE 1-22 REMEDIAL PROJECT

Well Name WELL NO. 1, WELL NO. 2, WELL NO. 3 AND WELL NO. 4 API No: ?

Field EAST POPLAR OIL FIELD Class and Type: **1H 1NH 2D 2R 3** CLASS 5

Commercial Disposal (2D) Well? **Y** or **N**

Operating Status: **NC** **NS** **UC** **AC** ***EFFECTIVE DATE:***

LOCATION

County ROOSEVELT Indian Land? **Y** or **N** Reservation: FT. PECK RESERVATION

Quarter/Quarter: NW / SW Section: 22 Township: 28 **S** / **N** Range: 51 / **E** / **W**

Number of Wells in application: 4

New Well, Existing Well, or Conversion: **N** **E** **C**

Aquifer Exemption Requested? **Y** **N** ?

Application assigned to: _____

Comments to be entered into UIC Menu:

_____

_____

_____

UICMENU: UIC WELL INVENTORY DATA ENTRY SCREEN
PERMIT APPLICATION DATA ENTRY SCREEN

*Data entered into UICMENU Date:*_____ *Initials:*_____

3. EPA
Correspondence

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
999 18TH STREET - SUITE 300
DENVER, CO 80202-2466
http://www.epa.gov/region08

SEP 7 2001

Ref: 8ENF-T

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Wilbur Dover, Manager
Operations Services
Pioneer Natural Resources USA, Inc.
1400 Williams Square West
5202 North O'Connor Blvd.
Irving, Texas 75039-3746

Re: UNDERGROUND INJECTION CONTROL (UIC)
Minor Permit Modification
Emergency Class V Area Permit #MT5913-00000
Biere #1-22 Well Remediation

Dear Mr. Dover:

On August 28, 2001, you spoke with Nathan Wiser, of the United States Environmental Protection Agency, Region 8 (EPA), regarding changes to the above-referenced permit. As you explained in that conversation, due to certain construction difficulties encountered during the construction of one of the injection wells under the permit (the Biere #1-22B well) you requested authority to make some minor modifications to the construction program for each of the injection wells being constructed for the purpose of remediating the Biere #1-22 well. On August 28, 2001, Mr. Wiser left you a telephone message indicating that the requested modifications were verbally approved in light of the construction difficulties you described. Pursuant to Title 40 of the Code of Federal Regulations (40 CFR), Section 144.34(b)(5), this serves as written notice that the UIC permit number MT5913-00000, signed and effective on July 31, 2001, is modified pursuant to 40 CFR §144.41(f) as specified below:

1. The language in the permit at Part II(C)(3) [Approved Injection Zone] is changed from:

"Injection shall be limited to an interval within the Judith River, between the depths of **688' and 720'**"

to:

Printed on Recycled Paper

"Injection shall be limited to an interval within the Judith River, between the depths of **688' and 900.**'"

2. The table in the permit at Part II(A)(1) [Casing and Cementing] is changed from:

Depth	*Hole Diameter*	*Casing Diameter*	*Casing*	*Cement*
0'- 35'	17-1/2"	13-3/8"	New 48# H-40 ST&C	35' to surface; Class "H" cement w/2%$CaCl_2$
0'-240'	12-1/4"	9-5/8"	New 32.5# H-40 ST&C	240' to surface; Class "G" cement
0'- TD (est. 688')	7-7/8"	5-1/2"	New 14# J-55 ST&C	TD to surface; Class "G" cement

to:

Depth	*Hole Diameter*	*Casing Diameter*	*Casing*	*Cement*
0' to between 35' and 65'	17-1/2"	13-3/8"	New 48# H-40 ST&C	**setting depth** to surface; Class "H" cement w/2%$CaCl_2$
0'-240'	12-1/4"	9-5/8"	New 32.5# H-40 ST&C	240' to surface; Class "G" cement
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If you have any questions regarding this matter, please feel free to contact Nathan Wiser, at (303) 312-6211.

Sincerely,

for Kerrigan G. Clough
Assistant Regional Administrator
Office of Partnerships and
Regulatory Assistance

cc: Arlyn Headress, Chairman
Fort Peck Tribal Executive Board
P.O. Box 1027
Poplar, MT 59255

Deb Madison, Manager
Environmental Programs
Assiniboine & Sioux Tribes
P.O. Box 1027
Poplar, MT 59255

George Hudak
Montana Board of Oil and Gas
2535 St. Johns Avenue
Billings, MT 59102

Aden Seidlitz, Field Manager
U.S. Department of Interior
Bureau of Land Management, Miles City Field Office
111 Garryowen Road
Miles City, MT 59301-0940

Steven Leifer
Baker & Botts LLP
The Warner
1299 Pennsylvania Avenue NW
Washington, DC 20004-2400

bcc: Jim Boyter 8MO)
John Wardell (8MO)
Barbara Burkland (8MO)

SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to: 9/07/01 NW 4166C
Mr. Wilbur Dover, Manager
Operations Services
Pioneer Natural Resources USA, Inc.
1400 Williams Square West
5202 North O'Connor Blvd.
Irving, TX 75039-3746

SEP 7 2001

BIERE #1-22 (MT5913-00000)

COMPLETE THIS SECTION ON DELIVERY

A. Received by *(Please Print Clearly)*

B. Date of Delivery 9/10

C. Signature
X
☐ Agent
☐ Addressee

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

SEP 14 2001

3. Service Type
XX Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? *(Extra Fee)* ☐ Yes

2. Article Number *(Copy from service label)* 7001 0320 0005 9387 1918

PS Form 3811, July 1999 Domestic Return Receipt 102595-00-M-0952

U.S. Postal Service
CERTIFIED MAIL RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)

OFFICIAL USE

Postage	$
Certified Fee	
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee	

SEP 7 2001
Postmark Here

7001 0320 0005 9387 1918

Mr. Wilbur Dover, Manager
Operations Services
Pioneer Natural Resources USA, Inc.
1400 Williams Square West
5202 North O'Connor Blvd.
Irving, TX 75039-3746

PS Form 3800, January 2001 See Reverse for Instructions

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
999 18TH STREET - SUITE 300
DENVER, CO 80202-2466
http://www.epa.gov/region08

SEP 7 2001

CONCURRENCE COPY

Ref: 8ENF-T

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Irving, Texas 75039-3746

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to:

8ENF-T NW 8/31/01

8RW-GW Insley for Hoyle 8/31/01

8PW Tuber 8/5/01

mailed 9/07/01 LG

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"Injection shall be limited to an interval within the Judith River, between the depths of **688' and 900.**"

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cc: Arlyn Headress, Chairman
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REGION 8
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DENVER, CO 80202-2466
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JUL 31 2001

Ref: 8P-W-GW

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Assistant Regional Administrator
Office of Partnerships and
Regulatory Assistance

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Statement of Basis
EPA Region 8 Guidances #34, #37, #39

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P.O. Box 1027
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Aden Seidlitz, Field Manager
United States Department of the Interior
Bureau of Land Management, Miles City Field Office
111 Garryowen Road
Miles City, MT 59301-0940

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http://www.epa.gov/region08

JUL 31 2001

CONCURRENCE COPY

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8ENF-T NW 7-30-01 8P-W-GW 7/31/01 8P-W-GW 7/31/01 mailed 8/1/01 8P-W Tuber 7/31/01

Printed on Recycled Paper

Please note that under the terms of the Final Permit, Pioneer Natural Resources USA, Inc. is authorized only to drill and construct the proposed injection wells, and must fulfill the "Prior to Commencing Injection" requirements of the Permit, Part II Section C Subpart 1 and obtain written or verbal Authorization To Inject prior to commencing injection.

It is the responsibility of the operator to be familiar with and to comply with all provisions of the Emergency Permit.

The permit and the authorization to inject are issued for 90 days unless modified, revoked and reissued, or terminated.

If you have any questions on the enclosed Emergency Permit or the Statement of Basis, please call Nathan M. Wiser at (303) 312-6211.

Sincerely,

Kerrigan G. Clough
Assistant Regional Administrator
Office of Partnerships and
Regulatory Assistance

Enclosures: Emergency Permit
Statement of Basis
EPA Region 8 Guidances #34, #37, #39

cc: copy of letter only
Mr. Arlyn Headdress, Chairman
Fort Peck Tribal Executive Board
P.O. Box 1027
Poplar, MT 59255

Mr. George Hudak
Montana Board of Oil and Gas
2535 St. Johns Avenue
Billings, MT 59102

Aden Seidlitz, Field Manager
United States Department of the Interior
Bureau of Land Management, Miles City Field Office
111 Garryowen Road
Miles City, MT 59301-0940

cc: complete copy including all enclosures

Mr. Steven Leifer
Baker & Botts LLP
The Warner
1299 Pennsylvania Avenue NW
Washington, DC 20004-2400

Ms. Deb Madison, Manager
Environmental Programs
Assiniboine and Sioux Tribes
P.O. Box 1027
Poplar, MT 59255

bcc: complete copy including all enclosures

Jim Boyter (8MO)

bcc: copy of letter only

John Wardell (8MO)
Barbara Burkland (8MO)

cc: complete copy including all enclosures

Mr. Steven Leifer
Baker & Botts LLP
The Warner
1299 Pennsylvania Avenue NW
Washington, DC 20004-2400

Ms. Deb Madison, Manager
Environmental Programs
Assiniboine and Sioux Tribes
P.O. Box 1027
Poplar, MT 59255

bcc: complete copy including all enclosures

Jim Boyter (8MO)

bcc: copy of letter only

John Wardell (8MO)
Barbara Burkland (8MO)

SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits. (NW # 4116C)

1. Article Addressed to:

Mr. Wilbur Dover AUG 1 2001
Manager, Operations Services
Pioneer Natural Resources USA, Inc.
1400 Williams Square West
5202 North O'Connor Boulevard
Irving, TX 75039-3746

COMPLETE THIS SECTION ON DELIVERY

A. Received by *(Please Print Clearly)* | B. Date of Delivery

C. Signature

X ☐ Agent ☐ Addressee

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

recd 8/6
AUG 9 2001

3. Service Type
XX Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? *(Extra Fee)* ☐ Yes

2. Article Number *(Copy from service label)*
7001 0320 0005 9387 1581

PS Form 3811, July 1999 Domestic Return Receipt 102595-00-M-0952

U.S. Postal Service
CERTIFIED MAIL RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)

OFFICIAL USE

Postage	$
Certified Fee	
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

Postmark Here
(#4116C)
JUL 31 2001

Sent To Mr. Wilbur Dover
Pioneer Natural Rsources USA, Inc.
Street, Apt. No. or PO Box No. 1400 Williams Square West
City, State, ZIP+4 5202 North O'Connor Boulevard
Irving, TX 75039-3746

PS Form 3800, January 2001 See Reverse for Instructions

7001 0320 0005 9387 1581

CATCH THIS! CATCH THIS! CATCH THIS!

Environmental Protection Agency
999 18th Street, Suite 300
DENVER, CO 80202-2466
FAX #:(303) 312-6409

Nathan,
I noticed the last name was minus a "D".
thanks,
KG

TO: Wilbur Dover ; Steven Leifer

FROM: Nathan Wiser

FAX #: (972) 969-3567 / (202) 585-1040

DATE: July 31, 2001

PHONE #: (972) 969-3920 / (202) 639-7723

COMPANY: PIONEER NATURAL RESOURCES USA, INC.

Number of Pages faxing (including cover sheets): 4

Comments: Hello Wilbur and Steve,

Enclosed in this FAX is the transmittal letter that accompanies the UIC Emergency Area C/V Permit. The whole permit, the statement of basis and this transmittal letter are being sent to each of you. The permit is now effective and expires in 90 days.

-Nathan Wiser (303-312-6211 telephone #)

CATCH THIS! CATCH THIS! CATCH THIS!

Environmental Protection Agency
999 18th Street, Suite 300
DENVER, CO 80202-2466
FAX #:(303) 312-6409
(303) 312-6211 telephone #

TO: Barbara Burkland FROM: Nathan Wiser

FAX #: 406 - 441 - 1125 DATE: July 31, 2001

PHONE #: 406 - 441 - 1140 x. 236

COMPANY: EPA R8 Montana Operations

Number of Pages faxing (including cover sheets): 4

Comments: Barbara - Please find the attached public notice regarding this Emergency UIC Permit - with (No advance public comment period)

If you have questions feel free to call me.

-Nathan Wiser

CATCH THIS! CATCH THIS! CATCH THIS!

Environmental Protection Agency
999 18th Street, Suite 300
DENVER, CO 80202-2466
FAX #:(303) 312-6409

TO: Marion Clincher

FROM: Nathan Wiser

FAX #: (406) 768-5743

DATE: July 31, 2001

PHONE #: -5783

COMPANY: Wotanin Wowapi

Public Notice

Number of Pages faxing (including cover sheets): 3

Comments: Marion - Please call me back with a cost estimate for publication. Please note that I have to fill in 2 dates, so the public notice is still not ready for actual publication, but I don't think its overall length will change any. - Nathan Wiser
- (303) 312-6211 Telephone -

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
999 18TH STREET - SUITE 300
DENVER, CO 80202-2466
http://www.epa.gov/region08

JUN 6 2001

Ref: 8ENF-T

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Wilbur Dover, Operations Services Manager
Pioneer Natural Resources USA, Inc.
1400 Williams Square West
5202 North O'Connor Blvd.
Irving, Texas 75039-3746

Re: UNDERGROUND INJECTION CONTROL (UIC)
Notice of Deficient Class V Permit Application
EPA Permit No. MT5913-00000
Biere 1-22 Well Remediation

Dear Mr. Dover:

The above-referenced permit application has been received and reviewed. Pursuant to Title 40 of the Code of Federal Regulations (40 CFR), Section 144.31(d), EPA is still unable to process it due to the lack of a complete understanding of the chemical description of the fluid to be injected. On April 12, 2001, you replied to EPA's March 30, 2001, letter sent to you regarding EPA's need for a more complete chemical description of the substance you propose to inject, "Injectrol U." Below is a listing of the chemical compounds EPA surmises is found in "Injectrol U" or its break-down by-products, as derived from the information you have sent to EPA. Please review this list and either (1) concur that this is the complete list of potential chemicals found in "Injectrol U" or its break-down by-products, or (2) correct this list by adding or removing potential chemicals found in "Injectrol U"or its break-down by-products. Also, please either (1) concur that the fluid to be injected will be solely "Injectrol U," or (2) specify what additional substances will be added to the "Injectrol U" solution.

<u>Chemical Content of "Injectrol U" or its Break-Down By-Products:</u>

Sodium Orthosilicate (Na_4SiO_2)
Sodium Metasilicate (Na_2SiO_3)
Sodium Disilicate ($Na_2Si_2O_5$)
Sodium Tetrasilicate ($Na_2Si_4O_9$)
Urea (aka Carbamide) (H_4N_2CO)
Sodium Ion (Na^+)
Silicon Ion (Si^{2+})
Silica (SiO_2)
Water (H_20)
Caustic Soda (NaOH)
Ammonia (NH3)

Printed on Recycled Paper

This information is needed in order (1) to determine that its injection is permissible under Federal regulations, and (2) to assess whether or not Pioneer's proposed groundwater monitoring program will adequately detect the proper chemicals needed to determine that the remediation of the Biere 1-22 well was a success or failure.

In the absence of this data, EPA will be unable to issue your requested Class V UIC area permit. Please provide the information requested in this letter within 15 days of your receipt of this letter, or pursuant to 40 CFR §124.3(d), your UIC permit application may be denied. If you have any questions, please contact Nathan Wiser at (303) 312-6211.

Sincerely,

for DEH

D. Edwin Hogle
Director
Ground Water Program

cc: Steven Leifer, Esq.
Baker Botts LLP
The Warner
1299 Pennsylvania Avenue, NW
Washington, D.C. 20004-2400

Deb Madison, Environmental Programs Manager
Assiniboine & Sioux Tribes
P.O. Box 1027
Poplar, Montana 59255

bcc: Jim Boyter, 8MO
Jim Eppers, 8ENF-L
Steven Moores, 8RC

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
999 18TH STREET - SUITE 300
DENVER, CO 80202-2466
http://www.epa.gov/region08

JUN 6 2001

CONCURRENCE COPY

Ref: 8ENF-T

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Wilbur Dover, Operations Services Manager
Pioneer Natural Resources USA, Inc.
1400 Williams Square West
5202 North O'Connor Blvd.
Irving, Texas 75039-3746

Re: UNDERGROUND INJECTION CONTROL (UIC)
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EPA Permit No. MT5913-00000
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Chemical Content of "Injectrol U" or its Break-Down By-Products:

Sodium Orthosilicate (Na_4SiO_2)
Sodium Metasilicate (Na_2SiO_3)
Sodium Disilicate ($Na_2Si_2O_5$)
Sodium Tetrasilicate ($Na_2Si_4O_9$)
Urea (aka Carbamide) (H_4N_2CO)
Sodium Ion (Na^+)
Silicon Ion (Si^{2+})
Silica (SiO_2)
Water (H_20)
Caustic Soda (NaOH)
Ammonia (NH3)

Printed on Recycled Paper

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
999 18TH STREET - SUITE 300
DENVER, CO 80202-2466
http://www.epa.gov/region08

OK!

CONCURRENCE COPY

Ref: 8ENF-T ~~8P-W-GW~~

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Wilbur Dover, Operations Services Manager
Pioneer Natural Resources USA, Inc.
1400 Williams Square West
5202 North O'Connor Blvd.
Irving, Texas 75039-3746

Re: UNDERGROUND INJECTION CONTROL (UIC)
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EPA Permit No. MT5913-00000
Biere 1-22 Well Remediation

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Sodium Metasilicate (Na_2SiO_3)
Sodium Disilicate ($Na_2Si_2O_5$)
Sodium Tetrasilicate ($Na_2Si_4O_9$)
Urea (aka Carbamide) (H_4N_2CO)
Sodium Ion (Na^+)
Silicon Ion (Si^{2+})
Silica (SiO_2)
Water (H_20)
Caustic Soda (NaOH)
Ammonia (NH3)

8ENF-T
NW
6-5-01

8P-W-GW
6/5/01 KG
mailed
6/06/01 KG

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This information is needed in order (1) to determine that its injection is permissible under Federal regulations, and (2) to assess whether or not Pioneer's proposed groundwater monitoring program will adequately detect the proper chemicals needed to determine that the remediation of the Biere 1-22 well was a success or failure.

In the absence of this data, EPA will be unable to issue your requested Class V UIC area permit. Please provide the information requested in this letter within 15 days of your receipt of this letter, or pursuant to 40 CFR §124.3(d), your UIC permit application may be denied. If you have any questions, please contact Nathan Wiser at (303) 312-6211.

Sincerely,

D. Edwin Hogle
Director
Ground Water Program

cc: Steven Leifer, Esq.
Baker Botts LLP
The Warner
1299 Pennsylvania Avenue, NW
Washington, D.C. 20004-2400

Deb Madison, Environmental Programs Manager
Assiniboine & Sioux Tribes
P.O. Box 1027
Poplar, Montana 59255

bcc: Jim Boyter, 8MO
Jim Eppers, 8ENF-L
Steven Moores, 8RC

TELEFAX COVER SHEET

DATE: 6/08/2001

TO: STEVEN LEIFER MAIL CODE: _____

BAKER BOTTS LLP

AGENCY/FIRM: THE WARNER PHONE: _____

CITY: _____ STATE: _____

TELEFAX MACHINE NUMBER: (202) 639-7890

PLEASE INCLUDE AREA CODE

NUMBER OF PAGES *(INCLUDING COVER SHEET)* 3

FROM: NATHAN WISER PHONE: (303) 312-6211

U.S. EPA REGION VIII
UNDERGROUND INJECTION CONTROL 8P-W-GW
999 18TH STREET
SUITE 500
DENVER CO 80202-2466

TELEFAX: (303) 312-7084
* FRONTDESK: (303) 312-6741

REMARKS: faxed 6/06/01 - letter to follow

SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to: 6/06/01 NW 4053C

Mr. Wilbur Dover
Operations Services Manager
Pioneer Natural Resources USA, Inc.
1400 Williams Square West
5202 North O'Connor Blvd.
Irving, TX 75039-3746

JUN 6 2001

COMPLETE THIS SECTION ON DELIVERY

A. Received by *(Please Print Clearly)* Maria Bellego

B. Date of Delivery 6/16

C. Signature X [signature]

☐ Agent ☒ Addressee

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

rec'd L6

JUN 14 2001

3. Service Type
XX Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? *(Extra Fee)* ☐ Yes

2. Article Number *(Copy from service label)*
Z 159 952 375 BIERE 1-22 (MT5913-00000)

PS Form 3811, July 1999 E Domestic Return Receipt 102595-00-M-0952

Z 151 952 375

US Postal Service 6/06/01 NW 4053C

Receipt for Certified Mail

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Sent to Mr. Wilbur Dover	
Street & Number Operations Services Manager	
Post Office, State, & ZIP Code Pioneer Natural Resources USA,	
Postage 1400 Williams Square West Inc.	
Certified Fee 5202 North O'Connor Blvd.	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, & Addressee's Address	
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Postmark or Date	

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
999 18TH STREET - SUITE 300
DENVER, CO 80202-2466
http://www.epa.gov/region08

MAR 30 2001

Ref: 8ENF-T

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Wilbur Dover, Operations Services Manager
Pioneer Natural Resources USA, Inc.
1400 Williams Square West
5202 North O'Connor Blvd.
Irving, Texas 75039-3746

Re: UNDERGROUND INJECTION CONTROL (UIC)
Notice of Deficient Class V Permit Application
EPA Permit No. MT5913-00000
Biere 1-22 Well Remediation

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Pioneer should submit a written, detailed chemical description of "Injectrol U," in either the form of actual chemical analytical results, or a complete list of all ingredients used in its production, along with their abundance. This information is needed in order (1) to determine that its injection is permissible under Federal regulations, and (2) to assess whether or not Pioneer's proposed groundwater monitoring program will adequately detect the proper chemicals needed to determine that the remediation of the Biere 1-22 well was a success or failure.

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In the absence of this data, EPA will be unable to issue your requested Class V UIC area permit. Please provide the information requested in this letter within 15 days of your receipt of this letter, or pursuant to 40 CFR §124.3(d), your UIC permit application may be denied. If you have any questions, please contact Nathan Wiser at (303) 312-6211.

Sincerely,

D. Edwin Hogle
Director
Ground Water Program

cc: Steven Leifer, Esq.
Baker Botts LLP
The Warner
1299 Pennsylvania Avenue, NW
Washington, D.C. 20004-2400

Deb Madison, Environmental Programs Manager
Assiniboine & Sioux Tribes
P.O. Box 1027
Poplar, Montana 59255

bcc: Jim Boyter, 8MO

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
999 18TH STREET - SUITE 300
DENVER, CO 80202-2466
http://www.epa.gov/region08

MAR 30 2001

Ref: 8ENF-T

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Pioneer Natural Resources USA, Inc.
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Irving, Texas 75039-3746

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
999 18TH STREET - SUITE 300
DENVER, CO 80202-2466
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MAR 30 2001

Ref: 8ENF-T

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RETURN RECEIPT REQUESTED

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Pioneer Natural Resources USA, Inc.
1400 Williams Square West
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Irving, Texas 75039-3746

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Director
Ground Water Program

cc: Steven Leifer, Esq.
Baker Botts LLP
The Warner
1299 Pennsylvania Avenue, NW
Washington, D.C. 20004-2400

Deb Madison, Environmental Programs Manager
Assiniboine & Sioux Tribes
P.O. Box 1027
Poplar, Montana 59255

bcc: Jim Boyter, 8MO

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
999 18TH STREET - SUITE 300
DENVER, CO 80202-2466
http://www.epa.gov/region08

MAR 30 2001

CONCURRENCE COPY

Ref: 8ENF-T

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Pioneer Natural Resources USA, Inc.
1400 Williams Square West
5202 North O'Connor Blvd.
Irving, Texas 75039-3746

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EPW-610
3/29/01 LG
Mailed
3/30/01 LG

3/30/01

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Director
Ground Water Program

cc: Steven Leifer, Esq.
Baker Botts LLP
The Warner
1299 Pennsylvania Avenue, NW
Washington, D.C. 20004-2400

Deb Madison, Environmental Programs Manager
Assiniboine & Sioux Tribes
P.O. Box 1027
Poplar, Montana 59255

bcc: Jim Boyter, 8MO

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

MAR 30 2001

1. Article Addressed to: 3/30/01 NW 3956C

Mr. Wilbur Dover
Operations Services Manager
Pioneer Natural Resources USA, Inc.
1400 Williams Square West
5202 North O'Connor Blvd.
Irving, TX 75039-3746

COMPLETE THIS SECTION ON DELIVERY

A. Received by (Please Print Clearly) L Beago

B. Date of Delivery 4/2/01

C. Signature

X Julunia Beago

☐ Agent
☒ Addressee

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

recd (LG)

APR 5 2001

3. Service Type

XX Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Copy from service label)
Z 159 952 319 (MT5913-00000 AREA PERMIT)

PS Form 3811, July 1999 J Domestic Return Receipt 102595-00-M-0952

Z 159 952 319

US Postal Service 3/30/01 NW 3956C

Receipt for Certified Mail

No Insurance Coverage Provided. (3956C)

Do not use for International Mail (See reverse)

Sent to Mr. Wilbur Dover	
Street & Number Operations Services Manager	
Pioneer Natural Resources USA, Inc.	
Post Office, State, & ZIP Code 1400 Williams Square West	
Postage 5202 North O'Connor Blvd.	$
Irving, TX 75039-3746	
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, & Addressee's Address	
TOTAL Postage & Fees	$
Postmark or Date	

PS Form 3800, April 1995

— IN-COMING REQUEST —

DoverW@pioneernrc.com

08/29/01 01:43 PM

To: Nathan Wiser/ENF/R8/USEPA/US@EPA
cc: Mamerows@pioneernrc.com
Subject: EPA Permit No. MT 5913-0000 Requested Modifications;Biere 1-22A-- D Wells

Nathan,as a followup to our telephone discussion on August 28,2001, Pioneer requests approval of the following permit modifications;

1. Permission to set surface casing between 35'-65' due to anticipated saltwater flow below 60'. The estimated setting depth of the surface casing for wells 1-22C and 1-22D will be aproximately 59'.

2. Request to change the permit total well depth to 900' from 720'. The reason for changing the total depth is to drill deep enough in the Judith River zone to establish communication with the Judith River aquifer. We drilled to 720' in the Biere 1-22B and did not see any water flow. We should contact the aquifer between 810'-838'. This will also change the permit injection zone from 688'-720' to 688'-900'.

Your prompt consideration and approval of the above changes will improve our current program and well control.

Wilbur Dover

Pioneer Natural Resources USA,Inc.

August 29,2001

PIONEER
NATURAL RESOURCES USA, INC.

SEP - 7 2001

August 30, 2001

Environmental Protection Agency
999 18th Street
Suite 500 (8ENF-T)
Denver, Colorado 80202

Re: EPA Permit No. MT 5913-0000
Requested Modifications; Biere 1-22A-D Wells

Attn: Nathan Wiser

Nathan, as a follow-up to our telephone discussion on August 28, 2001, Pioneer requests approval of the following permit modifications;

1. Permission to set surface casing between 35'-65' due to anticipated saltwater flow below 60'. The estimated setting depth of the surface casing for wells 1-22C and 1-22D will be approximately 59'.

2. Request to change the permit total well depth to 900' from 720'. The reason for changing the total depth is to drill deep enough in the Judith River zone to establish communication with the Judith River aquifer. We drilled to 720' in the Biere 1-22B and did not see any water flow. We should contact the aquifer between 810'-838'. This will also change the permit injection zone from 688'-720' to 688'-900'.

Your prompt consideration and approval of the above changes will improve our current program and well control.

Sincerely,

Wilbur L. Dover

Wilbur Dover
Manager-Operations Services

5205 N. O'CONNOR BLVD., SUITE 1400 · IRVING, TEXAS 75039-3746 · MAIN (972) 444-9001 · FAX (972) 969-3587

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NATURAL RESOURCES USA, INC.

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N. Wisler

June 14, 2001

DEH 6/18/01

United States Environmental Protection Agency
Region 8
999 18th Street – Suite 300
Denver, Colorado 80202-2466

Attn: Mr. D. Edwin Hogle
Director – Ground Water Program

Re: EPA UIC Permit Application
Response to Notice of Deficiency
EPA Permit No. MT5913-00000
Biere 1-22 Well Remediation

Dear Mr. Hogle:

In response to your certified letter dated June 6, 2001 requesting a complete and accurate list of chemical compounds found in Halliburton's product, Injectrol "U", Halliburton provided the following information.

1. Chemical Content of Injectrol "U"

- Caustic Soda (NAOH)
- Silica (SiO_2)
- Water (H_2O)
- Urea (aka Carbamide) (N_4 N_2 CO)

*Product is transported by tank trucks to well location in liquid form

2. Chemical Break-Down By - Products

Ammonia (NH_3)
Sodium Ion (N_A+)
Silicon Ion (Si_2+)
Water (H20)

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Sodium Ions (N_A+) already exist in the Judith River saltwater. The Silicon Ion (Si_2+) already exists in the Judith River sandstone formation and will not be a problem in the fresh water aquifer. The Ammonia (NH_3) released will be a very weak diluted solution and should be dissipated before reaching the fresh water aquifer.

In summary, Halliburton's Injectrol "U" product has been in use for 25-30 years and is designed to form a permanent seal, even at temperatures greater than 200°F. The product is environmentally safe and should not create any fresh water aquifer contamination.

Pioneer believes Injectrol "U" to be the best available product for the Biere 1-22 Well Remediation solution. If any of the Injectrol "U" product channels up to the fresh water aquifer after being injected into the Judith River injection wells, the saltwater plume around the Biere 1-22 well will accelerate the setting up of the 3-dimensional gel. This will reduce the possibility of chemical breakdown reaching the fresh water aquifer.

Hopefully, Pioneer has provided the EPA with the necessary information to enable the granting of our requested Class V UIC area injection permit.

Sincerely,

Wilbur Dover

Wilbur Dover
Manager-Operations Services

cc: Steve Leifer (Baker Botts LLP)
Steve Mamerow
Marc Skeen
John Ross (Brown Law Firm)

PIONEER

NATURAL RESOURCES

FAX TRANSMISSION

5205 N. O'Connor Blvd., Ste. 1400
Irving, TX 75039-3746
972/444-9001
Fax: 972/969-3567

To: NATHAN WISER - EPA

Date: 6-14-01

Fax #: 303-312-6409

Pages: 3 , including this cover sheet.

From: Wilbur Dover
Manager, Operations Services

Subject: RESPONSE TO DEFICIENCY; EPA PERMIT NO. MT 5913-00000
BIERE 1-22 REMEDIATION

COMMENTS:

NATHAN - PLEASE REVIEW ATTACHED RESPONSE & LET ME KNOW IF THIS IS WHAT YOU NEED TO GRANT OUR INJECTION PERMIT. WE HAVE OUR MONTANA WELL PERMITS FROM MONTANA BOARD OF OIL & GAS CONSERVATION. LET ME KNOW IF YOU NEED ANYTHING ELSE. ORIGINAL LETTER SENT CERTIFIED MAIL.

THANKS,
WILBUR DOVER

If you do not receive all the pages, please contact Kenya Burleson 972-969-3918

PIONEER
NATURAL RESOURCES USA, INC.

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EPA REGION VIII

April 12, 2001

United States Environmental Protection Agency
Region 8
999 18th Street – Suite 300
Denver, Colorado 80202-2466

Attn: Mr. D. Edwin Hogle
Director – Ground Water Program

Re: EPA UIC Permit Application
Response To Notice Of Deficiency
EPA Permit No. MT5913-00000
Biere 1-22 Well Remediation

Dear Mr. Hogle:

In response to your certified letter dated March 30, 2001 requesting detailed chemical description of Halliburton's "Injectrol U" product, please find the following information attached;

1. April 10, 2001 memo from Harold McGowen with Signa Engineering Services with a chemical description and leaching test information from Halliburton.

2. Halliburton's Product Fact Sheet on Injectrol "U".

3. Ausimont's Product Fact Sheet on Sodium Silicate in Aqueous Solution.

4. MSDS Data on Sodium Silicate Solution & UREA.

Hopefully, the attached information will be sufficient for your staff to complete our UIC permit application review and grant our permit for the Biere 1-22 Well Remediation.

Pioneer believes Injectrol "G" to be the best available product that will give the best results in stopping the leak in or around the Biere 1-22 well location by injecting below fracture pressures into the Judith River Formation. We are confident that it is a safe product to inject and very little chance it will reach the fresh water aquifer.

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Again, we hope your staff will expedite review and approval of our permit application so we can implement our proposed action plan at the Biere 1-22 well location.

If your staff has any questions about the attached information, please contact me at 972-969-3920.

Sincerely,

Wilbur L. Dover

Wilbur L. Dover
Manager – Operations Services

Cc: Marc Skeen
Steve Liefer
John Ross
Steve Mamerow

Dover, Wilbur

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APR 16 2001
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From: Harold McGowen [mmcgowen@SIGNA.NET]
Sent: Wednesday, April 11, 2001 5:45 PM
To: Wilbur Dover (E-mail)
Subject: FW: Biere 1-22 Remediation - INJECTROL U

Based on the information available at this time Signa does not perceive any significant environmental risk from the planned Injectrol U treatment. Please review the description and analysis provided below.

INJECTROL U Sealant

Chemical Description

Injectrol is the trade name used by Halliburton to designate a group of no solids, sealant systems prepared with dilute fresh water solutions of sodium silicate, usually sodium metasilicate. These solutions are used to seal leaks in well/formation systems and have low placement viscosity, ~1.5 cp. In the case of Injectrol U Sealant, a dilute solution of urea, an internal activator, is added to the sodium silicate solution. The urea causes the sodium silicate solution to polymerize and form a semi-solids particulate mass (3-dimensional structure) at a designed set time. This set time is dependent on the concentration of the sodium silicate and the urea solution.

Specific concentrations of the Injectrol U Sealant components are:
Grade 40 Sodium Silicate (sodium metasilicate or Na_2SiO_3) with a SiO_2:Na_2O ratio of 3.22% – 16% v/v results in an ~8.7% active solution based upon weight
Urea Solution – 0.14% - 0.72% w/w (actual quantity is determined by desired polymerization time)

Below is a general description of sodium silicate and urea, and we can provide MSDSs for these two chemicals if required. Sodium silicate, any one of several compounds containing sodium oxide, Na_2O, and silica, Si_2O, or a mixture of sodium silicates. Sodium orthosilicate is Na_4SiO_4 (or $2Na_2O \cdot SiO_2$); sodium metasilicate is Na_2SiO_3 (or $Na_2O \cdot SiO_2$); sodium disilicate is $Na_2Si_2O_5$ (or $Na_2O \cdot 2SiO_2$); sodium tetrasilicate is $Na_2Si_4O_9$ (or $Na_2O \cdot 4SiO_2$). All these compounds are transparent, glassy or crystalline solids that have high melting points (above 800°C) and are water-soluble. They are produced chiefly by fusing sand and sodium carbonate in various proportions. The product is commonly known as water glass. The greatest single use of sodium silicates is as a raw material for making silica gel.

Urea, also called carbamide, the diamide of carbonic acid. Its formula is H_2NCONH_2. Urea has important uses as a fertilizer and feed supplement, as well as a starting material for the manufacture of plastics and drugs. It is a colorless, crystalline substance that melts at 271° F and decomposes before boiling. Urea is the chief nitrogenous end product of the metabolic breakdown of proteins in all mammals and some fishes. The material occurs not only in the urine of all mammals but also in their blood, bile, milk, and perspiration. In the course of the breakdown of proteins, amino groups (NH_2) are removed from the amino acids that partly comprise proteins. These amino groups are converted to ammonia (NH_3), which is toxic to the body and thus must be converted to urea by the liver. The urea then passes to the kidneys and is eventually excreted in the urine.

Leaching Test

Halliburton's lab in Duncan, Oklahoma performed a "leaching" test in the laboratory to provide some insight to possible urea contamination of the fresh water by their Injectrol U Sealant. Their findings show urea could still be leached out from the set Injectrol U Sealant over time with continued exposure to fresh water. However, the potential urea contamination in the fresh water should not be significant.

There are two main factors that will severely restrict this minimum expected exposure of fresh water to urea:

1. Only the outer boundary of the Injectrol U Sealant trapped in the porous rock will be subjected to potential exposure to fresh water. The water will not have access to the set gel trapped within the pore throats of the sandstone formation.

2. The salt water in the Judith contains calcium ions. Therefore both the inner and the outer "curtain" of the Injectrol U treatment will be exposed to these ions. Almost immediately upon exposure to these ions to a solution containing sodium silicate an insoluble precipitant of calcium silicate and calcium hydroxide forms. The presence of this additional barrier to fresh water will further limit access to the Injectrol U Sealant.

Given the above points, the laboratory test was devised to determine a "worst case" scenario - a continual washing of the

Injectrol U Sealant by an unlimited supply of fresh water.

One hundred grams of Injectrol U gel, containing the equivalent amount of urea catalyst to represent 500 pounds urea per 1000 gallons of the dilute sodium silicate solution, was prepared and placed into a 4 oz glass container. The surface area on top of the gelled Injectrol U was 16 cm2. The rate of dissolution at 200 degrees F to fresh water was determined by placing 25 cc of fresh water (preheated to 200 F) on the surface of the Injectrol U gel. After 2 hours, the water was decanted off the surface of the gel and replaced by 25 cc of pre-heated fresh water. This cycle was repeated every 2 hours until 8 hours had elapsed. After the last sample was taken, 25 cc of preheated fresh water was placed on the surface of the gel and left until 72 hours had elapsed since the initiation of the test. The quantity of the components formed from the urea catalyst which were being removed from the gel was determined by measuring the concentration of nitrogen present in each sample. (Urea hydrolyzes in water to form nitrogen and weak carboxylate acids). There was initially 6 grams of urea present in the solution, 47% of which will be quantity of nitrogen available (2,820,000 ppm).

See attached plot of the cumulative concentration of nitrogen released over time (test results). This rate of "leaching" under these extreme circumstances indicates that less than 0.6% of the catalyst is anticipated to be released. In this particular case, using 20,000 gallons Injectrol U, containing 10,000 pounds of urea, this would be equivalent to an estimated 60 pounds.

Conclusions

The Sodium Silicate will setup and become completely immobile rendering it inert. To the extent that there is a pathway from the Judith to the aquifer, it must necessarily be very small. Therefore, it is very unlikely that any of the Injectrol U will reach the fresh water aquifer from the injection point in the Judith. There is leachable urea in Injectrol U. However, according to Halliburton's interpretation of FDA 21CFR184, there is no limit set for urea contamination in fresh drinking water because it is generally recognized as safe in small quantities. More importantly, the insignificant amount of urea that could possibly leach into the environment in this application would be rendered even more negligible because of the massive dilution that would occur in the fresh water zone. Therefore, even in the worst case scenario, only slight traces of urea or urea by-products are expected to be detectable in the water of the aquifer.

Prepared by:

Harold E. McGowen III, PE, PMP
Senior VP of Engineering Services
Signa Engineering Corp.
2 Northpoint Drive, Suite 550
Houston, Texas 77060

Phone: 281-774-1023
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and

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E-mail: w.k.ott@wcthou.com
Web: <http://www.wcthou.com>

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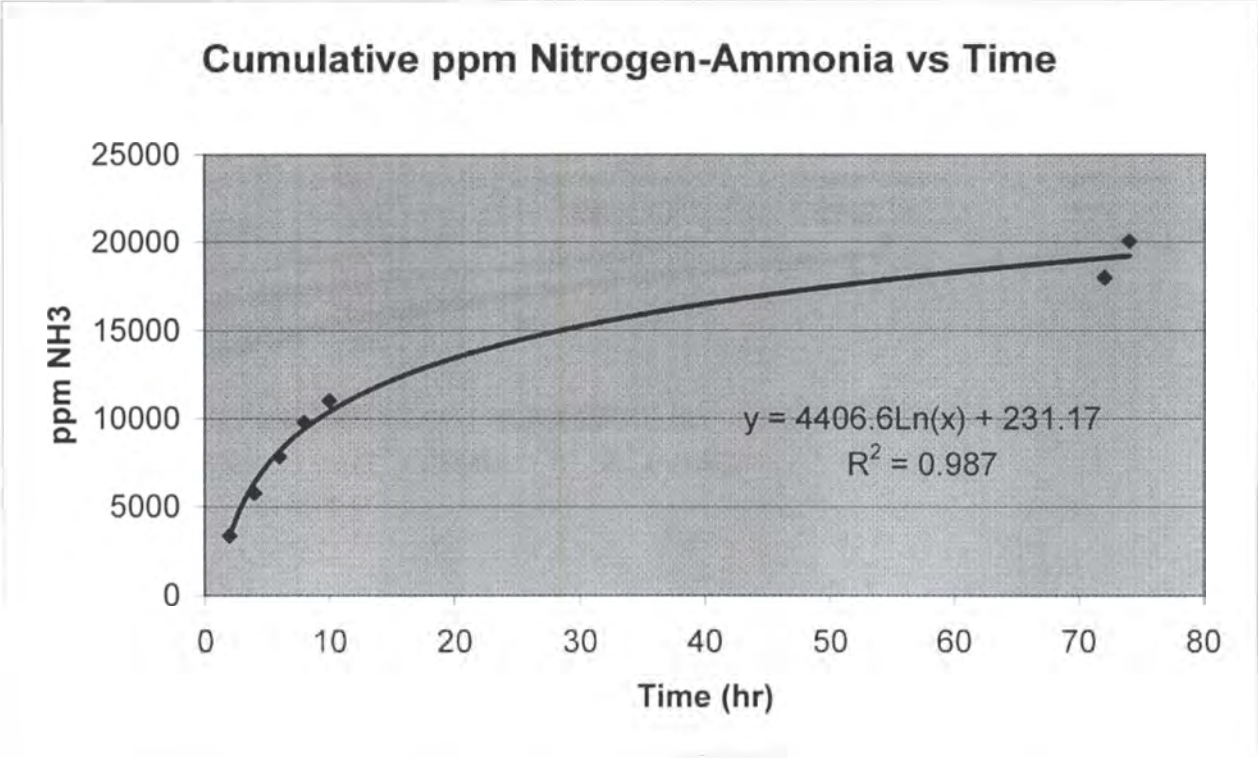
Time (hr)	ppm NH3	Cumulative ppm NH3	Cumulative mg NH3 leached from gel	% Total NH3 available leached from gel
2	3362	3362	0.08405	0.000247
4	2398	5760	0.144	0.000424
6	2078	7838	0.19595	0.000576
8	1957	9795	0.244875	0.00072
10	1223	11018	0.27545	0.00081
72	6950	17968	0.4492	0.001321
74	2090	20058	0.50145	0.001475

~ 14.61988 % NH3 released in formulation from urea



100 gm of gelled Injectrol U placed in a 4 oz bottle. 25 cc of fresh water placed on the surface (16.05 cm2 surface). Test at 200 F. Fluid samples taken at discrete intervals and measured for nitrogen content. NH2CONH2 + OH- = 2NH3 + CO2

INJECTROL® U

Sealant

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INJECTROL® Service is an internally catalyzed silicate system that achieves intermediate depth-of-matrix penetration. This action helps control water flow during drilling, completion, production, and injection operations.

FEATURES

INJECTROL® U sealant is a three-component system containing INJECTROL® A component, Catalyst III, and water.

The gel strengths of INJECTROL® gels are inversely proportional to gel time. The less time required for gelation, the stronger the resultant gel. Often, a tail-in solution of INJECTROL® U sealant is a more highly catalyzed INJECTROL® U solution.

Often, the activator concentration is increased during the treatment to help increase the strength of the INJECTROL® gel nearest the wellbore.

APPLICATIONS

INJECTROL® U sealant is effective in hot wells with temperatures of at least 180°F (82°C). INJECTROL® U sealant provides usable pump times at temperatures as high as 300°F (149°C), which enables its use at bottomhole injection temperatures (BHITs) of about 300°F (149°C).

INJECTROL® U sealant uses Catalyst III for its activator. This system provides widely variable set times and precipitates particles of hard solids when this time has elapsed. Laboratory testing shows that Catalyst III is an effective plugging agent in rock matrices.

Shut-in times of approximately 48 hours should allow the near-wellbore temperature to build up and set the INJECTROL® U sealant.

INJECTROL® A Component—Product Specifications

Part No.	70.15607	**pH**	11.3
Form	clear colorless to hazy liquid	**Boiling Point**	213°F (100°C)
		Pour Point	35°F (1°C)
Specific Gravity	1.400	**Freeze Point**	30°F (-1°C)
Bulk Density	11.66 lb/gal	**Packaging**	54-gal drum

Catalyst III—Product Specifications

Part No.	516.00108	**pH**	7.2% for 10% solubility
Form	White, solid beads	**Bulk Density**	65 lb/ft^3
Specific Gravity	1.335	**Packaging**	50-lb bag

COMPATIBILITIES

INJECTROL® U sealant is incompatible with strong acids. Additionally, if INJECTROL® U sealant is injected into sandstone formations with low permeability, or wells that take fluid at a very low rate, HYFLO® Super-Cel ($^1/_2$ lb/ft of interval) should be added to the first 2,000 gal of INJECTROL® solution for improved injectivity.

INJECTROL® U sealant can be mixed with fresh water or 2% KCl. Field brines should be avoided.

BENEFITS

In addition to being mixed as a single solution, INJECTROL® U sealant provides the following benefits:

- low injection rates
- injection pressures well below the fracturing pressure
- exact displacement or a small underdisplacement into the formation

HALLIBURTON®

Sales of Halliburton products and services will be in accord solely with the terms and conditions contained in the contract between Halliburton and the customer that is applicable to the sale.

H01946

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972-969-3567

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Sodium Silicate Solution

MSDS Number: S4982 --- *Effective Date: 02/23/01*

1. Product Identification

Synonyms: Water Glass; Soluble Glass; Silicate of Soda; Egg Preserver
CAS No.: Not applicable to mixtures.
Molecular Weight: Not applicable to mixtures.
Chemical Formula: Na2O(SiO2)x.(H2O)x
Product Codes: 3877

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sodium Silicate	1344-09-8	35 - 40%	Yes
Water	7732-18-5	60 - 65%	No

3. Hazards Identification

Emergency Overview
WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES SEVERE IRRITATION TO EYES, SKIN AND RESPIRATORY TRACT.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 1 - Slight
Flammability Rating: 0 - None
Reactivity Rating: 0 - None
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT
Storage Color Code: Orange (General Storage)

Potential Health Effects
Diluted solutions of sodium silicate are strong alkaline irritants. The solid sodium silicate is corrosive. Exposure to alkaline corrosives may result in severe burns depending on the concentration and duration of exposure. Sodium silicate is a type of amorphous silica and does not cause pulmonary silicosis.
Inhalation:
A strong alkaline irritant. Inhalation can cause severe irritation of mucous membranes and upper respiratory tract. Symptoms may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting. High concentrations may cause lung damage.
Ingestion:
A strong alkaline irritant. Causes irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea. Solid sodium silicate: Alkaline corrosive ingestion may produce burns to the lips, tongue, oral mucosa, upper airway, esophagus and occasionally stomach.

Skin Contact:
A strong alkaline irritant. Causes severe irritation. Symptoms include redness, itching and pain. Dries to form a glass film which can cut skin. Solid sodium silicate: Dermal contact with alkaline corrosives may produce pain, redness, severe irritation or full thickness burns.
Eye Contact:
A strong alkaline irritant. Alkaline eye exposures produce severe irritation with effects similar to those of dilute caustics. Inflammation or burns with possible damage to the eye tissues can occur together with tearing and considerable pain.
Chronic Exposure:
No information found.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or impaired respiratory function may be more susceptible to the effects of the substance.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full face piece operated in the pressure demand or other positive pressure mode.

---

6. Accidental Release Measures

Caution! Floor and other surfaces may be slippery. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8.

Contain and recover liquid when possible. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer!

---

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Amorphous Silica, including natural diatomaceous earth:
- OSHA Permissible Exposure Limit (PEL):
(80 mg/m3) / (%SiO2) (TWA).
- ACGIH Threshold Limit Value (TLV):
10 mg/m3 (TWA) inhalable particulate;
3 mg/m3 (TWA) respirable particulate.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
Clear to cloudy, viscous liquid.

Odor:
Odorless.
Solubility:
Complete (100%)
Specific Gravity:
1.3 - 1.5
pH:
11 - 12.5
% Volatiles by volume @ 21C (70F):
ca. 70
Boiling Point:
102C (216F)
Melting Point:
No information found.
Vapor Density (Air=1):
Not applicable.
Vapor Pressure (mm Hg):
18 @ 20C (68F)
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
No information found.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Fluorine, mineral acids, organic acids, organic materials. May produce hydrogen gas on prolonged contact with metals. Gels when mixed with acids.
Conditions to Avoid:
Incompatibles.

---

11. Toxicological Information

No LD50/LC50 information found relating to normal routes of occupational exposure.

Cancer Lists---NTP Carcinogen---

Ingredient	Known	Anticipated	IARC Category
Sodium Silicate (1344-09-8)	No	No	None
Water (7732-18-5)	No	No	None

---

12. Ecological Information

Environmental Fate:
No information found.

Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

Chemical Inventory Status - Part 1

Ingredient	TSCA	EC	Japan	Australia
Sodium Silicate (1344-09-8)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

Chemical Inventory Status - Part 2--Canada--

Ingredient	Korea	DSL	NDSL	Phil.
Sodium Silicate (1344-09-8)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

Federal, State & International Regulations - Part 1--SARA 302--SARA 313--

Ingredient	RQ	TPQ	List Chemical	Catg.
Sodium Silicate (1344-09-8)	No	No	No	No
Water (7732-18-5)	No	No	No	No

Federal, State & International Regulations - Part 2--RCRA--TSCA-

Ingredient	CERCLA	261.33	8(d)
Sodium Silicate (1344-09-8)	No	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No
TSCA 12(b): No
CDTA: No
SARA 311/312:
Acute: Yes
Chronic: No
Fire: No
Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: None allocated.
Poison Schedule: None allocated.

WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **2** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES SEVERE IRRITATION TO EYES, SKIN AND RESPIRATORY TRACT.
Label Precautions:
Avoid contact with eyes, skin and clothing.
Wash thoroughly after handling.
Avoid breathing vapor or mist.
Keep container closed.
Use only with adequate ventilation.
Label First Aid:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.
Product Use:
Laboratory Reagent.
Revision Information:
No changes.
Disclaimer:
****

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.
****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

UREA

MSDS Number: U4725 --- *Effective Date: 11/17/99*

1. Product Identification

Synonyms: Carbamide resin; Isourea; Carbonyl diamide; Carbonyldiamine
CAS No.: 57-13-6
Molecular Weight: 60.06
Chemical Formula: (NH2) 2CO
Product Codes:
J.T. Baker: 4111, 4203, 4204, 4206, 5594, 5607
Mallinckrodt: 3192, 7729, 7816, 8642, 8644, 8647, 8648

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Urea	57-13-6	99 - 100%	Yes

3. Hazards Identification

Emergency Overview
WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 0 - None
Flammability Rating: 1 - Slight
Reactivity Rating: 0 - None
Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT
Storage Color Code: Orange (General Storage)

Potential Health Effects
Inhalation:
Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath. May be absorbed into the bloodstream with symptoms similar to ingestion.
Ingestion:
Causes irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea. May also cause headache, confusion and electrolyte depletion.
Skin Contact:
Causes irritation to skin. Symptoms include redness, itching, and pain.
Eye Contact:
Causes irritation, redness, and pain.
Chronic Exposure:
A study of 67 workers in an environment with high airborne concentrations of urea found a high incidence of protein metabolism disturbances, moderate emphysema, and chronic weight loss.
Aggravation of Pre-existing Conditions:
Supersensitive individuals with skin or eye problems, kidney impairment or asthmatic condition should have physician's approval before exposure to urea dust.

14. Transport Information

Not regulated.

---

15. Regulatory Information

Chemical Inventory Status - Part 1

Ingredient	TSCA	EC	Japan	Australia
Urea (57-13-6)	Yes	Yes	Yes	Yes

Chemical Inventory Status - Part 2--Canada--

Ingredient	Korea	DSL	NDSL	Phil.
Urea (57-13-6)	Yes	Yes	No	Yes

Federal, State & International Regulations - Part 1--SARA 302--SARA 313--

Ingredient	RQ	TPQ	List Chemical	Catg.
Urea (57-13-6)	No	No	No	No

Federal, State & International Regulations - Part 2--RCRA--TSCA-

Ingredient	CERCLA	261.33	8(d)
Urea (57-13-6)	No	No	No

Chemical Weapons Convention: No
TSCA 12(b): No
CDTA: No
SARA 311/312:
Acute: Yes
Chronic: Yes
Fire: No
Pressure: No
Reactivity: No (Pure / Solid)

Australian Hazchem Code: No information found.
Poison Schedule: No information found.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: 1 Flammability: 0 Reactivity: 0
Label Hazard Warning:
WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.
Label Precautions:
Avoid breathing dust.
Keep container closed.
Avoid contact with eyes, skin and clothing.
Use only with adequate ventilation.

Sodium Silicate in Aqueous Solution

Chemical Formula: Na_2O . (1.6-2.0) SiO_2

Ausimont manufactures alkaline silicates in aqueous solution with different SiO_2/Na_2O ratios and various concentration of active substance, starting from particularly selected sands through a direction reaction with caustic soda (NaOH). This process, combined with filtration and purification stages, permits the manufacture of products with a high grade of purity and characterized by:

- excellent transparency
- absence of colorations
- low metal content

Product By Industry Click Here

Typical Properties				
Density (Be)	38/40	48/50	50/52	52/54
SiO2/Na2O weight ratio (w/w)	2.0 ± 0.1	2.0 ± 0.1	2.0 ± 0.1	1.6 ± 0.1
Active Content (%)				
Viscosity at 20°C (cps)	50 ± 30	200 ± 100	400 ± 100	500 ± 200
pH (dil 1:10)	12.25 ± 0.1	12.35 ± 0.1	12.40 ± 0.1	12.75 ± 0.1
Appearance	clear colorless solution			

Applications

Detergency: Alkalinity supplier for detergents. These products are widely used in the formulation of powder detergents for washing machines and hand washing. Due to their specific properties, silicates play a number of roles, both during the detergent production and during laundry washing. Particularly, they provide for a correct level of alkalinity, buffering the pH of the washing liquor, they work as anticorrosive agents for the washing machine, are active as chelating agents of the most important metals, so favoring the best performance of the other ingredients, and finally act as "glueing" agents for the detergent granule manufacture, allowing the achievement of tight, free-flowing and attrition resistant particles.

Pulp and Paper: alkaline silicates, particularly those having an SiO2/Na2O=2 ratio, are mainly utilized in the bleaching of pulp with hydrogen peroxide. In addition to the alkalinity supply, necessary for the best exploitation of the oxidizing effect of hydrogen peroxide, and to the pH buffering values suitable for bleaching, silicates show a remarkable stabilization of hydrogen peroxide, reducing its decomposition and improving the bleaching result, through an effective heavy metal complexation.

Experience Our Technology!

Related Topics:

Base Chemicals:
Alpoclar®
Sodium Hypochlorite

Hydrogen Peroxide:
Hydrogen Peroxide
Bacter Proof® Hydrogen Peroxide

Eureco® Bleaching Agent

Oxystrong® Peracetic Acid

Sodium Silicates:
Granular Sodium Disilicate

Sodium Perborate:
Sodium Perborate Tetrahydrate
Sodium Perborate Monohydrate

RECEIVED
APR 16 2001
EPA REGION VIII

Ceramic: Alkaline silicates are widely used as basic components of liquid formulations for ceramic mixture fluidization.

Foundry: Sodium silicates carry out a hardening process of the foundry molds, allowing for heat-resistant molds with sharp edges, which reduce the amount of waste. Due to their good eco-toxicological compatibility and to the absence of harmful emissions, these products ensure a very good working environment.

Contact Us For More Info on This Product

Packaging:

Bulk: trucks of 25 tons max

• Ausimont's Worldwide Locations • Contact Ausimont

Site design by Digital Design Works, Inc.
If you have any questions, comments or suggestions please E-mail us.

PIONEER

NATURAL RESOURCES

FAX TRANSMISSION

5205 N. O'Connor Blvd., Ste. 1400
Irving, TX 75039-3746
972/444-9001
Fax: 972/969-3567

To: NATHAN WISER - EPA

Date: 4-12-01

Fax #: 303-312-6409

Pages: 18 , including this cover sheet.

From: Wilbur Dover
Manager, Operations Services

Subject: INVECTROL "U" DATA - EPA PERMIT NO. MT5913-0000
BIERE 1-22 WELL REMEDIATION PROJECT

COMMENTS:

NATHAN - PLEASE CALL IF YOU HAVE ANY QUESTIONS.

THANKS,

WILBUR DOVER

972-969-3920

If you do not receive all the pages, please contact Konya Burleson 972-969-3918

PIONEER

NATURAL RESOURCES

FAX TRANSMISSION

5205 N. O'Connor Blvd., Ste. 1400
Irving, TX 75039-3746
Fax: 972/969-3567

To: NATHAN WISER - EPA **Date:** 3-13-01

Fax #: 303-312-~~[illegible]~~ 6409 **Pages:** 2 , including this cover sheet.

From: WILBUR DOVER

Subject: INJECTROL "U" - HALLIBURTON PRODUCT

COMMENTS:

NATHAN - PLEASE FIND INFORMATION FROM HALLIBURTON RELATED TO INJECTROL "U". THE CAS# IS 1344-09-8. FEEL FREE TO CALL MR. DEWAYNE DALRYMPLE (580-251-3981) OR MR. STEVE BURFORD (580-251-4213) AT HALLIBURTON'S FIELD RESEARCH LAB IN DUNCAN, OK. IF YOU OR MEMBERS OF YOUR STAFF NEED ADDITION INFO. FROM HALLIBURTON.

WILBUR DOVER
972-969-3920

Dover, Wilbur

From: Dwyann Dalrymple [Dwyann.Dalrymple@Halliburton.com]
Sent: Monday, March 12, 2001 2:51 PM
To: Wilber Dover
Cc: Pat Finley; Frank Zamora; Dwain King
Subject: Injectrol U

Mr. Dover,

Injectrol U is composed of a dilute solution of soldium silicate. Actual active sodium silicate present in the treating fluid will be between 6 and 7% . Liquid sodium silicate is composed of Na2O, SiO2, and water. The SiO2 is essentially sand. Caustic is used to liquify the SiO2. The water is the solvent by which the SiO2 and Na2O are maintained in the liquid form. The Injectrol U system forms a gel (3-dimensional structure) within the rock matrix after a predetermined time has elapsed at or above the design temperature. This means that even if the solution doesn't come in contact with a reactive material (such as a silica surface or divalent cation...Ca++) a gel will still form. Once the SiO2 falls out of solution and forms a solid mass, the great majority of material present is SiO2 (silica).

Sodium silicates are non-flammable, non-explosive, and non-toxic. The only concern would be the relatively high pH of the initial solution. Sodium silicates are used in water treatment plants as water clarifiers, in laundry detergents, etc.

For more information on Halliburton Conformance Services, visit our website at:
<http://www.halliburton.com/products/itp/itp/menu_conformance.asp>

Regards,
Dwyann Dalrymple

Halliburton Energy Services
2600 South Second Street
Duncan, OK 73536-0439
Tel: 580 251 3981
Fax: 580 251 3189
Home: 580 252 2211
e-mail: Dwyann.Dalrymple@Halliburton.com

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NaOH = caustic
No buffering capacity

pH: 12+

food or agric. grade

lactose
✓ urea – N_2 fertilizer
+ water

>180°F urea degrades
to ≈ pH 10-11
gel forms

Silica adsorbs on s.s.
worst. slight rise in pH

pH measure

Ca-silic
Ca. OH_2

Dwyann -
Cell # 580-512-7100

4. Operator Correspondence

PIONEER
NATURAL RESOURCES USA, INC

RECEIVED
MAR 07 2001
Office of Enforcement
Compliance & Environmental
Justice

March 6, 2001

United States Environmental Protection Agency
Region 8
999 8th Street – Suite 500
Denver, Colorado 80202

RECEIVED
MAR 8 2001
EPA REGION VIII

Attn: Mr. Nathan M. Wiser
Environmental Scientist

Re: EPA UIC Permit Application
Biere 1-22 Remedial Project MT5913-00000 AREA PERMIT NUMBER
Roosevelt Co. Montana

Dear Mr. Wiser:

In reponse to EPA's Emergency Administrative Order, Docket No. SDWA 8-99-68 issued by your Region 8 Denver office on September 30, 1999 and as a follow-up to our meeting in your office on February 16, 2001; the attached EPA UIC Permit Application and necessary attachments are submitted for your initial review for completeness prior to forwarding to the permit writer section.

Pioneer became aware of a potential problem with groundwater contamination in Roosevelt County, Montana when we were named in a lawsuit in 1998. An old Mesa Petroleum lease, Biere was drilled by Mesa Petroleum in 1970 and plugged and abandoned in 1984, when the (2) existing wells – Biere #1 SWDW & Biere 1-22 were plugged. Biere 1-22 was plugged again in 1985 from a relief well (25' NNW) completed in the Judith River Zone.

The lease expired and all surface equipment was removed in 1989. Mesa & Parker Parsley merged in August, 1997 to form Pioneer Natural Resources USA, Inc.

In response to EPA's Order issued on September 30, 1999, Pioneer has conducted extension field investigation in the vicinity of the old Mesa Petroleum (Biere Wells) between February & June 2000. In early May 2000, eight shallow monitoring wells were drilled & completed to the base of the shallow water table aquifer. In May & June, 2000 samples were collected from these wells and other surrounding wells and the analyses are included in the attachments.

5205 N. O'CONNOR BLVD., SUITE 1400 · IRVING, TEXAS 75039-3746 · MAIN: (972) 444-9001 · FAX: (972) 969-3587

RECEIVED

MAR 07 2001

EPA has determined that Pioneer's Biere 1-22 has caused or contributed and/or is continuing to cause or contribute to the endangerment of a USDW.

Pioneer is now prepared, pursuant to the attached proposed, to take responsive action to insure that if the Biere 1-22 is a continuing source of contamination that such contamination will be stopped. Hopefully your office will expedite review and approval of our permit application so we can implement our proposed action plan.

Should you need to discuss our application or need additional information, please contact me at 972-969-3920.

Sincerely,

Wilbur L. Dover

Wilbur L. Dover
Manager – Operations Services

wld/kb

cc: Marc Skeen
Steve Liefer
John Ross

MT 50913-00000

PIONEER
NATURAL RESOURCES USA, INC.

RECEIVED
MAR 07 2001
Office of Enforcement
Compliance & Environmental
Justice

March 6, 2001

United States Environmental Protection Agency
Region 8
999 8th Street – Suite 500
Denver, Colorado 80202

RECEIVED
MAR 8 2001
EPA REGION VIII

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Environmental Scientist

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Biere 1-22 Remedial Project MT5913-00000 AREA PERMIT NUMBER
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5205 N. O'CONNOR BLVD., SUITE 1400 IRVING, TEXAS 75039-3746 · MAIN (972) 444-9001 · FAX (972) 969-3587

MAR 07 2001

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Sincerely,

Wilbur L. Dover

Wilbur L. Dover
Manager – Operations Services

wld/kb

cc: Marc Skeen
Steve Liefer
John Ross

APPENDIX C

Plugging and Abandonment Plan

PLUGGING AND ABANDONMENT PLAN

for the

Biere #1-22A through Biere #1-22D Wells

NW SW Section 22 T28N R51E
Roosevelt County, Montana

UIC Permit No. MT5913-00000

FOR EACH WELL:

Plug #1 Set a cast iron bridge plug in casing above injection zone, at approximately 678'. Place a 100-foot plug from 678' to 578, using at least 12 sacks of 14.5 lb/gal Class C cement. Tag and record top of Plug #1. Fill casing with plugging gel of at least 9.5 lb/gal between plugs.

Plug #2 Place a 100-foot cement plug in casing from approximately 100' to surface with at least 12 sacks of 14.5 lb/gal Class C cement. Record top of Plug #2.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

EPA

(Proposed) PLUGGING AND ABANDONMENT PLAN

NAME AND ADDRESS OF FACILITY	NAME AND ADDRESS OF OWNER/OPERATOR
Biere 1-22 Remedial Project	Pioneer Natural Resources USA, Inc. 5205 N. O'Connor Blvd, Irving, Tx. 75039-374

LOCATE WELL AND OUTLINE UNIT ON SECTION PLAT — 640 ACRES

N
W E
S

STATE	COUNTY	PERMIT NUMBER
Mont.	Roosevelt	

SURFACE LOCATION DESCRIPTION
___ 1/4 of C 1/4 of NW 1/4 of SW 1/4 of Section 22 Township 28N Range 51E

LOCATE WELL IN TWO DIRECTIONS FROM NEAREST LINES OF QUARTER SECTION AND DRILLING UNIT

Surface Location 1980 ft. from (N/S) S Line of quarter section
and 660 ft. from (E/W) W Line of quarter section

Lat. 48.1631320
Long. 105.1259920

TYPE OF AUTHORIZATION

- ☐ Individual Permit
- ☒ Area Permit
- ☐ Rule

Number of Wells 4

Lease Name Biere Lease

WELL ACTIVITY

- ☐ CLASS I
- ☐ CLASS II
  - ☐ Brine Disposal
  - ☐ Enhanced Recovery
  - ☐ Hydrocarbon Storage
- ☐ CLASS III
- X CLASS IV

Well Number Biere, 1-22A, 1-22B 1-22C & 1-22D

CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT(LB/FT)	TO BE PUT IN WELL (FT)	TO BE LEFT IN WELL (FT)	HOLE SIZE
5 1/2	14#/ft	688'	688'	7 7/8"

METHOD OF EMPLACEMENT OF CEMENT PLUGS

- ☐ The Balance Method
- ☐ The Dump Bailer Method
- ☒ The Two-Plug Method
- ☐ Other

CEMENTING TO PLUG AND ABANDON DATA:	PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6	PLUG #7
Size of Hole or Pipe in which Plug Will Be Placed (inches)	5 1/2"	5 1/2"					
Depth to Bottom of Tubing or Drill Pipe (ft.)	578'	100'					
Sacks of Cement To Be Used (each plug)	12 sxs.	12 sxs.					
Slurry Volume To Be Pumped (cu. ft.)	13.7	13.7					
Calculated Top of Plug (ft.)	578'	0					
Measured Top of Plug (if tagged ft.)	-	-					
Slurry Wt. (Lb./Gal.)	14.5	14.5					
Type Cement or Other Material (Class III)	C	C					

LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS AND INTERVALS WHERE CASING WILL BE VARIED *(If any)*

From	To	From	To
Open Hole 4 1/2"			
688'	720'		

Estimated Cost to Plug Wells
$15,000/Well - 4 Wells - $60,000

CERTIFICATION

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. (Ref. 40 CFR 144.32)

NAME AND OFFICIAL TITLE *(Please type or print)*	SIGNATURE	DATE SIGNED
Wilbur Dover-Mgr.-Operations Serv.	Wilbur Dover	3-6-01

WELLBORE SCHEMATIC

PLUGGING PROPOSAL

DRILLING PROGNOSIS

"Pioneer Natural Resources USA Inc."

WELL	:	Biere Remedial Well	
FIELD	:	Poplar	
CATEGORY	:	Remedial / Vertical	
COUNTY	:	Roosevelt	STATE: Montana
LOCATION	:	22 - T28N - R51E	
OBJECTIVE	:	Top of Judith River	
ELEVATION	:	2,074 GL	

HOLE SIZE	LOGGING PROGRAM	CASING & CEMENT	FLUID PROPERTIES
17 1/2"	0' 100' PLUG 12 SX. CEMENT PLUG 100' 40' - 45' goos from Clay to Sand Geology - Glacial-U & Top of Bearpaw Shale Expect formation flow & 180- BHT	13-3/8" Surface Casing Class H + 2% CaCl2:	
12 1/4"	Mudloggers all the Time 240' 9.5# MUD	9-5/8" Intermediate Casing Class G	
	Geology - Bearpaw Shale Expect heavy formation flow (up to 90 BPH) & Temps up to 205F		Mud Weight ppg PV: YP: F/L: Mud Type:
7 7/8"	100' PLUG 12 SXS. CEMENT CIBP @ 678' Injection Path 688'	5-1/2" Casing Class G	
4-1/2"	Geology - Judith River Sand (698'-876') (Porosity: 20%-30%, Permeability: +/- 1 Darcy) Espect heavy formation flow (up to 90 BPH) & Temps up to 205F 720'		Mud Weight ppg PV: YP: F/L: Mud Type:

PREPARED BY: Gilbert Davis DATE: 3-6-01

APPROVED BY: _____ DATE: _____

Pardue-Welch, Kimberly

From: Swanson, Amy
Sent: Monday, March 30, 2015 11:05 AM
To: sleifer@bakerbotts.com
Cc: Wiser, Nathan; Wang, Gary; Pardue-Welch, Kimberly; Michael.Jacobs@pxd.com
Subject: Pioneer UIC Well Information
Attachments: MT50913- 00000 (2001 06) Permit PA plans.pdf; 2000306.letter.pdf; 20090629.letter.pdf

Steve. Thank you for the information in your 3/27/2015 email. In return, I am attaching several documents for your information prior to today's call at 12:30 pm MDT (2:30 pm EDT) to discuss Pioneer's East Poplar Oil Field underground injection control wells and their financial responsibility (FR) status.

First, as we discussed last week, I am providing the plugging and abandonment plan for the Biere 1-22A – 22D class V wells permitted by the EPA pursuant to Emergency Area Permit No. MT5913. (See attached MT5913-00000 Permit PA plans.) Based on the information available to the EPA at this time, there is confusion on whether one of these four wells (1-22A) has already been plugged and abandoned, or whether this well was ever drilled. We would like clarification on this issue. As discussed during our February 2015 meeting, the other three wells remain open and are no longer active. Pioneer plans to plug and abandon these wells. The Surety Bond and subsequent rider that you provided on 3/27/15 covers these wells.

Second, the EPA believes that the A-1 well referenced in your email dated 3/18/15 is different from the PNR-1 well. The A-1 well appears to be an old Mesa Petroleum salt water disposal well called the Biere A-1 (SWD), likely inherited by Pioneer through its acquisition of Mesa Petroleum. (See the attached letter dated 3/6/2001). The sundry notices you provided on 3/18/15 relate to this well which the EPA agrees was plugged at the same time as the leaking Biere oil well on 9/15/84.

The PNR-1 well appears to be PNR-1-WD which currently is an active remediation class V disposal well pursuant to an individual permit. (See the attached letter dated 6/24/2009). As recent as 1/22/2015, quarterly monitoring results were submitted for this well to the EPA. Our records show that we may not have a record of current FR coverage for this well. While it appears the FR method for this well is a financial statement, we do not have copies of the annual financial statement for this well for the past three years. If this disposal well has not been plugged and abandoned, then Pioneer needs to establish adequate FR for the well immediately to comply with the UIC FR requirements for permitted injection wells at 40 C.F.R. 144.52(a)(7). $100K to P&A PNR 1

Third, during last week's conversation you asked whether class V wells are subject to the EPA's FR requirements. The answer is yes. Whereas the FR regulations for rule-authorized wells only apply to class I, II and III wells, all non-rule authorized injection activity regardless of well classification is subject to the permitting requirements set forth in subpart D of 40 C.F.R. part 144, including the FR requirements at 40 C.F.R. 144.52(a)(7). The EPA's UIC FR guidance entitled "Federal Financial Responsibility Demonstrations for Owners and Operators of Class II Oil- and Gas-Related Injection Wells" provides that the federal financial responsibility requirements broadly apply to everyone who owns or operates injection wells of any of the five classes in any state or U.S. territory.

As we discussed on the phone and per Gary's email scheduling today's call, the steps for properly plugging and abandoning Wells 1-22A – 22D are as follows:

- Notify EPA of Pioneer's intent to plug and abandon pursuant to the P&A plan on file for MT5913-00000. Alternatively, submit an updated P&A to EPA. EPA has a P&A plan form available to be filled out at http://www.epa.gov/ogwdu/uic/pdfs/reportingforms/7520-14.pdf.
- Submit to EPA the plugging and abandonment affidavit (form no. 7520-13) along with the well schematic or well bore diagram for each well to verify that the wells have been properly plug and abandoned.

- EPA's Technical Enforcement Program will release the bond of $100,000 currently held for these wells to Pioneer.
- EPA's TEP Program will coordinate with the UIC Program office to terminate the Emergency Area Permit MT5913-00000.

EPA looks forward to discussing these issues with you and Mike in greater detail on the conference call. I plan to participate to ensure that I am up to speed and on the same page as everyone else. Talk to you soon,

Amy Swanson |Senior Attorney
Legal Enforcement Program | USEPA Region 8 | 8ENF-L
303.312.6906 | swanson.amy@epa.gov

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
DENVER, CO 80202-1129
Phone 800-227-8917
http://www.epa.gov/region08

JUN 24 2009

Ref: 8P-W-GW

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Dave Holmes
Pioneer Natural Resources USA, Inc.
1401 17th Street, Suite 1200
Denver, CO 80202

Re: Underground Injection Control (UIC)
UIC Permit No. MT51141-07750
Authorization to Inject and
Minor Modification: Increase in MAIP
PNR-1 WD
Roosevelt County, MT

Dear Mr. Holmes,

Thank you for submitting the additional information regarding Part II Mechanical Integrity Demonstration and the repeated Step Rate Test (SRT), which we received on Dec 23, 2008. To date we have received the following requirements of your UIC Permit that is to be submitted to the Director:

1. Completed EPA Form No. 7520-10
2. Cement Bond Log
3. Pore pressure calculation of the proposed injection zones
4. Part I Mechanical Integrity Demonstration - Standard Annulus Pressure Test
5. Step Rate Test (SRT) results (performed 5/15/2008 & 11/19/2008)
6. Part II Mechanical Integrity Demonstration - Radioactive Tracer Test
7. Part II Mechanical Integrity Demonstration - Temperature Survey

All required information has been submitted, and has been reviewed. Based on the new SRT submitted, as of the date of this letter, Pioneer is authorized to commence injection into PNR WD-1 at a maximum allowable injection pressure (MAIP) of 1985 psi.

Should you choose to apply for an increase to the MAIP at any future date, a demonstration of Part II Mechanical Integrity must be conducted and, in addition, new supporting data such as a new SRT will be required. You must receive prior authorization from the Director in order to inject at pressures greater than the permitted MAIP during the test(s).

Effective upon the receipt of this letter, Administrative approval hereby is granted for injection under the conditions of your Permit as modified by the condition stated above in this letter. Please be reminded that it is the responsibility of the owner/operator to be aware of, and to comply with, all conditions of the PNR WD-1 Permit MT51141-07750 and relevant modifications as issued.

As of this approval, responsibility for permit compliance and enforcement is transferred to the Region 8 UIC Technical Enforcement Program office. Please direct all future notification, reporting, monitoring and compliance correspondence to the following address, referencing your UIC Permit number and well name.

US EPA Region 8
UIC Technical Enforcement Program
Attn: Nathan Wiser
Mail Code: 8ENF-UFO
1595 Wynkoop Street
Denver, CO 80202-1129

If you have questions regarding the above action, please call Wendy Cheung at 303-312-6242 or 1-800-227-8917, ext. 312-6242.

Sincerely,

for Stephen S. Tuber
Assistant Regional Administrator
Office of Partnerships and Regulatory Assistance

cc: Debi Madison
Fort Peck Assiniboine & Sioux Tribes
Office of Environmental Protection
603 Court Avenue, Box 1027
Poplar, Montana 59255

George Hudak
Montana Board of Oil and Gas Conservation
2535 St. John's Avenue
Billings, MT 59102

Printed on Recycled Paper

5. Public Notices / Comments

AFFIDAVIT OF PUBLICATION

RECEIVED
AUG 2 0 2001
ENVIRONMENTAL VIII

FORT PECK RESERVATION)
)
State of Montana)
Roosevelt County)

Karla DuBoise, duly swears that She is the Office Mgr. of the WOTANIN WOWAPI, a newspaper of general circulation published weekly at Poplar, on the Fort Peck Indian Reservation, County of Roosevelt, State of Montana; That the notice hereunto attached and entitled: _____ Legal Ad _____ was published in said newspaper, the WOTANIN WOWAPI, once each week for 1 successive weeks as follows:

The first publication of said notice was on the 9 day of August, 2001;

The second publication of said notice was on the _____ day of _____, 19____;

The third publication of said notice was on the _____ day of _____, 19____;

The last publication of said notice was on the _____ day of _____, 19____;

That the said notice was published in the regular and entire issue of every number of the said newspaper, WOTANIN WOWAPI, during the period and time of said publication, and in the newspaper proper, not in a supplement.

SIGNED: Karla DuBoise

Publication Costs: 1 Folios ____: $ 169.00

PUBLIC NOTICE

ISSUANCE OF AN EMERGENCY UNDERGROUND INJECTION CONTROL PERMIT
TO
Pioneer Natural Resources USA, Inc.

DRAFT ** DO NOT PUBLISH ** DRAFT

PURPOSE OF PUBLIC NOTICE

The purpose of this notice is to serve notice of Region VIII U.S. Environmental Protection Agency's (EPA's) Underground Injection Control Program office decision to issue an Emergency UIC Area Class V Permit No. MT5913-00000 for the construction and operation of up to four aquifer remediation injection wells in the East Poplar Oil Field, Roosevelt County, Montana. The issuance of the Emergency UIC Area Permit is effective on _____, 2001, and will be effective for 90 days until _____, 2001, after which date the Permit will automatically expire.

BACKGROUND

Pioneer Natural Resources USA, Inc. (Pioneer) of Irving, Texas, proposes to drill and complete up to four new Class V aquifer remediation injection wells for injection of INJECTROL U fluid or cement into the upper Judith River Formation between the depths of 688 and 720 feet below ground level. The wells will be located in the immediate area surrounding the existing Biere #1-22 former oil production well. The Biere #1-22 well was improperly plugged in 1984 and is now leaking contaminants into the shallow groundwater in the Quaternary deposits that serve as the drinking water source in the vicinity. Pioneer, in its application, represents that injection of the fluid INJECTROL U will surround and encase the wellbore of the Biere #1-22 well, solidify, and form a physical barrier to preclude the current upward fluid movement from deep underground. INJECTROL U is a sodium silicate water solution that hardens when the temperature elevates. The four subject wells are described as follows:

Biere #1-22A; Biere #1-22B; Biere #1-22C; and Biere #1-22D

NW SW Section 22 T28N R51E Roosevelt County, Montana (approximately 0.3 mile NW of Lockman residence off BIA Hwy 75, located about 3.5 miles NE of Poplar, Montana)

The purpose of the injection activity is limited to stopping on-going contamination from entering the Quaternary deposits via the existing Biere #1-22 wellbore. The EPA has determined that continued contamination of the Quaternary deposits aquifer via the existing Biere #1-22 wellbore poses an imminent and substantial endangerment to the health of persons, since there are water supply wells drawing water for human consumption from the Quaternary deposits aquifer in the vicinity of the Biere #1-22 well, one of the sources of the existing contamination.

Pioneer was able to obtain the use of a drill rig necessary to drill and complete up to four injection wells, even though such rigs are currently quite scarce. Pioneer estimates drilling activities to commence around August 15, 2001, and to persist for approximately one month, drilling 24 hours each day, 7 days each week.

The regulations governing the UIC program, at Title 40 of the Code of Federal Regulations, Section 144.34(a)(1) contemplate that there may be instances where an imminent and substantial endangerment requires the issuance of a UIC permit without the normal and customary public notice and opportunity to comment on a draft UIC permit. This public notice is meant to inform the public that such an emergency UIC permit has been issued. Any comments may be expressed in writing to the EPA address below.

PUBLIC COMMENTS

Information submitted by the applicant, as well as the Statement of Basis and Emergency UIC Area Permit prepared by EPA, is available for public inspection on business days from 9:00 a.m. to 5:00 p.m. at the following location:

U.S. Environmental Protection Agency
999 18th Street, Suite 300
Denver, Colorado 80202-2466
Attention: Nathan M. Wiser
(8ENF-T)

A copy of the Statement of Basis and Emergency UIC Area Permit prepared by EPA is also available for public inspection on business days from 9:00 a.m. to 4:30 p.m. at the following location:

Fort Peck Tribal Offices
Assiniboine & Sioux Tribal
Environmental Office
603 Court Avenue
Poplar, Montana 59255

_____
Date of Publication

32-D-31
8-9-01

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ISSUANCE OF AN EMERGENCY UNDERGROUND INJECTION CONTROL PERMIT
TO
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Fort Peck Tribal Offices
Assiniboine & Sioux Tribal Environmental Office
603 Court Avenue
Poplar, Montana 59255

ww: 8/9/01

Hunter Jade Lambert on August 8th - Love You Dad, Mom. & Sister Alexis

---

To our brother
Ronnie Clincher
way over in Laurel
Thinking about you as Aug. 15 nears.
Happy Birthday!!

Happy Birthday
to
Donny Moran
on Aug. 15th
Love,
Lesley

Happy 13th Birthday to Quincy John Eagleman on 8/14/01. Son, the years have past by so past! Remember to take pride in all that you do in life and do it all with pride!! We love you honey! Son, We love you with all our hearts & will always be here for you. The Good Lord has truly blessed us with you on August 14, 1988 @ 1:25 a.m. and everyday thereafter. With much pride & love for you and in you! Love, Mom, bro Cat, & sisters Jori & Demiree and o' course the "livestock"

Happy Birthday to Anita Beans on August 7 - Have a good one! With lotsa Love, Sarah, Dion, Nona, Iris Jean, Diondra Beans and Rain Sky

---

Even thos its a little late, I had to wish U a Happy Birthday and to say thanks for sticking with me, no matter what! Happy Birthday Deedee

---

Oh Grandmother

Oh Grandmother, you are better than my mother. Oh Grandmother, I would never forget the day you took me in and cared the way you did. Oh Grandmother, thanks for being like a mother, To me and my brother. Oh Grandmother, I'll love you forever.
Love Your Grandson, Blaine Granbois
To My Grandmother
Debbie Clark

Thank You, Thank You So very much to my ole' Grandma Rita Belgarde and Uncle "Cat Man" for thinking of me when you won on your bingo card. You made me & my Grandma Shaggs so happy when you brought my brand new bike to me! Most of all I know my Dad is watching over all of us. Because its people like you, who help us out during the lonely time. Again, we thank you! Love, William "Louie" Conklin, Jr. and Grandma Shagg's

---

Happy Birthday wishes to my Daddy Sammy Savior - Hope you have a good day! I'm glad your my Daddy! I love you with all my heart! Love you, your daughter Samantha Savior

---

Happiest Birthday "Moody-Anna" Aug. 12 to the "happiest" one of us all! Take care of yourself in this new year of your life! Love, from your sisters & their families

---

My Alliana Joy.....
.....beautiful, perfect, innocent, litte loving soul, without you, I don't think my life would be whole. Baby, your my only reason for living, you bring the whole world back to me, when I think I'd drift away. You open up my eyes and open up my heart. Baby, I love you with all my heart, without you, I don't think I would try, but every since you came into my life, I fell in love with your pretty brown eyes, and your fascinating smile. Your curious, angelic spirit, makes my heart feel your "worth it", and when I hold you so close, and gaze into your little face, and tell you I love you, just you knowing, makes me feel that when your older, you would understand that all you would have is just ME, and I know that someday, My Alliana Joy, your going to be somebody special, because baby, you ARE somebody special!!
Love your Mom, Rhonda Clark

This is a birthday note about a brother It's about someone who never gets to hear, nearly enough, what a wonderful guy he is. He's a person who has been thanked by my heart

---

Happy Birthday to Our Many Relatives - Grandma Ida Black dog on Aug. 7th, Cousin Jennifer Long Hair on Aug. 7th, Grandma Dani Red Bul on Aug. 16th, Cousin Clarice Longtree on Aug. 21st, Uncle Roger Running Bear, Jr. on Aug. 24th, Cousin Nathelle Long Hair Frederick on Aug. 27th, Grandpa Duane Green on Aug. 31 Grandma Lydia Long Hair on Aug. 31st. Love, Derrick and Darren Long Hair

---

Happy 2nd Birthday to my Angel & our Little Aunt Traci Allen - Baby, we hope you have a nice birthday! You really do mean the world to us. There's not a day that goes by without you in our thoughts. Love Infinity X Infinity The True Parshall's Yolanda, Kris, Niki

---

To my wonderful & ever loving children: Catlin, Quincy, Jori & Demiree. I just wanted you all too know that you guys are the reason live. I know that at times we don't s eye to eye, but my love for you kid will be never ending. I will always be here for you and you all will be "1st & foremost" in my life always. We are going through a hard time in our lives right now, but the causes for that.... well we just have to pray for "them" now and always. Remember God hears all prayers, even the ones you pray about for your "Daddy", Quincy, As long as we say our prayers, things will be ok, Love Your Mom,
Cissy Eagleman

Correction of corrections for Barry Allen Beach from Your mother whale: Praise The Lord, Thanking Jesus, that we are actually here today, its after midnite as we speak, & i'm really dead but refuse to die (a) miracles always tho, except that horrid dr's report about the lump & pain, its normal? for whom? pray for lost

WOTANIN WOPAKU
FORT PECK TRIBAL NEWSPAPER
BOX 1027
POPLAR, MT 59255
PHONE 406-768-5388, 5386
FAX 406-768-5743

TO: Nathan Wiser - E.P.A.

AT: (303) 312-6409

FR: Marian Clincher - Ad Rep.

DATE: 7/31/01

NUMBER OF PAGES INCLUDING COVER SHEET: One(1)

COMMENTS: Thank you for your ad. I measured it and it's Approx 26 inches total (including heading) @ $6.50/per col. inch would be $169.00/per wk - Call if any questions - Thanks!

Marian
(406) 768-5387

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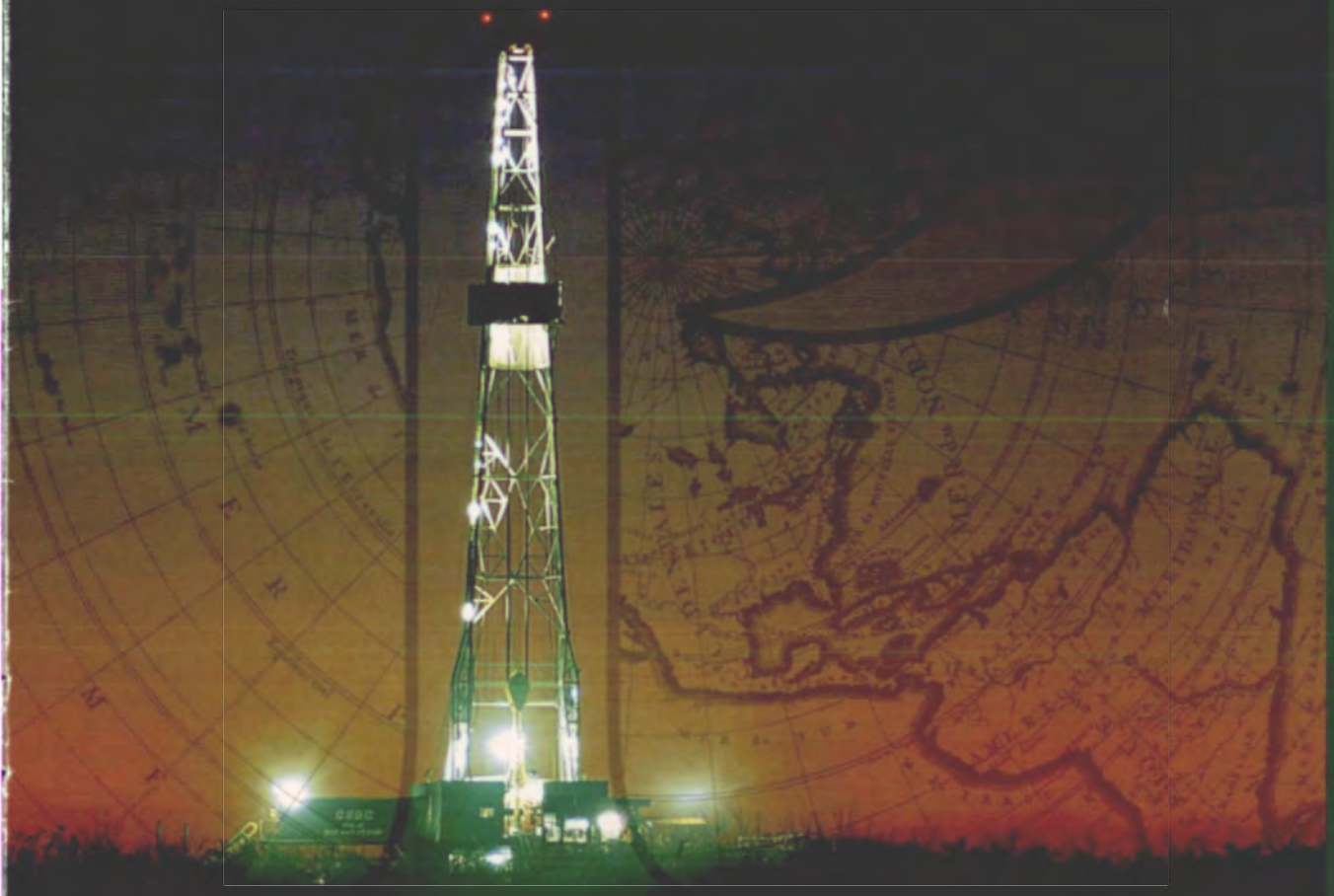
603 Court Avenue
Poplar, Montana 59255

_____
Date of Publication

PIONEER

NATURAL RESOURCES



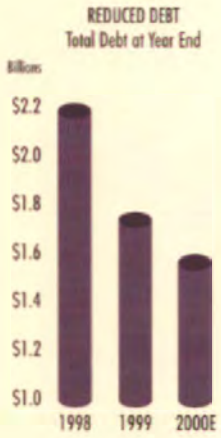
1999 RESULTS

EXECUTED PLAN

- Continued Successful Drilling Program
- Reduced Debt
- Improved Financial Performance
- Reduced Operating and G&A Costs

SUCCESSFUL 1999 DRILLING PROGRAM

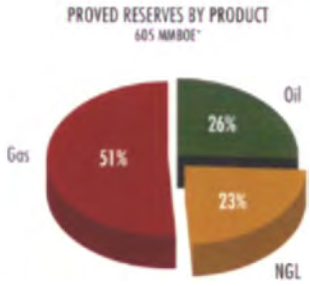
- Replaced 178% of Production
- Drilled 304 Wells - 93% Successful
- All-In Finding Cost - $2.21 per BOE*



FOCUSED ON INCREASING NET ASSET VALUE

- Great Long-Lived Assets Provide Foundation and Stable Cash Flow
- One of the Lowest E&P Cost Structures
- Over 1,700 Development Locations with Significant Exploration Upside
- Committed to Strengthening Balance Sheet

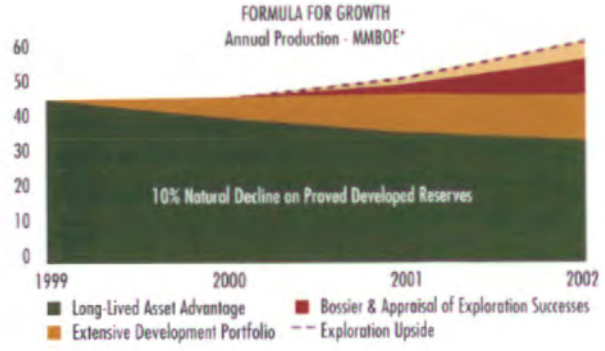
PIONEER NATURAL RESOURCES is a large independent exploration and production company with total proved reserves of 605 million barrels oil equivalent. The Company's reserves are equally balanced between natural gas and oil with a reserves-to-production ratio of 14 years providing stable production as a foundation for long-term growth. Pioneer's three domestic core properties - the Hugoton and West Panhandle gas fields and the Spraberry oil field - represent 70% of the Company's total reserve base. Pioneer's strategy focuses on adding value by expanding core assets through development, exposing the Company to significant upside through exploration and maximizing returns through streamlined operations.



During 1999, Pioneer substantially reduced debt and maintained core asset production with limited capital investment. Pioneer replaced 178% of its production during 1999 for an all-in finding cost of $2.21 per barrel oil equivalent. The Company also significantly reduced operating and general and administrative costs, furthering its position as the lowest cost operator in its core areas.

In 2000, Pioneer plans an active drilling program and capital expenditures of $250 million. Excess cash flow and proceeds from non-strategic asset divestitures will be dedicated to debt reduction. Pioneer expects to increase production in Argentina and Canada and maintain U.S. production through its development activities. Over 250 development wells are planned from an inventory of over 1,700

*BOE - Barrel Oil Equivalent on 6:1 basis



locations. Development drilling in Pioneer's East Texas Bossier gas play and the Pawnee and My Way fields is currently adding significant new domestic production, complementing core property drilling. Pioneer's properties in the Neuquen Basin of Argentina and in Northeast British Columbia, Canada provide high-return growth through low-risk, low-cost development.

Appraisal drilling on Pioneer's existing discoveries in South Africa and in two Deepwater Gulf of Mexico blocks will further define reserve potential and possible development alternatives focused on initiating production in early 2002.

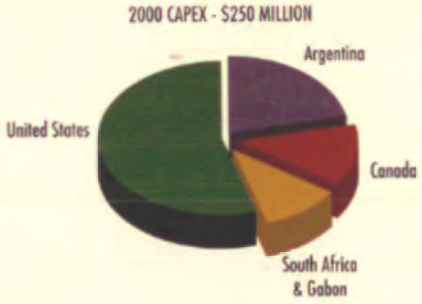
Exploration activities with high-impact potential represent approximately 20% of 2000 capital expenditures. Pioneer plans to drill four to five domestic exploration wells in the Gulf Coast onshore/shelf area and one to two wells offshore South Africa. Pioneer's first well offshore Gabon is planned for 2001.

With its long-lived asset foundation, a focus on cost leadership, a balanced portfolio of growth opportunities, and a commitment to further enhance financial flexibility, Pioneer is positioned to add value in 2000 and beyond.

2000 GOALS

FOCUSED ON INCREASING NET ASSET VALUE

- Exploit Large Development Inventory in U.S., Argentina and Canada
- Develop East Texas Bossier to New Core Area
- Confirm Recent Exploration Successes in Deepwater Gulf of Mexico and South Africa
- Drill 7 Exploration Projects with Net Unrisked Reserve Potential of 300 - 400 Million BOE*
- Strengthen Balance Sheet



PROVED RESERVES

12/31/99

	Liquids MMBBL	*Gas BCF*	*Total MMBOE**	*%*
United States	259	1,315	478	79%
Argentina	30	416	99	16%
Canada	4	145	28	5%
Total	293	1,876	605	100%

Forward-Looking Statements

Except for historical information contained herein, the statements in this profile are forward-looking statements that are made pursuant to the Safe Harbor Provisions of the Private Securities Litigation Reform Act of 1995. Forward-looking statements, and the business prospects of Pioneer Natural Resources Company, are subject to a number of risks and uncertainties which may cause the Company's actual results in future periods to differ materially from the forward-looking statements. These risks and uncertainties include, among other things, volatility of oil and gas prices, product supply and demand, competition, government regulation or action, litigation, the costs and results of drilling and operations, the Company's ability to replace reserves or implement its business plans, access to and cost of capital, uncertainties about estimates of reserves, quality of technical data, and environmental risks. These and other risks are described in the Company's 10-K and 10-Q Reports and other filings with the Securities and Exchange Commission.

PIONEER NATURAL RESOURCES

Long-Lived Asset Foundation and Development Portfolio

CROWN JEWELS

Pioneer's domestic core properties, with their long productive lives, provide the foundation on which the Company is building its future. These "crown jewel" properties - the Hugoton and West Panhandle gas fields and the Spraberry oil field - represent 70% of the Company's reserve base or 426 million barrels of oil equivalent reserves and are expected to generate over $4 billion in future net cash flows. This cash flow is used to replace produced reserves, fund core asset growth, and help fuel the Company's high-potential exploration program.

INVENTORY OF DRILLING LOCATIONS

Oil:	Spraberry	500+
	Argentina	275
Gas:	West Panhandle	200
	Hugoton	250
	Bossier, Other	100
	Canada	150
	Argentina	275
Total		1,750

Pioneer continues to expand and develop these core areas through horizontal drilling in the West Panhandle field and active drilling programs in the Spraberry and Hugoton fields. Pioneer utilizes the latest technology to automate operations and takes advantage of economies of scale to further its position as the lowest cost operator in these core areas. With a combined reserves-to-production ratio of 17 years, these properties provide exceptional stability and strength. Pioneer has approximately 1,000 locations available for future development of these core properties.

EAST TEXAS BOSSIER

The Bossier Sand is Pioneer's newest onshore gas play. With a current position of over 30,000 acres, the Company is poised for significant growth from this extremely active new area. As activity has moved across this play toward Pioneer's acreage position, the sands being discovered are deeper and cleaner, significantly improving drilling results. Pioneer has participated in several Bossier wells with initial rates ranging from 3 to 10 million cubic feet of gas per day

and estimated reserves of three to four billion cubic feet of gas per well. The Company has planned 20 to 25 wells in its 2000 development program. Pioneer will continue to map the play and evaluate 3-D data anticipating that a multi-year drilling program can be sustained on existing acreage.

OTHER U.S. DEVELOPMENT

In South Texas, Pioneer continues to aggressively develop the Edwards Reef in its Pawnee field adding production through its advanced horizontal drilling program supported by 3-D seismic. In the prolific My Way/Lonesome Reef play in the Permian Basin, Pioneer has drilled three field extension discoveries on structural build-ups defined by 3-D seismic. Additional wells are planned in each of these and several other areas, and Pioneer is actively processing and interpreting new 3-D seismic data to further expand its inventory of drilling locations for future exploration and development.

ARGENTINA

Pioneer's Argentine properties represent approximately 20% of total current production and consist of 27 blocks on approximately 1.6 million acres primarily located in the Neuquen and Austral basins. The Neuquen Basin, where Pioneer plans a 60-well program in 2000, is relatively undeveloped offering a frontier for continuing activity. Pioneer increased its position in this core area during 1999, acquiring eight new blocks covering 230,000 acres. These new blocks supplement Pioneer's growth plans in Argentina adding many potential drilling locations in a familiar geologic environment. Pioneer expects Argentine production to increase 10% to 15% annually.

CANADA

In Canada, Pioneer's activities focus on its core area in northeast British Columbia and just across the border into Alberta. With 132 producing wells and an additional 250,000 net undeveloped acres, this area offers significant opportunity to increase production and reserves. Pioneer's acreage is strategically located at the northern end of the Alliance Pipeline scheduled to deliver gas into the U.S. Chicago market beginning in October, 2000. The 2000 development plan calls for 45 wells which are expected to provide a 20% increase in production from this Canadian core area.

Exploration Program and Appraisal of Exploration Successes

GULF COAST / GULF OF MEXICO SHELF

Pioneer currently holds over 150,000 net acres in the Texas-Louisiana Gulf Coast region, both onshore and offshore. Since late 1997 the company has acquired over 5,000 square miles of 3-D seismic in this area and identified over 60 exploratory leads. The Company estimates that prospect reserve potential in this area ranges from 50 to 200 billion cubic feet per well. In 2000, Pioneer plans to drill four to five exploratory wells as the majority interest owner and operator. The prospects to be drilled in 2000 include an onshore well in Vermilion Parish, Louisiana, an offshore well in the West Cameron area off Louisiana and several wells in the Big Hum trend offshore Texas. The Company plans to add new acreage in this area and maintain an exploratory drilling program of four to five wells per year.

2 YEAR EXPLORATION PROGRAM NET RESERVE POTENTIAL
MMBOE*

Gulf Coast	50 - 75
Deepwater GOM	50 - 75
South Africa	250 - 325
Gabon	100 - 125
Total	450 - 600

DEEPWATER GULF OF MEXICO

Pioneer participated in two Deepwater Gulf of Mexico discoveries during 1999. The Company's first well was a

discovery on the Aconcagua Prospect in Mississippi Canyon 305. Pioneer owns a 25% working interest in this discovery with partners Elf Exploration (Operator - 50%) and Mariner Energy (25%). The appraisal well drilled in early 2000 found over 250 net feet of gas pay establishing the potential for first production by late 2001 via Elf's Canyon Express joint development program.

Pioneer's second Deepwater Gulf of Mexico discovery was on the Devil's Tower Prospect in Mississippi Canyon 773. The discovery well encountered a significant number of hydrocarbon bearing sands, and appraisal drilling is expected to begin in the second quarter of 2000. Pioneer has a 16% working interest with Mariner Energy, the operator with a 50% working interest. The Company holds an interest in two additional Deepwater Gulf of Mexico blocks and continues to define other prospective areas to acquire leases.

ASSETS + PEOPLE + TECHNOLOGY = SUCCESS

Pioneer is committed to utilizing the most advanced technologies available to our industry to increase drilling success, maximize reservoir recovery, reduce costs and improve productivity. Pioneer's people are experienced, enthusiastic and absolutely committed to adding value. With great assets, great people and advanced technology coming together, great things are happening at Pioneer!

SOUTH AFRICA

Pioneer holds exploration and production agreements with the Republic of South Africa covering approximately 13 million acres along the southern coast in Blocks 7, 9, 10, 11A, 12A, 13A/B and 14A/B. Thirty oil and gas discoveries have been established on Block 9. Two of these are currently producing. The Oribi Field produces up to 25,000 barrels of oil per day; and the F-A Field produces approximately 190 MMcf of natural gas and 10,000 barrels of condensate per day. Pioneer participated in two successful wells drilled under this agreement in 1998 establishing the Sable field where an additional appraisal well will be drilled in early 2000. Recoverable reserves are estimated at 30 to 40 million barrels of oil, and initial production from five to six wells is expected to approach 40,000 barrels of oil per day. First production is anticipated in 2002. Pioneer holds a 35% working interest in this field. Pioneer also plans to drill exploratory wells on two prospects in the southern half of Block 9 during the second half of 2000.

GABON

Pioneer holds an exploration and production agreement with the Republic of Gabon that gives the Company the exclusive right to explore, develop and produce oil and natural gas in the offshore Olowi Block. This block, consisting of approximately 315,000 acres in less than 130 feet of water, is located three miles southeast of the giant Gamba oil field, an existing field which has estimated recoverable reserves of more than 300 million barrels. It is also on trend with smaller oil fields to the southeast. Prior drilling on the block, based on antiquated 2-D seismic data, has proved the existence of both oil and gas at shallow depths of less than 3,400 feet, and Pioneer believes the use of modern seismic, drilling and production technology offers opportunities for commercial development. Pioneer acquired 3-D seismic data on 700 square kilometers of this block late in 1999. The data will be processed and analyzed in 2000 in preparation for drilling Pioneer's first well in early 2001.

CORPORATE HEADQUARTERS

Pioneer Natural Resources Company
1400 Williams Square West
5205 N. O'Connor Blvd.
Irving, TX 75039
(972) 444-9001

STOCK EXCHANGE LISTINGS

Pioneer Natural Resources Company (PXD) is traded on the New York Stock Exchange and the Toronto Stock Exchange

WEB ADDRESS

www.pioneernrc.com

STOCK TRANSFER AGENT AND REGISTRAR

Communication concerning the transfer or exchange of shares, lost certificates or change of address should be directed to:

Continental Stock Transfer & Trust Company
2 Broadway
New York, NY 10004
(888) 509-5586

INFORMATION REQUESTS

To receive additional copies of the Annual Report on Form 10-K as filed with the Securities and Exchange Commission, to obtain this or other Pioneer publications or to be placed on the direct mailing list, please contact:

Pioneer Natural Resources Company / Investor Relations
1400 Williams Square West
5205 N. O'Connor Blvd.
Irving, TX 75039
(972) 969-3583

INVESTOR RELATIONS / MEDIA CONTACT

Shareholders, portfolio managers, brokers and securities analysts seeking information concerning Pioneer's operations or financial condition are encouraged to contact Susan Spratlen, Director of Corporate Communications and Investor Relations, at (972) 444-9001.

MANAGEMENT COMMITTEE

Scott D. Sheffield
President, Chairman and Chief Executive Officer

Timothy L. Dove
Executive Vice President and Chief Financial Officer

Dennis E. Fagerstone
Executive Vice President

Danny L. Kellum
Vice President

Mark L. Withrow
Executive Vice President and General Counsel

PIONEER
NATURAL RESOURCES

Form Approved. OMB No. 2040-0042.

United States Environmental Protection Agency

Underground Injection Control Permit Application

(Collected under the authority of the Safe Drinking Water Act. Sections 1421, 1422, 40 CFR 144)

EPA RECEIVED MAR 07 2001 Office of Enforcement Compliance & Environmental Justice

REGISTERED MAR 8 2001 EPA REGION VIII

I. EPA ID Number				T/A	C
U					

Read Attached Instructions Before Starting

For Official Use Only

Application approved (mo day year)	Date received (mo day year)	Permit Number	Well ID	FINDS Number
	03 08 2001	MT5913-00000 AREA PERMIT NUMBER		

II. Owner Name and Address			III. Operator Name and Address		
Owner Name: Pioneer Natural Resources USA, Inc.			Operator Name: Pioneer Natural Resources USA, Inc.		
Street Address: 5205 N O'Connor Blvd.		Phone Number: 972-969-3920	Street Address: 5205 N O'Connor Blvd.		Phone Number: 972-969-3920
City: Irving	State: TX	ZIP CODE: 75039-3746	City: Irving	State: TX	ZIP CODE: 75039-3746

IV. Commercial Facility	V. Ownership	VI. Legal Contact	VII. SIC Codes
[ ] Yes [X] No	[X] Private [ ] Federal [ ] Other	[ ] Owner [X] Operator	1311

VIII. Well Status *(Mark "x")*

[ ] A. Operating	Date Started (mo day year)	[ ] B. Modification/Conversion	[X] C. Proposed

IX. Type of Permit Requested *(Mark "x" and specify if required)*

[ ] A. Individual	[X] B. Area	Number of Existing Wells	Number of Proposed Wells	Name(s) of field(s) or project(s)
			4	Biere 1-22 Remedial Project

X. Class and Type of Well *(see reverse)*

A. Classes(es) (enter codes(s))	B. Type(s) (enter codes(s))	C. If class is "other" or type is code 'x,' explain	D. Number of wells per type (if area permit)
Class V	5x26		4 - Injectors

XI. Location of Well(s) or Approximate Center of Field or Project

Latitude Deg	Min	Sec	Longitude Deg	Min	Sec	Township and Range Sec	Twp	Range	1/4 Sec	Feet From	Line	Feet From	Line
						22	28N	51E	SW	660'	W	1980'	S

XII. Indian Lands (Mark 'x')

[X] Yes
[ ] No

XIII. Attachments

(Complete the following questions on a separate sheet(s) and number accordingly; see instructions)
For Classes I, II, III, (and other classes) complete and submit on a separate sheet(s) Attachments A--U (pp 2-6) as appropriate. Attach maps where required. List attachments by letter which are applicable and are included with your application.

XIV. Certification

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. (Ref. 40 CFR 144.32)

A. Name and Title *(Type or Print)*	B. Phone No. *(Area Code and No.)*
Wilbur Dover - Manager Operations Services	972-969-3920
C. Signature: Wilbur L. Dover	D. Date Signed: 3-06-01

EPA Form 7520-6 (Rev. 8-91)

Well Class and Type Codes

Class I	Wells used to inject waste below the deepest underground source of inking water.
Type "I"	Nonhazardous industrial disposal well
"M"	Nonhazardous municipal disposal well
"W"	Hazardous waste disposal well injecting below USDWs
"X"	Other Class I wells (not included in Type "I," "M," or "W")
Class II	Oil and gas production and storage related injection wells.
Type "D"	Produced fluid disposal well
"R"	Enhanced recovery well
"H"	Hydrocarbon storage well (excluding natural gas)
"X"	Other Class II wells (not included in Type "D," "R," or "H")
Class III	Special process injection wells.
Type "G"	Solution mining well
"S"	Sulfur mining well by Frasch process
"U"	Uranium mining well (excluding solution mining of conventional mines)
"X"	Other Class III wells (not included in Type "G," "S," or "U")
Other Classes	Wells not included in classes above.
	Class V wells which may be permitted under §144.12
	Wells not currently classified as Class I, II, III, or V.

Attachments to Permit Application

Class	Attachments
I new well	A, B, C, D, F, H — S, U
existing	A, B, C, D, F, H — U
II new well	A, B, C, E, G, H, M, Q, R; optional — I, J, K, O, P, U
existing	A, E, G, H, M, Q, R — U; optional — J, K, O, P, Q
III new well	A, B, C, D, F, H, I, J, K, M — S, U
existing	A, B, C, D, F, H, J, K, M — U
Other Classes	To be specified by the permitting authority

A. AREA OF REVIEW METHODS & NOTIFICATION OF LAND OWNERS

B. MAPS OF WELLS AND AREA OF REVIEW

C. CORRECTIVE ACTION PLAN & WELL DATA

D. NAMES & DEPTHS OF UNDERGROUND SOURCES OF DRINKING WATER (USDW)

G. GEOLOGIC DATA ON INJECTION & CONFINING ZONES

H. OPERATING DATA

I. FORMATION TESTING PLAN

J. STIMULATION PROGRAM

K. INJECTION PROCEDURES

M. CONSTRUCTION DETAILS

O. PLAN FOR WELL FAILURES

P. MONITORING PROGRAM

Q. PLUGGING & ABANDONMENT PLAN

R. NECESSARY RESOURCES

S. AQUIFER EXEMPTION (S)

T. EXISTING EPA PERMITS (ORDERS)

U. DESCRIPTION OF BUSINESS

A

AREA OF REVIEW METHODS & NOTIFICATION OF LAND OWNERS

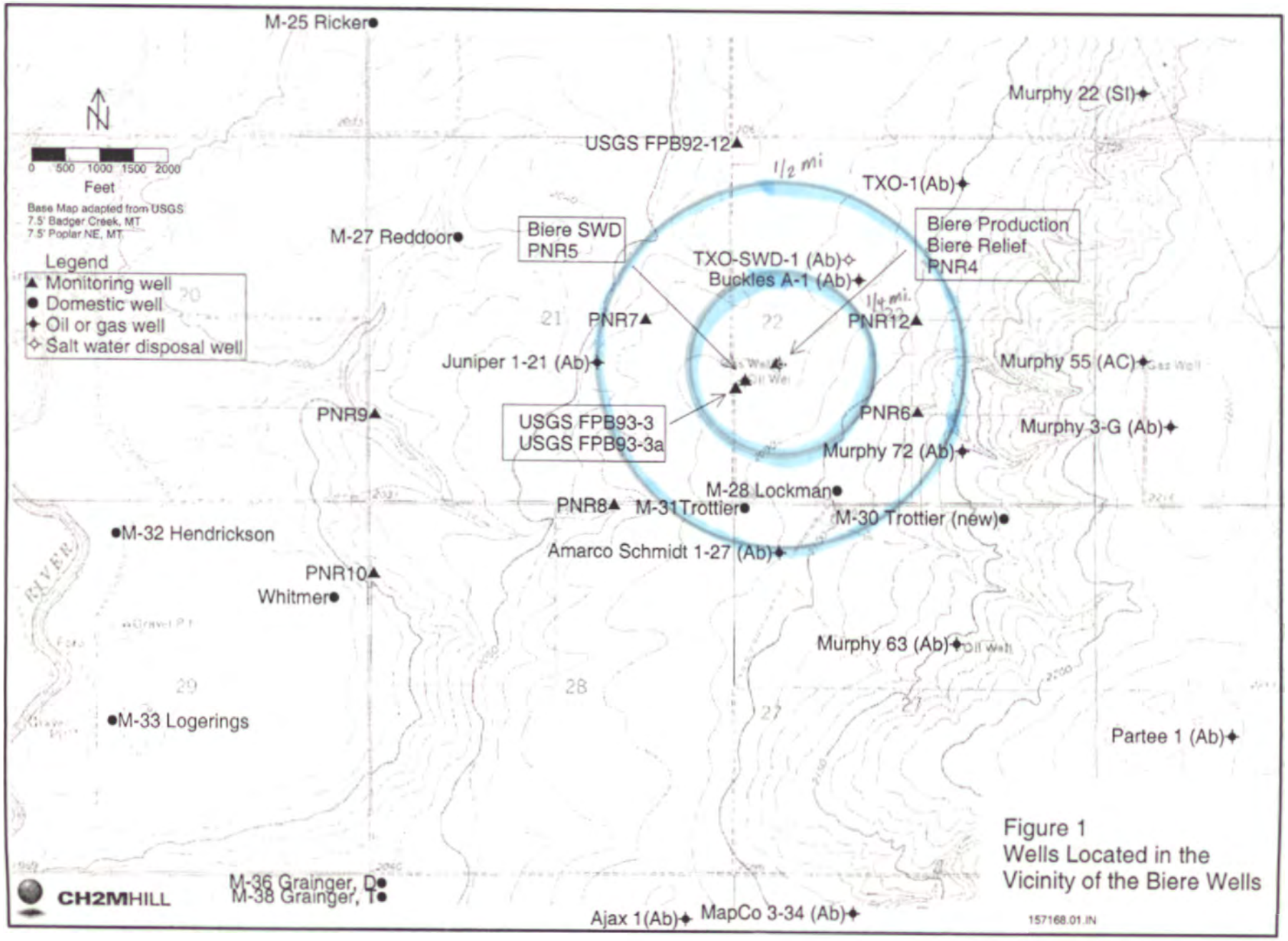


Figure 1
Wells Located in the
Vicinity of the Biere Wells

vation

East Poplar Unit, Homeowners

Occupant						
KOHL, DANNY	POPLAR	MT	5097	15	29N	51E
LIEN, BIRDELL	POPLAR	MT	4849	20	29N	51E
ZIMMERMAN, BILL	SIDNEY	MT	5448	1	28N	51E
ABBOTT, JOE	POPLAR	MT	5540	4	28N	51E
KIRN, AUDREY	POPLAR	MT	5584	8	28N	51E
KIRN, MICHAEL	POPLAR	MT	5632	8	28N	51E
GRAY HAWK, RACHEL L.	POPLAR	MT	5647	16	28N	51E
MARTELL, RENE JOSI	POPLAR	MT	5666	17	28N	51E
RICKER SR., GEORGE HELEN	POPLAR	MT	5712	17	28N	51E
BLEAZARD, ROSS LAURA	POPLAR	MT	5866	29	28N	51E
WHITMER, WARREN DONNA	POPLAR	MT	58702	29	28N	51E
LOEGERING, MAVIS	POPLAR	MT	5910	29	28N	51E
GRANDCHAMP, DENISE	POPLAR	MT	5947	33	28N	51E
GRAINGER, TRIVIAN	POPLAR	MT	5957	33	28N	51E
KIRN SR., JESSE	POPLAR	MT	6037	32	28N	51E
FOUR BEAR, CHARLES	POPLAR	MT	5678	17	28N	51E
TROTTIER, TIM, DONNA	POPLAR	MT	5713	16	28N	51E
LOCKMAN, WILLIAM	POPLAR	MT	5715	16	28N	51E
REDDOOR, IRMA	POPLAR	MT	0	0	28N	51E
GRAINGER, IVA	POPLAR	MT	5128	15	29N	51E
RANF, MARIE	POPLAR	MT	5743	13	28N	51E

52E

28N53E

N
W E
S

- Homesites
- Roads
- Township
- Reservation Boundary 1988

15 Miles

under authority of §1431(i) of the Act, 42 U.S.C. §300(i), Respondents are ordered to perform the following actions:

A. PROVIDE TEMPORARY SAFE DRINKING WATER SOURCE TO IDENTIFIED RESIDENCES

The Respondents shall continue to provide an alternative source of water that meets the EPA drinking water standards (40 C.F.R. Part 142) for drinking and cooking to the residences of the contaminated area. The water shall be provided in the quantity of one gallon per person per day in each residence. This water is to be provided on a regular basis in an easily accessible manner to the residence. The residences known to have contaminated water or which have drinking water which is threatened with contamination at this time are listed below and on the attached map (Attachment #1) :

Current Resident	City	State	Residence Address	Sec	Twn	Rge
Kohl, Danny	Poplar	MT	5097 Road 251	15	29N	51E
Lien, Birdell	Poplar	MT	4849 Road 2050	20	29N	51E
Zimmerman, Bill	Poplar	MT	5448 Road 251	01	28N	51E
Abbott, Joe	Poplar	MT	5540 Road 75	04	28N	51E
Kirn, Audrey	Poplar	MT	5584 Road 75	08	28N	51E
Kirn, Michael	Poplar	MT	5632 Road 75	08	28N	51E
Gray Hawk, Rachel	Poplar	MT	5647 Road 75	16	28N	51E

Trottier, Tim & Donna	Poplar	MT	5713 Road 75	16	28N	51E
Lockman, Lyle	Poplar	MT	5715 Road 75	16	28N	51E
Four Bears, Charles	Poplar	MT	5678 Road 75	17	28N	51E
Martell, Rene & Josi	Poplar	MT	5666 Road 75	17	28N	51E
Ricker Sr., George & Helen	Poplar	MT	5712 Road 75	17	28N	51E
Bleazard, Ross & Laura	Poplar	MT	5866 Road 150	29	28N	51E
Whitmer, Warren & Donna	Poplar	MT	58702 Road 75	29	28N	51E
Loegering, Mavis	Poplar	MT	5910 Road 150	29	28N	51E
Kirn Sr., Jesse	Poplar	MT	6037 Road 150	32	28N	51E
Grandchamp, Denise	Poplar	MT	5947 Road 75	33	28N	51E
Grainger, Trivian	Poplar	MT	5957 Road 75	33	28N	51E
Grainger, Iva	Poplar	MT	5128 Road 251	15	29N	51E
Ranf, Marie and Corne, Warren	Poplar	MT	5743 Road 251	13	28N	51E

There may be a need to supply domestic water to additional residents, including other residents or locations drawing domestic water from the Quaternary

HKM Engineering
222 North 32nd Street, Suite 700
P.O. Box 31318
Billings, MT 59107-1318
(406) 656-6399

January 8, 2001

Mr. and Mrs. L. M. Lockman
P.O. Box 686
Poplar, Montana 59255

Dear Mr. and Mrs. Lockman:

We are continuing to investigate and consider an appropriate response to the Biere Well situation. We recently developed a Proposed Response Action Plan for the Biere well site, and sent a copy of that Plan to E. P. A. and the Fort Peck Tribe for their comments. Enclosed for your information and comment is a copy of that Plan. We hope to reach an agreement with E. P. A. regarding this Plan in the near future, and would then like to implement the Plan as soon as possible during this next year, 2001. Implementation of this Response Plan would require our access to the Biere well site again, and we would like to work out an arrangement for such access and implementation of this Plan, which would minimize impact to you and accommodate to the extent possible, your farming operations. We will keep you advised of further developments, and if you have any questions or comments, I will be happy to discuss matters with you, either by telephone, or in person.

Thank you.

Sincerely,

CHARLES PETERSON, P.G.

CP:dka

54714.001

HKM Engineering
222 North 32nd Street, Suite 700
P.O. Box 31318
Billings, MT 59107-1318
(406) 656-6399

December 26, 2000

Deb Madison
Fort Peck Tribes
605 Indian Avenue
P.O. Box 1027
Poplar, Montana 59255

RE: Biere Well Site, East Poplar Oilfield

Dear Ms. Madison:

Pioneer Natural Resources recently conducted investigatory activities near the "Biere" well site, located at the south flank of the East Poplar Oil Field. Following the investigation, I provided your office with a Field Investigation Report, summarizing the results of the groundwater sampling and other measures implemented at the site.

Pioneer and its technical consultants have now developed a proposed plan for preventing any future migration of contaminants from the Biere well site. Pioneer would like to implement the response measures outlined in the plan as soon as possible. We ask that you review the plan and let us know if you have any questions, comments or concerns.

A copy of the plan also is being provided to the E. P. A. We look forward to your response.

Sincerely,

Charles Peterson, P.G.

CP:dka

Enclosure: (1)

B

MAPS OF WELLS AND AREA OF REVIEW

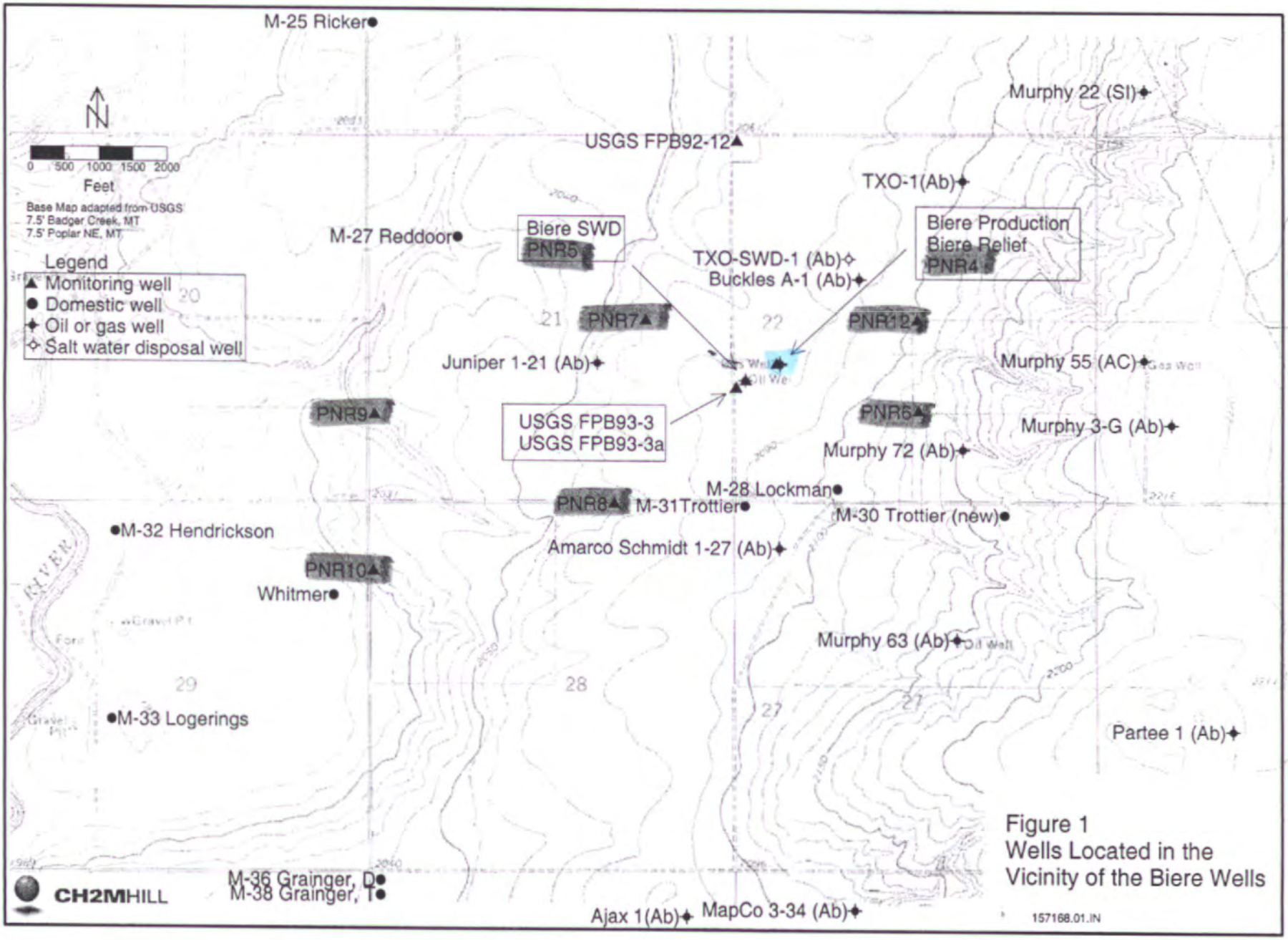


Figure 1
Wells Located in the
Vicinity of the Biere Wells

ATTACHMENT 2

WELL LIST BY COMPANY

Murphy Oil Corporation

Murphy Oil USA, Inc.

Murphy Exploration & Production Company

Provide the information required above for those wells listed below and all other wells constructed, operated, or plugged in the sections listed below:

East Poplar Oil Field Near Poplar, Montana in T28N R51E Sections 1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 15, 16, 21, 22, 23, and 24.

LOCATION	WELL NAME
Sec 1 T28N R51E	
C SW NW	Murphy 3
C SW NE	Murphy 99
NE SE	Murphy 76
Sec 2 T28N R51E	
SW NE	Murphy 1
C SE NW	Murphy 18 Also known as: Zimmerman EPU #18 or the 7-B Well
SW NE	Murphy 2-D Also known as: EPU 2-D
SE SE	Zimmerman EPU 116 - New Well
C SW SW	Zimmerman EPU #5 Also known as Murphy #5 or the 7-A Well
C SE SE	Murphy 17
Sec 3 T28N R51E	
SW NW	Murphy 80-D Also known as: Tribal Unit #80-D
	Murphy 82
C SW SE	Murphy 12

C SE SE	Murphy 14
SEC 4 T28N R51E	
SW NW	Murphy 59-D
C SW NE	Murphy 45
Sec 9 T28N R51E	
SE NE	Murphy 67
Sec 10 T28N R51E	
NW NW	Murphy 11
NW NE	Polumbus (Huber) 4
NW NE (50 feet east of Huber #4)	Polumbus (Huber) 4-A
NE	Polumbus (Huber) 1-W
NE NE	Polumbus (Huber) 3
SE NW	Murphy 13
SW NE	Polumbus (Huber) 2
SE SW NE	Murphy 5
SW NW	Polumbus (Huber) 1
C NW SE	Murphy 8-D
E SW NE	(Murphy) Huber 5 SWD Previously known as the Huber 5 (Production)
NE SE	Murphy 6
Sec. 11 T28N R51E	
NWNW	Murphy 15
SW NW	Murphy 7 also known as EPU #7
SW NE	Murphy 68
C SW SW	Murphy 9
SW SE	Murphy 100
Sec. 12 T28N R51E	
SW SW	Murphy 24
SW NE	Murphy 61

Sec. 13 T28N R51E	
SE SW	Murphy 74
Sec. 14 T28N R51E	
C NW	Murphy 101 Also called the Tribal 101
SW SW NE	Murphy 20 Also called the Unit 20
SW SE	Murphy 104 Also called the Tribal 104
SW SW SW	Murphy 22 Also known as the Tribal Unit 22 and EPU 22
Sec. 15 T28N R51E	
C SW NE	Murphy 32 Also known as EPU32
Sec. 22 T28N R51E	
C NW NE	TXO -1 Also known as Buckles "B" #1
NW SE NW	Buckles SWD #1 Also known as TXO-SWD-1
C SE NW	Buckles A-1
SW SE	Tribal Unit #72 Also known as Murphy 72
Sec. 23 T28N R51E	
C SW NE	Murphy 26 (Also known as Fed. Unit #26)
C NW SW	Fed. Unit 55 Also known as Murphy 55

NE NE SW	Fed. Unit 3-G Also known as Murphy 3-G
Sec. 24 T28N R51E	
SW SW	Murphy 44
Sec. 27 T28N R51E	
C SW NE	Federal unit #63 Also known as EPU 63 or Murphy 63

Pioneer Natural Resources Company

for Mesa Petroleum Co.

Provide the information required above for those well(s) listed below and all other wells constructed, operated, or plugged in the sections listed below:

East Poplar Oil Field Near Poplar, Montana in T28N R51E Sections 1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 15, 16, 21, 22, 23, and 24.

(Respondent must also provide information on the **relief well** drilled near the Mesa Biere 1-22. Respondent must submit information on its location, depth, type of use, duration of use, and the plugging records.)

Sec. 22 T28N R51E	
C NW SW	Biere 1-22 Also know as: Mesa Biere 1-22
SW NW SW	Biere 1-W SWD Also known as: Mesa 1-W(Biere)

AMARCO Resources Company

Provide the information required above for those well(s) listed below and all other wells constructed, operated, or plugged in the sections listed below:

East Poplar Oil Field Near Poplar, Montana in T28N R51E Sections 1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 15, 16, 21, 22, 23, and 24.

(Respondent must also provide information on the **relief well** drilled near the Mesa Biere 1-22. Respondent must submit information on its location, depth, type of use, duration of use, and the plugging records.)

Sec. 22 T28N R51E	
C NW SW	Biere 1-22 Also known as: Mesa Biere 1-22
Sec. 27 T28N R51E	
C NW NW	Federal 1-27 Also known as: AMARCO Schmidt 1-27

W.R. Grace & Co.-Conn.

For: **Polumbus Corporation/Polumbus Company**

Provide the information required above for those well(s) listed below and all other wells constructed, operated, or plugged in the sections listed below:

East Poplar Oil Field Near Poplar, Montana in T28N R51E Sections 1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 15, 16, 21, 22, 23, and 24.

Sec. 10 T28N R51E	
NW NE	Polumbus (Huber) 4
NW NE (50 east of Polumbus 4)	Polumbus (Huber) 4-A
NE	Polumbus (Huber) 1-W
NE NE	Polumbus (Huber) 3
SE NW	Polumbus 13 Also known as: Murphy 13
SW NE	Polumbus (Huber) 2
SE SW NE	Polumbus 5 Also known as: Murphy 5
E SW NE	Huber 5 SWD Known as: Murphy 5 SWD Huber 5 Production well
SE NE SE	Grace 110x Also known as: EPU 110x-D

Marathon Oil Company

For: Texas Oil & Gas Corp.
Trade name TXO Production Corp.

Provide the information required above for those well(s) listed below and all other wells constructed, operated, or plugged in the sections listed below:

East Poplar Oil Field Near Poplar, Montana in T28N R51E Sections 1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 15, 16, 21, 22, 23, and 24.

Sec. 22 T28N R51E	
C NW NE	TXO -1 Also known as Buckles "B" #1
NW SE NW	Buckles SWD #1 Also known as TXO-SWD-1
C SE NW	Buckles A-1

EPEC-Altamont Corporation

For: Tenneco Oil Company Inc./ Tenneco-Altamont Corporation

Provide the information required above for those well(s) listed below and all other wells constructed, operated, or plugged in the sections listed below:

East Poplar Oil Field Near Poplar, Montana in T28N R51E Sections 1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 15, 16, 21, 22, 23, and 24.

Sec. 25 T28N R51E	
NW SW NE	Tenneco 1 Also known as G. Morse #1

C

CORRECTIVE ACTION PLAN & WELL DATA

C. Corrective Action Plan & Well Data

All wells within ½ mile radius of Biere 1-22

1. PNR4 – New Monitor Well
2. PNR 5 – New Monitor Well
3. PNR 6 – New Monitor Well
4. PNR 7 – New Monitor Well
5. PNR 12- New Monitor Well
6. USGS FPB93-3 – Monitor Well
7. USGS FPB93-3a – Monitor Well
8. TXD-SWD-1 Plugged & Abandoned
9. Biere Relief Well – Plugged & Abandoned
10. Biere SWD #1 – Plugged & Abandoned
11. Biere Relief 1-22 – Plugged & Abandoned
12. Juniper 1-21 – Plugged & Abandoned
13. Buckles A-1 Plugged & Abandoned (No Data Available)
14. Lockman M-28 – TA'D Water Well (No Well Completion Data)
15. Trotter M-31 – TA'D Water Well (No Well Completion Data)

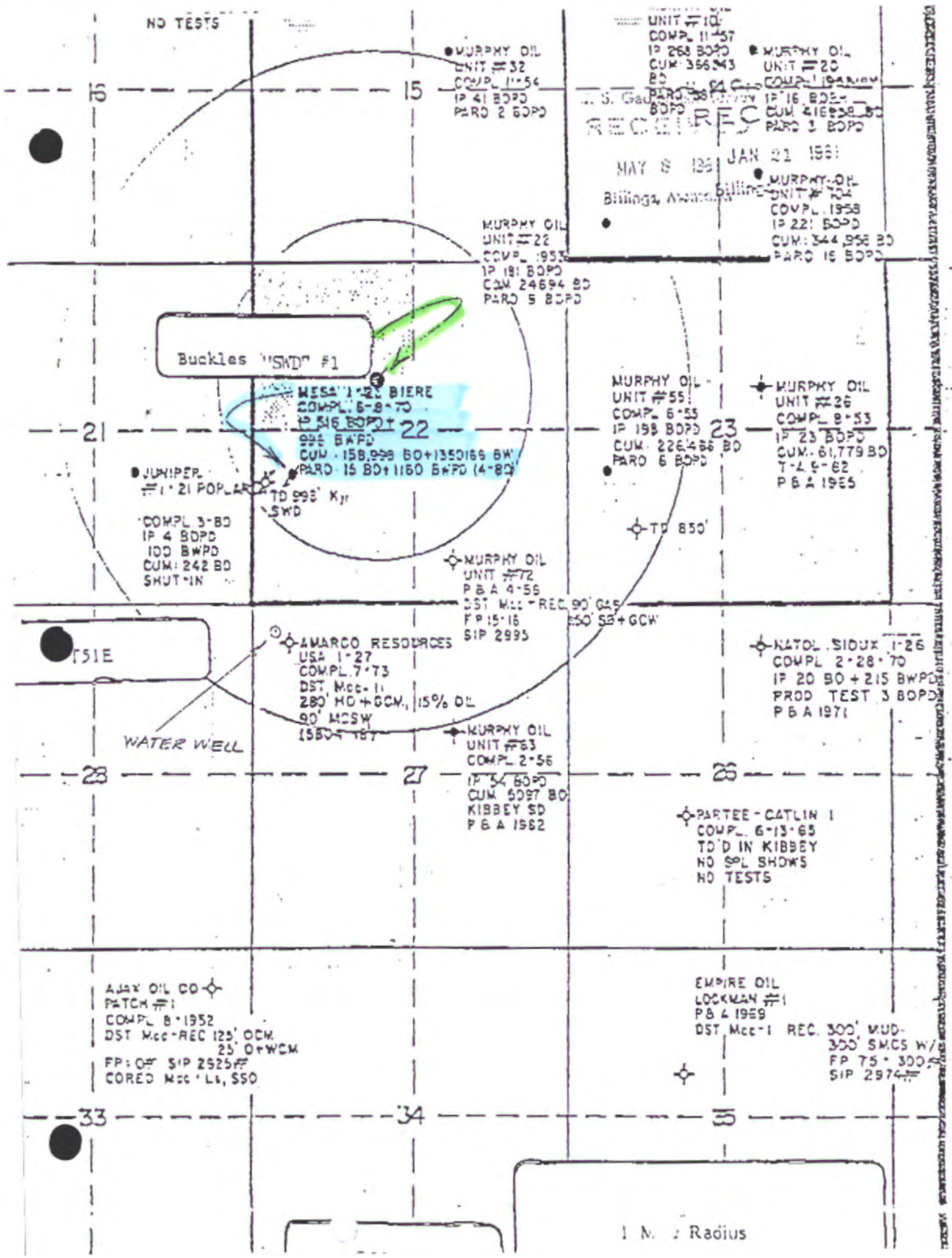

NO TESTS
MURPHY OIL
UNIT #32
COMPL 11-54
IP 41 BOPD
PARO 2 BOPD
UNIT #10
COMPL 11-57
IP 268 BOPD
CUM 356343 BO
PARO 38 BOPD
MURPHY OIL
UNIT #20
IP 16 BOPD
CUM 416838 BO
PARO 3 BOPD
RECEIVED
MAY 8 1961
JAN 21 1961
Billings, Montana
MURPHY OIL
UNIT #104
COMPL 1958
IP 221 BOPD
CUM: 344,958 BO
PARO 16 BOPD
MURPHY OIL
UNIT #22
COMPL 1953
IP 181 BOPD
CUM 24694 BO
PARO 5 BOPD
Buckles "SWD" #1
MESA 1-22 BIERE
COMPL 6-8-70
IP 516 BOPD+
996 BWPD
CUM 158,998 BO+1350166 BW
PARO 15 BO+1160 BWPD (4-80)
MURPHY OIL
UNIT #55
COMPL 6-55
IP 198 BOPD
CUM 226,466 BO
PARO 6 BOPD
MURPHY OIL
UNIT #26
COMPL 8-53
IP 23 BOPD
CUM 61,779 BO
T-A 9-62
P & A 1965
JUNIPER
#1-21 POPLAR
TD 998' Kyr
SWD
COMPL 3-80
IP 4 BOPD
100 BWPD
CUM: 242 BO
SHUT-IN
TD 850'
MURPHY OIL
UNIT #72
P & A 4-56
DST Mcc-REC 90' GAS
FP 15-16
SIP 2995
50' SO+GCW
T51E
AMARCO RESOURCES
USA 1-27
COMPL 7-73
DST Mcc-11
280' HO+GCM, 15% OIL
90' MCSW
NATOL SIOUX 1-26
COMPL 2-28-70
IP 20 BO+215 BWPD
PROD TEST 3 BOPD
P & A 1971
WATER WELL
MURPHY OIL
UNIT #63
COMPL 2-56
IP 54 BOPD
CUM 5097 BO
KIBBEY SD
P & A 1962
PARTEE-CATLIN 1
COMPL 6-13-65
TD'D IN KIBBEY
NO SPL SHOWS
NO TESTS
AJAX OIL CO
PATCH #1
COMPL 8-1952
DST Mcc-REC 125' OCM
25' O+WCM
FP: 0# SIP 2525#
CORED Mcc-Ls, SSO
EMPIRE OIL
LOCKMAN #1
P & A 1969
DST Mcc-1 REC. 300' MUD-
300' SMCS W/
FP 75-300#
SIP 2974#
16
15
21
22
23
28
27
26
33
34
35
1 M. Radius

TABLE 3
Historical Water Chemistry Analysis
Biere Well Evaluation

Well	Sample Date	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	HCO_3 mg/l	SO_4 mg/l	Cl mg/l
M-31 (Trottier - old)	08/28/1997	2000	844	19000	100	505	1600	36000
FPB-93-3	08/28/1997	1100	255	23600	410	444	1600	37000
Whitmer	08/27/1997	100	65	384	6.7	364	260	520
M-30 (Trottier - new)	09/03/1997	120	103	313	7	951	440	23
M-36 (Denise Grainger)	09/03/1997	170	120	433	6.9	642	1100	76
M-27 (Reddoor)	08/26/1990	330	200	590	12	314	330	1700
M-28 (Lockman)	07/20/1991	1600	1400	2200	20	708	1600	7900
FPB-92-12	07/24/1993	280	270	100	13	445	1500	15
M-25 (Ricker)	08/25/1990	160	120	530	8.7	342	150	1100
M-32 (Hendrickson)	08/17/1993	88	57	290	5.4	413	180	330
M-33 (Logerings)	08/23/1990	46	36	47	5.2	310	47	7.3
Murphy 63 (Mh - Miss. Heath Fm.)	01/24/1956	1400	230	21500	500	390	1400	36000
Tenneco 1 (Mc - Miss. Charles Fm.)	01/09/1967	810	150	63000	500	310	1500	98000
Buckles A-1(Mc - Miss. Charles Fm.)	04/30/1981	4000	970	26000	500	350	2300	50000

CH2MHILL

Well Number: PNR4

Client: Pioneer Natural Resources
Project: Biere Well Investigation
Location: Popular, MT
Project Number: 157168.01.IN

Driller: Sharp Drilling, Sidney, MT
Drilling Method: Mud Rotary Mayhew 1000
Sampling Method: Grab
Logged by: C. Feast
Start/Finish Date: 5/10/2000 to 5/12/2000

Depth (ft)	Sample Info: Sample #	Sample Info: Sample Type	Soil Log	Soil Description	Well Drawing	Well Construction Notes
-5						3.3 ft. above ground
0				Ground Surface		
5	1 Grab	G		**Top Soil** Soil over brown silty clay with occasional gravel, clay forms chunks in mud stream, dense, plastic.		2-in type 304 SS riser
10						Surface casing (not shown) 6" dia., .250" wall, steel well casing to 34.5 FBGS (shoe), cemented in 10" hole with neat cement grout
15				**CL** As above, color grades to gray by 20 feet gray below 20 feet.		
20	2 Grab	G				
25						Neat cement grout
30	3 Grab	G		**CL** Clay, occasional gravel, dense, plastic, gray.		
35	4 Grab	G				Hole Plug
40	5 Grab	G		**CL** Clay, gray to brown, very little gravel or sand.		
45				**SP** Sand layered with clay and silty sand.		10-20 CSSI Sand
50	6 Grab	G				
55				**GP** Gravel, coarse, rounded, some clay layers.		2-in type 304 SS screen 0.010 slot
60	7 Grab	G		**Shale** Bear Paw Shale, sticky, weathered, dark gray.		
65				End of Log		10" dia. hole 0 - 34.5 ft. 6" dia. hole 34.5 - 59.5 ft. Locking security cover not shown
70						
75						
80						
85						
90						
95						

CH2MHILL

Well Number: PNR5

Client: Pioneer Natural Resources
Project: Biere Well Investigation
Location: Popular, MT
Project Number: 157168.01.IN

Driller: Sharp Drilling, Sidney, MT
Drilling Method: Mud Rotary Mayhew 1000
Sampling Method: Grab
Logged by: C. Feast
Start/Finish Date: 5/8/2000 to 5/112000

Depth (ft)	Sample Info: Sample #	Sample Info: Sample Type	Soil Log	Soil Description	Well Drawing	Well Construction Notes
-5						
0				Ground Surface		2.9 ft. above ground
				Top Soil Silt with gravel, brown		
5	1 Grab	G				2-in type 304 SS riser
10						Surface casing (not shown) 6" dia., .250" wall, steel well casing to 34.5 FBGS (shoe), cemented in 10" hole with neat cement grout
15				**CL** Clay and silty clay with gravel, occassional large gravels, brown.		
20	2 Grab	G				
25						Neat cement grout
30						
	3 Grab			**GP - SP** Poorly graded gravels and poorly graded sands, fine to medium gravel and fine to coarse sand. Oil sheen and foam on pit. Brown.		Hole Plug
35						
40	4 Grab	G				
45				**GC - GP** Layers of clayey gravel, clean gravel, fine silty sand, brown		10-20 CSSI Sand
50						
55	5 Grab	G				2-in type 304 SS screen 0.010 slot
60						
	6 Grab			**Shale** Bear Paw Shale, sticky, weathered, dark gray.		10" dia. hole 0 - 34.5 ft. 6" dia. hole 34.5 - 64 ft. Locking security cover not shown
65				End of Log		
70						
75						
80						
85						
90						
95						

CH2MHILL

Well Number: PNR6

Client: Pioneer Natural Resources
Project: Biere Well Investigation
Location: Popular, MT
Project Number: 157168.O1.IN

Driller: Hansen Environmental, Glasgow, MT
Drilling Method: Hollow Stem Auger, CME 55
Sampling Method: Split Spoon
Logged by: C. Peterson/MSE-HKM
Start/Finish Date: 5/1/2000 to 5/1/2000

Depth (ft)	Sample Info: Number	Type	Recovery (in/in)	6"-6"-6"-6" (N)	Soil Log	Soil Description	Well Construction Notes
-5							
0						Ground Surface	2.5 ft *above ground*
						Top Soil	2" Sch. 40 PVC flush jt. threaded casing
5	1	SS	24/24	4 5 8 12		**CL** Lean clay, some fine gravels, little sand, moist, stiff, trace to few small white (gypsum) crystals.	Bentonite chips
10	2	SS	24/24	3 5 7 9			
15	3	SS	24/24	4 7 7 9		**CL** As above, colors change to red and motttled, very moist, fine black lignite fragments.	20 - 40 CSSI Sand
20	4	SS	18/24	2 5 9 12			
25	5	SS	-	4 10 10 12		**ML** Sandy silt, wet, stiff, some clay, light gray brown. Sand content increasing from 25 feet.	2" Sch. 40 PVC well screen, .010" slots
30	6	SS	-	3 9 13 13			
35	7	SS	-	3 6 9 11		**Shale** Bear Paw Shale (?), dry to wet, thinly laminated to massive, weak to soft, dark to light gray.	Nominal 7.25" diam. auger hole 0 to 32 ft.
40						End of Log	Locking security cover not shown
45							
50							
55							
60							
65							
70							
75							
80							
85							
90							
95							

CH2MHILL

Well Number: PNR7

Client: Pioneer Natural Resources
Project: Biere Well Investigation
Location: Popular, MT
Project Number: 157168.O1.IN

Driller: Hansen Environmental, Glasgow, MT
Drilling Method: Hollow Stem Auger, CME 55
Sampling Method: Split Spoon
Logged by: C. Feast
Start/Finish Date: 5/5/2000 to 5/5/2000

Depth (ft)	Sample Info: Number	Type	Recovery (In/in)	6"-6"-6"-6" (N)	Soil Log	Soil Description	Well Drawing	Well Construction Notes
-5								2.6 ft above ground
0						Ground Surface		
						Top Soil		2" Sch. 40 PVC flush jt. threaded casing
5	1	SS	18/24	7 6 7 8		**ML - CL** Silty clay, occ. fine gravel and coase sand grains, black mottles, moist, dense, stiff, med. brown.		Bentonite chips
10								
15	2	SS	24/24	4 3 4 7		**ML - CL** As above, gravel is larger (1/2" minus) and more common. Large cobble at 24 ft.		
20								
25	3	SS	24/24	2 5 7 9		**CL - ML** Silty clay, abundant Fe marbilization and inclusions, stiff, dense, plastic, moist, med to dark brown		
30	8*	SS	18/24	2 2 5 6				Bentonite pellets
35	9*	SS	24/24	2 5 7 9				20 - 40 CSSI Sand
40	10*	SS	14/24	7 12 12 10		**CL** Clay to silty clay as above, increase moisture and plasticity at 36.5 feet, coal frags. med. to dark brown		2" Sch. 40 PVC well screen, .010" slots
	11*	SS	24/24	10 8 7 15				
45	5	SS	20/24	5 12 17 19				
50	6a	SS	24/24	5 14 18 20		**GP - GW** Gravel, sandy, coarse, clean to dirty, wet, brown. Bedded clayey gravel and fine sand in bottom of spoon.		Nominal 7.25" diam. auger hole 0 to 42 ft.
55	6b	SS	24/24	7 12 15 18				Initial hole drilled to 62 feet, shale at 46 feet. Borehole too smeared to complete well. Moved 12 feet east and drilled and sampled to 44 feet. Shale at 44 feet in new hole. SS #'s 8, 9, 10 and 11 from new hole.
60	7	SS	-	4 13 28 30		**CL - Shale?** Bearpaw Shale. Clay to weathered shale, dark grey, platy but massive, no indurated fragments, iron stains and inclusions, plastic and sticky when wetted, increasingly dense and dry with depth, occ. bivalve shell fragments and casts.		
65								
70								
75						End of Log		
80								
85								
90								
95								

CH2MHILL

Well Number: PNR12

Client: Pioneer Natural Resources
Project: Biere Well Investigation
Location: Popular, MT
Project Number: 157168.O1.IN

Driller: Hansen Environmental, Glasgow, MT
Drilling Method: Hollow Stem Auger, CME 55
Sampling Method: Split Spoon
Logged by: C. Feast and C. Peterson/MSE-HKM
Start/Finish Date: 5/1/2000 to 5/1/2000

Depth (ft)	Sample Info: Number	Type	Recovery (In/In)	6"-6"-6"-6" (N)	Soil Log	Soil Description	Well Construction Notes
-5							
0						Ground Surface	3.1 ft above ground
						Top Soil Silt, clayey, moist, med. brown	
5	1	SS	20/24	4 7 7 7		**CL-ML** Sandy and silty clay, dense, mosit, stiff, trace orange mottling, med.brown.	
10	2	SS	20/24	2 4 6 7			
15	3	SS	24/24	3 5 9 10		**CL** Clay, lean, occ. 1/4" minus rounded gravel, very moist, mottled med.brown and gray, trace iron staining, plastic, stiff, med. brown.	
20	4	SS	0/24	3 7 9 11			2" Sch. 40 PVC flush jt. threaded casing
25	5	SS	24/24	3 7 8 13		**CL** Clay, lean, gravelly and sandy, very moist, occ. gypsum xtals and coal or charcoal fragments, med. brown.	
30	6	SS	24/24	3 6 8 11			
35	7	SS	2/24	1 4 7 10		**CL** Clay, lean, occ. fine gravel, stiff, dense, occ gypsum xtals and iron oxide staining, very moist, dark brown.	Bentonite chips
40	8	SS	24/24	4 8 11 15			
45	9	SS	24/24	3 13 16 19		**ML** Silt, clayey, very stiff, moist, light to med. brown becoming more gray with depth. Moisture increase, bedding plans and gray mottling, more evident from 50 -52 ft.	
50	10	SS	16/24	6 11 18 32			Bentonite pellets
55	11	SS	24/24	12 45 38 50/4			
60	12	SS	24/24	12 20 22 29		**SW - GP** Sand and Gravel, sand is well graded, fine grained, gravel poorly graded from fine to coarse, mostly clean with occ. thin silty beds, wet, light gray to light brown.	20 - 40 CSSI Sand
65	13	SS	12/24	8 8 26 36/3			
70	14	SS	21/24	8 11 11 10			2" Sch. 40 PVC well screen, .010" slots
75	15	SS	12/24	-			
80	16	SS	14/24	14 24 47 50/5		**Shale** Bear Paw Shale, Dense clay - weathered shale, massive, damp, occ. partings, slickensides and concoidal fractures in core, dark gray.	Nominal 7.25" diam. auger hole 0 to 80 ft.
85							Locking security cover not shown
90						End of Log	
95							

Well Drawing

CH2MHILL

Well Number: FPB93-3

Client: Pioneer Natural Resources
Project: Biere Well Investigation
Location: Popular, MT
Project Number: 157168.01.IN

Driller:
Drilling Method: Mud Rotary
Sampling Method:
Logged by: J.N. Thamke, USGS
Start/Finish Date: to 6/24/1993

Depth (ft)	Sample Info: Number	Type	Recovery (in/in)	6"-6"-6"-6" (N)	Soil Log	Soil Description	Well Drawing	Well Construction Notes
-5								
0						Ground Surface		1.6 ft. above ground
5								4-in type PVC riser
10						Clay loam and gravel, caramel-brown		Surface casing (not shown)
15								
20								
25								Bentonite Chips
30						**GC** Clay and gravel, mostly coarse to very coarse gravel, caramel-brown		
35						**Sand** Sand, fine-grained, caramel-brown		
40						Gravel and sand, mostly fine gravel, caramel-brown		
45						Sand and cobbles		Natural Cuttings
50						sand and large cobbles		
55								4-in type PVC screen 0.025 slot
60								
65								24 foot sump
70						**Shale** Shale, dark-gray, smooth, small calcareous pieces (Bearpaw Shale)		
75								
80								
85						*End of Log*		
90								Log and well construction from USGS Open File Report 95-749
95								

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB93-3	
Location number: 28N51E22CBCB01	
Geologic unit: Glacial deposits	
Lithology:	
Clay loam and gravel, caramel-brown	0-25
Clay and gravel, mostly coarse to very coarse pebble gravel, caramel-brown	25-33
Sand, fine-grained, caramel-brown	33-40
Gravel and sand, mostly fine pebble gravel, caramel-brown	40-46
Sand and cobbles	46-50
Sand and large cobbles	50-56
Shale, dark-gray, smooth, small pink calcareous pieces (Bearpaw Shale)	56-81
Completion details:	
Well completion:	
4-in. PVC casing, with breather cap	+1.6-52
4-in. PVC factory-slotted casing (0.025-in. slot size)	52-57
4-in. PVC casing, with end cap for sediment trap	57-81
Finish:	
Bentonite grout	0.5-44
Natural cuttings	44-81
Surface completion:	
6-in. steel protective casing, with locking cover	+1.6-2.4
2x2-ft cement pad	0-0.5

Remarks: Well drilled using mud rotary method; completed on June 24, 1993. Site geologist, J.N. Thamke. The purpose of this site is to provide a deep well and a shallow well in glacial deposits to measure vertical differences in water quality and density. This well is the deeper of two wells at the site; well FPB93-3A is the shallow well.

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB93-3A	
Location number: 28N51E22CBCB02	
Geologic unit: Glacial deposits	
Lithology:	
Clay and gravel, medium-sized pebbles, some sand	0-12
Clay and gravel, minor amounts of iron staining on clay; gravel more abundant than in interval above	12-20
Clay and gravel, mostly fine pebble gravel	20-26
Gravel, clay, and sand, black and brown; mostly coarse pebble gravel and fine sand	26-31
Sand and gravel, caramel-brown; mostly coarse pebble gravel	31-36
Gravel, very coarse pebble gravel	36-46
Gravel and sand, mostly very coarse pebble gravel	46-51
Completion details:	
Well completion:	
4-in. PVC casing, with breather cap	+1.8-41
4-in. PVC factory-slotted casing (0.025-in. slot size)	41-46
4-in. PVC casing, with end cap for sediment trap	46-49
Finish:	
Bentonite grout	0.5-37
Silica sand pack	37-51
Surface completion:	
6-in. steel protective casing, with locking cover	+1.8-2.2
2x2-ft cement pad	0-0.5

Remarks: Well drilled using mud rotary method; completed on June 25, 1993. Site geologist, J. N. Thamke. The purpose of this site is to provide a deep well and a shallow well in glacial deposits to measure vertical differences in water quality and density. This well is the shallower of two wells at the site; well FPB93-3 is the deep well.

Form 9-593 D

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
CONSERVATION DIVISION

Proprietary / Confidential information
U.S. Gov't Use Only

INDIVIDUAL WELL RECORD

Sec. 22
T. 28 N
R. 51 E
Principal Mer.
Ref. No. 56

INDIAN LAND: API # 25-085-21336
Date June 23, 1981

Reservation Ft. Peck Al.
14-20-0256-5066

Lessee Texas Oil & Gas Corporation
Operator ~~Texas Oil & Gas Corporation~~ TXO Production
Well No. SWD #1

State Montana
County Roosevelt
Field Unnamed E Popular Creek
District Billings
Subdivision NW SE NW

Location 1803' from N line and 1853' from W line of Section 22

Drilling approved May 8, 1981
Drilling commenced May 13, 1981
Drilling ceased May 25, 1981
Completed for production 6-20, 1981
Abandonment approved ____, 19__

Well elevation 2085 Gr. feet
Total depth 960 PB 850 feet
Initial production Dry
Gravity A. P. I. ____
Initial R. P. ____

Geologic Formations		Productive Horizons		
Surface	Lowest tested	Name	Depths	Contents
Bearpaw		Judith River	785-816	

WELL STATUS

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1981					SWDW							
1984						NIA SRA						

Remarks Will be P&A in Spring 1984

mth

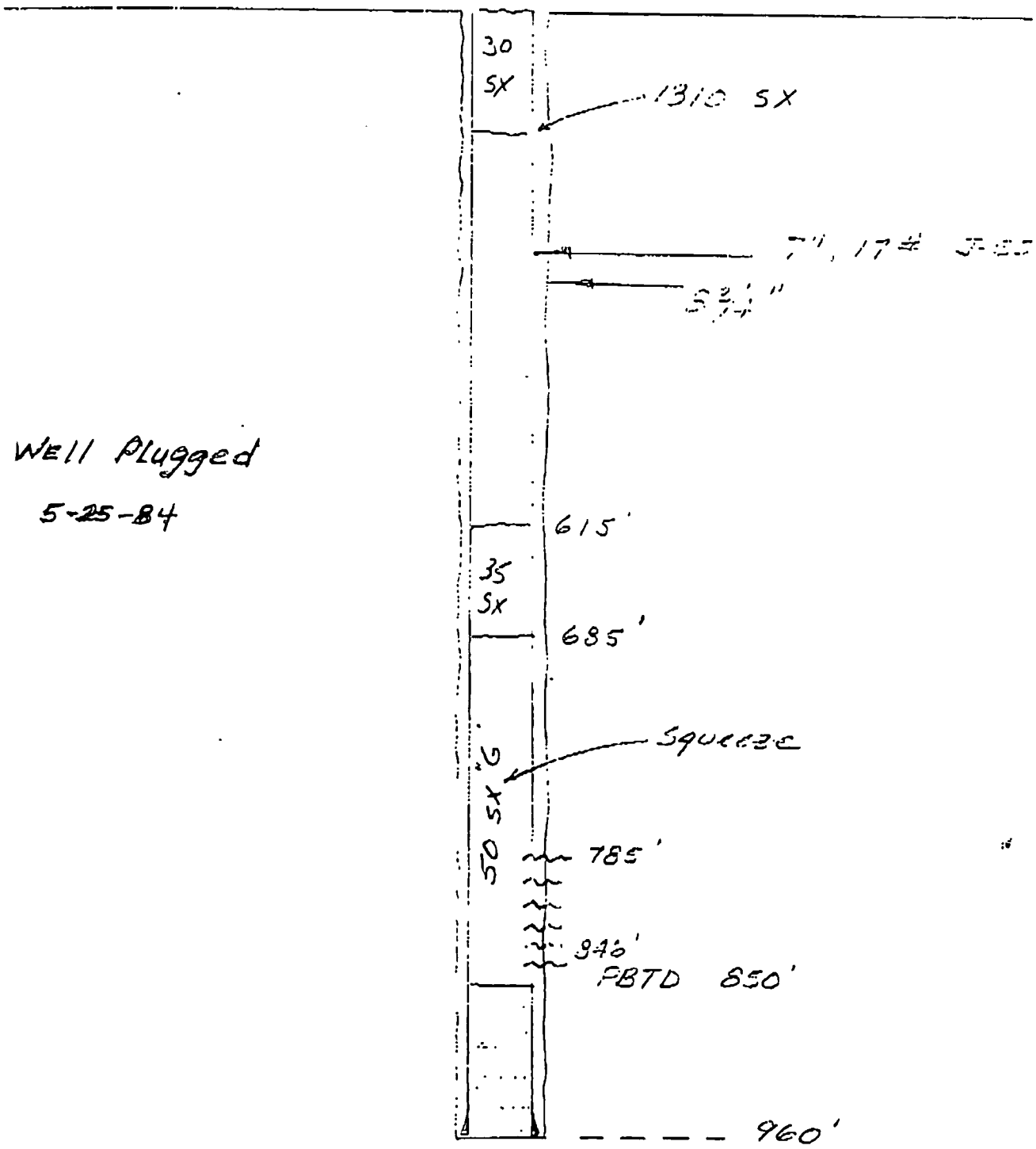
~~Buckles~~ TXD SWD #1

Casing Record:

7"cc @ 960' w/1310 sx.

BUCKLES SWD # 1
NW SE NW SEC. 22, T. 28 N., R. 51 E.
Roosevelt Co., MT.

14-20-0256-5066



Well Plugged
5-25-84

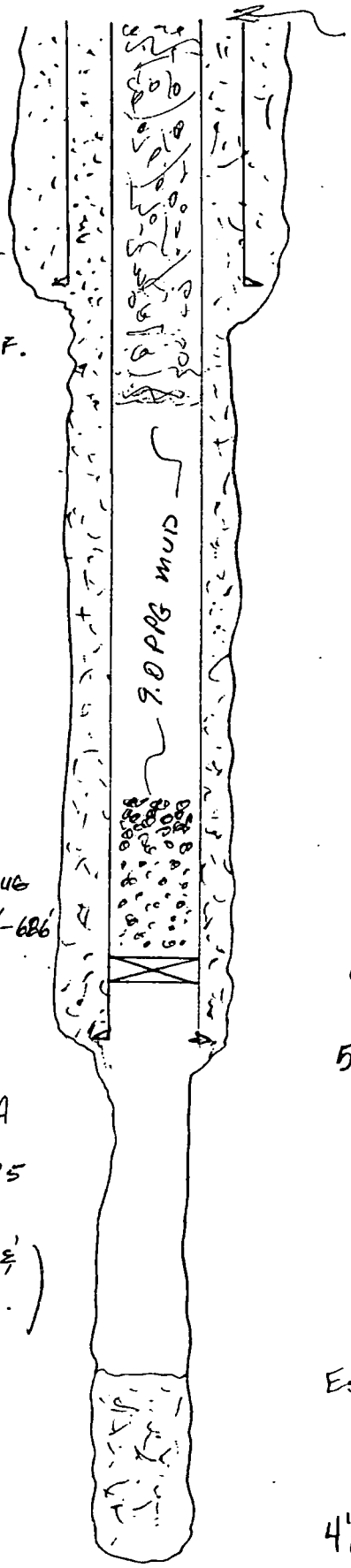
Judith River

MESA PETROLEUM CO.

ONSHORE DIVISON

Subject _____

Prepared By _____ Date _____



16" & 5½" - CUTOFF @ 4' BGL

BIERE RELIEF WELL 25' NNE OF BIERE 1-22

1985

10 SX CEMENT PLUG SET @ 93' — SURF.

16" @ 45' TOC SURF

128' STATIC T = 204°F BEFORE RUNNING 5½"

10 SX PLUG SET @ 589'-686'

660' STATIC T = 184°F

CIR @ 686'

5½ @ 699' TOC SURF

WELL P&A 8-29-85 (WELLTECH & WESTERN CO.)

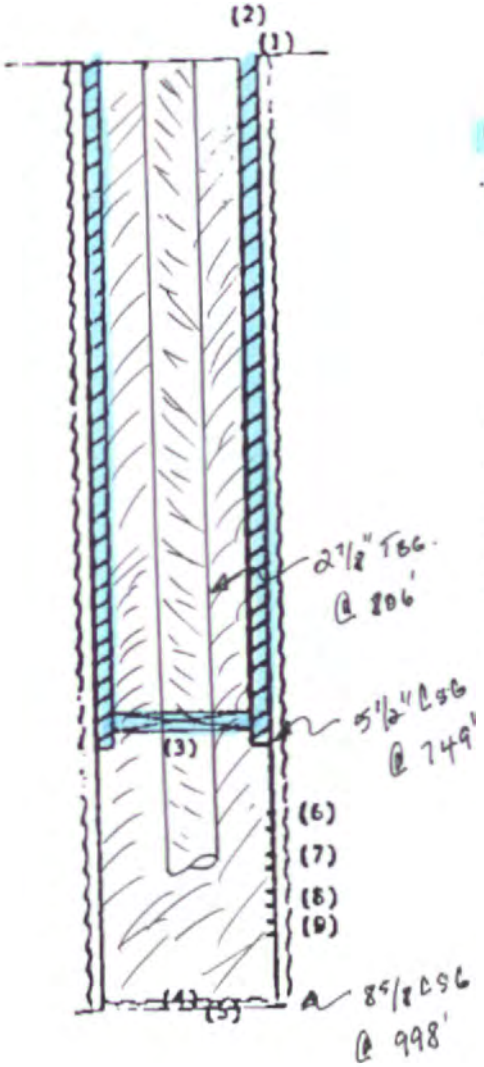
EST TOC IN OPEN HOLE 800'

4¼" OPEN HOLE 699' to 900'

RE1

MESA [illegible] CO.
Biere #1 SWD
1750' FSL & 140' FWL NWSW
Sec. 22, T28n, R51e
Roosevelt County, Montana

(BIERE #1 SWDW)



Grd. 2075' -- KB 2087' (2087)

(1) 8 5/8" - 24# STAC, Rge 2 set @ 998' KB cmt. w/500 sxs., cir. to surface

(2) 5 1/2" 15.5# Set @ 748.90', cmt. w/25 sxs., cir. to surface

(3) Cast Iron Bridge Plug set at 740'. Cement 5 1/2" casing from CIBP to Surface.

(4) PBTD @ 949' KB

(5) TD @ 998' KB

(6) Perf. 796-800 4 Hpf

(7) Perf. 804-808 4 Hpf

(8) Perf. 812-820 4 Hpf

(9) Perf. 825-834 4 Hpf

WELL P&A ON 9-16-84

BY FILLING CSG. (5 1/2") & TBG (2 7/8") W/ 250 SXS. CLASS 'H' CEMENT.

CSG. CUTOFF 4' BELOW GL.

Form No. 3

NOTICE
THIS FORM BECOMES A PERMIT WHEN STAMPED APPROVED BY AN AGENT OF THE BOARD.

(SUBMIT IN QUADRUPLICATE)
TO

BOARD OF OIL AND GAS CONSERVATION
OF THE STATE OF MONTANA

BILLINGS OR SHELBY

MAC 36-3.18(10)-818020
MAC 36-3.18(10)-818030
MAC 36-3.18(10)-818140
MAC 36-3.18(10)-818170
MAC 36-3.18(10)-818200
MAC 36-3.18(10)-818310
MAC 36-3.18(10)-818330
MAC 36-3.18(14)-818380

SUNDRY NOTICES AND REPORT OF WELLS

Notice of Intention to Drill		Subsequent Report of Water Shut-off	
Notice of Intention to Change Plans		Subsequent Report of Shooting, Acidizing, Cementing	
Notice of Intention to Test Water Shut-off		Subsequent Report of Altering Casing	
Notice of Intention to Redrill or Repair Well		Subsequent Report of Redrilling or Repair	
Notice of Intention to Shoot, Acidize, or Cement		Subsequent Report of Abandonment	X
Notice of Intention to Pull or Alter Casing		Supplementary Well History	
Notice of Intention to Abandon Well		Report of Fracturing	

(Indicate Above by Check Mark Nature of Report, Notice, or Other Data)

October 5, 1984

Following is a {notice of intention to do work / report of work done} on land {owned / leased} described as follows:

LEASE Biere

MONTANA (State) Roosevelt (County) Poplar (Field)

Well No Biere #A-1 (SWD) 22 (No. sec.) 28N (Township) 51E (Range) (Meridian)

The well is located 1750 ft. from {~~N~~ / S} line and 140 ft. from {~~E~~ / W} line of Sec. 22

LOCATE WELL SITE ACCURATELY ON PLAT ON BACK OF THIS FORM.

The elevation of the ground or K.B. above the sea level is 2087' KB

READ CAREFULLY **DETAILS OF PLAN OF WORK** READ CAREFULLY

(State names of and expected depths to objective sands, show sizes, weights, and lengths of proposed casings, indicating points, and all other important proposed work (particulars) with details of Shooting, Acidizing, Fracturing.)

DETAILS OF WORK
RESULT

Subject well was plugged on 9/15/84 by squeezing perfs w/140 sxs class "H" cement and filling 5½" casing and tubing w/110 sxs class "H" cement. Cut casing 4' below ground level. Welded cap on casing.

RECEIVED

OCT 5 1984

PRODUCTION RECORDS

Approved subject to conditions on reverse of form

Date

By

District Office Agent Title

Company Mesa Petroleum Co.

By Randy Nordsven
Randy Nordsven

Title Regulatory Agent

Address P. O. Box 2009 Amarillo TX 79189

BOARD USE ONLY
API WELL NUMBER

NOTE—Reports on this form to be submitted to the appropriate District for approval

WHEN USED AS PERMIT TO DRILL, PERMIT EXPIRES 30 DAYS FROM DATE OF APPROVAL IF WELL NOT SPUDDED OR EXTENSION REQUESTED.

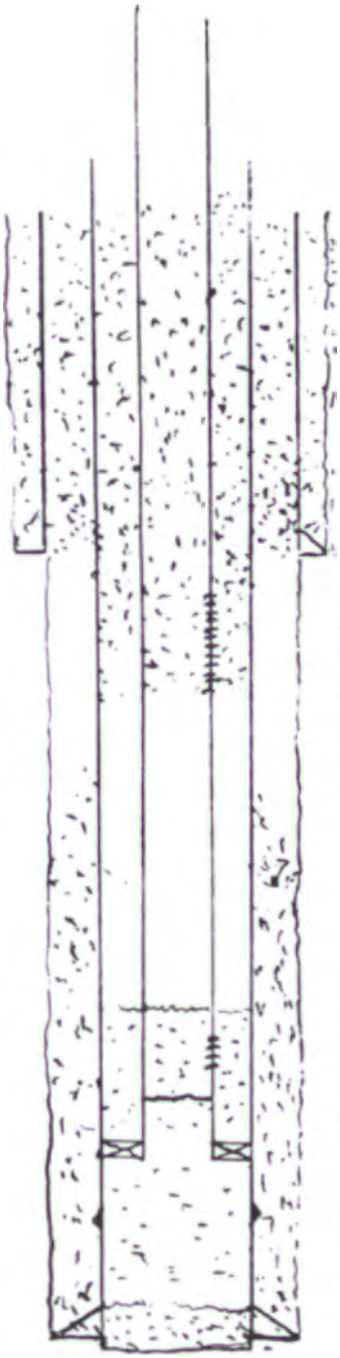
[redacted]

MESA PETROLEUM CO.

ONSHORE DIVISON

Subject P&A SKETCH

Prepared By _____ Date _____



BIERE 1-22
1980' FS - 660' FWL
22 - 28N - 51E
ROOSEVELT CO, MT

ELEV 2086 KB
2074 GL

SPUDDED @ 4 PM 5-6-70

24 jts 8 5/8" 24# @ 741' CMT/465 SXS
Perf 12 Holes 998'-996' - Pumped 30 SXS CLASS "H"
Pumped 85 SXS DN 5 1/2" Csg
Pumped 25 SXS DN 8 5/8" Csg
Pumped 20 SXS DN 2 7/8" TBG

698'-876' JUDITH RIVER
3200'-3570 DAKOTA
4840'-4992' TYLER
5155'-5288' KIBBY
5516'-5543 CLARKS "A"
5635'-5678' " "B"
5788-5805' " "C"

TOC Plug 5435'-5750' INSIDE & OUTSIDE of TBG (30 SXS "H")
Perf TBG - 4 Holes @ 5750'
TOC IN TBG @ 5760' (50 SXS Class "H") Plug
PKR @ 5766.81' KB w/ 2 7/8" J-55 EUE 8RD 6.7# @ 5766'

JET NOTCHED @ 5791' w/2000 gal 7.5% HCl
PBTD 5803' KB
175 jts 15# J-55 STAC 5.5" @ 5845' KB CMT w/675 SXS

RE1

BILLINGS OR SHELBY

MAC 36-3.18(10)-S18330
MAC 36-3.18(14)-S18380

OCT 1984 RECEIVED OIL & GAS CONS. COMM. STATE OF MONT. BILLINGS

SUNDRY NOTICES AND REPORT OF WELLS

Notice of Intention to Drill		Subsequent Report of Water Shut-off	
Notice of Intention to Change Plans		Subsequent Report of Shooting, Acidizing, Cementing	
Notice of Intention to Test Water Shut-off		Subsequent Report of Altering Casing	
Notice of Intention to Redrill or Repair Well		Subsequent Report of Redrilling or Repair	
Notice of Intention to Shoot, Acidize, or Cement		Subsequent Report of Abandonment Produced	X
Notice of Intention to Pull or Alter Casing		Supplementary Well History	
Notice of Intention to Abandon Well		Report of Fracturing	

(Indicate Above by Check Mark Nature of Report, Notice, or Other Data)

September 26, 1984

Following is a {notice of intention to do work / report of work done} on land {owned / leased} described as follows:

LEASE Biere

MONTANA (State) Roosevelt (County) Poplar (Field)

Well No. 1-22 C NW SW 22 (m. sec.) 28N (Township) 51E (Range) (Meridian)

The well is located 1980 ft. from {N / S} line and 660 ft. from {E / W} line of Sec. 22

LOCATE WELL SITE ACCURATELY ON PLAT ON BACK OF THIS FORM.

The elevation of the ground or K.B. above the sea level is 2086' KB

READ CAREFULLY **DETAILS OF PLAN OF WORK** READ CAREFULLY

(State names of and expected depths to objective sands; show size, weights, and lengths of proposed casings, cementing points, and all other important proposed work, particularly all details of Shooting, Acidizing, Fracturing.)

DETAILS OF WORK
RESULT

Subject well was plugged on 9/17/84 as follows: squeezed perfs at 5791' with 50 sxs cement. Top of cement at 5760'. Perforated tubing at 5750', spotted 30 sxs cement inside and outside of tubing from 5435' to 5750'. Perforated tubing from 993'-996' and pumped 50 sxs cement down tubing, pumped 85 sxs cement down 5-1/2" production casing. Pumped 220 sxs cement down 8-5/8" surface casing. Cut off casing 4' below ground level. Welded cap on 8-5/8" casing, dumped 10 sxs cement on top of cap. All casing and tubing was left in well.

LOCATION INSPECTED & APPROVED:

Approved subject to conditions on reverse of form

Date AUG - 5 1986

By Claire F. Humphrey by District Office Agent Title

Company Mesa Petroleum Co.

By Randy J. Nordquist

Title Regulatory Agent

Address P.O. Box 2009, Amarillo, TX 79189

806-378-1000

BOARD USE ONLY
API WELL NUMBER
25 (STATE) 195 (COUNTY) 21047 (WELL)

NOTE:—Reports on this form to be submitted to the appropriate District for approval

WHEN USED AS PERMIT TO DRILL, PERMIT EXPIRES 90 DAYS FROM DATE OF APPROVAL IF WELL NOT SPUDDED OR EXTENSION REQUESTED.

OVER X 206

xc: MOACC 0+3, Denver, Partners, Well File, Acctg, Cent Rcds, RN

Locate well by footage measurement from legal subdivision line, lease or property line and nearest drilling or producible well, if any.

Form No. 2
File at
Billings
or Shelby

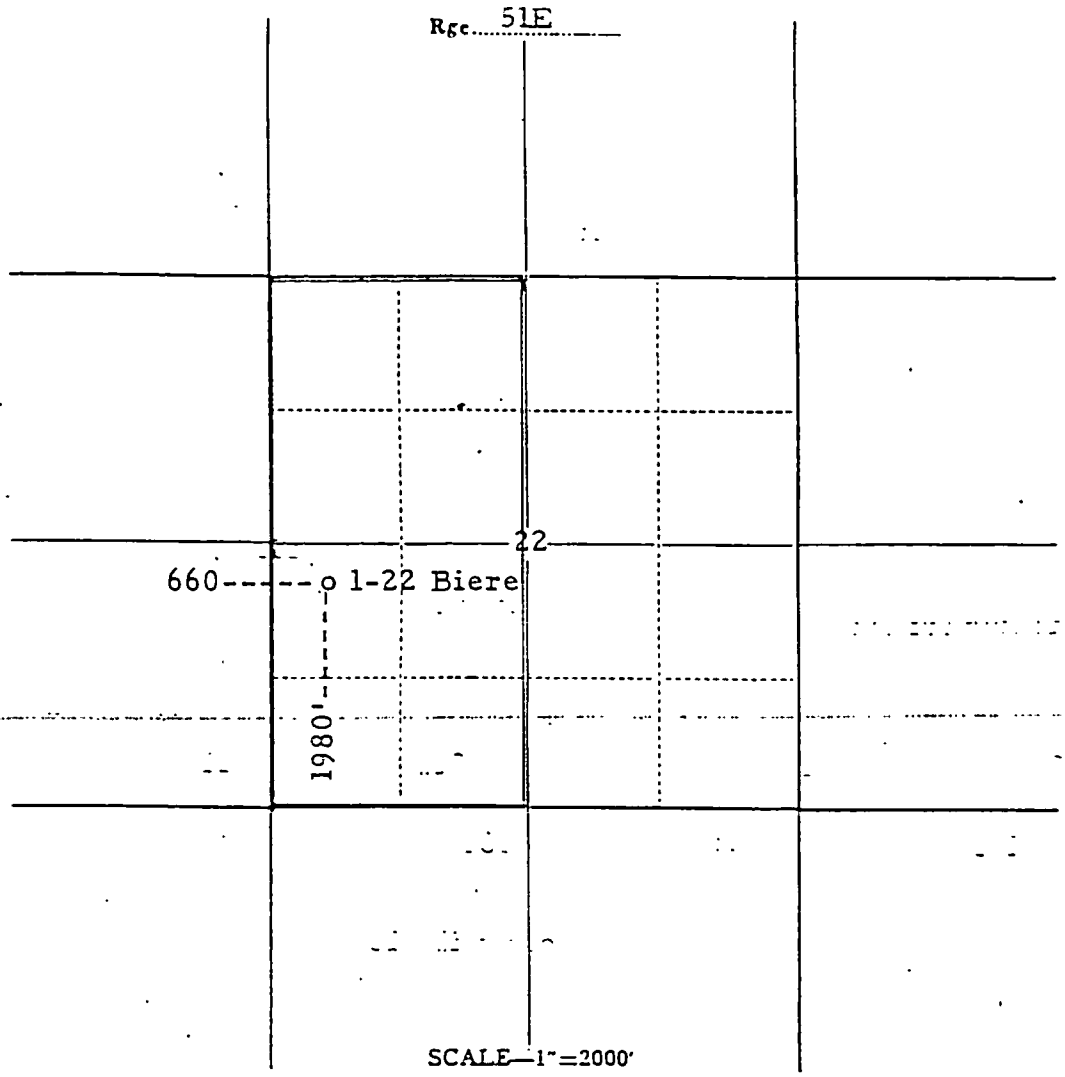
Rge. 51E

Form No. 2
File at
Billings
or Shelby

Locate
Well
Correctly

Locate
Lease
Boundary

Twp. 28N



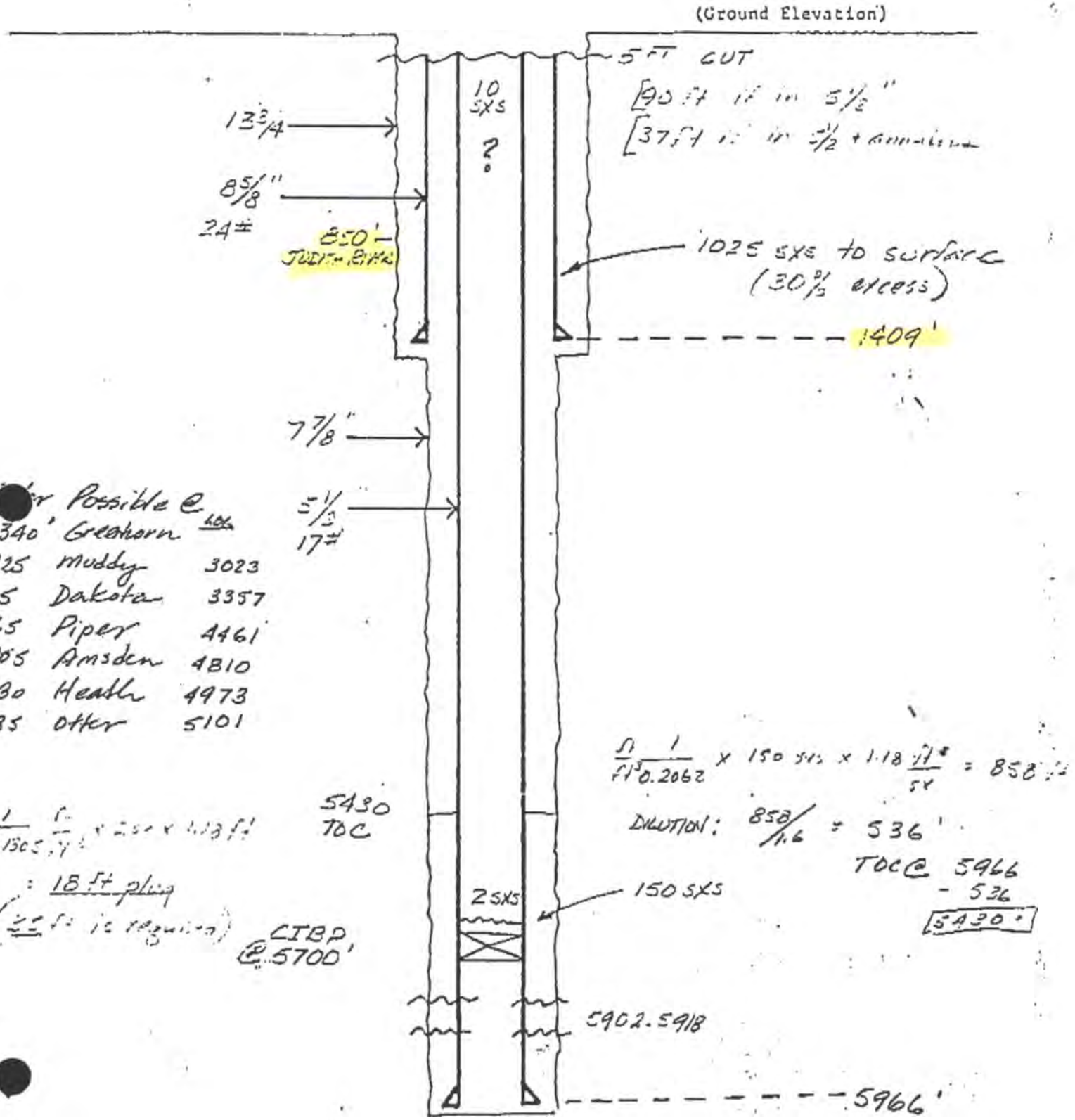
SCALE—1"=2000'

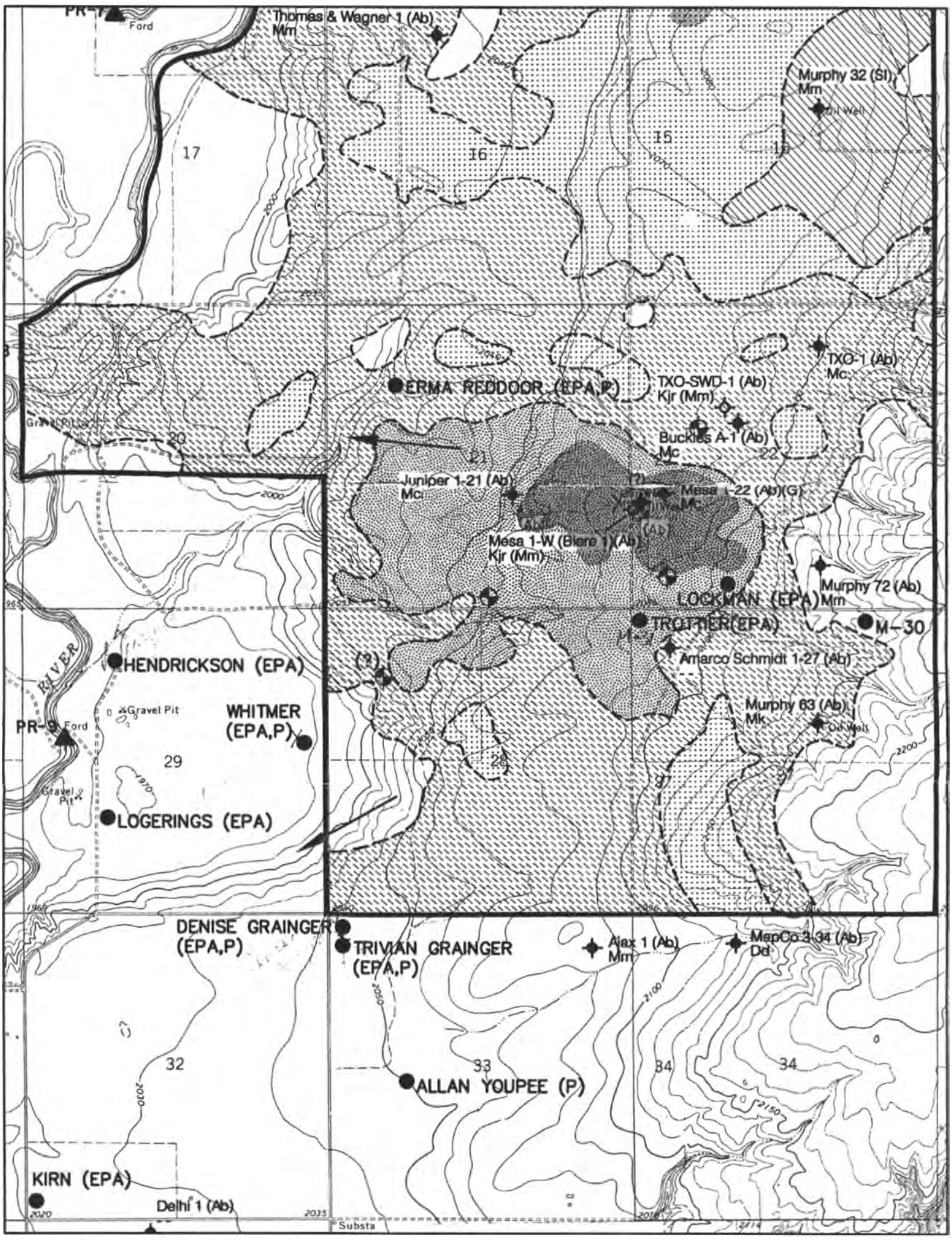
THE NOTICE OF INTENTION TO DRILL THIS WELL IS APPROVED SUBJECT TO THE FOLLOWING CONDITIONS:

1. Any person, before commencing the drilling of any oil or gas well, shall secure from the commission a drilling permit and shall pay to the commission therefor for the following amounts: for each well whose estimated depth is thirty-five hundred (3,500) feet or less, twenty-five dollars ($25.00); from thirty-five hundred and one (3,501) feet to seven thousand (7,000) feet, seventy-five dollars ($75.00); seven thousand (7,000) feet and deeper, one hundred fifty dollars ($150.00).
2. No well is to be spudded in unless the proper surety drilling bond has been posted and approved by the Oil and Gas Conservation Commission of the State of Montana.
3. Cable tool operators must construct an adequate sump to contain all mud and water bailed from the hole.
4. Surface or conductor casing must be properly cemented by an approved method to act as a tie in case an unexpected flow of oil, gas, or water should be encountered, unless special permission has been granted for formation shut-off.
5. Any contemplated change in status of a well such as to plug and abandon, deepen, plug back, redrill, alter casing, etc., must be presented on Sundry Notices and Report of Wells form for approval by agent prior to commencement of work.
6. All substantial showings of oil or gas must be tested for commercial possibilities before drilling ahead. Each such showing must be adequately protected by casing, mud or cement, as drilling progresses.
7. The production string must be cemented unless a formation shut-off or packer is approved by the agent. Sufficient cement must be used to protect the casing and possible productive formation exposed in the process of drilling not otherwise protected.
8. All production strings of casing must be tested by bailing or pressure to determine if there is a tight bond with the formation or possible leaks in the casing. The results of the test must be reported on Sundry Notices and Report of Wells form, said report to include the size, weight, thread and length of casing, amount of cement used, and date work is done. If test shows failure, the defect must be corrected before any drilling operations are resumed.
9. A satisfactory drilling record must be kept for each tour, showing top and thickness of each and all formations drilled and all other information of value, one copy of which is to be kept at the rig while drilling is in progress for examination when an agent visits the well.
10. All producing wells must be marked with name of the operator, number of the well, and location, using reasonable precautions to preserve these markings at all times.
11. Copies of all directional surveys, electrical logs, or tops from electrical log if electric survey is run, formation tests, and cementing record, as furnished by the cementing company, etc., must be filed with the State Inspector of the district together with four copies of the log, upon completion of the well.
12. All work must be done in conformity with the regulations of the Oil & Gas Conservation Commission of the State of Montana, as contained in "General Rules and Regulations," and amendments thereto, as well as regulations prescribed in lieu thereof.

DIAGRAM

Name of Operator JUNIPER [illegible] Lease No. 14-20-0252-4750
Lease Name & Well No. # 1-21 Legal Description NW SE 21-28N-51E
County & State Roosevelt Co., MT. Total Depth 5966 Oil, Gas, or Dry ____
Perforated Intervals 5902-5918
Reviewed By ____ Title ____ Date 9/10/81
Notes Assumed 1.18 ft³/sk yield





GROUNDWATER GRADIENT

PROPOSED MONITOR WELL

● PRIVATE WELL WITH NAME
(EPA)–EPA MONITORING
(P)–PLANTIFF

SCALE: 1:24,000

-N-

Source: Map showing location of possible and confirmed saline-water plumes, surface-water data-collection sites, known brine-injection wells, oil wells, pipelines, storage-tank facilities, and brine evaporation or storage pits in the East Poplar Oil Field Study Area, Northeastern Montana. (Thamke & Craigg, 1997).

VICINITY MAP
EAST POPLAR OIL FIELD

FIGURE #2

MSE-HKM ENGINEERING

14R144.102 | JAN. 2000

Plume.dwg

D

NAMES & DEPTHS OF UNDERGROUND SOURCES OF DRINKING WATER (USDW)

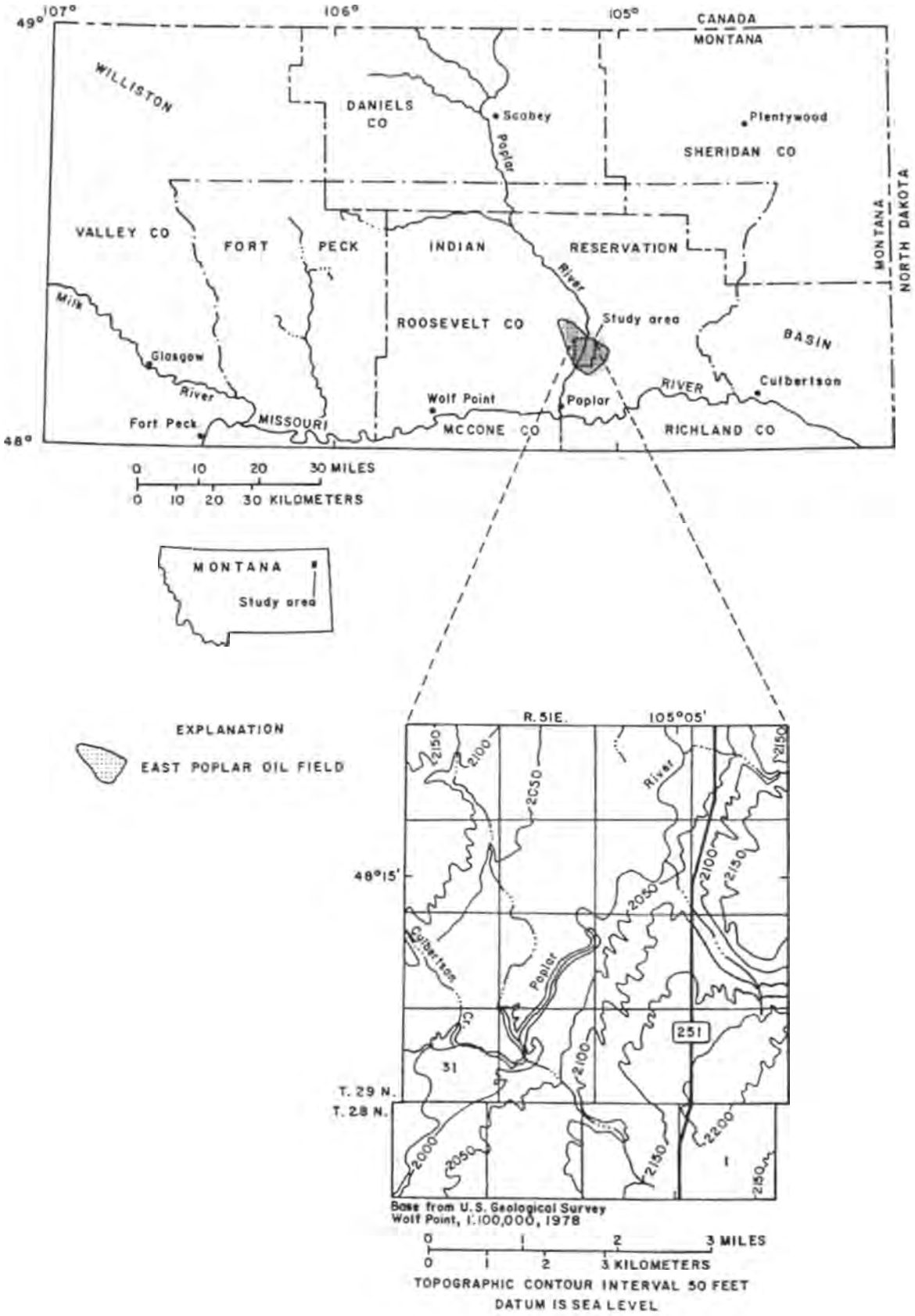


Figure 1.--Location of study area.

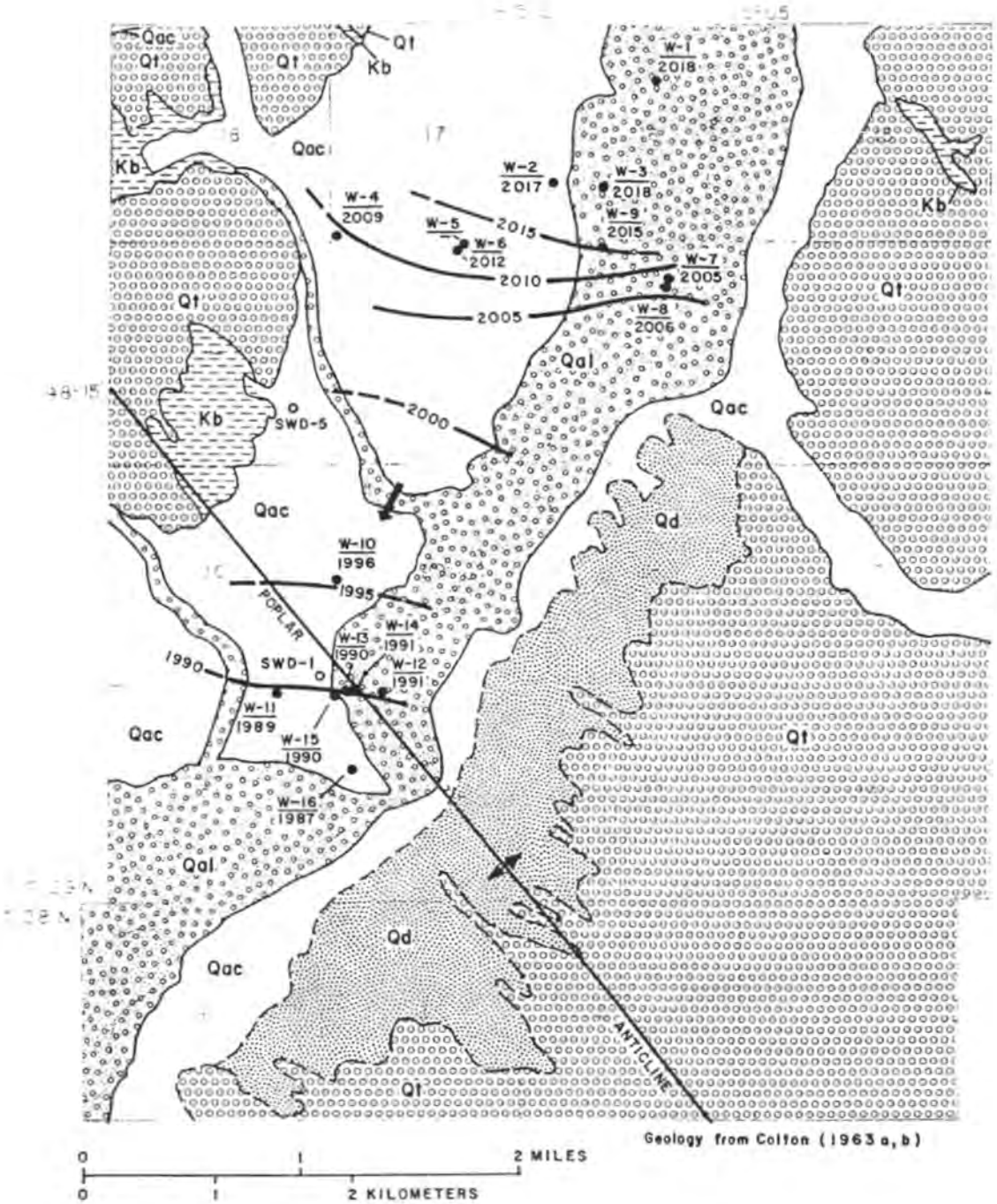


Figure 3.--Generalized geology, location of wells, and altitude of water levels in the alluvial aquifer.

CORRELATION OF MAP UNITS

Qal	Holocene	QUATERNARY
Qd	Pleistocene	
Qac		
Qt		
Unconformity		
Kb	Upper Cretaceous	CRETACEOUS

DESCRIPTION OF MAP UNITS

Qal — ALLUVIUM

Qd — DUNE SAND

Qac — FAN ALLUVIUM AND COLLUVIUM

Qt — TILL

Kb — BEARPAW SHALE

——— — — CONTACT--Dashed where approximately located

—2000— — POTENTIOMETRIC CONTOUR--Shows altitude at which water level would have stood in tightly cased wells, 1982. Dashed where approximately located. Contour interval 5 feet. Datum is sea level

→ GENERAL DIRECTION OF GROUND-WATER FLOW

DATA SITE

W-8 / 2006 • Water-supply, unused, or test well--Upper number is well number; lower number, where shown, is altitude of static water level, in feet above sea level

SWD-1 ○ Brine-disposal well and number

HYDROLOGY

Ground water

The alluvium is the source of most of the water from wells W-1 through W-16. Although several wells penetrate a limited thickness of saturated fan alluvium and colluvium, this limited thickness is not sufficient to yield much, if any, water to wells. The underlying Bearpaw Shale is a relatively impermeable bedrock unit that is a barrier to downward movement of water from the overlying units. As a result, all water in the alluvium eventually moves laterally downvalley.

The altitude of static water levels in wells and the generalized direction of ground-water flow are shown in figure 3. The altitude of static water levels indicates that the overall ground-water movement is from north to south down the Poplar River valley. Localized areas may have directional components of flow toward the river.

Based on chemical analyses of water samples collected from wells (table 2), the quality of ground water in the study area is extremely variable. Sodium, bicarbonate, and chloride are the dominant ions in water from most wells.

Dissolved solids, reported in milligrams per liter, is the sum of all dissolved constituents in the water and in reality is the total of the major ions in solution. Dissolved-solids concentrations of ground water sampled in the study area range from 488 to 114,000 mg/L (milligrams per liter).

In analyzing chemical-quality data, graphical methods are used to identify water types by a determination of the ionic compositions. The water type can be identified by use of chemical-constituent diagrams modified from Stiff (1951). These diagrams represent unit concentrations, in milliequivalents per liter, of the major constituents of each analysis plotted to scale. The diagram provides a visual comparison of the ionic content of each analysis.

The range in unit concentration of the major ions in water from the wells in the study area is too large to use the same scale for all diagrams. Chemical-constituent diagrams, at three different scales, for samples collected in 1982, are shown in figure 4. Visual inspection of the diagrams indicates that the water can be separated into four principal types representing different dominant ions and concentrations of dissolved solids.

Type 1 water contains sodium as the dominant cation and bicarbonate as the dominant anion. The dissolved-solids concentration ranges from 488 to 774 mg/L.

Type 2 water differs from Type 1 in that chloride has replaced bicarbonate as the dominant anion; sodium remains the dominant cation. However, the concentrations of calcium and magnesium vary considerably at each of the wells. The dissolved-solids concentration ranges from 1,610 to 7,210 mg/L. Wells W-4, W-6, and W-9 are located in a straight line (fig. 3) about three-quarters of a mile apart. The chemical composition of the water changes from significant quantities of calcium and magnesium in well W-4 to insignificant quantities in well W-9, and the total concentration of all constituents decreases. The unit concentrations of calcium and magnesium in water from well W-10 are almost the same as for sodium.

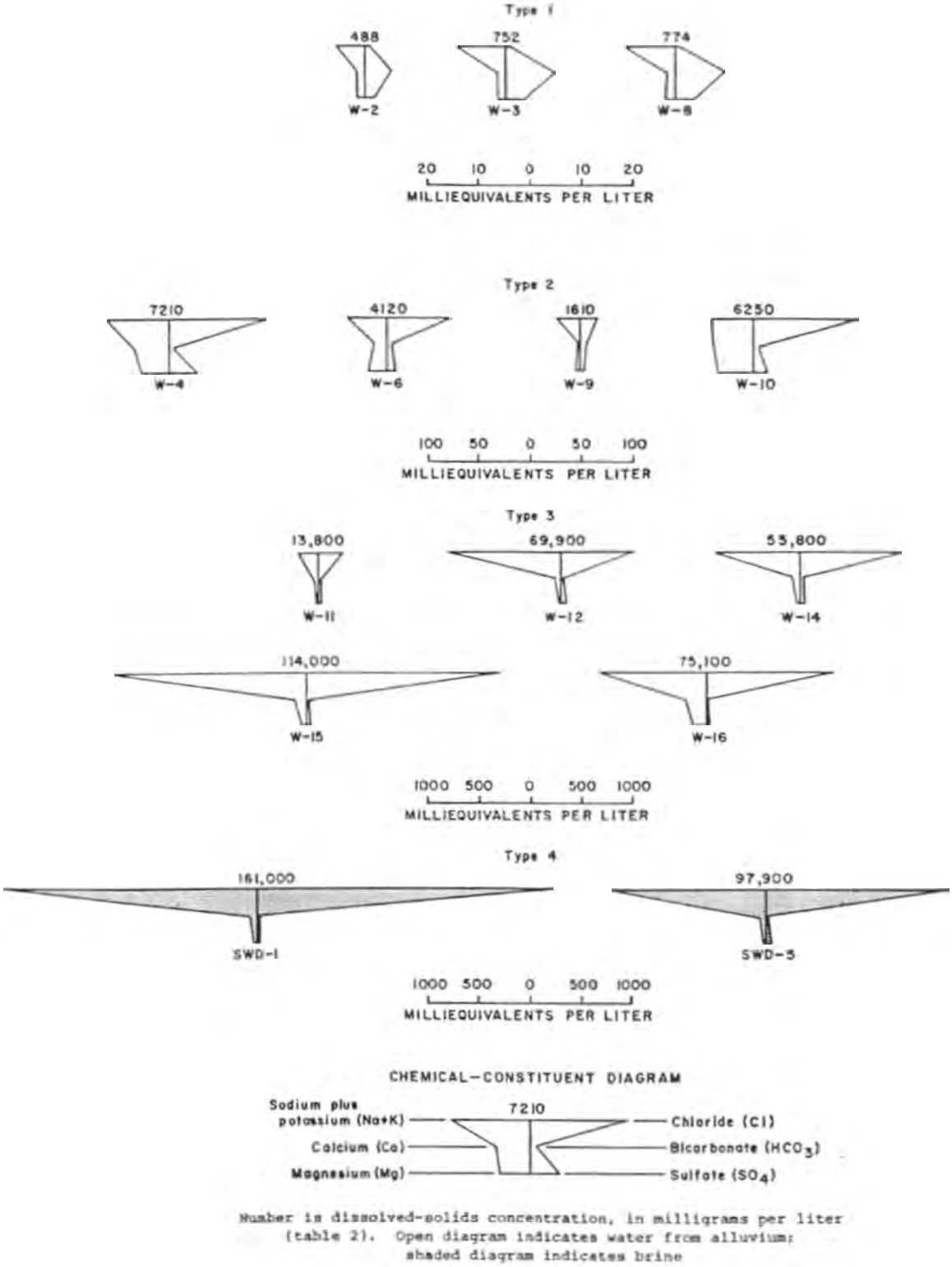


Figure 4.--Chemical-constituent diagrams for water sampled from wells in 1982.

Type 3 water also contains chloride and sodium as the dominant ions; however, the total concentration of constituents is larger than Type 2 water. The dissolved-solids concentration ranges from 13,800 to 114,000 mg/L. These waters are very similar to those of Type 4, which represents the brine being injected into brine-disposal wells SWD-1 and SWD-5. The dissolved-solids concentrations of the brine are 97,900 and 161,000 mg/L. The brine is a mixture of brines from oil-production wells.

The areal distribution of concentrations of sodium, chloride, and sulfate for water from the sampled wells is shown in figures 5-7. The concentrations of sodium (fig. 5) and chloride (fig. 6) in the test wells installed around brine-disposal well SWD-1 reflect the generalized ground-water movement in the area. Water from wells to the south and east have larger concentrations than does water from wells to the north and west. The reason for the smaller concentrations in water from well W-14 than in water from wells W-12 and W-15 is not known. It might be the result of differences in concentration with depth, permeability changes in the alluvium, or localized sources of brine such as pipelines. The concentration of sulfate (fig. 7) does not follow this pattern. Water in well W-16 has a concentration considerably less than water in well W-15. The reason for the decrease is unknown, but the decrease may be caused by geochemical reactions as the water moves through the alluvium.

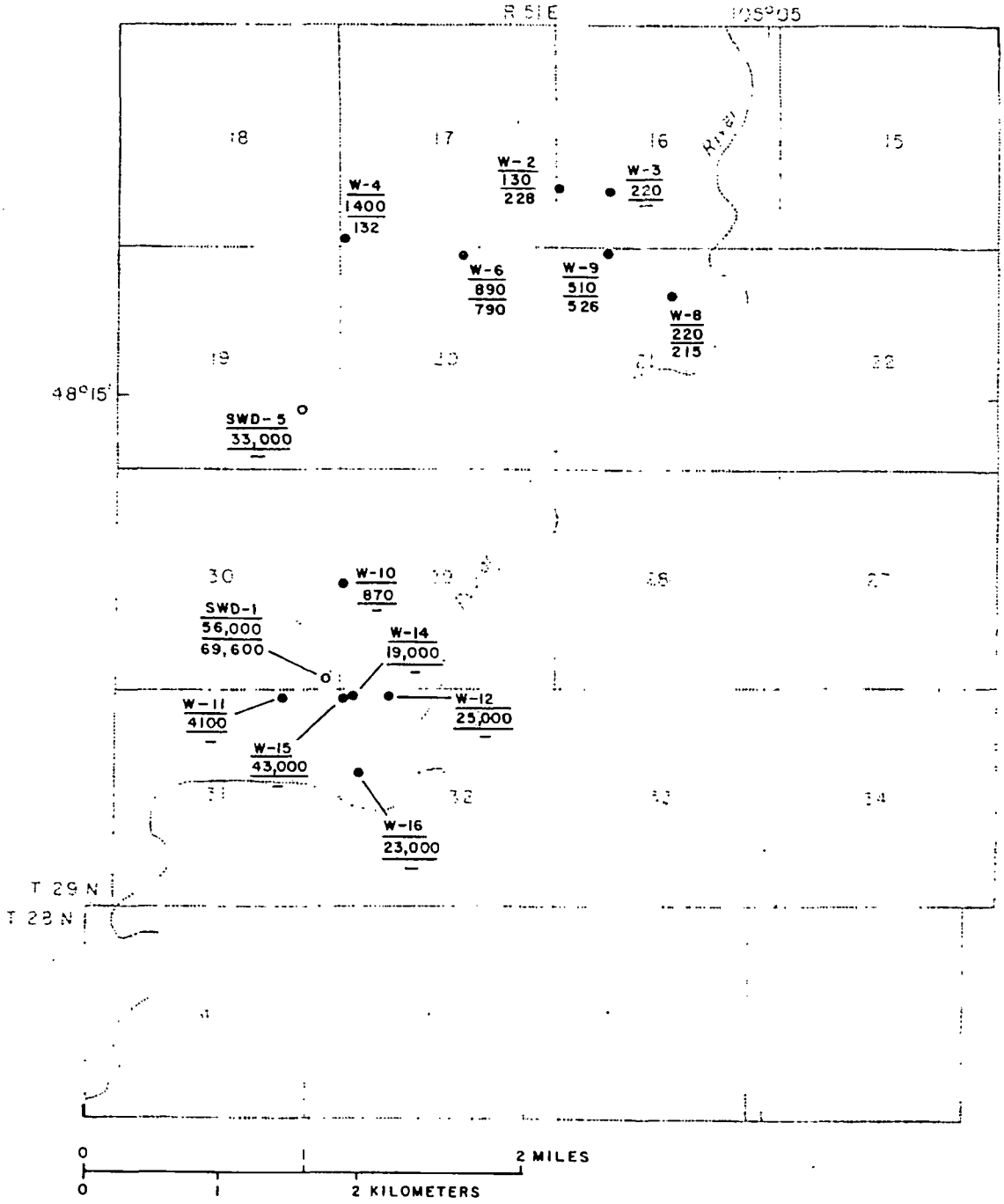
During the sampling of the test wells, the water temperature in well W-15 was 25.0°C, about 15°C greater than in the other test wells. Well W-15 is 238 feet southeast of brine-disposal well SWD-1. The temperature of the injected brine is about 80°-85°C.

Water is a byproduct in the production and recovery of most crude oil. Most of the water comes from the producing zone and represents the quality of water in those zones. In the study area, the Charles Formation is composed of limestone, anhydrite, dolomite, halite, and shale. The halite has been dissolved by the formation water, resulting in the brine produced in the East Poplar oil field. The quality of water in the Charles Formation varies both vertically and laterally throughout the field. The dissolved-solids concentration of samples collected during drill-stem tests, from flows sampled during the drilling process, or from production water ranges from about 16,000 to 201,000 mg/L (Feltis, 1980). The major constituents present in the brine are sodium and chloride.

Surface water

The Poplar River, a tributary to the Missouri River, is a perennial stream in the study area. During September 1981, discharge measurements were made at three of the sites shown in figure 8. Based on these measurements, the reach of the stream between sites PR-1 and PR-5 lost 0.96 ft^3/s to the ground-water system. However, a seep along the right bank about 0.6 mile downstream from site PR-3 indicates that the potentiometric surface was above the level of water in the river and was contributing inflow to the river. Although the net effect of the measurements confirms that this is a losing reach, the ground-water system contributes flow to the stream where perched ground water exists.

During the September measurements, water samples were collected at the three measurement sites for standard analysis and at two additional sites for chloride analysis (table 4 in Supplemental Data at back of report). These analyses indicate



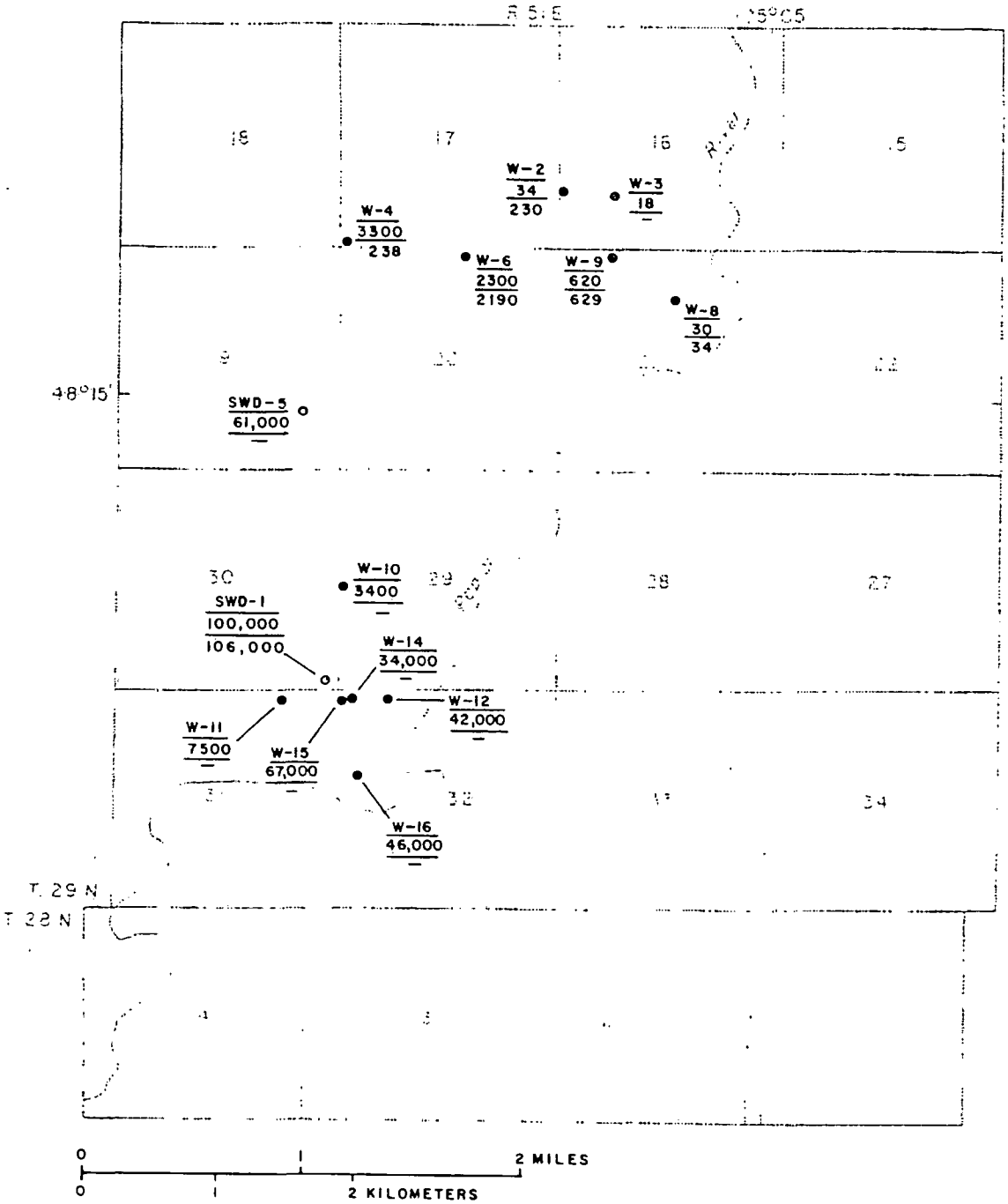
EXPLANATION

DATA SITE

W-4 / 1400 / 132 ● Water-supply, unused, or test well--Upper number is well number; middle number is sodium concentration, in milligrams per liter, of sample collected in 1982; lower number is sodium concentration, in milligrams per liter, of sample collected in 1979

SWD-1 / 56,000 / 69,600 ○ Brine-disposal well--Upper number is well number; middle number is sodium concentration, in milligrams per liter, of sample collected in 1982; lower number is sodium concentration, in milligrams per liter, of sample collected in 1979

Figure 5.--Sodium concentration of water from wells.



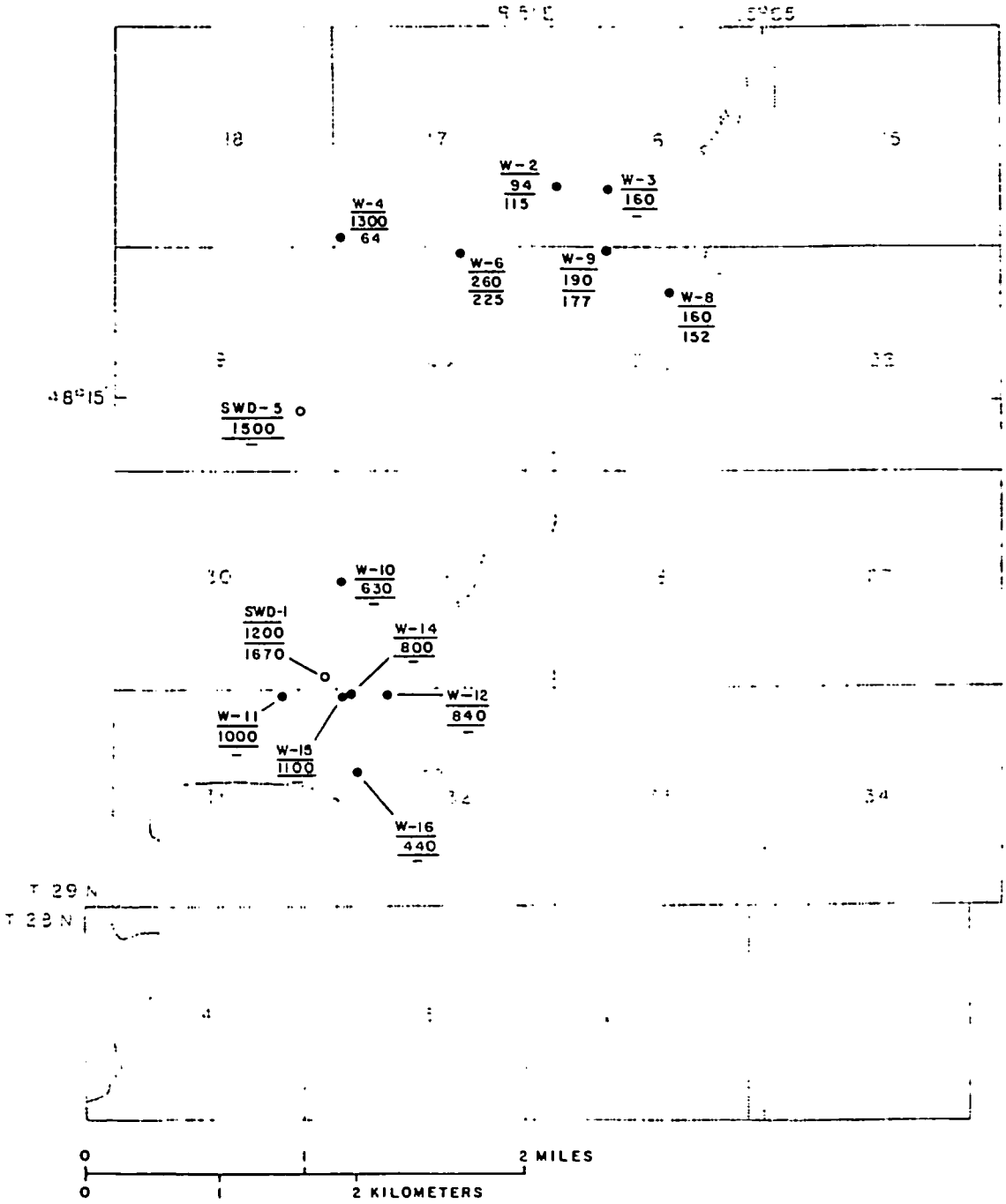
EXPLANATION

DATA SITE

W-4 / 3300 / 238 ● Water-supply, unused, or test well--Upper number is well number; middle number is chloride concentration, in milligrams per liter, of sample collected in 1982; lower number is chloride concentration, in milligrams per liter, of sample collected in 1979

SWD-1 / 100,000 / 106,000 ○ Brine-disposal well--Upper number is well number; middle number is chloride concentration, in milligrams per liter, of sample collected in 1982; lower number is chloride concentration, in milligrams per liter, of sample collected in 1979

Figure 6.--Chloride concentration of water from wells.



EXPLANATION

DATA SITE

W-4 / 1300 / 64 ● — Water-supply, unused, or test well--Upper number is well number; middle number is sulfate concentration, in milligrams per liter, of sample collected in 1982; lower number is sulfate concentration, in milligrams per liter, of sample collected in 1979

SWD-1 / 1200 / 1670 ○ — Brine-disposal well--Upper number is well number; middle number is sulfate concentration, in milligrams per liter, of sample collected in 1982; lower number is sulfate concentration, in milligrams per liter, of sample collected in 1979

Figure 7.--Sulfate concentration of water from wells.

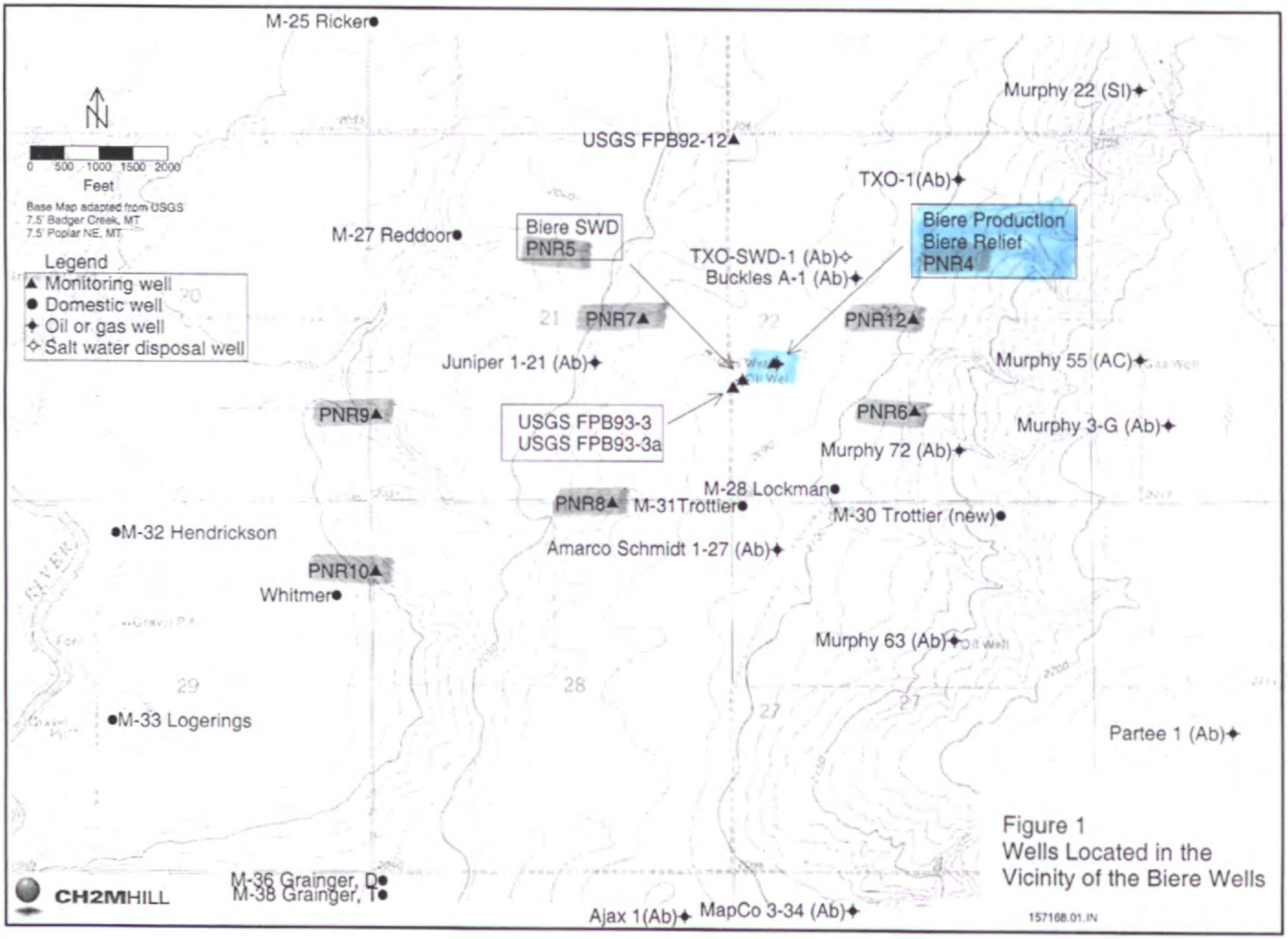


Figure 1
Wells Located in the
Vicinity of the Biere Wells

USGS REPORT 97-4000 By JOANNA THAMKE & STEVEN CRAIGG MAY - 1997

Pleistocene and Holocene fan alluvium and colluvium (shown as Qac in fig. 6) underlies flood plains and consists of slope-wash deposits derived from topographically higher deposits; lithologically the slope-wash deposits are similar to Holocene alluvium (described below). These deposits are not vertically extensive; Colton (1963a,b) reported that the maximum thickness is 20 ft. Laterally, however, these deposits can be more than 1 mi wide, although the average width is much smaller (fig. 6).

Holocene alluvium (shown as Qal in fig. 6) consists of stream-deposited clay, silt, sand, and gravel. The sand and gravel deposits typically occur as lenses of varying thickness. Detailed lithologic descriptions for 19 USGS monitoring wells completed in alluvium along the Poplar River are given in Thamke and others (1996, table 3).

For the purposes of this report, Pleistocene Wiota Gravel, Sprole Silt, glacial till, and dune sand are undifferentiated and are referred to as "glacial deposits"; Pleistocene and Holocene fan alluvium and colluvium and Holocene alluvium are undifferentiated and referred to as "alluvium." Lithologic logs from eight USGS monitoring wells drilled during this investigation indicate that the combined thickness of glacial deposits in the study area ranges from at least 56 to about 100 ft (Thamke and others, 1996, table 3). The combined thickness of alluvium ranges from 22 to 56 ft throughout the Poplar River valley (Thamke and others, 1996, table 3). Colton (1963a,b) reported that, in the vicinity of the study area, thickness of these deposits averages about 50 ft; Levings (1984, table 3) gave a range in thickness of 43-54 ft. Lithologic logs from monitoring wells drilled during this investigation indicate that, in most places, alluvium ranges in thickness from about 32 to 52 ft; a thickness of 22 ft, reported in USGS monitoring well FPB92-14 (located in NE1/4 SE1/4 NW1/4 NE1/4 sec. 21, T. 29 N., R. 51 W.), indicates a local subsurface high of the Bearpaw Shale (Thamke and others, 1996, table 3).

GENERAL HYDROGEOLOGY OF QUATERNARY DEPOSITS

The Quaternary deposits are the sole developed source of ground water for residents of the study area. In general, wells completed in Quaternary deposits provide sufficient yields and, in uncontaminated areas, potable water for domestic purposes. Few wells are completed below the Quaternary deposits because of the lack of water in the underlying Upper Cretaceous Bearpaw Shale which is 700-1,000 ft thick.

Ground-Water Occurrence and Movement

Water in Quaternary deposits occurs mainly under unconfined (water-table) conditions, although locally, conditions are semiconfined due to the heterogeneity of clays, silts, sands, and gravels. Depth to water below land surface in the study area generally ranges from about 5 to 44 ft in alluvium and about 7 to 130 ft in glacial deposits (Thamke and others, 1996, table 1). Fresh water in the Quaternary deposits in the study area is recharged by infiltration of precipitation, streamflow, and fresh water movement from upgradient areas. Water in the Quaternary deposits is discharged by streamflow, evapotranspiration, springs, and water withdrawals. Generalized potentiometric surface and direction of ground-water movement in Quaternary deposits are shown in figure 6 (pl. 1). The altitude of static water level in 1990-93 ranged from about 1,950 to 2,060 ft above sea level (Thamke and others, 1996, table 1). Water in Quaternary deposits east of the Poplar River generally moves westward toward the river where it merges with southward-flowing ground water in the Poplar River valley. Downward movement of water from Quaternary deposits into the underlying Bearpaw Shale probably is not significant because of the relatively impermeable nature of the Bearpaw; downward movement of water from Quaternary deposits into the Bearpaw probably occurs only locally to shallow depths, where minor fractures are present in the upper, eroded surface of the Bearpaw.

Hydraulic Characteristics

Two constant-discharge aquifer tests were conducted during August 1993 to determine general hydraulic characteristics of the Quaternary deposits. Because of the various deposits of clay, silt, sand, and gravel throughout the study area, the hydraulic characteristics may differ locally; hence, ranges are given for the selected hydraulic characteristics.

A constant-discharge aquifer test was conducted on August 18, 1993, in alluvium along the Poplar River, using one pumped well and three observation wells (NW1/4 NE 1/4 sec. 09, T. 29 N., R. 51 E. in Thamke and others, 1996, tables 1, 3, and 4; pl. 1). The general geology of the site consists of Holocene alluvium that unconformably overlies the Bearpaw Shale.

On the basis of lithologic logs of the USGS-installed wells used for the test (FPB92-15, FPB92-16, FPB92-17, and FPB93-1; Thamke and others, 1996, table 3), these deposits consist of interbedded sand of various grain sizes, gravelly sand, and gravel and cobbles; total thickness of the sequence ranges from about 37 to 42 ft. Because topographic relief at the test site is about 0.2 ft, the range in thickness indicates that the surface of the Bearpaw Shale is slightly irregular.

The other constant-discharge aquifer test was conducted on August 19, 1993, in glacial deposits east of the Poplar River, using one pumped well, two observation wells (SE1/4 SE1/4 sec. 33, T. 28 N., R. 51 E. in Thamke and others, 1996, tables 1, 3, and 5; pl. 1). The general geology of the site consists of Pleistocene glacial deposits that unconformably overlie the Bearpaw Shale. On the basis of lithologic logs of the USGS-installed wells used for the test (FPB93-4A, FPB93-4B, and FPB93-4C; Thamke and others, 1996, table 3), these deposits consist of interbedded and unconsolidated clay, silt, sand, and gravel of various sizes, with about 13-20 ft of gravel (Wiota Gravel) consistently present at the base; total thickness of the sequence of deposits is about 60 ft.

The aquifer-test data at the alluvium test site were analyzed using standard curve-matching procedures for unconfined aquifers (delayed gravity-response type curves) of Neuman (1972, 1975). The data plots for this site clearly indicate delayed yield from storage. At the alluvium test site, the mean transmissivity value computed for the three observation wells is 1,900 ft^2/d and the mean hydraulic conductivity value is 63 ft/d. The hydraulic conductivity value is based on a horizontal hydraulic gradient of one; the hydraulic gradient at this site is probably much smaller than one. These values are reasonable for an unconfined sand and gravel aquifer. The aquifer-test data at the glacial deposits test site were analyzed using Theis (1935) methods as described in Lohman (1972). At the glacial deposits test site, the value computed for transmissivity was 3,100 ft^2/d; the computed hydraulic conductivity at this site was 165 ft/d. The hydraulic conductivity value is based on a horizontal hydraulic gradient of one; the hydraulic gradient at this site is probably much smaller than one.

The computed values for storage coefficient are 0.001-0.004 at the site of the alluvium and 0.003-0.01 at the site of the glacial deposits and are anomalously small for an unconfined aquifer. Lohman (1972, p. 40) suggested that the reason for this type of anomaly is that in shorter term aquifer tests of unconfined aquifers, where early time data are used for analysis, "it (storage coefficient) is only an apparent value observed before gravity drainage (is) completed." Therefore, published values of storage coefficient averaging 0.21-0.27 for sand and 0.22-0.25 for gravels are considered to be more reliable than those computed for this study; for example, see Johnson (1967, p. D70).

Ground-Water Quality

The quality of water in Quaternary deposits in the study area is highly variable and is dependent on location relative to sources of contamination. Dissolved solids, reported in milligrams per liter, is the sum of all dissolved constituents in the water and is predominantly composed of the major ions in solution. Sodium, bicarbonate, and chloride are the dominant ions in water from most wells completed in the Quaternary deposits. Of these dominant ions, only chloride generally exhibits a conservative behavior and generally is present in natural water at low concentrations (Hem, 1985). Therefore, concentrations of dissolved solids and chloride ions are used in this investigation to classify types of ground water.

The EPA has established regulations and standards for public drinking-water supplies. These regulations and standards are not used to regulate the quality of water produced from individual privately owned wells, but to serve as guidelines with which to evaluate the water quality. Primary Drinking-Water Regulations[1] are not established for dissolved solids and chloride. However, Secondary Drinking-Water Standards[2] specify SMCL's of 500 mg/L for dissolved solids and 250 mg/L for chloride. Dissolved-solids concentrations in water sampled during 1989-93 from

[1]National Primary Drinking-Water Regulations are established for contaminants which, if present in drinking water, may cause adverse human health effects. Either a Maximum Contaminant Level (MCL) or a treatment technique is specified by these regulations for regulated contaminants. MCL's are health-based and enforceable (U.S. Environmental Protection Agency, 1996).

[2]Secondary Drinking-Water Standards are established for contaminants that can adversely affect the taste, odor, or appearance of water and result in discontinuation of use of the water. These regulations specify Secondary Maximum Contaminant Levels (SMCL), which are esthetically based and nonenforceable (U.S. Environmental Protection Agency, 1996).

wells completed in the Quaternary deposits ranged from 427 to 91,100 mg/L; 26 of the 27 privately owned wells contained water with dissolved-solids concentrations that exceed the SMCL (Thamke and others, 1996, table 6). Chloride concentrations in water sampled during 1989-93 from wells completed in the Quaternary deposits ranged from 7.3 to 58,000 mg/L; 15 of the 27 privately owned wells contained water with chloride concentrations that exceed the SMCL (Thamke and others, 1996, table 6).

On the basis of dominant ions and dissolved-solids concentration, Levings (1984) identified three principal water-quality types from alluvium in the Poplar River valley; a fourth water-quality type, representing the actual brine produced with the crude oil, also was identified. Distinguishing characteristics of the four water types are: Type 1 water is not dominated by the chloride anion and dissolved-solids and chloride concentrations are similar to water in Quaternary deposits in other parts of the reservation; Type 2 water is dominated by the chloride anion and the chloride concentration range typically is 330-4,800 mg/L; Type 3 water is dominated by the chloride anion and the chloride concentration is typically greater than 5,200 mg/L; Type 4 water is actual samples from brine-injection wells. These general water types have been defined in greater detail for this investigation and provide a useful classification to describe water-quality variability within the current study area. Water-quality diagrams (Stiff, 1951) illustrate these representative water-quality types (fig. 8, pl. 1). The water-quality diagrams represent unit concentrations of the major ions, in milliequivalents per liter. Unit concentrations take into account both mass and ionic charge and, therefore, the total milliequivalents per liter of cations (left side of graph) should equal that of the anions (right side of graph). The range in unit concentration of the major ions in water from the wells is too large to use the same scale for all diagrams; therefore, a different scale is used for each of the four water types in figure 8. The characteristics of these four water types are listed in table 3.

Type 1 water from wells completed in the Quaternary deposits is located mostly in the northern and southern thirds of the study area and represents the uncontaminated water quality (fig. 8). The chemical composition of Type 1 water ranges from a sodium bicarbonate to a sodium sulfate, with a few instances of magnesium sulfate, magnesium bicarbonate, or calcium bicarbonate chemical compositions. The dissolved-solids and chloride concentrations of Type 1 water range from 427 to 2,680 mg/L and 7.3 to 260 mg/L, respectively (Thamke and others, 1996, table 6; table 3 in this report). Privately owned wells completed in the Quaternary deposits with Type 1 water are used for drinking-water supply.

Type 2 water from wells completed in the Quaternary deposits is located in various parts of the study area and represents natural ground water that has been moderately contaminated by brine (fig. 8). The chemical composition of Type 2 water is sodium chloride. The dissolved-solids and chloride concentrations of Type 2 water range from 1,170 to 8,860 mg/L and 330 to 4,800 mg/L, respectively (Thamke and others, 1996, table 6; table 3 in this report). Privately owned wells completed in Quaternary deposits containing Type 2 water generally are not used for drinking-water purposes, because the large dissolved-solids and chloride concentrations make the water unpalatable.

Type 3 water from wells completed in the Quaternary deposits is located in two locations—one near the center and one near the southwest quarter of the study area. Type 3 water represents ground water that has been considerably contaminated by brine. The chemical composition of Type 3 water principally is sodium chloride with a few cases of magnesium chloride. The dissolved-solids and chloride concentrations in Type 3 are much larger than Type 2 water, ranging from 10,100 to 91,100 mg/L and 5,200 to 58,000 mg/L, respectively (Thamke and others, 1996, table 6). Privately owned wells completed in Quaternary deposits containing Type 3 water were used in the past for domestic purposes, but are now unused for any domestic purpose.

Type 4 water, which is very similar to Type 3 water, represents the actual brine that is disposed into brine-injection wells. The chemical composition of Type 4 water is sodium chloride. The dissolved-solids and chloride concentrations in brine range from 47,700 to 201,000 mg/L and 27,000 to 120,000 mg/L, respectively (Thamke and others, 1996, table 6).

Electromagnetic Apparent Conductivity

Electromagnetic geophysical methods can be used to measure the cumulative electrical conductivity of the soil and water matrix. The unit of conductivity for these methods is millimho per meter (mmho/m).

Table 3. Characteristics of water types and correlation of electromagnetic apparent conductivity used to delineate saline-water plumes in Quaternary deposits in the East Poplar oil field study area

[Abbreviations: Cl, chloride; HCO_3, bicarbonate; Mg, magnesium; Na, sodium; SO_4, sulfate; mg/L, milligrams per liter; mmho/m, millimho per meter; mi^2, square miles; N/A, not applicable; 10V, 10-meter, vertical-dipole orientation; 20H, 20-meter, horizontal-dipole orientation; 20V, 20-meter, vertical-dipole orientation; 40H, 40-meter, horizontal-dipole orientation. Symbols: ≥, greater than or equal to; <, less than]

Water type	Water use	Major ions	Dissolved-solids concentration range (mg/L)	Chloride concentration range (mg/L)	Electromagnetic apparent conductivity in Area 1 (fig. 11 and 12, pl. 2)	Electromagnetic apparent conductivity in Area 2 (fig. 13 and 14, pl. 2)	Subarea designation (fig. 16, pl. 1)	Saline-water plume type (pl. 3)	Areal extent within geophysical survey (mi^2)
Type 1–Uncontaminated	Suitable for most domestic purposes.	Na-HCO_3, Na-SO_4, Mg-SO_4, Mg-HCO_3, Ca-HCO_3	427-2,680	7.3-260	< 40 mmho/m (10V) or < 60 mmho/m (20H)	< 40 mmho/m (20V) or < 60 mmho/m (40H)	Subarea 1–low electromagnetic apparent conductivity	N/A	9.2
Type 2–Moderately contaminated ground water	Suitable for some domestic purposes; generally not used for drinking water.	Na-Cl	1,170-8,860	330-4,800	≥ 40 mmho/m (10V) and ≥ 60 mmho/m (20H); exclusive of subarea 3	≥ 40 mmho/m (20V) and ≥ 60 mmho/m (40H); exclusive of subarea 3	Subarea 2–moderate electromagnetic apparent conductivity	Type 2	7.6
Type 3–Considerably contaminated ground water	Unsuitable for any domestic purpose.	Na-Cl Mg-Cl	10,100-91,100	5,200-58,000	≥ 50 mmho/m (10V) and ≥ 70 mmho/m (20H)	≥ 50 mmho/m (20V) and ≥ 70 mmho/m (40H)	Subarea 3–high electromagnetic apparent conductivity	Type 3	5.0
Type 4–Brine (from oil production)	N/A	Na-Cl	47,700-201,000	27,000-120,000	N/A	N/A	N/A	N/A	N/A

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LABORATORY ANALYSIS REPORT

MSE-HKM	Project ID:	BIERE WELL SITE, POPLAR OIL FIELD		
Charlie Peterson	Sample ID:	LOCKMAN CULVERT WELL (M-28)		
PO Box 31318	Laboratory ID:	00-54376-3		
Billings, MT 59107-1318	Sample Matrix:	Water		
	Sample Date:	01-Jun-00 1200		
	Received at lab:	05-Jun-00	Reported:	12-Jun-00

	Results	Units	Qual	Reporting Limit	Regulatory Limit	Method	Analyzed	
Calcium	1530	mg/l		1		EPA 200.7	09-Jun-00 1110	MKE
Magnesium	749	mg/l		1		EPA 200.7	09-Jun-00 1110	MKE
Potassium	62	mg/l		1		EPA 200.7	09-Jun-00 1110	MKE
Sodium	14200	mg/l		1		EPA 200.7	09-Jun-00 1110	MKE
Total Hardness as CaCO3	6920	mg/l		1		CALC.	09-Jun-00 1409	RLH
Chloride	25800	mg/l		1		EPA 300.0	08-Jun-00 1228	RLH
Sulfate	1910	mg/l		1		EPA 300.0	07-Jun-00 2040	RLH
Alkalinity as CaCO3	600	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Bicarbonate	732	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Carbonate	<1	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Specific Conductance @ 25 C	58900	umhos/cm		1		SM2510B	09-Jun-00 1745	CAR
Total Dissolved Solids Calculated	44700	mg/l		1		CALC.	09-Jun-00 1409	RLH
pH	7.1	s.u.		0.1		EPA 150.1	05-Jun-00 1600	CAR
Nitrogen, Nitrate plus Nitrite	20.9	mg/l		0.05		EPA 353.2	06-Jun-00 1751	BAS
Iron	8.6	mg/l		0.03		EPA 200.7	08-Jun-00 1802	MKE

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LABORATORY ANALYSIS REPORT

MSE-HKM	Project ID:	BIERE WELL SITE, POPLAR OIL FIELD		
Charlie Peterson	Sample ID:	M-30		
PO Box 31318	Laboratory ID:	00-54376-4		
Billings, MT 59107-1318	Sample Matrix:	Water		
	Sample Date:	01-Jun-00 1230		
	Received at lab:	05-Jun-00	Reported:	12-Jun-00

	Results	Units	Qual	Reporting Limit	Regulatory Limit	Method	Analyzed	
Calcium	126	mg/l		1		EPA 200.7	09-Jun-00 1112	MKE
Magnesium	118	mg/l		1		EPA 200.7	09-Jun-00 1112	MKE
Potassium	7	mg/l		1		EPA 200.7	09-Jun-00 1112	MKE
Sodium	325	mg/l		1		EPA 200.7	09-Jun-00 1112	MKE
Total Hardness as CaCO3	801	mg/l		1		CALC.	09-Jun-00 1410	RLH
Chloride	36	mg/l		1		EPA 300.0	07-Jun-00 2051	RLH
Sulfate	501	mg/l		1		EPA 300.0	07-Jun-00 2051	RLH
Alkalinity as CaCO3	1020	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Bicarbonate	1240	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Carbonate	<1	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Specific Conductance @ 25 C	2380	umhos/cm		1		SM2510B	05-Jun-00 1602	CAR
Total Dissolved Solids Calculated	1740	mg/l		1		CALC.	09-Jun-00 1410	RLH
pH	8.0	s.u.		0.1		EPA 150.1	05-Jun-00 1602	CAR
Nitrogen, Nitrate plus Nitrite	<0.05	mg/l		0.05		EPA 353.2	06-Jun-00 1752	BAS
Iron	5.63	mg/l		0.03		EPA 200.7	08-Jun-00 1808	MKE

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LABORATORY ANALYSIS REPORT

MSE-HKM	Project ID:	BIERE WELL SITE, POPLAR OIL FIELD		
Charlie Peterson	Sample ID:	TROTTIER OLD WELL (M-31)		
PO Box 31318	Laboratory ID:	00-54376-5		
Billings, MT 59107-1318	Sample Matrix:	Water		
	Sample Date:	01-Jun-00 1340		
	Received at lab:	05-Jun-00	Reported:	12-Jun-00

	Results	Units	Qual	Reporting Limit	Regulatory Limit	Method	Analyzed	
Calcium	1760	mg/l		1		EPA 200.7	07-Jun-00 1721	RLH
Magnesium	783	mg/l		1		EPA 200.7	07-Jun-00 1721	RLH
Potassium	122	mg/l		1		EPA 200.7	07-Jun-00 1721	RLH
Sodium	20200	mg/l		1		EPA 200.7	07-Jun-00 1721	RLH
Total Hardness as CaCO3	7610	mg/l		1		CALC.	09-Jun-00 0919	RLH
Chloride	36000	mg/l		1		EPA 300.0	08-Jun-00 1240	RLH
Sulfate	1690	mg/l		1		EPA 300.0	07-Jun-00 2103	RLH
Alkalinity as CaCO3	461	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Bicarbonate	562	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Carbonate	<1	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Specific Conductance @ 25 C	80500	umhos/cm		1		SM2510B	09-Jun-00 1745	CAR
Total Dissolved Solids Calculated	60800	mg/l		1		CALC.	09-Jun-00 0919	RLH
pH	7.1	s.u.		0.1		EPA 150.1	05-Jun-00 1605	CAR
Nitrogen, Nitrate plus Nitrite	0.17	mg/l		0.05		EPA 353.2	06-Jun-00 1752	BAS
Iron	9.5	mg/l		0.03		EPA 200.7	08-Jun-00 1810	MKE

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LABORATORY ANALYSIS REPORT

MSE-HKM	Project ID:	BIERE WELL SITE, POPLAR OIL FIELD		
Charlie Peterson	Sample ID:	FPB-92-12		
PO Box 31318	Laboratory ID:	00-54376-6		
Billings, MT 59107-1318	Sample Matrix:	Water		
	Sample Date:	01-Jun-00 1550		
	Received at lab:	05-Jun-00	Reported:	12-Jun-00

	Results	Units	Qual	Reporting Limit	Regulatory Limit	Method	Analyzed	
Calcium	240	mg/l		1		EPA 200.7	07-Jun-00 1723	RLH
Magnesium	260	mg/l		1		EPA 200.7	07-Jun-00 1723	RLH
Potassium	14	mg/l		1		EPA 200.7	07-Jun-00 1723	RLH
Sodium	95	mg/l		1		EPA 200.7	07-Jun-00 1723	RLH
Total Hardness as CaCO3	1670	mg/l		1		CALC.	08-Jun-00 1620	RLH
Chloride	11	mg/l		1		EPA 300.0	07-Jun-00 2115	RLH
Sulfate	1410	mg/l		1		EPA 300.0	07-Jun-00 2115	RLH
Alkalinity as CaCO3	389	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Bicarbonate	474	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Carbonate	<1	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Specific Conductance @ 25 C	2580	umhos/cm		1		SM2510B	05-Jun-00 1607	CAR
Total Dissolved Solids Calculated	2330	mg/l		1		CALC.	08-Jun-00 1620	RLH
pH	7.9	s.u.		0.1		EPA 150.1	05-Jun-00 1607	CAR
Nitrogen, Nitrate plus Nitrite	3.94	mg/l		0.05		EPA 353.2	06-Jun-00 1754	BAS
Iron	12.1	mg/l		0.03		EPA 200.7	08-Jun-00 1812	MKE

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LABORATORY ANALYSIS REPORT

MSE-HKM	Project ID:	BIERE WELL SITE, POPLAR OIL FIELD		
Charlie Peterson	Sample ID:	FPB-93-3		
PO Box 31318	Laboratory ID:	00-54376-7		
Billings, MT 59107-1318	Sample Matrix:	Water		
	Sample Date:	01-Jun-00 1655		
	Received at lab:	05-Jun-00	Reported:	12-Jun-00

	Results	Units	Qual	Reporting Limit	Regulatory Limit	Method	Analyzed	
Calcium	1080	mg/l		1		EPA 200.7	07-Jun-00 1726	RLH
Magnesium	257	mg/l		1		EPA 200.7	07-Jun-00 1726	RLH
Potassium	403	mg/l		1		EPA 200.7	07-Jun-00 1726	RLH
Sodium	23400	mg/l		1		EPA 200.7	07-Jun-00 1726	RLH
Total Hardness as CaCO3	3770	mg/l		1		CALC.	09-Jun-00 0919	RLH
Chloride	39800	mg/l		1		EPA 300.0	08-Jun-00 1251	RLH
Sulfate	1730	mg/l		1		EPA 300.0	07-Jun-00 2127	RLH
Alkalinity as CaCO3	396	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Bicarbonate	483	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Carbonate	<1	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Specific Conductance @ 25 C	87000	umhos/cm		1		SM2510B	09-Jun-00 1745	CAR
Total Dissolved Solids Calculated	67000	mg/l		1		CALC.	09-Jun-00 0919	RLH
pH	7.1	s.u.		0.1		EPA 150.1	05-Jun-00 1617	CAR
Nitrogen, Nitrate plus Nitrite	<0.05	mg/l		0.05		EPA 353.2	06-Jun-00 1755	BAS
Iron	<0.08	mg/l	*	0.03		EPA 200.7	07-Jun-00 1910	RLH

*Detection limit raised due to matrix interference.

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LABORATORY ANALYSIS REPORT

MSE-HKM	Project ID:	BIERE WELL SITE, POPLAR OIL FIELD		
Charlie Peterson	Sample ID:	WHITMER WELL		
PO Box 31318	Laboratory ID:	00-54376-13		
Billings, MT 59107-1318	Sample Matrix:	Water		
	Sample Date:	31-May-00		
	Received at lab:	05-Jun-00	Reported:	12-Jun-00

	Results	Units	Qual	Reporting Limit	Regulatory Limit	Method	Analyzed	
Calcium	133	mg/l		1		EPA 200.7	07-Jun-00 1746	RLH
Magnesium	88	mg/l		1		EPA 200.7	07-Jun-00 1746	RLH
Potassium	8	mg/l		1		EPA 200.7	07-Jun-00 1746	RLH
Sodium	432	mg/l		1		EPA 200.7	07-Jun-00 1746	RLH
Total Hardness as CaCO3	695	mg/l		1		CALC.	08-Jun-00 1626	RLH
Chloride	794	mg/l		1		EPA 300.0	07-Jun-00 2324	RLH
Sulfate	279	mg/l		1		EPA 300.0	07-Jun-00 2324	RLH
Alkalinity as CaCO3	352	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Bicarbonate	429	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Carbonate	< 1	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Specific Conductance @ 25 C	3220	umhos/cm		1		SM2510B	05-Jun-00 1635	CAR
Total Dissolved Solids Calculated	1970	mg/l		1		CALC.	08-Jun-00 1626	RLH
pH	8.2	s.u.		0.1		EPA 150.1	05-Jun-00 1635	CAR
Nitrogen, Nitrate plus Nitrite	<0.05	mg/l		0.05		EPA 353.2	06-Jun-00 1801	BAS
Iron	4.82	mg/l		0.03		EPA 200.7	08-Jun-00 1834	MKE

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LABORATORY ANALYSIS REPORT

MSE-HKM	Project ID:	BIERE WELL SITE, POPLAR OIL FIELD		
Charlie Peterson	Sample ID:	PNR-5		
PO Box 31318	Laboratory ID:	00-54376-8		
Billings, MT 59107-1318	Sample Matrix:	Water		
	Sample Date:	01-Jun-00 1810		
	Received at lab:	05-Jun-00	Reported:	12-Jun-00

	Results	Units	Qual	Reporting Limit	Regulatory Limit	Method	Analyzed	
Calcium	1170	mg/l		1		EPA 200.7	09-Jun-00 1114	MKE
Magnesium	213	mg/l		1		EPA 200.7	09-Jun-00 1114	MKE
Potassium	396	mg/l		1		EPA 200.7	09-Jun-00 1114	MKE
Sodium	22600	mg/l		1		EPA 200.7	09-Jun-00 1114	MKE
Total Hardness as CaCO3	3810	mg/l		1		CALC.	09-Jun-00 1421	RLH
Chloride	38900	mg/l		1		EPA 300.0	09-Jun-00 1130	MKE
Sulfate	1690	mg/l		1		EPA 300.0	07-Jun-00 2138	RLH
Alkalinity as CaCO3	267	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Bicarbonate	325	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Carbonate	<1	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Specific Conductance @ 25 C	85100	umhos/cm		1		SM2510B	09-Jun-00 1745	CAR
Total Dissolved Solids Calculated	65200	mg/l		1		CALC.	09-Jun-00 1421	RLH
pH	7.4	s.u.		0.1		EPA 150.1	05-Jun-00 1626	CAR
Nitrogen, Nitrate plus Nitrite	<0.05	mg/l		0.05		EPA 353.2	06-Jun-00 1756	BAS
Iron	0.2	mg/l		0.03		EPA 200.7	08-Jun-00 1814	MKE

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LABORATORY ANALYSIS REPORT

MSE-HKM	Project ID:	BIERE WELL SITE, POPLAR OIL FIELD		
Charlie Peterson	Sample ID:	PNR-6		
PO Box 31318	Laboratory ID:	00-54376-9		
Billings, MT 59107-1318	Sample Matrix:	Water		
	Sample Date:	31-May-00		
	Received at lab:	05-Jun-00	Reported:	12-Jun-00

	Results	Units	Qual	Reporting Limit	Regulatory Limit	Method	Analyzed	
Calcium	109	mg/l		1		EPA 200.7	07-Jun-00 1730	RLH
Magnesium	77	mg/l		1		EPA 200.7	07-Jun-00 1730	RLH
Potassium	6	mg/l		1		EPA 200.7	07-Jun-00 1730	RLH
Sodium	75	mg/l		1		EPA 200.7	07-Jun-00 1730	RLH
Total Hardness as CaCO3	587	mg/l		1		CALC.	08-Jun-00 1622	RLH
Chloride	14	mg/l		1		EPA 300.0	07-Jun-00 2202	RLH
Sulfate	229	mg/l		1		EPA 300.0	07-Jun-00 2202	RLH
Alkalinity as CaCO3	511	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Bicarbonate	624	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Carbonate	<1	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Specific Conductance @ 25 C	1210	umhos/cm		1		SM2510B	05-Jun-00 1627	CAR
Total Dissolved Solids Calculated	849	mg/l		1		CALC.	08-Jun-00 1622	RLH
pH	8.0	s.u.		0.1		EPA 150.1	05-Jun-00 1627	CAR
Nitrogen, Nitrate plus Nitrite	0.06	mg/l		0.05		EPA 353.2	06-Jun-00 1758	BAS
Iron	0.09	mg/l		0.03		EPA 200.7	08-Jun-00 1816	MKE

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LABORATORY ANALYSIS REPORT

MSE-HKM	Project ID:	BIERE WELL SITE, POPLAR OIL FIELD		
Charlie Peterson	Sample ID:	PNR-7		
PO Box 31318	Laboratory ID:	00-54376-11		
Billings, MT 59107-1318	Sample Matrix:	Water		
	Sample Date:	31-May-00		
	Received at lab:	05-Jun-00	Reported:	12-Jun-00

	Results	Units	Qual	Reporting Limit	Regulatory Limit	Method	Analyzed	
Calcium	2770	mg/l		1		EPA 200.7	07-Jun-00 1736	RLH
Magnesium	2130	mg/l		1		EPA 200.7	07-Jun-00 1736	RLH
Potassium	55	mg/l		1		EPA 200.7	07-Jun-00 1736	RLH
Sodium	6800	mg/l		1		EPA 200.7	07-Jun-00 1736	RLH
Total Hardness as CaCO3	15700	mg/l		1		CALC.	09-Jun-00 0921	RLH
Chloride	21700	mg/l		1		EPA 300.0	08-Jun-00 1315	RLH
Sulfate	1540	mg/l		1		EPA 300.0	07-Jun-00 2300	RLH
Alkalinity as CaCO3	343	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Bicarbonate	418	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Carbonate	<1	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Specific Conductance @ 25 C	48200	umhos/cm		1		SM2510B	09-Jun-00 1745	CAR
Total Dissolved Solids Calculated	35300	mg/l		1		CALC.	09-Jun-00 0921	RLH
pH	7.2	s.u.		0.1		EPA 150.1	05-Jun-00 1631	CAR
Nitrogen, Nitrate plus Nitrite	4.11	mg/l		0.05		EPA 353.2	06-Jun-00 1841	BAS
Iron	2.6	mg/l		0.03		EPA 200.7	08-Jun-00 1826	MKE

ENERGY LABORATORIES, INC.
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FAX (406) 252-6069 • 1-800-735-4489 • E-MAIL eli@energylab.com

LABORATORY ANALYSIS REPORT

MSE-HKM	Project ID:	BIERE WELL SITE, POPLAR OIL FIELD		
Charlie Peterson	Sample ID:	PNR-8		
PO Box 31318	Laboratory ID:	00-54376-12		
Billings, MT 59107-1318	Sample Matrix:	Water		
	Sample Date:	31-May-00		
	Received at lab:	05-Jun-00	Reported:	12-Jun-00

	Results	Units	Qual	Reporting Limit	Regulatory Limit	Method	Analyzed	
Calcium	272	mg/l		1		EPA 200.7	07-Jun-00 1740	RLH
Magnesium	200	mg/l		1		EPA 200.7	07-Jun-00 1740	RLH
Potassium	12	mg/l		1		EPA 200.7	07-Jun-00 1740	RLH
Sodium	420	mg/l		1		EPA 200.7	07-Jun-00 1740	RLH
Total Hardness as CaCO3	1500	mg/l		1		CALC.	09-Jun-00 1521	RLH
Chloride	380	mg/l		1		EPA 300.0	07-Jun-00 2312	RLH
Sulfate	738	mg/l		1		EPA 300.0	07-Jun-00 2312	RLH
Alkalinity as CaCO3	464	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Bicarbonate	566	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Carbonate	<1	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Specific Conductance @ 25 C	4080	umhos/cm		1		SM2510B	05-Jun-00 1633	CAR
Total Dissolved Solids Calculated	2350	mg/l		1		CALC.	09-Jun-00 1521	RLH
pH	7.8	s.u.		0.1		EPA 150.1	05-Jun-00 1633	CAR
Nitrogen, Nitrate plus Nitrite	<0.05	mg/l		0.05		EPA 353.2	06-Jun-00 1800	BAS
Iron	25.2	mg/l		0.03		EPA 200.7	08-Jun-00 1832	MKE

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LABORATORY ANALYSIS REPORT

MSE-HKM	Project ID:	BIERE WELL SITE, POPLAR OIL FIELD		
Charlie Peterson	Sample ID:	PNR-9		
PO Box 31318	Laboratory ID:	00-54376-2		
Billings, MT 59107-1318	Sample Matrix:	Water		
	Sample Date:	01-Jun-00 1010		
	Received at lab:	05-Jun-00	Reported:	12-Jun-00

	Results	Units	Qual	Reporting Limit	Regulatory Limit	Method	Analyzed	
Calcium	583	mg/l		1		EPA 200.7	07-Jun-00 1711	RLH
Magnesium	355	mg/l		1		EPA 200.7	07-Jun-00 1711	RLH
Potassium	16	mg/l		1		EPA 200.7	07-Jun-00 1711	RLH
Sodium	887	mg/l		1		EPA 200.7	07-Jun-00 1711	RLH
Total Hardness as CaCO3	2920	mg/l		1		CALC.	09-Jun-00 1419	RLH
Chloride	3060	mg/l		1		EPA 300.0	07-Jun-00 2028	RLH
Sulfate	609	mg/l		1		EPA 300.0	09-Jun-00 1043	MKE
Alkalinity as CaCO3	263	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Bicarbonate	321	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Carbonate	<1	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Specific Conductance @ 25 C	9310	umhos/cm		1		SM2510B	05-Jun-00 1557	CAR
Total Dissolved Solids Calculated	5700	mg/l		1		CALC.	09-Jun-00 1419	RLH
pH	7.3	s.u.		0.1		EPA 150.1	05-Jun-00 1557	CAR
Nitrogen, Nitrate plus Nitrite	<0.05	mg/l		0.05		EPA 353.2	06-Jun-00 1750	BAS
Iron	35.4	mg/l		0.03		EPA 200.7	08-Jun-00 1800	MKE

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LABORATORY ANALYSIS REPORT

RECEIVED
JUL 10 2000
CH2M HILL
BOISE

MSE-HKM	Project ID:	BIERE WELL SITE, POPLAR OIL FIELD		
Charlie Peterson	Sample ID:	PNR-10		
PO Box 31318	Laboratory ID:	00-54376-1		
Billings, MT 59107-1318	Sample Matrix:	Water		
	Sample Date:	01-Jun-00 0845		
	Received at lab:	05-Jun-00	Reported:	12-Jun-00

	Results	Units	Qual	Reporting Limit	Regulatory Limit	Method	Analyzed	
Calcium	208	mg/l		1		EPA 200.7	07-Jun-00 1707	RLH
Magnesium	111	mg/l		1		EPA 200.7	07-Jun-00 1707	RLH
Potassium	8	mg/l		1		EPA 200.7	07-Jun-00 1707	RLH
Sodium	435	mg/l		1		EPA 200.7	07-Jun-00 1707	RLH
Total Hardness as CaCO3	978	mg/l		1		CALC.	08-Jun-00 1612	RLH
Chloride	147	mg/l		1		EPA 300.0	07-Jun-00 1953	RLH
Sulfate	1210	mg/l		1		EPA 300.0	07-Jun-00 1953	RLH
Alkalinity as CaCO3	528	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Bicarbonate	645	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Carbonate	<1	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Specific Conductance @ 25 C	3120	umhos/cm		1		SM2510B	05-Jun-00 1555	CAR
Total Dissolved Solids Calculated	2480	mg/l		1		CALC.	08-Jun-00 1612	RLH
pH	7.6	s.u.		0.1		EPA 150.1	05-Jun-00 1555	CAR
Nitrogen, Nitrate plus Nitrite	<0.05	mg/l		0.05		EPA 353.2	06-Jun-00 1750	BAS
Iron	12.1	mg/l		0.03		EPA 200.7	08-Jun-00 1758	MKE

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LABORATORY ANALYSIS REPORT

MSE-HKM	Project ID:	BIERE WELL SITE, POPLAR OIL FIELD		
Charlie Peterson	Sample ID:	PNR-12		
PO Box 31318	Laboratory ID:	00-54376-10		
Billings, MT 59107-1318	Sample Matrix:	Water		
	Sample Date:	31-May-00		
	Received at lab:	05-Jun-00	Reported:	12-Jun-00

	Results	Units	Qual	Reporting Limit	Regulatory Limit	Method	Analyzed	
Calcium	425	mg/l		1		EPA 200.7	07-Jun-00 1732	RLH
Magnesium	328	mg/l		1		EPA 200.7	07-Jun-00 1732	RLH
Potassium	17	mg/l		1		EPA 200.7	07-Jun-00 1732	RLH
Sodium	362	mg/l		1		EPA 200.7	07-Jun-00 1732	RLH
Total Hardness as CaCO3	2410	mg/l		1		CALC.	08-Jun-00 1623	RLH
Chloride	78	mg/l		1		EPA 300.0	07-Jun-00 2249	RLH
Sulfate	2030	mg/l		1		EPA 300.0	07-Jun-00 2249	RLH
Alkalinity as CaCO3	699	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Bicarbonate	853	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Carbonate	<1	mg/l		1		SM2320B	07-Jun-00 0906	MKE
Specific Conductance @ 25 C	4580	umhos/cm		1		SM2510B	05-Jun-00 1629	CAR
Total Dissolved Solids Calculated	4020	mg/l		1		CALC.	08-Jun-00 1623	RLH
pH	7.6	s.u.		0.1		EPA 150.1	05-Jun-00 1629	CAR
Nitrogen, Nitrate plus Nitrite	95.7	mg/l		0.05		EPA 353.2	06-Jun-00 1840	BAS
Iron	39.3	mg/l		0.03		EPA 200.7	08-Jun-00 1820	MKE

G

GEOLOGIC DATA ON INJECTION & CONFINING ZONES

Judith River Formation

(Proposed Injection Zone)

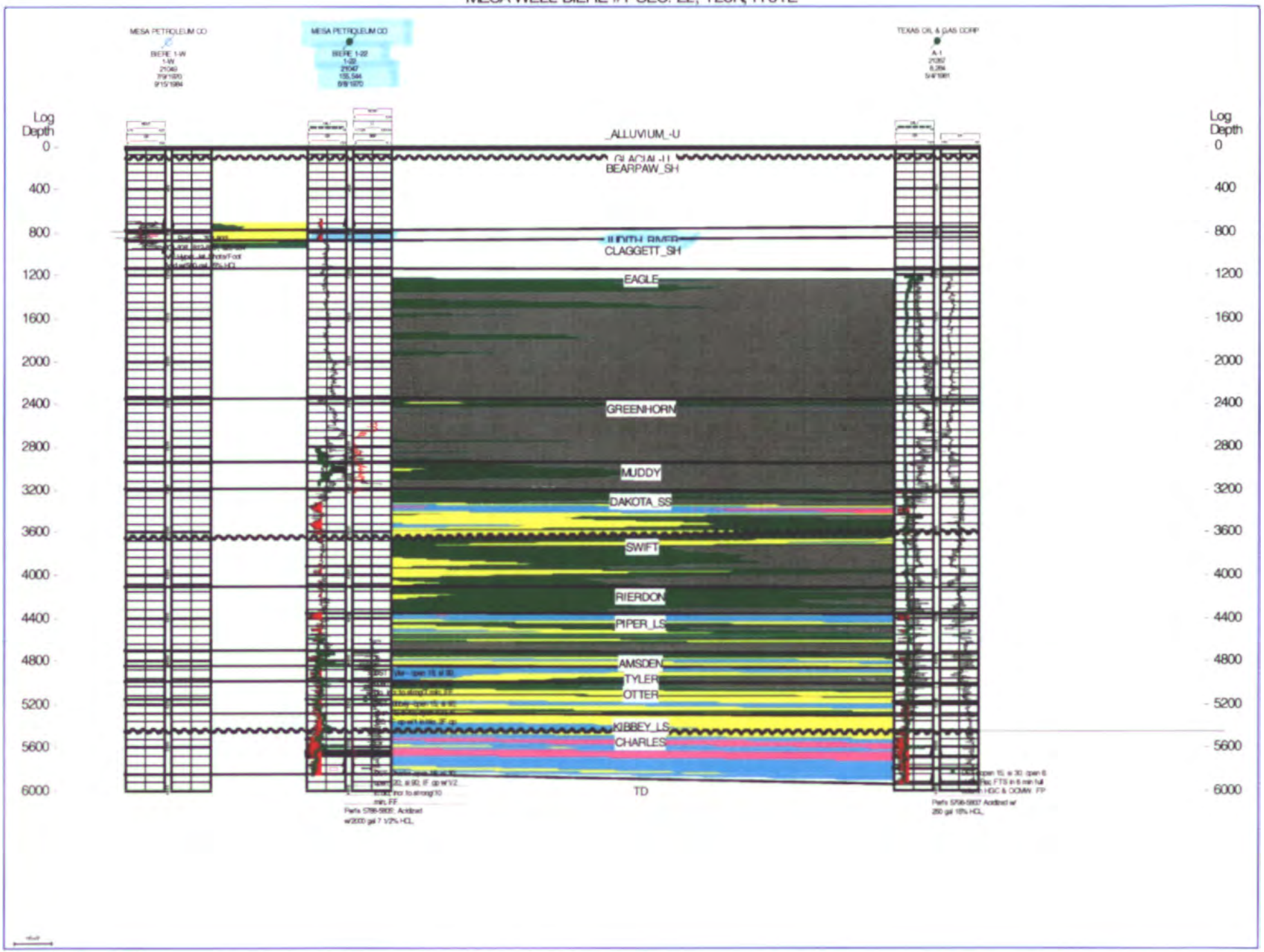
The Judith River Formation (Upper Cretaceous-Montana Group) ---- The Judith River Formation consists of regressive deposits of non marine and shallow-water marine strata with thickness generally 90 to 136 feet. The Bearpaw Shale is directly above the Judith River. The top of the Judith River in the Biere 1-22 well is @ 698' and the base of the Judith River is @ 878'. The calculated fracture gradient is ± 1.10 psi/ft. The Judith River formation water in this area is primarily re-injected produced water from the Charles Formation with chloride concentrations ranging from 60,000 ppm to 110,000 ppm.

Table 1. Generalized stratigraphic column for the Montana part of the Williston Basin (Modified from Balster, 1980, and Rice, 1976a)

Erathem	System	Series	Geologic unit		
Cenozoic	Quaternary	Holocene	Alluvium		Fan alluvium and colluvium, dune sand
		Pleistocene	Glacial deposits, Sprole Silt Wiota Gravel		
	Tertiary	Pliocene	Flaxville Formation		
		Paleocene	Fort Union Formation		
Mesozoic	Cretaceous	Upper Cretaceous	Hell Creek Formation		
			Fox Hills Sandstone	Montana Group	
			Bearpaw Shale		
			Judith River Formation		
			Claggett Shale		
			Eagle Sandstone		
			Telegraph Creek Formation		
			Niobrara Formation	Colorado Group	
			Carlile Shale		
			Greenhorn Formation		
			Belle Fourche Shale		
		Lower Cretaceous	Mowry Shale		
			Newcastle Sandstone		
			Skull Creek Shale		
			Fall River Sandstone		"Dakota Sandstone"
			Fuson Shale		
			Lakota Formation		

Erathem	System	Series	Geologic unit		
Mesozoic	Jurassic	Upper Jurassic	Morrison Formation		
			Swift Formation	Ellis Group	
		Middle Jurassic	Rierdon Formation		
			Piper Formation		
			Nesson Formation		
	Triassic		Spearfish Formation		
Paleozoic	Permian		Minnekahta Limestone		
			Opeche Formation		
	Pennsylvanian		Minnelusa Sandstone		
			Tyler Formation		
	Mississippian		Heath Formation	Big Snowy Group	
			Otter Formation		
			Kibbey Sandstone		
			Charles Formation	Madison Group	
			Mission Canyon Limestone		
			Lodgepole Limestone		
	Devonian, Silurian, Ordovician, and Cambrian rocks, undivided		Sedimentary rocks consisting of sandstone, siltstone, shale, limestone, and dolomite		
Precambrian			Crystalline igneous and metamorphic rocks		

MESA WELL BIERE #1-SEC. 22, T28N, R 51E



DIV. SANTA FAY

COUNTY / FIELD or LOCATION / WELL / COMPANY

COMPANY MESA PETROLEUM CO.

WELL BIERE # 1-22

FIELD WILDCAT

COUNTY ROOSEVELT STATE MONTANA

LOCATION
NW SW

Sec. 22 Twp. 28 N Rge. 51 E

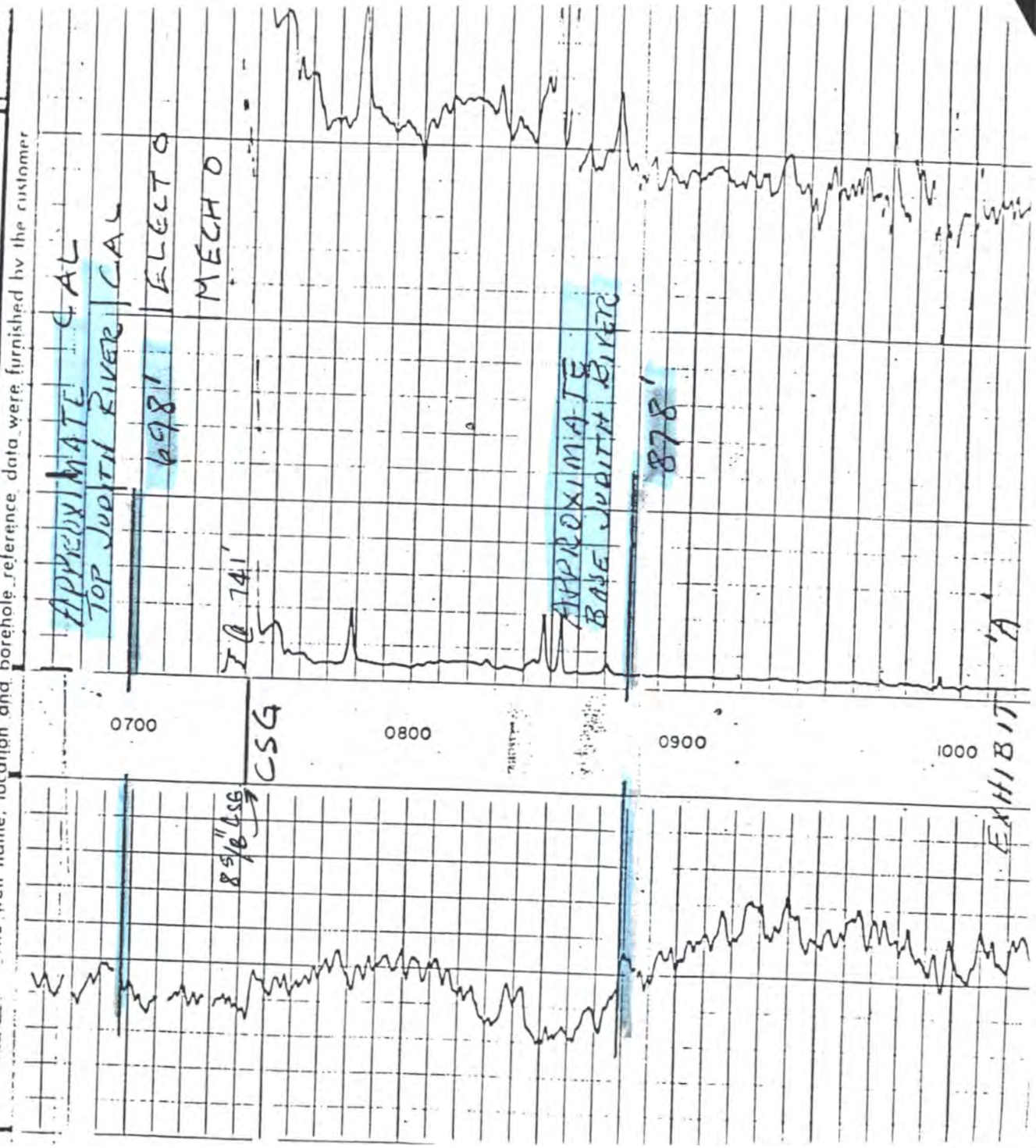
Other Services:
SNP
MLL
MDP

Permanent Datum: GL. Elev. 2074
Log Measured From KB 12 Ft. Above Perm. Datum
Drilling Measured From KB

Elev.: K.B. 2086
D.F.
G.L. 2074

Date	5-25-70			
Run No.	ONE			
Depth—Driller	5845			
Depth—Logger	5845			
Btm. Log Interval	5840			
Top Log Interval	741			
Casing—Driller	8 5/8 @ 741	@	@	@
Casing—Logger	741			
Bit Size	7 7/8			
Type Fluid in Hole	SBM			
Dens. / Visc.	10.9 / 58			
pH / Fluid Loss	9 / 6.0 ml	ml	ml	ml
Source of Sample	FLOW LINE			
R_m @ Meas. Temp.	.116 @ 67 °F	@ °F	@ °F	@ °F
R_{mf} @ Meas. Temp.	.103 @ 67 °F	.035 @ 195 °F	@ °F	@ °F
R_{mc} @ Meas. Temp.	— @ — °F	@ °F	@ °F	@ °F
Source: R_{mf} R_{mc}	M / —			
R_m @ BHT	.055 @ 195 °F	@ °F	@ °F	@ °F
Time Since Circ.	4 HRS			
Max. Rec. Temp.	195 °F	°F	°F	°F
Equip. / Location	5642 / WESTN			
Recorded By	ERICKSON			
Witnessed By	MR. GRAHAM	MR. TOLD		

The well name, location and borehole reference data were furnished by the customer



H

OPERATING DATA

3. *INJECTION FLUIDS ANALYSIS*

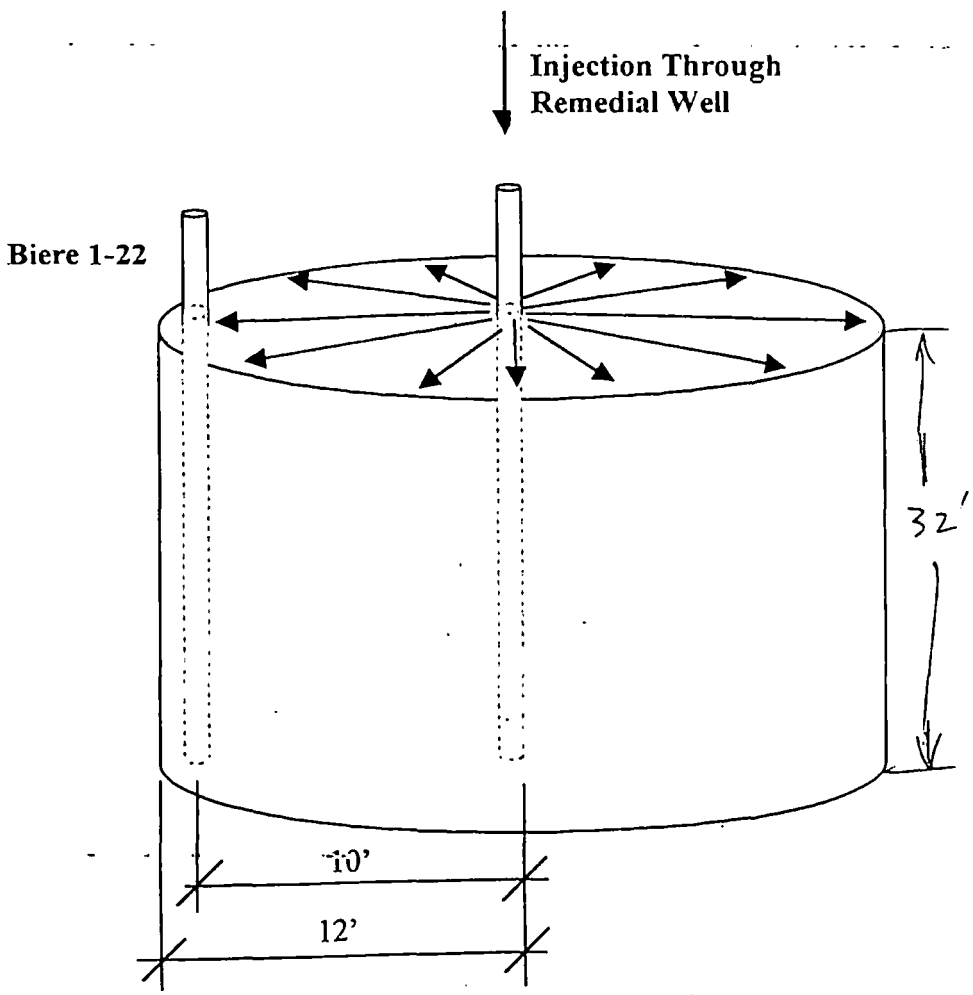
When selecting the fluids to be used in this project, we must first consider the volumes involved. We are considering injecting fluid through four wells. Moreover, we assume that the Judith Formation is a sandstone with 20% porosity and a permeability of +/- 1 Darcy.

The remedial wells will be drilled 10 feet away from the Biere 1-22 well, and we will inject into 32' of exposed formation. The volume of fluid required may be approximated by assuming radial injection behavior as shown in Figure 4 below. The overlap between the injection patterns will provide excess volume which should insure a good squeeze. The volume of void space (assuming 20% porosity[1]) that the remedial fluid will have to fill is:

Injecting Volume $_{pore}$ **(1 well)** = 516 bbls (or 21,667 gallons)
Injecting Volume $_{pore}$ **(4 wells)** = 2,064 bbls (or 86,668 gallons)

This volume assumes the injecting fluid will travel from the remedial well to the Bierre #1-22, at a distance of 12' (10' radius + 2' extra to surround the well bore).

Figure 4 - Approximation of Injection Pattern



[1] Estimate provided by Pioneer

The main function of the injection fluid is to plug the matrix and all existing fractures around the Biere 1-22 well, while avoiding the creation of any new fractures.

The ideal remedial fluid must have the following characteristics:

1. No filter cake.
2. Deep penetration.
3. Similar flowing properties as water (low viscosity).
4. Resistance to temperature (In this case, 200°F – Max).
5. Strong & permanent.
6. Environmentally friendly.
7. Must resist relatively high pressure differentials.
8. Readily available.
9. Cost effective.

The fluid considered should NOT form any filter cake while being pumped. The formation of such a cake would result in early plugging of the pores being injected, preventing us from pumping the full amount of fluid necessary to reach the target (Biere 1-22 well). Of the fluids considered as candidates, only **Halliburton's INJECTROL-U** complies with all of the stipulated requirements. What follows is a brief description of the product gleaned from data from, and conversations with, Halliburton.

Injectrol U

Halliburton has recommended their INJECTROL product as the best choice for this application. Moreover, Halliburton has provided a recommended injection procedure for placement of the material (details may be found in the Squeezing Procedure of the drilling program). INJECTROL sealant is an inorganic material (sodium silicate) which has proven very successful in forming a permanent barrier to water in both producing and injection wells. Based on the information provided by Halliburton, INJECTROL is placed as a water-thin fluid, which changes to a very firm gel at a controlled time. The initial low viscosity of the treating fluid combined with the firmness of the gel which allows for the depth of penetration and strength required for effective matrix sealing.

Zonal isolation may be necessary when treating either a producing or injection well. Placement techniques include packers, treating perforations, dual injection and open hole injection methods. Matrix rates (below the fracture gradient) should be maintained to fill the porosity with the material. INJECTROL service is applicable between 60 F and 260 F.

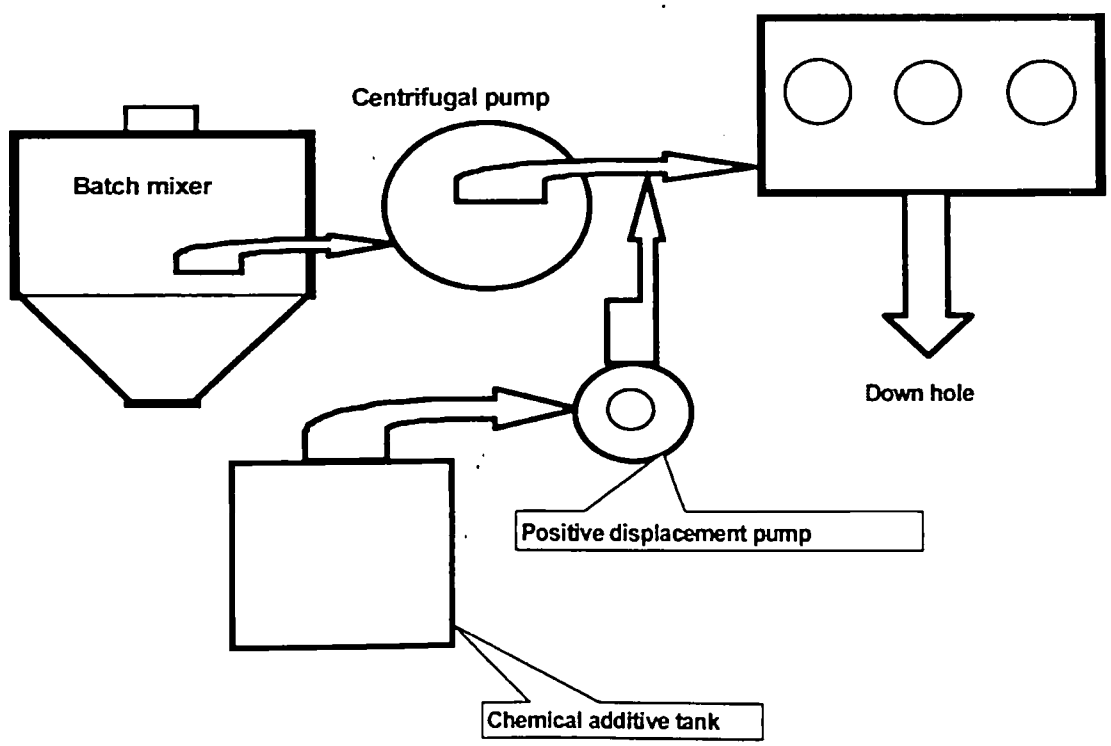
Advantages

- Inexpensive materials allow large volume treatments.
- Materials are readily available.
- Large volume treatments give deep formation penetration.
- The shut-in time on the treated well is short (overnight).
- Low viscosity is necessary for ease of penetration.

Equipment Requirements for Injection of Remedial Fluids (General)

1. Batch Mixer
2. Storage Tanks
3. Centrifugal Pump
4. Pump(s)
5. Data Acquisition System
6. Pressure Transducers
7. Flow Meters
8. Discharge Lines and Valves
9. Suction Hoses and associated valves, tees, etc.
10. Laboratory Equipment for Pilot Testing offshore
11. Tool / Laboratory Container
12. Injection Skid for Chemical Additives

Equipment set up (HALLIBURTON ON-SITE)



PRELIMINARY SQUEEZING PROCEDURE

1. Review CBL from the 3 new relief wells.

2. Send Injectrol mixing water samples to HES Williston lab for testing with Injectrol, this will be gel time and compatibility testing. If same water is for cementing send sufficient for Injectrol testing too. Save the samples for future reference. HES must verify compatibility before starting injection.

3. Check on the supplier of the frac tanks, have to be cleaned and neutralized.

4. Order out sufficient Injectrol to mix and pump a minimum of 2,000 bbls. There will be 500 bbls pre-mixed Injectrol (plus sufficient excess[3]) for each new relief well and for the existing relief well, on location. Verify BHT, material quantities on location and make visual examination of material.

5. Run Wellcat temperature simulation for job design. HES must optimize job design.

6. MIRU Halliburton Acid Pumper equipment, clean and test all pumps, manifolds, valves, etc. Must have 100% backup for injection pump on location and manifolded up for injection (Can not afford to shut down in the middle of the job because of an equipment problem).

7. MI, Level and fill minimum of 8 frac tanks (possibly more for excess fluid[3]). MIRU centrifugal transfer pump and test operation for moving fluid from backup tanks. Inspect frac manifold and valves for leaks.

8. Have to have sufficient monitoring equipment to take real-time readings from each of the relief wells, the 3 new ones and the existing or "old" relief well. These readings need to be a minimum of injection pressure, temperature, and rate.

9. Hold safety meeting.

10. Spot equipment, rig up, test, and prepare Injectrol mixtures. The Injectrol will be pumped as a 2 stream injection for each well (one pump unit with 100% backup for each well). There will be 2 frac tanks, one with Injectrol A and one with the initiator, for each well. This will allow the mixing to occur at the wellhead and allow for any changes in the plans without the risk of premature gelation of the Injectrol. The equipment will be rigged up to the 5-1/2" casing. Valving must be in place to control the well when the job is completed. Need to verify valves ratings, burst and collapse for the casing to avert any problems with the proposed injection.

11. Do injection tests for each well and verify frac gradient, be prepared to change job design based on those results.

12. Circulate Injectrol to the end of tubing in each new injection well.

[3] Final design will include sufficient excess to continue pumping if required.. More detailed injection procedure will prepared by Halliburton for use in the field.

13. Begin injection operations pumping the Injectrol at matrix injection rates.

14. Monitor the injection for any changes in pressure from the new relief wells or the "old" relief well. Maintain injection pressure below frac gradient as determined from leak-off test and injection test above. Injecting below the frac gradient will insure that no fractures are created. The Judith is estimated to be a 1 darcy sand[4]. The tail-end Injectrol will be a different concentration to account for any cool-down effects and to have a faster gelation time for the end of the job.

15. Leave "old" relief well open and monitor for pressure variation and flow of water or possibly injectrol. Log data every 15 min. and report in daily operations report.

16. Once all of the Injectrol for each injector has been pumped (including excess), displace Injectrol with water to end of tubing in each well.

17. Circulate Injectrol to the end of tubing in "old" relief well. Begin injection of Injectrol into the "old" relief well. The tail-end Injectrol will be a different concentration to account for any cool-down effects and to have a faster gelation time for the end of the job.

18. Displace Injectrol with water to end of tubing in "old" relief well.

19. Shutdown and wait on the gelation of the Injectrol.

20. Test each well for injection and flow back.

21. If testing is acceptable, rig down. If testing is not acceptable, wait for extended gelation period[5] and retest for injection and flow back.

22. Shut-in wells. RDMO Halliburton.

23. Injection wells will be observed. Prepare wellhead equipment and gauges in all relief wells for observation period (length of observation period to be determined by Pioneer representatives).

[4] Based on verbal data from Pioneer
[5] Request recommendation from Halliburton

I

FORMATION TESTING PLAN

I. Formation Testing Plan

Once injection wells are completed, pump-in rates will be established & ISIP will be verified for fracture gradient calculation. This will be done on each injector.

J

STIMULATION PROGRAM

J. Stimulation Program

No stimulation of the Judith River is planned prior to injection of the plugging material (Injectrol).

K

INJECTION PROCEDURES

K. Injection Procedures

1. Fluid delivery to injection site will be by truck.

2. All fluid will be stored in frac tanks on site.

3. Halliburton services will provide pump trucks & pumping equipment. Equipment will come out of Williston Halliburton Station.

4. Halliburton will continuously monitor pressures & volumes. If emergency occurs, the injection process will be shut down immediately.

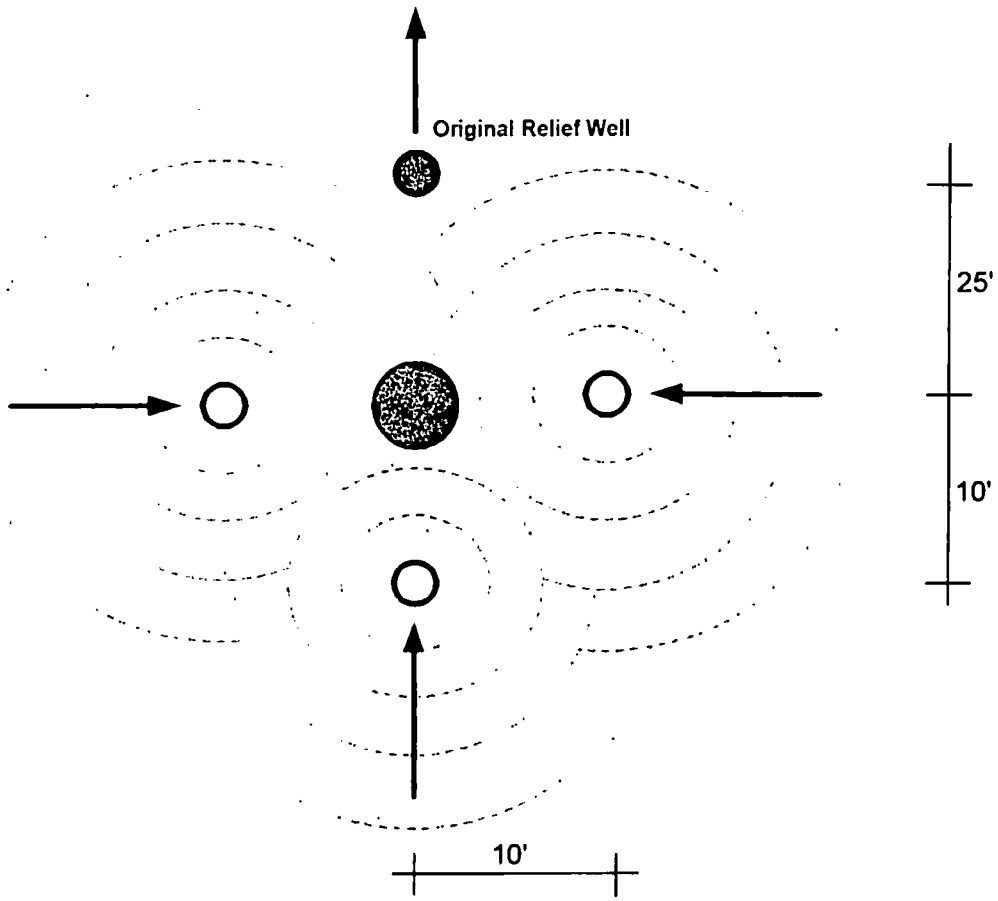
GENERAL WELL PLAN[2]

1. Prepare location for drilling rig.
2. Clean cellar for relief well. Build cellars for 3 new wells.
3. Move in and rig up rat-hole machine and drill three 17-1/2" holes at the specified locations, down to 65'. Run & cement 13-3/8" casing to bottom. Rig down and move out rat-hole machine.
4. Move in and rig up drilling rig and related equipment.
5. Drill 12-1/4" hole to 240' (100' below bottom of Glacial-U aquifer). Run and cement 9-5/8" csg.
6. Drill 7-7/8" hole to ±688' (10' above the Top of the Judith Sandstone). Run 5-1/2" casing to bottom and cement to surface.
7. Drill 4-1/2" hole to ±720' (leaving exposed 10' of the Bearpaw Shale and 22' of the Top of the Judith Sandstone). POOH.
8. RIH with 2 7/8" tubing to +/- 678'. Install tubing head and prepare well for injection.
9. Repeat steps 4 through 8 in the next two wells.
10. Move in and rig up drilling rig and related equipment to "old" relief well.
11. Remove wellhead/cap. RIH with 4 ½" bit. Drill cement plugs. Circulate and condition hole down to top of cement at +/- 800 feet. POOH.
12. RIH with 2 7/8" tubing. Hang same from wellhead. Install pressure gauge to monitor pressures while injection operations take place.
13. Squeeze 3 wells with remedial fluid and observe behavior through monitoring "old" relief well.
14. As returns of remedial fluid are observed in the "old" relief well, stop injection in the other 3 wells.
15. Proceed to inject remedial fluid through the "old" relief well, to complete squeezing operations.
16. Allow fluid to set.
17. Observe wells.

[2] Detailed and intermediate steps are provided in the Detailed Drilling Procedure.

Biere Remediation Project
Roosevelt County, Montana
Pioneer Natural Resources USA
Inc.

Option #2



M

CONSTRUCTION DETAILS

Signa Engineering Corp.

DRILLING PROGRAM

(Biere 1-22 Remedial Wells)
Pioneer Natural Resources USA, Inc

ROOSEVELT COUNTY, MONTANA

GENERAL INFORMATION

WELL INFORMATION

Well Name:	Biere 1-22 Remedial Wells
Operator:	Pioneer Natural Resources USA, Inc
Field:	Poplar Field
Permit:	N/A
Well Type:	Remedial, Vertical
County, State:	Roosevelt County, Montana
Objective:	Judith River
Projected Depth:	720' TVD
Location:	22 – T28N – R51E
Elevation:	2,074' GL
BHST:	Estimated BHST = +/- 130°F @ 720' (based on offset information from "relief" well). Possible high temperature point observed at +/- 140').
AFE:	N/A

DRILLING / SQUEEZING OPERATIONS - GOALS & OBJECTIVES

1. Squeeze the Biere 1-22 well through four remedial wells in order to stop and prevent any possible future contamination due to migration of pollutants to the aquifer.
2. Avoid further contamination of the aquifer during the remedial operations.
3. Drill the remedial wells in the most efficient and economical manner.
4. Monitor the squeezing operations to ensure success of operations.
5. Comply with all environmental rules and regulations of the State of Montana.
6. Provide a safe working environment for the personnel during the execution of the procedures presented in this document.
7. Document all stages of the remedial operations for further analysis and consultation.

GENERAL WELL PLAN[2]

1. Prepare location for drilling rig.

2. Clean cellar for relief well. Build cellars for 3 new wells.

3. Drill water well. ? (RISKY IN THIS AREA - LIMITED VOLUME - MAYBE TRUCK)

4. Move in and rig up rat-hole machine and drill three 17-1/2" holes at the specified locations, down to 35'. Run & cement 13-3/8" casing to bottom. Rig down and move out rat-hole machine.

5. Move in and rig up drilling rig and related equipment.

6. Drill 12-1/4"hole down to 240'. Run and cement 9-5/8" casing.

7. Drill 7-7/8" hole to ±688' (10' above the Top of the Judith Sandstone). Run 5-1/2" casing to bottom and cement to surface.

8. Drill 4-1/2" hole to ±720' (leaving 10' of the Bearpaw Shale and 22' of the Top of the Judith Sandstone exposed). POOH.

9. RIH with 2 7/8" tubing to +/- 678'. Install tubing head and prepare well for injection.

10. Repeat steps 5 through 9 in the next two wells.

11. Move in and rig up drilling rig and related equipment to "old" relief well.
    welded cap - 3'-4' BGL.

12. Remove wellhead/cap. RIH with 4 ½" bit. Drill cement plugs. Circulate and condition hole down to top of cement at +/- 800 feet. POOH.

13. RIH with 2 7/8" tubing. Hang same from wellhead. Install pressure gauge to monitor pressures while injection operations take place.

14. Squeeze 3 wells with remedial fluid and observe behavior through monitoring old "relief" well.

15. As returns of remedial fluid are observed in the old "relief" well, stop injection in the other 3 wells.

16. Proceed to inject remedial fluid through the old "relief" well, to complete squeezing operations.

17. Allow fluid to set.

18. Observe wells.

[2] Detailed and intermediate steps are provided in the Detailed Drilling Procedure.

WELLBORE SCHEMATIC

DRILLING PROGNOSIS
"Pioneer Natural Resources USA Inc."

WELL	:	Biere Remedial Well	
FIELD	:	Poplar	
CATEGORY	:	Remedial / Vertical	
COUNTY	:	Roosevelt	STATE: Montana
LOCATION	:	22 - T28N - R51E	
OBJECTIVE	:	Top of Judith River	
ELEVATION	:	2,074 GL	

HOLE SIZE		LOGGING PROGRAM	CASING & CEMENT	FLUID PROPERTIES
17 1/2"			13-3/8" Surface Casing Class H + 2% CaCl2:	
	35'	40' - 45' goes from Clay to Sand Geology - Glacial-U & Top of Bearpaw Shale Expect formation flow & 120- BHT		
12 1/4"		Mudloggers all the Time	9-5/8" Intermediate Casing Class G	
	240'	Geology - Bearpaw Shale Expect heavy formation flow (up to 90 BPH) & Temps up to 20-F		Mud Weight ppg PV: YP: F/L: Mud Type:
7 7/8"			5-1/2" Casing Class G	
	688'	Injection Path		
4-1/2"	720'	Geology - Judith River Sand (698'-876') (Porosity: 20%-30%, Permeability: +/- 1 Darcy) Espect heavy formation flow (up to 90 BPH) & Temps up to 20-F		Mud Weight ppg PV: YP: F/L: Mud Type:

PREPARED BY: _____ DATE: _____

APPROVED BY: _____ DATE: _____

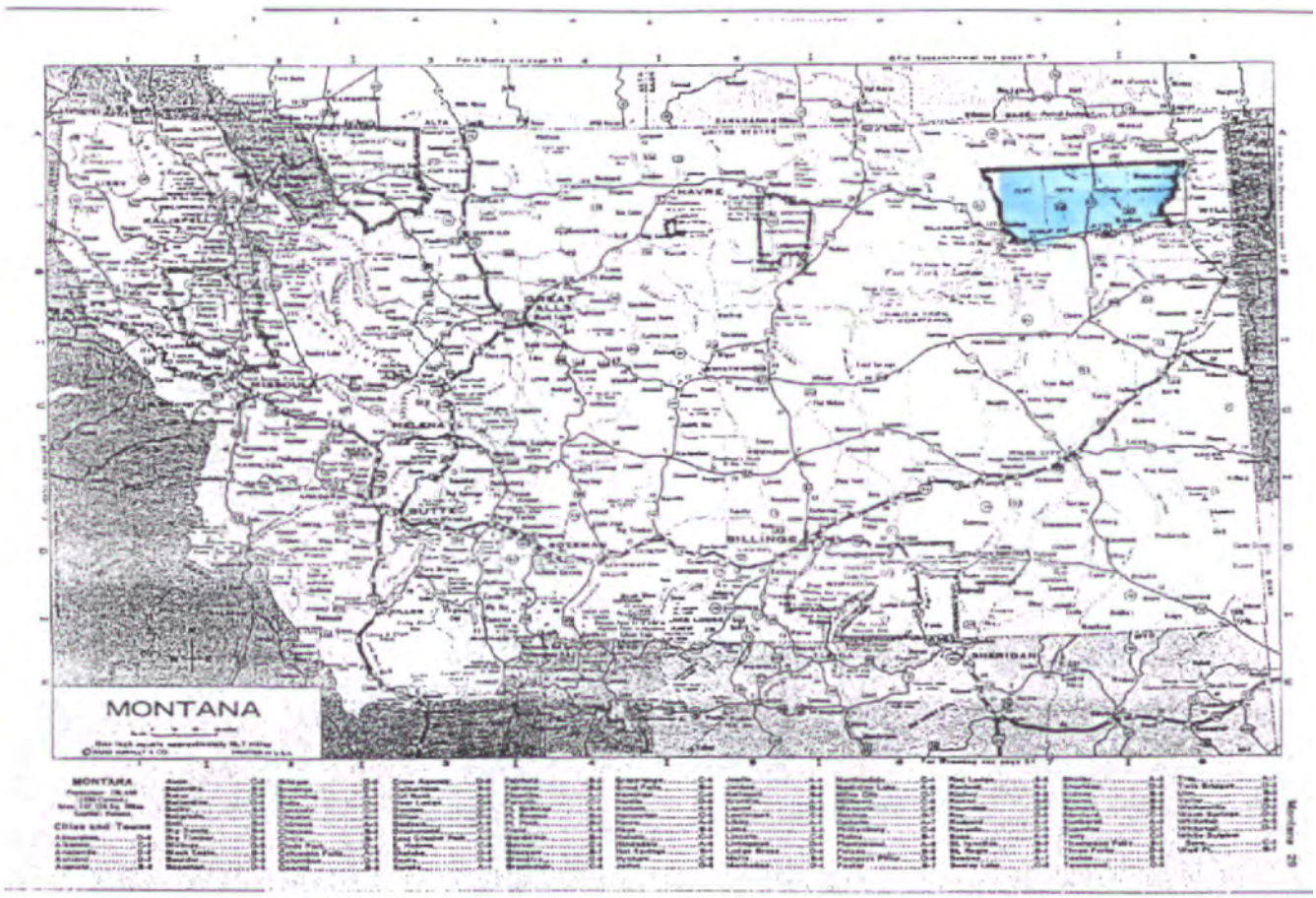
TELEPHONE LIST

Service	Contact	Company	Phone #'s	
DRILLING				
Drilling Manager	Steve Mamerow	Pioneer	(972) 444-9001	mamerows@pioneernrc.com
Manager Oper. Services	Wilbur Dover	Pioneer	(972) 444-9001	doverw@pioneernrc.com
Project Engineer:	Harold McGowen	Signa Engr. Corp.	(281) 774-1000	mmcgowen@signa.net
		Mobil/Pager	(713) 824 4560	
Drilling Engineer:	R.Gonzalez	Signa Engr. Corp.	(281) 774-1000	rgonzalez@signa.net
		Pager	(800) 210 9684	

SERVICE COMPANIES

Rig Contractor:
Drilling Fluids
Cementer
Bit Supplier
Wellhead
Tubular Supply
Completion Tools
Turbolators

MONTANA MAP



LOCATION PLAT

Locate well by footage measurement from legal subdivision line, lease or property line and nearest drilling or producible well, if any.

Form No. 2
File at
Billings
or Shelby

Rge. 51E

Form No. 2
File at
Billings
or Shelby

Locate
Well
Correctly

Locate
Lease
Boundary

Twp. 28N

THE NOTICE OF INTENTION TO DRILL THIS WELL IS APPROVED SUBJECT TO THE FOLLOWING CONDITIONS:

1. Any person, before commencing the drilling of any oil or gas well, shall secure from the commission a drilling permit and shall pay to the commission therefor for the following amounts: for each well whose estimated depth is thirty-five hundred (3,500) feet or less, twenty-five dollars ($25.00); from thirty-five hundred and one (3,501) feet to seven thousand (7,000) feet, seventy-five dollars ($75.00); seven thousand (7,000) feet and deeper, one hundred fifty dollars ($150.00).
2. No well is to be spudded in unless the proper surety drilling bond has been posted and approved by the Oil and Gas Conservation Commission of the State of Montana.
3. Cable tool operators must construct an adequate sump to contain all mud and water bailed from the hole.
4. Surface or conductor casing must be properly cemented by an approved method to act as a tie in case an unexpected flow of oil, gas, or water should be encountered, unless special permission has been granted for formation shut-off.
5. Any contemplated change in status of a well such as to plug and abandon, deepen, plug back, redrill, alter casing, etc., must be presented on Sundry Notices and Report of Wells form for approval by agent prior to commencement of work.
6. All substantial showings of oil or gas must be tested for commercial possibilities before drilling ahead. Each such showing must be adequately protected by casing, mud or cement, as drilling progresses.
7. The production string must be cemented unless a formation shut-off or packer is approved by the agent. Sufficient cement must be used to protect the casing and possible productive formation exposed in the process of drilling not otherwise protected.
8. All production strings of casing must be tested by bailing or pressure to determine if there is a tight bond with the formation or possible leaks in the casing. The results of the test must be reported on Sundry Notices and Report of Wells form, said report to include the size, weight, thread and length of casing, amount of cement used, and date work is done. If test shows failure, the defect must be corrected before any drilling operations are resumed.
9. A satisfactory drilling record must be kept for each tour, showing top and thickness of each and all formations drilled and all other information of value, one copy of which is to be kept at the rig while drilling is in progress for examination when an agent visits the well.
10. All producing wells must be marked with name of the operator, number of the well, and location, using reasonable precautions to preserve these markings at all times.
11. Copies of all directional surveys, electrical logs, or tops from electrical log if electric survey is run, formation tests, and cementing record, as furnished by the cementing company, etc., must be filed with the State Inspector of the district together with four copies of the log, upon completion of the well.
12. All work must be done in conformity with the regulations of the Oil & Gas Conservation Commission of the State of Montana, as contained in "General Rules and Regulations," and amendments thereto, as well as regulations prescribed in lieu thereof.

3 GEOLOGY & MAPS

WELL & GEOLOGY SUMMARY

LOCATE WELL CORRECTLY

660' 1980'

(SUBMIT IN TRIPLICATE)
TO
OIL AND GAS CONSERVATION COMMISSION
OF THE STATE OF MONTANA
BILLINGS OR SHELBY

JUL 1970 RECEIVED

Form No. (Cont. Rule 108.3 & 5)

LOG OF WELL

12

Company Mesa Petroleum Co. Lease Biere Well No. 1-22

Address Box 2009 Amarillo, Texas Field (or Area) Poplar

The well is located 1980 ft. from (S) line and 660 ft. from (W) line of Sec. 22

Sec. 22 T. 28N R. 51E County Roosevelt Elevation 2086 KB 2074 GL (D.F., D.D. or G.L.)

Commenced drilling 5-6-70, 19__; Completed ~~XXXXX~~ 6-8-70, 19__

The information given herewith is a complete and correct record of the well. The summary on this page is for the conditi of the well at the above date.

Completed as oil (oil well, gas well, dry hole)

Signed [signature]

Title Production Superintendent

Date July 7, 1970

IMPORTANT ZONES OF POROSITY

(denote oil by O, gas by G, water by W; state formation if known)

From	698	to	876	Judith River	W	From	5516	to 5543	Charles "A" W
From	3200	to	3570	Dakota	W	From	5635	to 5678	Charles "B" W
From	4840	to	4992	Tyler	W	From	5788	to 5805	Charles "C" O & W
From	5155	to	5288	Kibbey Ss.	W	From		to	

CASING RECORD

Size Casing	Weight Per Ft.	Grade	Thread	Casing Set	From	To	Sacks of Cement	Cut and Pulled from
8 5/8	24	J	8	741			465	none
5 1/2	15	J	8	5845	TOC @ 2660'		675	none

TUBING RECORD

Size Tubing	Weight Per Ft.	Grade	Thread	Amount	Perforations
2 7/8	6.7	J	8	5767	5791

COMPLETION RECORD

Rotary tools were used from 0 to 5845

Cable tools were used from to

Total depth 5845 ft.; Plugged back to 5803 T.D.; Open hole from to

PERFORATIONS Interval From	To	Number and Size and Type	ACIDIZED, SHOT, SAND-FRACED, CEMENTED Interval From	To	Amount of Material Used	Pressure
5791		Hydro-jet	5791		2000 gals 7 1/2% HCL	

(If P&A show plugs above)

INITIAL PRODUCTION

Well is producing from Charles "C" zone (pool) formation.

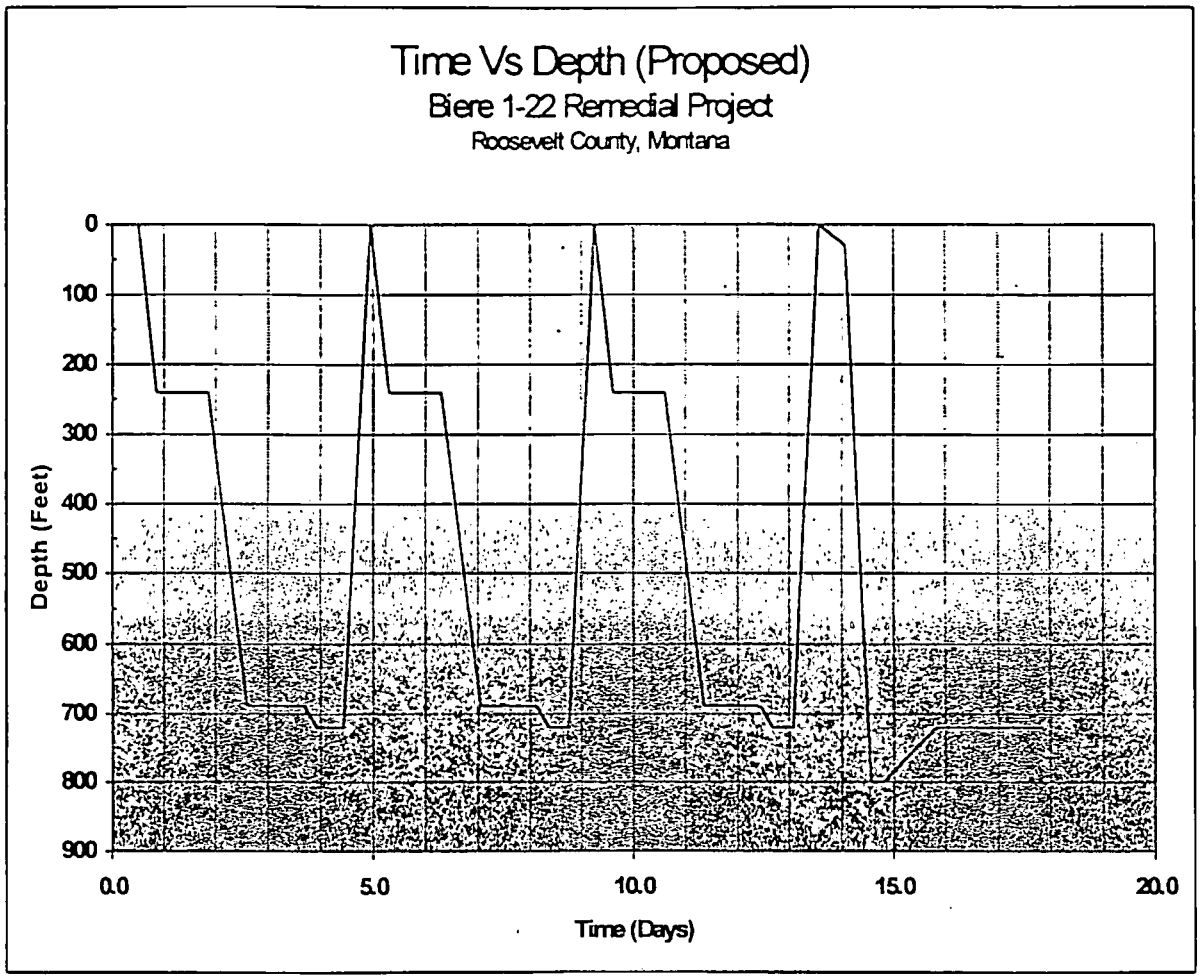
I.P. 516 barrels of oil per 24 hours flowing (pumping or flowing)

150 Mcf of gas per 24 hours.

966 barrels of water per 24 hours, or 65 % W.C.

(OVER)

DEPTH VERSUS DAYS CURVE



TIME VS DEPTH TABLE

Time Vs Depth (Proposed)

Biere 1-22 Remedial Project
Roosevelt County, Montana

Hrs.	Days	Total Days	Depth	Details
0.0	0.0	0.0	0	
12.0	0.5	0.5	0	MI & RU Equipment. Test Hydril
8.5	0.4	0.9	240	Drill from 35' to 240'. Circulate and clean hole. Wiper trip
6.0	0.3	1.1	240	Run and Cmt 9 5/8" casing
12.0	0.5	1.6	240	WOC
6.0	0.3	1.9	240	Run CBL & N/U
18.0	0.8	2.6	688	Drill from 240' to 688'. Circ & cond hole
8.0	0.3	2.9	688	Run and Cmt 5 1/2" Casing
12.0	0.5	3.4	688	WOC
6.0	0.3	3.7	688	Run CBL & N/U
6.0	0.3	3.9	720	P/U BHA. Test shoe. Drill to 720'
6.0	0.3	4.2	720	Circ & Cond. Perform Leak-Off Test to establish Frac Gradient. POOH
6.0	0.3	4.4	720	RIH with 2 7/8" tubing and hang same. Prepare well for injection
12.0	0.5	4.9	0	MI & RU Equipment. Test Hydril
8.5	0.4	5.3	240	Drill from 35' to 240'. Circulate and clean hole. Wiper trip
6.0	0.3	5.6	240	Run and Cmt 9 5/8" casing
12.0	0.5	6.0	240	WOC
6.0	0.3	6.3	240	Run CBL & N/U
18.0	0.8	7.0	688	Drill from 240' to 688'. Circ & cond hole
8.0	0.3	7.3	688	Run and Cmt 5 1/2" Casing
12.0	0.5	7.8	688	WOC
6.0	0.3	8.1	688	Run CBL & N/U
7.0	0.3	8.4	720	P/U BHA. Test shoe. Drill to 720'
3.0	0.1	8.5	720	Circ & Cond. POOH
6.0	0.3	8.8	720	RIH with 2 7/8" tubing and hang same. Prepare for injection
12.0	0.5	9.3	0	MI & RU Equipment. Test Hydril
8.5	0.4	9.6	240	Drill from 35' to 240'. Circulate and clean hole. Wiper trip
6.0	0.3	9.9	240	Run and Cmt 9 5/8" casing
12.0	0.5	10.4	240	WOC
6.0	0.3	10.6	240	Run CBL & N/U
18.0	0.8	11.4	688	Drill from 240' to 688'. Circ & cond hole
8.0	0.3	11.7	688	Run and Cmt 5 1/2" casing
12.0	0.5	12.2	688	WOC
6.0	0.3	12.4	688	Run CBL & N/U
6.0	0.3	12.7	720	P/U BHA. Test shoe. Drill to 720'
6.0	0.3	12.9	720	RIH with 2 7/8" tubing and hang same. Prepare well for injection
3.0	0.1	13.1	720	Circ & Cond. POOH
12.0	0.5	13.6	0	MI & RU Equipment. Test Hydril
12.0	0.5	14.1	300	RIH & drill 30' of cement plug. Circ & cond hole
12.0	0.5	14.6	800	RIH to 680'. Drlg 50' of cement. RIH to bottom. Circ & cond hole
6.0	0.3	14.9	800	RIH with 2 3/8" tubing and hang. Prepare for injection
12.0	0.5	15.4	720	R/U Halliburton Injection Equipment
12.0	0.5	16.9	720	Perform Injection
24.0	1.0	17.8	720	Waiting on fluid to set. Monitor well
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

5 DETAILED OPERATIONS PROCEDURES

NOTE: THE DETAILED PROCEDURE HIGHLIGHTS THE BASIC WELL PLAN. THE OTHER SECTIONS GIVING MORE COMPLETE DETAILS ARE UNDERLINED AND IN PARENTHESIS, WHERE APPROPRIATE.

LOCATION CONSTRUCTION & RIG UP

1. Check the roads to the location and stabilize as needed to bring in required equipment.

2. Clean and level location. Prepare same to bring in equipment.

3. Drill water well.

4. Clean cellars of the Biere 1-22 and Biere 1-22 Relief Well.

5. Construct three 8' by 6' cellar with corrugated metal ring (make sure cellar size complies with rig requirements).

6. Move in and rig up Rathole Machine. Drill 17-1/2" hole down to ~~35'~~ 60'-65'. Run and cement 13 3/8" conductor pipe to bottom. If cement does not circulate to surface, top out casing with 1" tubing and fill to surface with standard cement + 2% CaCl2. WOC. Have 13-3/8" SOW Bell Nipple on location in the event unable to space out conductor properly.

7. Drill mouse hole and set conductor. Drill rat hole.

8. Repeat steps 6 and 7 two times (for a total of three conductor pipes for the drilling of the new relief wells).

9. Rig down and move out Rathole Machine.

DRILLING PROCEDURE

1. Move in and rig up drilling rig.

2. Position rig over the conductor of the first relief well to be drilled and level substructure accordingly. Pull test all deadman anchors for stability. Replace any anchors that are doubtful.

3. Notify the Montana Board of Oil and Gas Conservation and advise them of the spud date and time.

4. Install a 13 3/8" X 9 5/8" Larkin Casing Head (screw-on type), 13 3/8" Casing Btm X 9 5/8" Slip & Seal Assembly. Install screw-on type drilling flange / BOP Adapter for 13 3/8" Larkin Head X 13 5/8" 3M Flange, on top of casing head to be ready to nipple up BOP stack on top.

5. Pick up and install 13 5/8" 3,000 psi WP BOP Stack, low-pressure rotating head and choke manifold (See Details in BOP Section).
6. Test rams, choke manifold and Hydril to 2,000 psi with test plug. Test rotating head to 350 psi or 70% of full capacity. Run full accumulator test. Report results

7. P/U a 12-1/4" milled tooth bit (see Bit Program) and BHA. RIH and test 13-3/8"casing to 500 psi. Drill out cement and cementing equipment. Drill down to +/- 240' with fresh water (may need some extra footage since a screw-on type head will be used, and spacing may become an issue). If conditions require it, weight up system as needed. Take drift survey at 240'. Circulate and condition hole.
   - Some fluid influx may be observed while drilling this section.
   - Some very high temperatures may be observed in this section (120° - 200°F)
   - Ensure proper X-Over are on location prior to spud.
   - If needed, sweep hole as necessary with gel sweeps

8. Short trip to surface. Circulate & condition hole prior to running casing. Make sure hole is stable and no water influx is observed. POOH. Contact Montana Board of Oil and Gas Conservation and inform them of intent to run and cement casing.

9. Run and cement 9-5/8" casing (see Casing and Cementing Detail Sheet). Note: Thread lock shoe joint.

10. Reciprocate casing during cementing. Cement returns to surface should be monitored and recorded on morning report. If necessary, top out casing with 50 feet of 1" tubing and fill to surface with 50 sx of standard cement + 2% $CaCl_2$.

11. N/D BOP's. Space out and install a 9 5/8" Larkin Casing Head (9 5/8" 8rd Casing bottom X 5 ½" Slip & Seal Assembly) with Drilling Flange Adapter (9 5/8" Larkin Head X 11" 3M Flange). Total time before drill out should be 12 hours.

    - Have one or two joints of extra casing on location to cover for any damaged joints.
    - Run casing at a constant and reasonable speed. Be sure to keep csg. moving as much as possible.
    - Have 9-5/8" SOW Bell Nipple on location in the event unable to space out casing properly.

12. NU BOP's & rotating head.

13. Rig up wireline unit. Run CBL Log and report results to office. Rig down wireline unit.

14. PU 7-7/8" milled tooth bit (see Bit Program) and BHA. RIH and test casing to 1,600 psi. or 70% of burst capacity. Drill float equipment and 10' of formation. Test 9-5/8" casing seat to 9.4 ppg equivalent mud weight. Notify operations engineer if shoe does not test.

15. Drill to ±688' (10' above Judith River Sandstone), with spud mud. Circulate and condition hole. Weight up mud in order to stabilize hole and stop any possible fluid influx. POOH.

    - Some severe flow of fluid may be observed (+/- 80-90 BPH).
    - Take drift survey at 688'.

- Make short trips as required.
- Circulate well and observe clean stabilized hole prior to tripping.

16. Run Temperature Log in open hole. Report results to office. Results will be used to design the injection remedial job.

17. R/U casing crews. Run and cement 5-1/2" casing to ±688' (See Cementing and Tubular Section). Contact Montana Board of Oil and Gas Conservation prior to cementing.

18. N/D BOP's. Space out and install a 3M Larkin Tubing Head (Type R 5 ½" 8rd X 2 7/8" Slip & Seal Assembly) with Drilling Flange / BOP Adapter (5 1/2" Larkin Head X 7 1/16" 3M Flange). Total time before drill out should be 12 hours.

    - Note: Baker lock the shoe joint(s)
    - Wash down as necessary.
    - WOC for 12 hours.

19. N/U rig BOP's (See BOP Section). Test BOP'S, choke manifold and annular preventer to 250 low and 3,000 psi high. Install & test rotating head with test cap to 350 psi. Report results in morning report.

20. Run CBL Log from TOC to surface. Report results to office.

21. PU 4-1/2" milled tooth bit (see Bit Program) and BHA. RIH to TOC. Test casing to 3,000 psi or 70% of burst capacity prior to drilling out. Displace mud with fresh water.

22. Drill out cementing equipment and drill down to +/- 720' (leaving exposed 10' of the Bearpaw Shale and 22' of the Judith River Sandstone). Circulate and condition hole with brine (9 PPG or as required to kill the well).

23. Perform a Leak-off Test to establish actual fracture gradient to be used in injection job. POOH and LD drill string.

24. PU and RIH with 2 7/8" N-80 8rd EUE 6.5 PPF tubing down to +/- 680'. Hang tubing in tubing head and N/U Larkin-type tree in preparation for injection job (see Wellhead Section). Secure well and monitor pressure gauges on annulus of each section daily.

25. Repeat steps 1 through 24 for the drilling of the next two remedial wells. Avoid steps 3, 16 and 23 which will only be performed in the drilling of the first remedial well.

26. Move in and rig up drilling rig to old relief well.

27. Position rig over the conductor of the old relief well and level substructure accordingly. Pull test all deadman anchors for stability. Replace any anchors that are doubtful.

28. Weld on 5-1/2" SOW Bell Nipple. Install a 3,000 psi WP screw-on type casing head. Install screw-on type adapter flange on top of casing head to be ready to nipple up BOP stack on top (5 1/2" Larkin Head X 7 1/16" 3M Flange) and test same.

29. Pick up and install 3,000 psi WP BOP Stack and choke manifold (See Details in BOP Section).

30. P/U 4 1/2" bit and BHA. Drill out surface cement plug (+/- 30 feet). RIH to +/- 686' (approx. TOC of intermediate cement plug).

31. Test 5 1/2" casing integrity to 2,000 psi.

32. Circulate and clean hole with fresh water. Drill +/- 50' of cement. Care must be exercised since some fluid pressure may be accumulated under this cement plug. Circulate and clean hole. RIH to +/- 800' (approx. TOC of third and last cement plug). Circulate and clean hole with brine (9 PPG or as required to kill the well). POOH and LD drill string.

33. PU RIH with 2 7/8" N-80 8rd EUE 6.5 PPF tubing down to +/- 680'. Hang tubing in tubing head and N/U connections to prepare for injection job. Secure well.

34. Rig up and prepare wells for Halliburton injection equipment.

35. Release Rig.

STUCK PIPE PREVENTION METHODS FOR INTERMEDIATE AND PRODUCTION HOLE

While drilling the intermediate and production portions of the well, continue to use the following precautions to minimize chances of sticking the drill string. **MEET WITH ALL DRILLERS AND TOOLPUSHERS TO ENSURE UNDERSTANDING. POST A COPY IN THE DOGHOUSE FOR ALL CREWS.**

(1) Pipe movement:

- Keep pipe moving at all times possible.
  - Rotate the string on all connections and on trips while in open hole.
  - Reciprocate and rotate pipe while circulating.
- Always begin pipe motion in a downward direction while in the vertical section of the hole.
- Ream at least the last three singles to bottom on trips.
- Wipe the hole prior to each connection.

(2) Drill String:

- Use the drill string design described elsewhere in the drilling program.
- Use spiral DCs and spiral HWDP while drilling, if available.

(3) Drilling Fluid/Hole Conditioning:

- Maintain minimum MW necessary to control the well.
- Maintain Annular Velocity at +140 ft./min.
- Maintain circulation as long as possible on connections.

(4) Hole Monitoring:

- Monitor the volume of cuttings over the shakers, noticing any change. Ensure the shakers are clean prior to tripping.
- Monitor torque and drag, and report Pick-Up, Slack-Off and Rotating weight on the morning report. Report depth and magnitude of overpull.
- Watch for indications of swabbing, indicating tight hole.
- Watch for fill on connections and trips.

(5) Stuck Pipe: If pipe becomes differentially stuck while drilling the vertical section of the hole:

- Stop pump (or slow significantly);
- Torque the string;
- Slack off all weight in an attempt to free the string.

6 CASING PROGRAM

CASING SUMMARY

CASING & TUBING REQUIREMENTS*

Biere 1-22 Relief Wells

SECTION	DEPTH		OD	ID	DRIFT	JOINT	WT.	GRADE	CONN.	BURST	COLLAPSE	TENSION
	FROM	TO	(in)	(in)	(in)	OD	(ppf)			(psi)	(psi)	(lbs)
Surface Casing	0'	35'	13 3/8"	12.72	12.559	14.375	48	H-40	STC	1,730	740	607,000
Intermediate Csg.	0'	240'	9 5/8"	9.001	8.845	10.63	32.3	H-40	STC	2,270	1,370	365,000
Production Csg.	0'	688'	5 1/2"	5.012	4.887	6.05	14	J-55	STC	4,270	3,120	222,000

SECTION	REASON FOR CASING
Surface Casing	Need to set BOP's. Last point without water influxes (which will benefit the quality of the cement job).
Intermediate Csg.	Protect Glacial-U Aquifer.
Production Csg.	Force injection fluid in the Judith River Sandstone and protect other formations from fracturing.

*** All casing sizes specified here are minimums required. Different weights and grades may be considered as long as they comply with the minimum ID's required by the next bit or equipment to be used.**

7 DRILLING FLUIDS PROGRAM

DRILLING FLUIDS

Interval	Bit Size, in.	Casing Size, in.	Depth (MD), feet	Mud Type	Mud Weight, lb/gal
I	17 1/2"	13 3/8"	35'	Water	8.34 – 8.34
II	12 1/4"	9 5/8"	240'	Spud Mud	8.34 – 8.6
III	7 7/8"	5 1/2"	688'	Spud Mud + Weighted Material	8.6–9.5
IV	4 1/2"	Open Hole	720'	Fresh Water	8.34

8 CEMENT DESIGN

9-5/8" CASING CEMENT & DETAIL SHEET

Pioneer Natural Resources USA, Inc Casing Cementing and Detail Sheet

WELL: Biere Remedial COUNTY: Roosevelt, Montana FIELD: Poplar DATE: Sept/11/00

BTM (MD/TVD): ,240' / ,240' HOLE SIZE: 12 1/4" CASING SIZE: 9 5/8"

STRING (RUNNING ORDER) MAKE UP TORQUE (FT-LB)

1)	0	-	-	(')	0.00 #/ft	0 0	•	0
2)	-	-	-	(')	0.00 #/ft	0 0	•	0
3)	-	-	240	(240')	32.30 #/ft	H-40 STC	•	4,340

SPACE FLOAT EQUIPMENT AS FOLLOWS:

ITEM	LOCATION:
(1) - STC FLOAT SHOE	BOTTOM OF 1ST JOINT
(1) - 9 5/8" X 12 1/4" BOWSPRING TURBOLIZER w/ STOP RING	6' ABOVE CSG SHOE
(1) - 9 5/8" X 12 1/4" BOWSPRING TURBOLIZER w/ STOP RING	BELOW 1ST COLLAR
(1) - 9 5/8" X 12 1/4" FLOAT COLLAR	BETWEEN 1ST. & 2ND. JOINT
(4) - STC BOWSPRING TURBOLIZERS	EVERY JOINT
-	

CEMENT (MIXING ORDER) CEMENT CO. Halliburton Williston, North Dakota (888) 774-3963

TYPE	ADDITIVES	SKS	WT - ppg	YIELD	GAL/SK
LEAD:	N/A				
N/A	N/A	**	N/A	0.00	0
TAIL:	0.25 lb/sx Lost Circ + 3% KCl +				
Premiun Plus	0.2% Thixotropic	120**	14.5	1.41	6.85

Note: Top of Cement @ ' (240' above Casing Shoe) with 100% Excess in Open Hole.
(Gas block agent will be added to cement - amount to be determined after testing slurries).

CEMENT PROPERTIES:
Tail: 24 hrs Compressive Strength > (N/A) psi. 72 hrs Compressive Strength > (N/A) psi. BHST = 142°F
Tail: No Free Water & Fluid Loss < N/C cc.
Pump Time = 2. hrs.

CEMENTING PROCEDURE:
Cement requires 20 bbls of mix water. Pump 10 bbls of Fresh Water ahead of slurry.
Displace casing with 16 bbls of mud at maximum rate for turbulence. Reciprocate pipe with 20 ft strokes while mixing and displacing cement. WOC 24 hrs before drilling out.

MISCELLANEOUS INFORMATION:
Use torque monitoring equipment (NOT Torque Turn) while making-up casing. Send field casing and cementing detail sheet to office.
Collapse resistance of 32.30# H-40 STC casing is 913 psi with Safety Factor of 1.5.
Estimated Maximum Shut in Pressure = 500 psi. Burst SF of 32.30# H-40 STC casing is 4.54 .
Maximum recommended tension of 32.30# H-40 casing is 170,180,000 # @ 67%.
Buoyant weight of casing with 8.6# mud on the inside and outside of the casing is 7,000 #.
Test casing to 70% of Burst or 1,600#. Test Rams and choke lines to 2,000#. Test Hydril to 2,000
350 psi with test cap.
Note: Use (1) wiper plug(s). Also, Have one extra bottom plug available for emergencies.
Note: Cement company to bring cement out to location in bins prior to cementing for testing field blends pump time, retarder, water loss, compressive strengths etc.
** If available use hole volume determined from caliper log to determine cement volumes (caliper volume plus 100%).

*** CALL Montana Board of Oil and Gas Conservation PRIOR TO CEMENTING ***

Prepared by: Signa Engineering Corp. Approved by: _____

5-1/2" INTERMEDIATE CASING CEMENT & DETAIL SHEET

Pioneer Natural Resources Casing Cementing and Detail Sheet

WELL: Biere Remedial **COUNTY:** Roosevelt, Montana **FIELD:** Poplar **DATE:** Sep/11/00

BTM (MD/TVD): ,688' / ,688' **HOLE SIZE:** 7 7/8" **CASING SIZE:** 5 1/2"

STRING (RUNNING ORDER) **MAKE UP TORQUE (FT-LB)**

1)	0	-	-	( )	0.00 #/ft	0 0	*	0
2)	-	-	-	( )	0.00 #/ft	0 0	*	0
3)	-	-	688	(688')	14.00 #/ft	J-55 STC	*	1,720

SPACE FLOAT EQUIPMENT AS FOLLOWS:

ITEM	LOCATION:
(1) - STC FLOAT SHOE	BOTTOM OF 1ST JOINT
(1) - 5 1/2" X 7 7/8" BOWSPRING TURBOLIZER W/ STOP RING	6' ABOVE CSG SHOE
(1) - 5 1/2" X 7 7/8" BOWSPRING TURBOLIZER	BETWEEN 1ST & 2ND JOINT
(1) - 5 1/2" X 7 7/8" BOWSPRING TURBOLIZER W/ STOP RING	MIDDLE OF 2ND JOINT
(1) - STC FLOAT COLLAR	BETWEEN 2ND & 3RD JOINTS
(8) - STC BOWSPRING TURBOLIZER	EVERY SECOND JOINT
-	

CEMENT (MIXING ORDER) **CEMENT CO.** Halliburton Williston, North Dakota (888) 774-3963

TYPE	ADDITIVES	SKS	WT - ppg	YIELD	GAL/SK
LEAD:	---------				
		**	N/A	0.00	0
TAIL:		95**	13	1.75	9.18
Premium Plus/Pozmix	4% Extender+3% KCl+0.4%Fluid Loss+ 0.25lb/sx Lost Circ+0.2% Thixotropic				

Note: Top of Cement @ Surface with 30% excess.

CEMENT PROPERTIES:
Tail: 24 hrs Compressive Strength > N/A psi. 72 hrs Compressive Strength > N/A psi. BHST = 128°F
Tail: No Free Water & Fluid Loss < N/A cc.
Pump Time = 4 hrs.

CEMENTING PROCEDURE:
Cement requires 21 bbls of mix water. Pump 20 bbls of OB-1 Spacer ahead of slurry.
Displace casing with 15 bbls of mud at maximum rate for turbulence. Reciprocate pipe with 10 ft strokes while mixing and displacing cement. WOC 24 hrs before drilling out.

MISCELLANEOUS INFORMATION:
Use torque monitoring equipment while making-up casing. Send field casing and cementing detail sheet to Pioneer Natural Resources c
##
Estimated Maximum Shut in Pressure = 1,500 psi. Burst SF of 14.00# J-55 STC casing is 2.85 .
Maximum reccomended tension of 14.00# J-55 casing is 129,000,000 # @ 75%.
Buoyant weight of casing with 9.5# mud on the inside and outside of the casing is 9,000 #.
Note: Use (1) wiper plug(s).
Note: Cement company to bring cement out to location in bins prior to cementing for testing field blends pump time, retarder, water loss, compressive strengths etc.
** If available use hole volume determined from caliper log to determine cement volumes (caliper volume plus 30%).

*** CALL Montana Boards of Oil and Gas Conservation PRIOR TO CEMENTING ***

Prepared by: Signa Engineering Corp. Approved by: _____

9 BITS

9.1 BIT PROGRAM

Offsets Used for Comparison
Biere 1-22
Biere 1-22 Relief Well
EPU 116

Proposed Hole and Casing Design		
Hole Size(in)	Casing Size(in)	MD Depth(ft)
17-1/2	13-3/8	35'
12-1/4	9-5/8	240'
7 7/8	5-1/2	688'
4-1/2	Open Hole	720'

7.2 BIT SUMMARY INFORMATION

Hole Section: 17-1/2
Depth: 0'-35'
Bit Type: Retip Milled Tooth
IADC Code: **111**
Footage: 35' Each Well

Drilling Applications
Designed for soft-formation, top-hole drilling in low-strength, unconsolidated clays, sands and silty marine sediments. Typically used as a spud bit.

Design Specifications	
Bearing Type	Open Roller
Journal Angle	32-1/2°
Offset	3/8"
Seal	None
Number of Rows	7
Number of Teeth	75
Bit Connection	6-5/8" Reg.

Hole Section: 12-1/4
Depth: 35'-240'
Bit Type: Retip Milled Tooth
IADC Code: 515X
Footage: 205' Each Well

Drilling Applications

Designed for drilling intervals of very soft, low-compressive strength, unconsolidated formations such as clays, marls, soft shales, sands, halites and gypsums.

Design Specifications

Bearing Type	Spinodal
Journal Angle	32-1/2°
Offset	3/8"
Seal	O-Ring
Number of Rows	7
Number of Teeth	65
Bit Connection	6-5/8" Reg.

Hole Section: 7-7/8
Depth: 240'-688'
Bit Type: New Milled Tooth
IADC Code: 117
Footage: 448' Each Well

Drilling Applications

Designed to drill long intervals of soft to medium-soft, low-compressive strength, unconsolidated formations such as clays, marls, soft shales, unconsolidated sands, halites and gypsums.

Design Specifications

Bearing Type	Spinodal
Journal Angle	32-1/2°
Offset	5/16"
Seal	O-Ring
Number of Rows	7/3
Number of Teeth	54/58
Bit Connection	4-1/2" Reg.

Hole Section: 4-1/2
Depth: 688'-720'
Bit Type: New Milled Tooth
IADC Code: 111
Footage: 32' Each Well

Drilling Applications

Designed to drill long intervals of soft to medium-soft, low-compressive strength, unconsolidated formations such as clays, marls, soft shales, unconsolidated sands, halites and gypsums.

10 LOGGING PROGRAM

No e-logs are planned at this time. CBL logs will be run to assure the quality of the cement jobs. Two runs will per performed per well (3 wells). This is **ONLY** a proposed program, and may be changed according to the project needs.

1. *RUN #1*

Depth:	0' - 240' (Cased Hole)
Casing Size:	9 5/8"
Service Company:	N/A
Type of Unit:	N/A
Logs:	CBL
Scales:	As requested by Pioneer Representatives

2. *RUN #2 (ONLY IN 1st. WELL)*

Depth:	0' - 688' (Open Hole)
Hole Size:	12 1/4"
Service Company:	N/A
Type of Unit:	N/A
Logs:	Temperature Survey Log
Scales:	As requested by Pioneer Representatives

2. *RUN #3*

Depth:	0' - 688' (Cased Hole)
Casing Size:	5 1/2"
Service Company:	N/A
Type of Unit:	N/A
Logs:	CBL
Scales:	As requested by Pioneer Representatives

3. ***MUDLOGGERS should be available all the time, at least during the first well.***

11 BLOW OUT PREVENTER & AUXILIARY EQUIPMENT

The BOP stack will be composed of a single 3,000 psi WP shear/blind ram with a 3,000 psi annular preventer and a low-pressure rotating head (500 psi) on top. This equipment should be rigged up after setting the 13 3/8" surface casing. (see wellbore schematic below).

Note: It is important to check the clearance between the BOP stack + rotating control device and the substructure of the drilling rig.

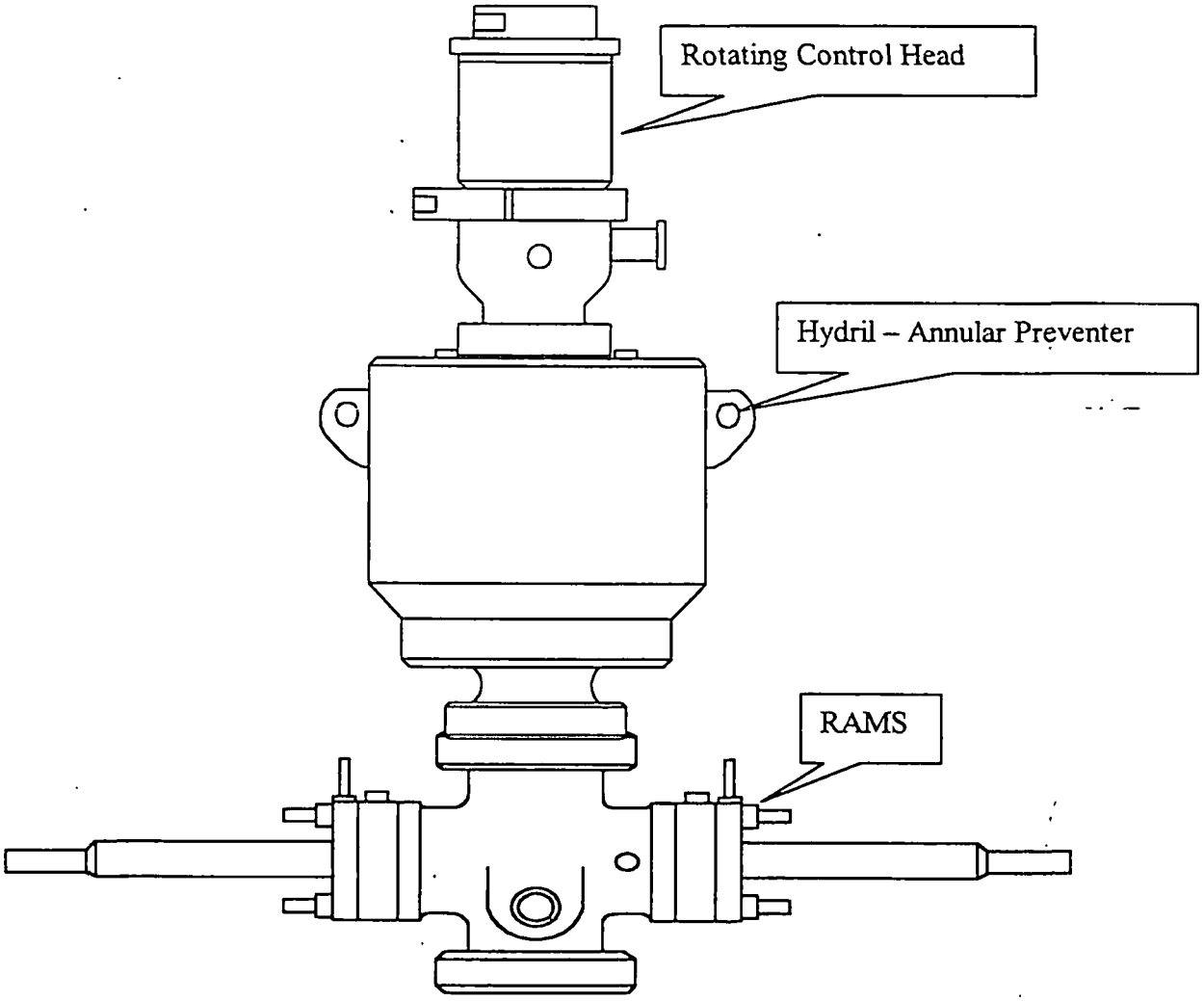
1. All BOP's and the accumulator should be thoroughly serviced and tested on location. Leaking accumulator valves should be replaced before drilling commences.

2. All accumulator bottles should be checked for pre-charge pressures and volume requirements should be affirmed.

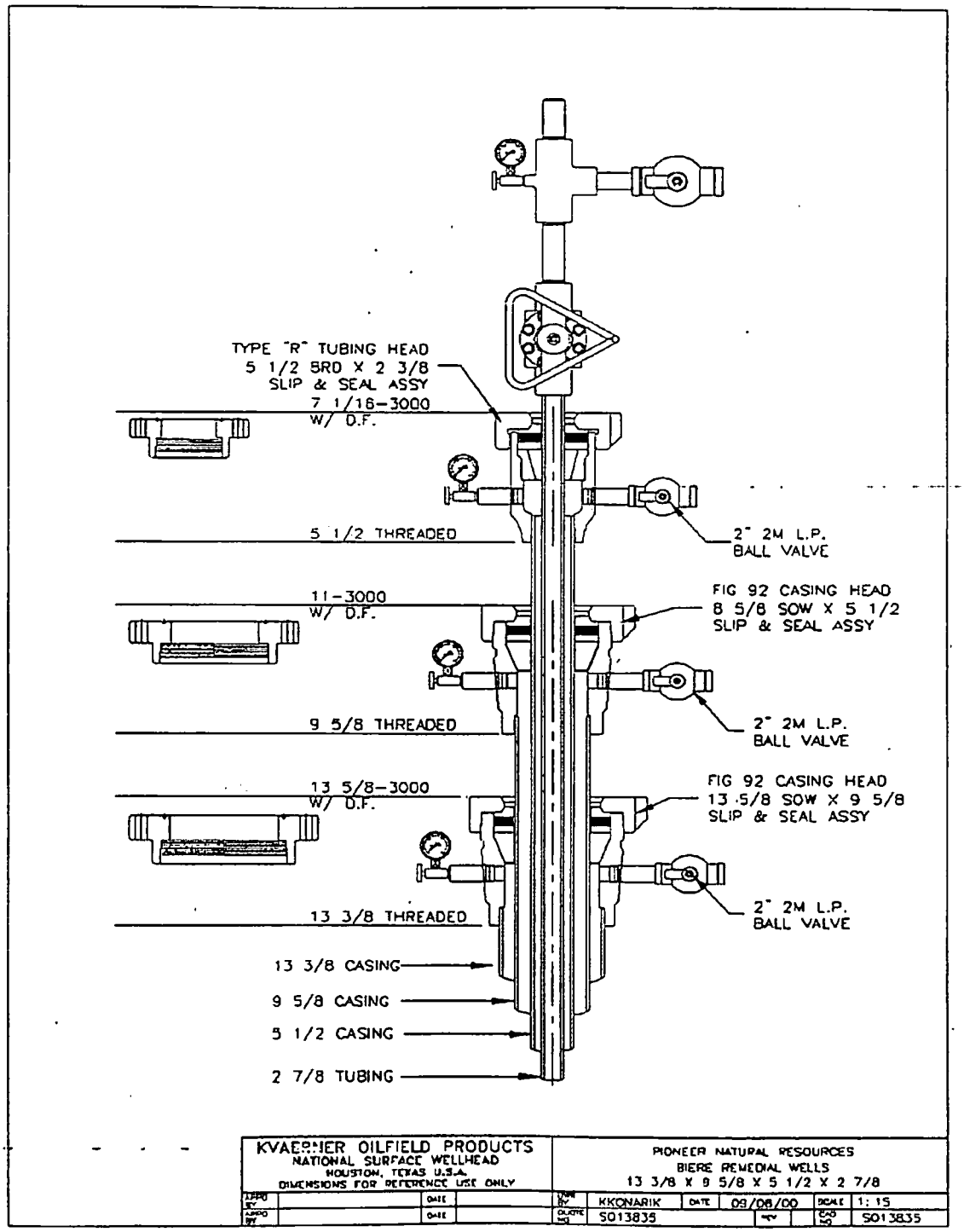
3. A kelly cock to be kept in string at all times.

4. A stabbing valve for the drill string and 2-7/8" tubing with wrenches will be kept on the derrick floor at all times while running pipe.

BOP STACK SCHEMATIC



WELLHEADS & EQUIPMENT



O

PLAN FOR WELL FAILURES

O. Plan For Well Failures

The injection wells are to be utilized only for the purpose of injecting a plugging material in the Judith River to stop leakage from the Biere 1-22 Well. If the injectrol "U" does not seal as contemplated, cement will be used prior to plug & abandonment of the injectors.

Once the project is complete, the surface will be restored to satisfaction of landowner & EPA.

P

MONITORING PROGRAM

P. Monitoring Program

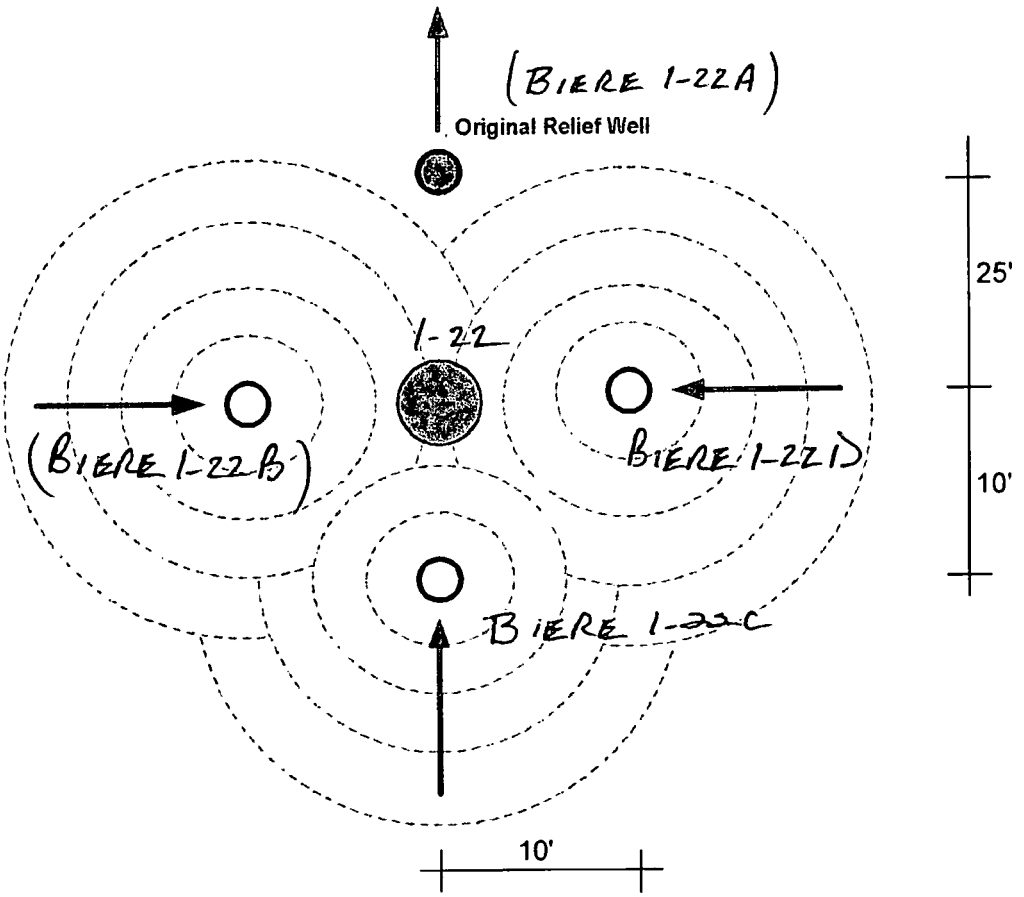
The attached map shows the location of Pioneer's monitor wells PNR4, PNR5, PNR6, PNR7, PNR8, PNR9, PNR10 & PNR12. All of these wells were drilled in 2000 and are available for monitoring injection results above the Bearpaw shale. The old Biere Relief well (25' NNE) of the Biere 1-22 (old producer) will be re-entered and cleaned out to original total depth. It will be equipped to monitor the injection of the sealing product (Halliburtons' Injectrol "U") into the proposed injection wells (diagram attached).

Once the EPA and Pioneer is satisfied with the results of the injection matrix sealing results; the Biere relief well will be squeezed also.

Pioneer will continue to monitor the results of the injection squeeze results on a monthly basis for the first (6) six months after treatment and then quarterly for the next (6) months. At this point, all results will be reviewed with the EPA's Denver staff to determine the future monitoring schedule.

Biere Remediation Project
Roosevelt County, Montana
Pioneer Natural Resources USA
Inc.

Option #2 (PROPOSED INJECTION PLAN)



Monitoring Plan for the Shallow Groundwater

Biere Well Response Action Project
Pioneer Natural Resources USA, Inc.

January 30, 2001

Monitoring Program

The proposed monitoring plan encompasses two simultaneous monitoring programs to meet these objectives, 1) quarterly testing of shallow monitoring wells near the Biere well and 2) semi-annual monitoring of more distant wells. Assuming long-term access agreements can be obtained from the controlling agencies and private well owners, the specific wells in each group are as follows:

Quarterly Monitoring

PNR 4	PNR 5
PNR 6	PNR 7
PNR 12	USGS FPB 92-3
USGS FPB 92-12	M-28 (Lockman)
M-31 (Trottier)	

Semi Annual Monitoring

PNR 8	PNR 9
PNR 10	M-27 (Reddoor)
Buckles-Whitmer	M-30 (Trottier new supply well)

The proposed monitoring program of quarterly and semi-annual sampling schedules is designed to accommodate expected changing dynamics near the Biere well versus the longer-term changes with flow distance (time). The quarterly sampling in the wells closest to the Biere well will provide better resolution in the area where significant and possibly rapid changes in water chemistry should occur. For the more distant down gradient wells and the background wells, the semi-annual sampling program will provide adequate characterization of the changes in the aquifer chemistry over time and improve the general knowledge of flow paths and chemistry trends in the aquifer. Well locations are provided on Figure 1.

Analyses

The proposed monitoring parameters for each group are identical and consist of:

Temperature*	Specific Conductivity*
pH*	Total Dissolved Solids
Sodium	Chloride
TPH	BTEX

Asterisks indicate field parameters. Temperature, specific conductivity and pH will be measured in the field as the well is being purged prior to sampling. Specific conductivity and pH will also be determined in the laboratory.

On an annual basis, all wells will be sampled for additional ions to allow water typing, to evaluate changes in other chemistry parameters and for use in establishing water chemistry relationships between wells. The supplementary parameters are:

Calcium	Magnesium
Potassium	Sodium
Total Hardness	Alkalinity
Bicarbonate	Carbonate
Nitrogen (Nitrate plus Nitrite)	

Sampling Procedures

Within one 24-hour period at the start of each sampling event, water levels will be measured in all wells for which access can be obtained and that are not being actively pumped. Wells M-30, Buckles-Whitmer, and possibly M-27, are active wells for which a water level measurement may not be feasible to collect.

All wells will be sampled in a generally "clean" to "dirty" sequence, based on previous sample data, beginning with the wells most distant from the Biere well and culminating with PNR 4.

<u>All Wells Except PNR 4</u>

These wells will be sampled using a variety of equipment depending on the physical condition of the well, depth to water, and the existence or availability of existing equipment. The monitoring wells and wells M-28 and M-31 will be sampled using a portable submersible sampling pump that is flushed and decontaminated between samples. Water level in well PNR 8 is too deep and the well does not make enough water to sample with a pump and therefore a Teflon bailer will be used to sample this well. Domestic wells M-30, Buckles-Whitmer and M-27 (if operational) will be sampled directly from the existing pump discharge from a faucet or tap that is not affected by any water softeners or filters.

<u>Well PNR 4</u>

This well has a thick accumulation of oil on the water surface and repeated monitoring of this well under these conditions is problematic. Therefore, prior to sealing the Biere well, PNR 4 will be retro-fitted in an attempt to allow sampling of the fluid in the shallow aquifer without first having to remove, handle and dispose of the accumulated oil. The initial conceptual approach is to equip the well with a secondary liner installed inside the current well casing. The liner will be equipped with a very limited screened interval (approximately the lower 6 inches maximum) and will be temporarily sealed to allow installation through the standing column of oil without filling the liner. Several options

are being considered for the temporary plug ranging from a soluble solid (salt) to puncturing a membrane.

Once in place with the perforations at the very bottom of the water column the liner should not accumulate significant oil and therefore all monitoring and samples will use the liner. If a suitable pressure transducer, thermistor and conductivity probe can be located this well may be so equipped and only periodic confirmation samples and direct measurements will be collected. However, as of the date of this monitoring plan, no dedicated equipment capable of handling the elevated temperature and high conductivity anticipated for this well has been located.

Purge Water Handling

Water removed prior to sampling (purge water) will be contained at the wellhead for those wells sampled quarterly, except for FPB-12, PNR-6 and PNR-12. For those wells sampled on a semi-annual basis, and background wells FPB92-12, PNR-6 and PNR-12, pre-sample purge water will be discharged at the wellhead in a manner that does not cause erosion or ponding of water near the wellhead.

Containerized purge water will be transported from each well to a central storage location. At an average purge volume of about 10 gallons per well, each quarterly sampling event will generate about 60 gallons of contained purge water. The final containment and disposal method for the sample purge water cannot be identified at this time but will be established prior to initiating the sampling. The disposal options that are being considered are discussed in the following paragraphs.

Offsite Disposal. The specific conductivity of the containerized water will be measured and a sample collected for BTEX and TPH at the end of each sampling event. The results of this sample will be used to determine appropriate disposal of the contained liquid.

If the BTEX constituent concentrations are below their respective Maximum Contaminant Limit (MCL), it may be possible to contract with a local vacuum truck service to retrieve the water and dispose of it in the Poplar or Wolf Point sewage treatment system, assuming arrangements with either city can be obtained. If BTEX concentrations are above MCL's it may be necessary for the containerized water to be retrieved by a licensed waste oil hauler and shipped offsite for appropriate disposal.

Onsite Disposal. An option for disposal of purge water that works well in dry, windy environments such as exists in this area, is construction of a temporary, shallow, lined evaporation pond. A pond, approximately 10 feet square and 1 foot deep line with high density polyethylene (HDPE) will hold about 750 gallons if full. Each sampling event will produce about 60 gallons of purge water which will fill the pond about three-quarters of an inch deep. A location near PNR 5 would be ideal for a small evaporation pond in that it is flat, overlies the plume, is in an area previously disturbed by oil field brine disposal and is central to the study area.

Quality Assurance/Quality Control

Chain of Custody and Analytical Methods

All samples will be submitted following standard Chain of Custody (COC) protocols to a state approved, independent laboratory for analysis using the current EPA methods prescribed in SW-846. Laboratory detection and reporting limits will meet or exceed (be less than) the State of Montana or EPA groundwater protection standards for the specific compound or constituent. Laboratory QA/QC procedures for organic analyses, including Reagent Blanks and Surrogate Recovery Reports will be provided by the laboratory with each analytical report.

Field, Equipment and Travel Blanks

One set of field blanks, equipment blanks, and travel blanks will be collected during each sampling event to evaluate whether the organic sample results are being adversely impacted by secondary contaminant sources including cross contamination from equipment, bottle contamination or contaminants introduced during shipping. Because of the higher reporting limits, no QA/QC blanks will be collected for the non-organic constituents and parameters being analyzed for.

Because of the sensitivity of the analysis, BTEX samples will be stored and shipped separately from the other sample containers. Samples with known or suspected BTEX constituents will be stored and shipped separately from other BTEX samples. A travel blank will accompany each BTEX shipping container.

One field blank will be collected during each sampling event. The field blank will be prepared by pouring laboratory grade de-ionized water into a 40 ml vial to simulate ambient conditions at the well head when the actual BTEX sample was collected.

One equipment blank sample will be collected during each sampling event. As with the field blank, the specific well where the sample is collected will vary from event to event at the discretion of the sampling team. The procedure for the equipment blank will vary depending the sampling equipment being used. For bailed wells, if a re-useable bailer is being used, between uses the bailer will be washed and rinsed using soap, de-ionized water, a methanol rinse then followed by a second rinse of de-ionized water. Prior to collecting a sample with the bailer from a well designated to have an equipment blank collected, the bailer will be filled with laboratory grade, de-ionized water, then a 40 ml vial sample bottle will be filled from the bailer and submitted for BTEX analysis.

Equipment blank sample preparation for wells sampled by portable, non-dedicated, sample pumps will vary somewhat depending the type of pump used. To the extent possible, dedicated tubing will be used for each well to avoid cross contamination issues. The general procedure for pump decontamination and collection of equipment blanks is as follows. The pump will be washed and rinsed between uses and between wells by pumping approximately 1 gallon of a soap solution followed by 2 to 3 gallons of rinse

water through the pump. If non-dedicated pump discharge hose is used the decontamination solution will be pumped through the tubing. The wash and rinse water will be directed over the pump electrical cable to simultaneously decontaminate the wire. An equipment blank will be prepared by inserting the pump into a source of laboratory grade de-ionized water and collecting a sample in a 40 ml vial following the same procedures as would be followed in collecting a normal sample. The equipment blank sample will be submitted for BTEX analysis.

Duplicate Samples

Periodically, at the discretion of the project team, blind duplicate samples may be collected and submitted for analysis. In general duplicate samples will be used to verify BTEX results in pertinent wells. Blind duplicates will be collected by sequentially filling two sets of 40 ml vials from the sample pump discharge stream. One set will be fully labeled, including well number, date and time; the duplicate set of vials will be labeled with simple identifier but will not include date or time. Duplicate samples will be submitted under COC protocols with the normal samples. The specific well(s) from which duplicate samples will be collected, in any, have not been established.

Split Samples

Split samples (duplicate samples sent to two different laboratories) are not anticipated at this time. However, Pioneer may submit split samples for several reasons, including questions or concerns about the accuracy of the laboratory or to provide data for comparison of laboratories. It is also anticipated that interested parties or regulatory agencies may request split samples for submission to their own independent laboratories. Pioneer will attempt to accommodate requests for split samples by providing access to the sample discharge streams during a scheduled sampling event so the requesting party can collect their own samples.

MONITORING SCHEDULE AND DURATION

To provide a better baseline on the shallow aquifer water chemistry, samples will be collected from all wells immediately prior to the onset of remedial measures at the Biere well. Following remediation, the proposed quarterly and semi-annual sampling schedule will be initiated. Quarterly sampling will typically be conducted in March, June, September and December. Semi-annual sampling will be conducted in March and September. The schedule for winter and spring sampling events will be flexible to avoid inclement weather. To the extent possible the samples will be collected during the same annual time frame to allow seasonal comparison of water chemistry trends.

The results of each sampling event will be submitted to the appropriate regulatory agencies for general information. Unless obvious and immediate changes to the monitoring program are warranted based on these periodic submissions, the monitoring program will be conducted under this schedule for a period of two years (8 quarters) after the Biere well remediation is completed. At the end of this period the results of the 8

quarterly samples and 4 semi-annual samples will be combined with the existing water chemistry data and presented in a written report to the regulatory agencies. The report will provide analysis of the results relative to the two objectives of the monitoring program. It is anticipated that the monitoring report will also provide the basis for discussions with the agencies regarding any modifications to the monitoring program or if additional remedial actions are warranted.

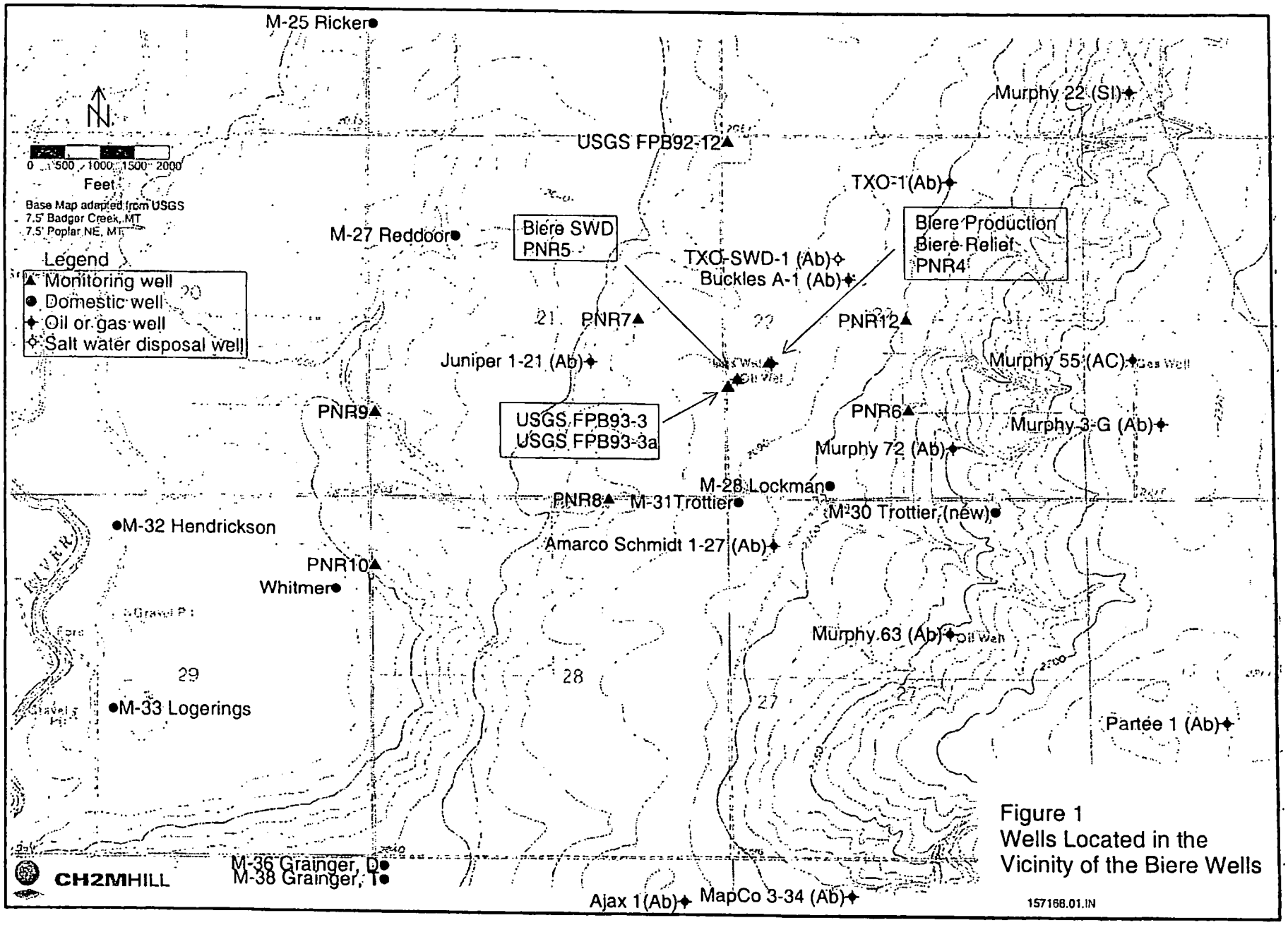


Figure 1
Wells Located in the
Vicinity of the Biere Wells

Q

PLUGGING & ABANDONMENT PLAN

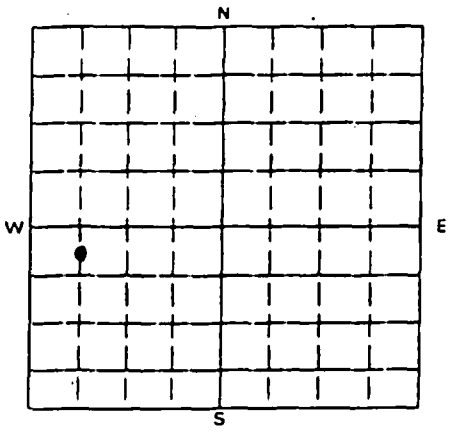
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

EPA

(Proposed) PLUGGING AND ABANDONMENT PLAN

NAME AND ADDRESS OF FACILITY	NAME AND ADDRESS OF OWNER/OPERATOR
Biere 1-22 Remedial Project	Pioneer Natural Resources USA, Inc. 5205 N. O'Connor Blvd, Irving, Tx. 75039-3746

LOCATE WELL AND OUTLINE UNIT ON SECTION PLAT — 640 ACRES



STATE	COUNTY	PERMIT NUMBER
Mont.	Roosevelt	

SURFACE LOCATION DESCRIPTION
___ 1/4 of C 1/4 of NW 1/4 of SW 1/4 of Section 22 Township 28N Range 51E

LOCATE WELL IN TWO DIRECTIONS FROM NEAREST LINES OF QUARTER SECTION AND DRILLING UNIT

Surface Location 1980 ft. from (N/S) S Line of quarter section
and 660 ft. from (E/W) W Line of quarter section

Lat. 48.1631320
Long. 105.1259920

TYPE OF AUTHORIZATION

- ☐ Individual Permit
- ☒ Area Permit
- ☐ Rule

Number of Wells 4

Lease Name Biere Lease

WELL ACTIVITY

- ☐ CLASS I
- ☐ CLASS II
  - ☐ Brine Disposal
  - ☐ Enhanced Recovery
  - ☐ Hydrocarbon Storage
- ☐ CLASS III
- X CLASS IV

Well Number Biere, 1-22A, 1-22B 1-22C & 1-22D

CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT(LB/FT)	TO BE PUT IN WELL (FT)	TO BE LEFT IN WELL (FT)	HOLE SIZE
5 1/2	14#/ft	688'	688'	7 7/8"

METHOD OF EMPLACEMENT OF CEMENT PLUGS

- ☐ The Balance Method
- ☐ The Dump Bailer Method
- ☒ The Two-Plug Method
- ☐ Other

CEMENTING TO PLUG AND ABANDON DATA:	PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6	PLUG #7
Size of Hole or Pipe in which Plug Will Be Placed (inches)	5 1/2"	5 1/2"					
Depth to Bottom of Tubing or Drill Pipe (ft.)	578'	100'					
Sacks of Cement To Be Used (each plug)	12 sxs.	12 sxs.					
Slurry Volume To Be Pumped (cu. ft.)	13.7	13.7					
Calculated Top of Plug (ft.)	578'	0					
Measured Top of Plug (if tagged ft.)	-	-					
Slurry Wt. (Lb./Gal.)	14.5	14.5					
Type Cement or Other Material (Class III)	C	C					

LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS AND INTERVALS WHERE CASING WILL BE VARIED *(If any)*

From	To	From	To
Open Hole 4 1/2"			
688'	720'		

Estimated Cost to Plug Wells

$15,000/Well - 4 Wells - $60,000

CERTIFICATION

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. (Ref. 40 CFR 144.32)

NAME AND OFFICIAL TITLE *(Please type or print)*	SIGNATURE	DATE SIGNED
Wilbur Dover-Mgr.-Operations Serv.	Wilbur Dover	3-6-01

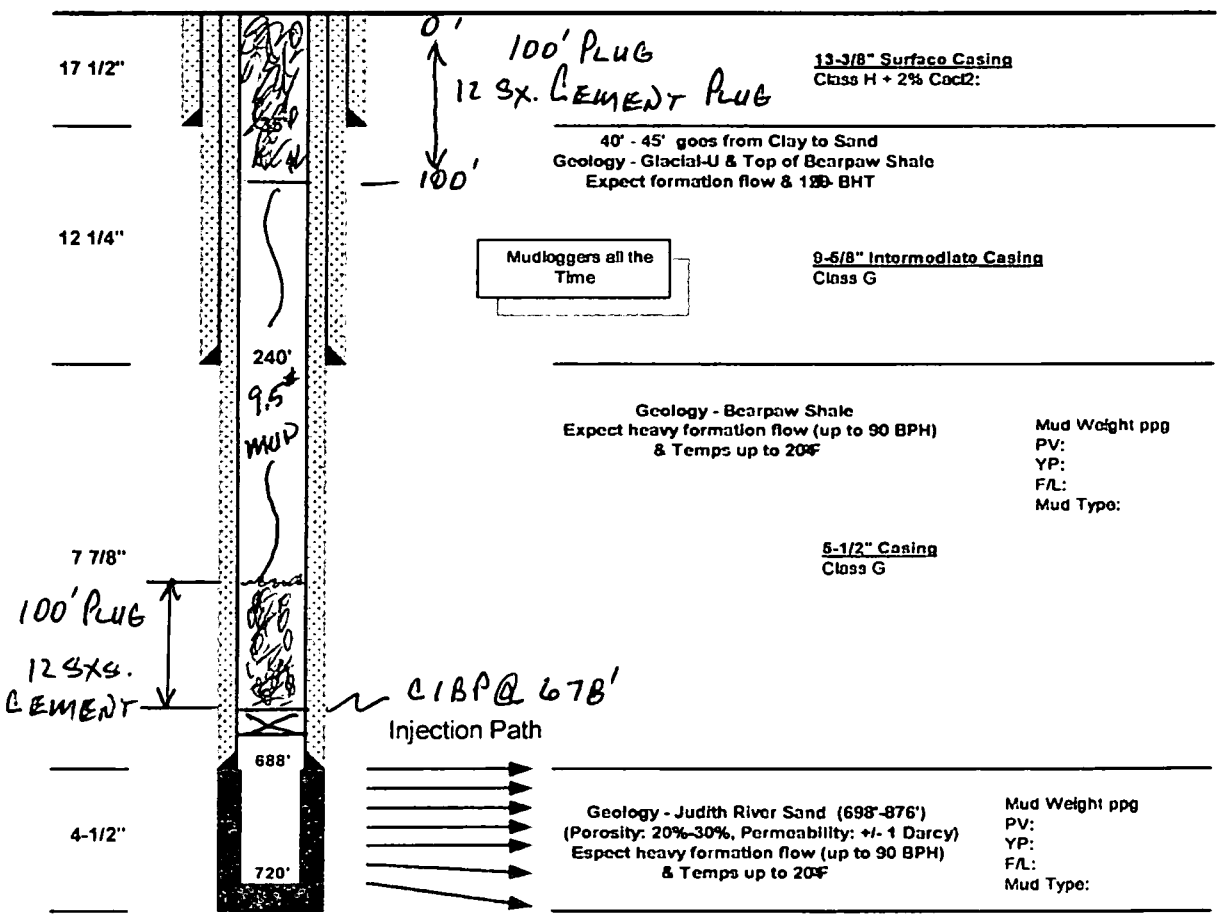
EPA Form 7520-14

WELLBORE SCHEMATIC

PLUGGING PROPOSAL

DRILLING PROGNOSIS
"Pioneer Natural Resources USA Inc."

WELL	:	**Biere Remedial Well**	
FIELD	:	**Poplar**	
CATEGORY	:	**Remedial / Vertical**	
COUNTY	:	**Roosevelt**	**STATE:** **Montana**
LOCATION	:	**22 - T28N - R51E**	
OBJECTIVE	:	**Top of Judith River**	
ELEVATION	:	**2,074 GL**	



PREPARED BY: Gilbert Davis **DATE:** 3-6-01

APPROVED BY: _____ **DATE:** _____

MESA PETROLEUM CO.

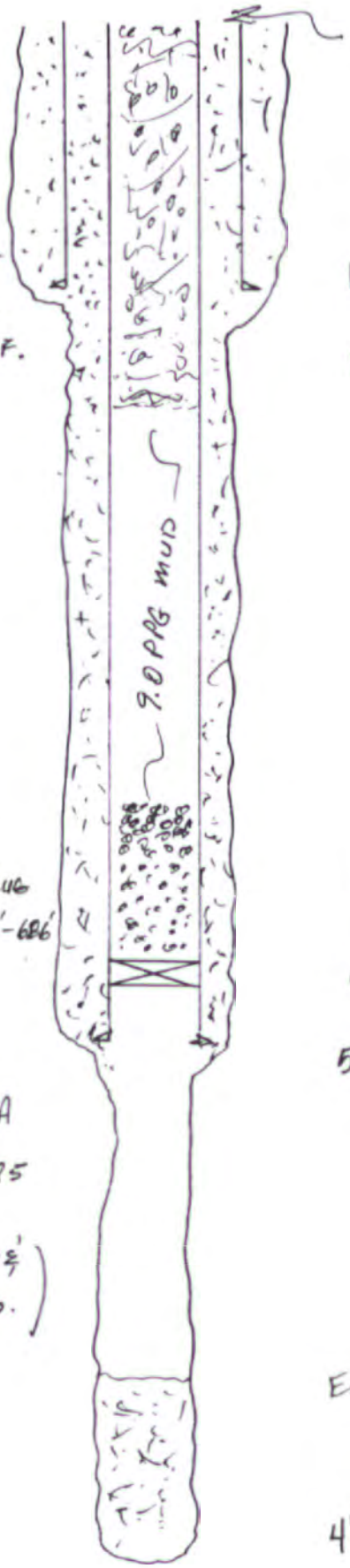
ONSHORE DIVISON

Subject (PROPOSED - PLUG & ABANDON)

Prepared By _____ Date _____

(NOW BIERE 1-22A)
BIERE RELIEF WELL
25' NNE OF
BIERE 1-22

1985



16" & 5½" - CUTOFF
@ 4' BGL

10 SX CEMENT
PLUG SET @
93' — SURF.

16" @ 45' TOC SURF

128' STATIC T = 204°F BEFORE RUNNING 5½"

10 SX PLUG
SET @ 589'-686'

660' STATIC T = 184°F

CIR @ 686'

5½ @ 699' TOC SURF

WELL P&A
8-29-85
(WELLTECH & WESTERN CO.)

EST TOC IN OPEN HOLE 800'

4¼" OPEN HOLE 699' to 900'

RE1

R

NECESSARY RESOURCES

Comparable Language Accept

SURETY PERFORMANCE BOND

U.S. ENVIRONMENTAL PROTECTION AGENCY
UNDERGROUND INJECTION CONTROL
FINANCIAL RESPONSIBILITY REQUIREMENT

TO: Regional Administrator
ATTN: Underground Injection Control 8ENF-T
Financial Responsibility
U.S. EPA Region VIII
999 18th Street, Suite 500
Denver, Colorado 80202-2466

BOND COVERS THE PLUGGING OF INJECTION WELLS

Date bond executed: March 2, 2001

Effective Date: March 2, 2001

Principal: Pioneer Natural Resources USA, Inc.
(Legal name of owner or operator)

5205 North O'Connor Blvd., 1400 Williams Square West, Irving, TX 75039
(Business address of owner or operator)

Type of organization: Corporation
(Individual, joint venture, partnership, or corporation)

State of incorporation: _____

Surety(ies): St. Paul Fire and Marine Insurance Company
(Name)
8144 Walnut Hill Lane, Ste 1199, Dallas, TX 75232
(Business Address)

EPA Identification number, name, address, and plugging and abandonment amount(s) for each injection well guaranteed by this bond. (Indicate plugging and abandonment amounts for each well. Attach separate list if necessary.)

Injection Well Information	Plug & Abandon Amount	
Biere 1-22 Remedial Project	1-22A	$25,000
Biere Injection Wells	1-22B	$25,000
	1-22C	$25,000
Roosevelt Co., Montana	1-22D	$25,000

Total penal sum of bond: $ 150,000

Surety's bond number: KC0578

KNOW ALL PERSONS BY THESE PRESENTS, That we, the Principal and Surety(ies) hereto are firmly bound to the U.S. Environmental Protection Agency (hereinafter called EPA), in the above penal sum for the payment of which we bind ourselves, our heirs, executors, administrators, successors, and assigns jointly and severally; provided that, where the Surety(ies) are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is it set forth opposite the name of such Surety, but if no limit of lability is indicated, the limit of liability shall be the full amount of the penal sum.

WHEREAS said Principal is required, under the Underground Injection Control Regulations, as amended, to have a permit or comply with provisions to operate under rule for each injection well identified above, and

WHEREAS said Principal is required to provide financial assurance for plugging and abandonment as a condition of the permit or approval to operate under rule, and

WHEREAS said Principal shall establish a standby trust fund as is required when a surety bond is used to provide such financial assurance;

NOW, THEREFORE, the conditions of this obligation are such that if the Principal shall faithfully perform plugging and abandonment, whenever required to do so, of each injection well for which this bond guarantees plugging and abandonment, in accordance with the plugging abandonment plan and other requirements of the permit or provisions for operating under rule and other requirements of the permit or provisions for operating under rule as may be amended, pursuant to all applicable laws, statutes, rules and regulations, as such laws, statutes, rules, and regulations may be amended,

Or, if the Principal shall provide alternate financial assurance as specified in Subpart F of 40 CFR 144, and obtain the EPA Regional Administrator's written approval of such assurance, within 90 days after the date of notice of cancellation is received by both the Principal and the EPA Regional Administrator(s), from the Surety(ies), then this obligation shall be null and void. Otherwise it is to remain in full force and effect.

The Surety(ies) shall become liable on this bond obligation only when the Principal has failed to fulfill the conditions described above.

Upon notification by an EPA Regional Administrator that the Principal has been found in violation of the plugging and abandonment requirements of 40 CFR 144, for an injection well which

this bond guarantees performances of plugging and abandonment, the Surety(ies) shall either perform plugging and abandonment with the plugging and abandonment plan and other permit conditions or provisions for operating under rule and other requirements or place the amount for plugging and abandonment into a standby trust fund as directed by the EPA Regional Administrator.

Upon notification by an EPA Regional Administrator that the Principal has failed to provide alternate financial assurance as specified in Subpart F of 40 CFR 144, and obtain written approval of such assurance from the EPA Regional Administrator(s) during the 90 days following receipt by both the Principal and the EPA Regional Administrator(s) of a notice of cancellation of the bond, the Surety(ies) shall place funds in the amount guaranteed for the injection well(s) into the standby trust fund as directed by the EPA Regional Administrator.

The Surety(ies) hereby waive(s) notification of amendments to plugging and abandonment plans, permits, applicable laws, statutes, rules, and regulations and agrees that no such amendment shall in any way alleviate its (their) obligation on this bond.

The liability of the Surety(ies) shall not be discharged by any payment or succession of payments hereunder, unless and until such payment or payments shall amount in the aggregate to the penal sum of the bond, but in no event shall the obligation of the Surety(ies) hereunder exceed the amount of said penal sum.

The Surety(ies) may cancel the bond by sending notice by certified mail to the owner or operator and to the EPA Regional Administrator(s) for the Region(s) in which the injection well(s) is (are) located, provided, however, that cancellation shall not occur during the 120 days beginning on the date of receipt of the notice of cancellation by both the Principal and the EPA Regional Administrator(s), as evidenced by the return receipts.

The Principal may terminate this bond by sending written notice to the Surety(ies); provided, however, that no such notice shall become effective until the Surety(ies) receive(s) written authorization for termination of the bond by the EPA Regional Administrator(s) of the EPA Region(s) in which the bonded injection well(s) is (are) located.

(The following paragraph is an optional rider that may be included but is not required.)

Principal and Surety(ies) hereby agree to adjust the penal sum of the bond yearly so that it guarantees a new plugging and abandonment amount, provided that the penal sum does not increase by more than 20% in any one year, and no decrease in the penal sum takes place without the written permission of the EPA Regional Administrator(s).

IN WITNESS WHEREOF, The Principal and Surety(ies) have executed this Performance Bond and have affixed their seals on the date set forth above.

The persons whose signatures appear below hereby certify that they are authorized to execute this surety bond on behalf of the Principal and Surety(ies) and that the wording on this surety bond is identical to the wording specified in 40 CFR 144.70(c), as such regulation was constituted on the date this bond was executed.

PRINCIPAL:

Pioneer Natural Resources USA, Inc.
(Name)

5205 North O'Connor Blvd.,
1400 Williams Square West
Irving, TX 75039
(Address)

(Signature)

Vice President
(Title)

Corporate Seal

CORPORATE SURETY(IES):

St. Paul Fire and Marine
Insurance Company
(Name)

8144 Walnut Hill Lane Ste 1199
Dallas, TX 75232
(Address)

214-363-1645
(Surety Telephone Number)

(Signature)

Tracy L Gingras
Attorney-in-Fact
(Title) Aon Risk Services of TX, Inc.
301 Commerce St Suite 2101
Fort Worth, TX 76102

Corporate Seal

State of Incorporation

Minnesota
State of Incorporation

$ 450.00
Bond Premium

$ 150,000
Liability Limit

(For every co-surety, provide signature(s), corporate seal, and other information in the same manner as for Surety above.)

Laquita Diane Estep, Cynthia Marie Prewitt, James Michael Rutledge, Elaine Sturgess Wakefield, Howard Randy White and Tracy L. Gingras

of the City of Fort Worth, State Texas, their true and lawful Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign its name as surety to, and to execute, seal and acknowledge any and all bonds, undertakings, contracts and other written instruments in the nature thereof on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

IN WITNESS WHEREOF, the Companies have caused this instrument to be signed this 15th day of July, 1999.

Seaboard Surety Company
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company
St. Paul Mercury Insurance Company

United States Fidelity and Guaranty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.

MICHAEL B. KEEGAN, Vice President

MICHAEL R. MCKIBBEN, Assistant Secretary

State of Maryland
City of Baltimore

WARNING: THIS POWER OF ATTORNEY IS INVALID UNLESS THE RED BORDER

On this 15th day of July, 1999, before me, the undersigned officer, personally appeared Michael B. Keegan and Michael R. McKibben, who acknowledged themselves to be the Vice President and Assistant Secretary, respectively, of Seaboard Surety Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, United States Fidelity and Guaranty Company, Fidelity and Guaranty Insurance Company, and Fidelity and Guaranty Insurance Underwriters, Inc. and that they, as such, being authorized so to do, executed the foregoing instrument for the purposes therein contained by signing the names of the corporations by themselves as duly authorized officers.

In Witness Whereof, I hereunto set my hand and official seal.

My Commission expires the 13th day of July, 2002.

REBECCA EASLEY-ONOKALA, Notary Public

This Power of Attorney is granted under and by the authority of the following resolutions adopted by the Boards of Directors of Seaboard Surety Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, United States Fidelity and Guaranty Company, Fidelity and Guaranty Insurance Company, and Fidelity and Guaranty Insurance Underwriters, Inc. on September 2, 1998, which resolutions are now in full force and effect, reading as follows:

RESOLVED, that in connection with the fidelity and surety insurance business of the Company, all bonds, undertakings, contracts and other instruments relating to said business may be signed, executed, and acknowledged by persons or entities appointed as Attorney(s)-in-Fact pursuant to a Power of Attorney issued in accordance with these resolutions. Said Power(s) of Attorney for and on behalf of the Company may and shall be executed in the name and on behalf of the Company, either by the Chairman, or the President, or any Vice President, or an Assistant Vice President, jointly with the Secretary or an Assistant Secretary, under their respective designations. The signature of such officers may be engraved, printed or lithographed. The signature of each of the foregoing officers and the seal of the Company may be affixed by facsimile to any Power of Attorney or to any certificate relating thereto appointing Attorney(s)-in-Fact for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, and subject to any limitations set forth therein, any such Power of Attorney or certificate bearing such facsimile signature or facsimile seal shall be valid and binding upon the Company, and any such power so executed and certified by such facsimile signature and facsimile seal shall be valid and binding upon the Company with respect to any bond or undertaking to which it is validly attached; and

RESOLVED FURTHER, that Attorney(s)-in-Fact shall have the power and authority, and, in any case, subject to the terms and limitations of the Power of Attorney issued them, to execute and deliver on behalf of the Company and to attach the seal of the Company to any and all bonds and undertakings, and other writings obligatory in the nature thereof, and any such instrument executed by such Attorney(s)-in-Fact shall be as binding upon the Company as if signed by an Executive Officer and sealed and attested to by the Secretary of the Company.

I, Michael R. McKibben, Assistant Secretary of Seaboard Surety Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, United States Fidelity and Guaranty Company, Fidelity and Guaranty Insurance Company, and Fidelity and Guaranty Insurance Underwriters, Inc. do hereby certify that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies, which is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I hereunto set my hand this 2nd day of March, 2001.

Michael R. McKibben, Assistant Secretary

To verify the authenticity of this Power of Attorney, call 1-800-421-3880 and ask for the Power of Attorney clerk. Please refer to the Power of Attorney number, the above-named individuals and the details of the bond to which the power is attached.

86326 Rev. 4-99 Printed in U.S.A.

S

AQUIFER EXEMPTION (S)

S. Aquifer Exemption

The area surrounding the Biere #1-22 and the proposed injection area (±25' radius around Biere # 1-22) is an area of elevated saline water plume based on a 1997 USGS report by Joanna N. Thamke and Steven D. Craigg. A copy of this mapped area is attached for your review.

The proposed injection of Halliburton's Injector "U" (Soduim Silicate) will not extend this plume area nor will it increase the impacted area as the injected volumes will be approximately 2,064 bbls. This will cover about one quarter of an acre based on acre-foot coverage at one foot deep. This is a worst case as we will be injecting into 32' of Judith River Formation.

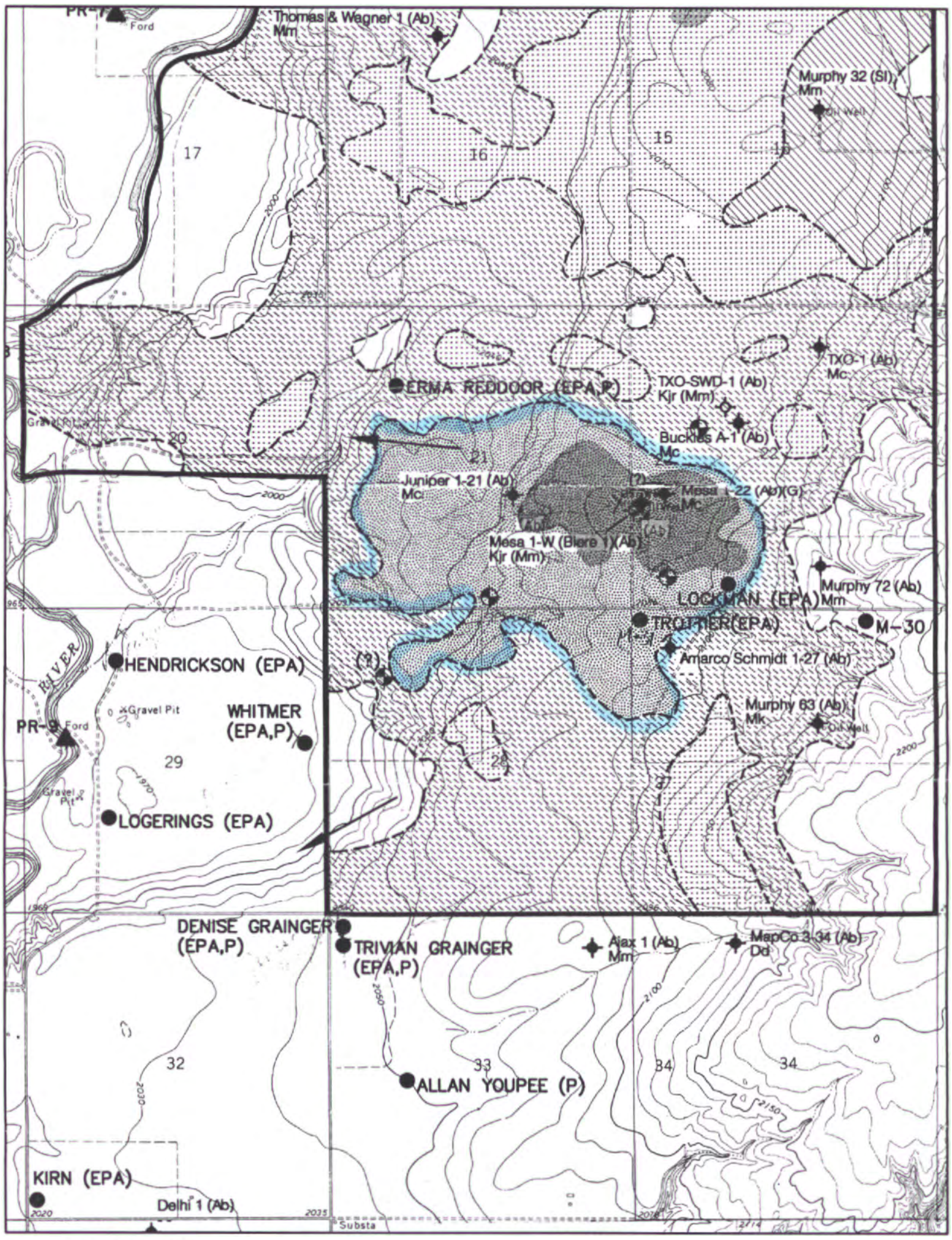
In conclusion, this project should have an exemption for the following reasons;

1. Saline-water plume area extends well beyond the proposed injection area (± 0.25 acre).

2. The sodium silicate will become a firm gel within a short time frame & become an effective matrix seal.

3. The EPA has ordered Pioneer to take corrective actions to stop fluid migration at the Biere 1-22 location.

4. A continuing monitoring program will be maintained.



Source: Map showing location of possible and confirmed saline-water plumes, surface-water data-collection sites, known brine-injection wells, oil wells, pipelines, storage-tank facilities, and brine evaporation or storage pits in the East Poplar Oil Field Study Area, Northeastern Montana. (Thamke & Craigg, 1997).

VICINITY MAP

EAST POPLAR OIL FIELD

FIGURE #2

HKM ENGINEERING

14R144.102 | JAN. 2000

Plume.dwg

T

EXISTING EPA PERMITS (ORDERS)

Form Approved. OMB No. 2040-0042. Expires 9-30-86

Form 4 UIC

EPA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

UNDERGROUND INJECTION CONTROL PERMIT APPLICATION

(Collected under the authority of the Safe Drinking Water Act, Sections 1421, 1422, 40 CFR 144)

EPA ID NUMBER

		T/A	C
U			

READ ATTACHED INSTRUCTIONS BEFORE STARTING

FOR OFFICIAL USE ONLY

Application approved mo	day	year	Date Received mo	day	year	Permit/Well Number	Comments

II. FACILITY NAME AND ADDRESS

Facility Name: Biere #A-1 (SWD)

Street Address: Poplar Field

City: | State: | ZIP Code:

III. OWNER/OPERATOR AND ADDRESS

Owner/Operator Name: Mesa Petroleum Co.

Street Address: P. O. Box 2009

City: Amarillo | State: TX | ZIP Code: 79189

IV. OWNERSHIP STATUS *(Mark 'x')*

☐ A. Federal ☐ B. State ☒ C. Private

☐ D. Public ☐ E. Other *(Explain)*

V. SIC CODES

1311 | 1382

VI. WELL STATUS *(Mark 'x')*

☒ A. Operating — Date Started: mo 7, day 4, year 70

☐ B. Modification/Conversion ☐ C. Proposed

VII. TYPE OF PERMIT REQUESTED *(Mark 'x' and specify if required)*

☒ A. Individual ☐ B. Area

Number of Existing wells: | Number of Proposed wells: | Name(s) of field(s) or project(s):

VIII. CLASS AND TYPE OF WELL *(see reverse)*

A. Class(es) *(enter code(s))*	B. Type(s) *(enter code(s))*	C. If class is "other" or type is code 'x,' explain	D. Number of wells per type (if area permit)
II	D	N/A	N/A

IX. LOCATION OF WELL(S) OR APPROXIMATE CENTER OF FIELD OR PROJECT

C	A. Latitude Deg	Min	Sec	B. Longitude Deg	Min	Sec	Township and Range Twsp	Range	Sec	¼ Sec	Feet from	Line	Feet from	Line
I							28N	51E	22	SW	1750	S	140	W

X. INDIAN LANDS *(Mark 'x')*

☐ Yes ☒ No

XI. ATTACHMENTS

(Complete the following questions on a separate sheet(s) and number accordingly; see instructions)

FOR CLASSES I, II, III (and other classes) complete and submit on separate sheet(s) Attachments A — U (pp 2-6) as appropriate. Attach maps where required. List attachments by letter which are applicable and are included with your application:

XII. CERTIFICATION

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. (Ref. 40 CFR 144.32)

A. Name and Title *(Type or Print)*: Randy Z. Nordsven, Regulatory Coordinator

B. Phone No. *(Area Code and No.)*: (806) 378-4887

C. Signature: Randy Z. Nordsven

D. Date Signed: 7-17-84

Well Class and Type Codes

Class I	Wells used to inject waste below the deepest underground source of drinking water.
Type "I"	Nonhazardous industrial disposal well
"M"	Nonhazardous municipal disposal well
"W"	Hazardous waste disposal well injecting below USDWs
"X"	Other Class I wells (not included in Type "I," "M," or "W")
Class II	Oil and gas production and storage related injection wells.
Type "D"	Produced fluid disposal well
"R"	Enhanced recovery well
"H"	Hydrocarbon storage well (excluding natural gas)
"X"	Other Class II wells (not included in Type "D," "R," or "H")
Class III	Special process injection wells.
Type "G"	Solution mining well
"S"	Sulfur mining well by Frasch process
"U"	Uranium mining well (excluding solution mining of conventional mines)
"X"	Other Class III wells (not included in Type "G," "S," or "U")
Other Classes	Wells not included in classes above.
	Class V wells which may be permitted under §144.12
	Wells not currently classified as Class I, II, III, or V.

JUL 4 1984
RECEIVED
OIL & GAS CONS. COMM.
STATE OF MONT.
BILLINGS

Attachments to Permit Application

Class	Attachments
I new well	A, B, C, D, F, H — S, U
existing	A, B, C, D, F, H — U
II new well	A, B, C, E, G, H, M, Q, R; optional — I, J, K, O, P, U
existing	A, E, G, H, M, Q, R — U; optional — J, K, O, P, Q
III new well	A, B, C, D, F, H, I, J, K, M — S, U
existing	A, B, C, D, F, H, J, K, M — U
Other Classes	To be specified by the permitting authority

IN THE MATTER OF THE APPLICATION)
OF MESA PETROLEUM COMPANY FOR)
AN ORDER PERMITTING UNDERGROUND)
DISPOSAL OF WATER FROM THE)
CHARLES 'C' ZONE OF THE POPLAR)
FIELD, ROOSEVELT COUNTY, MONTANA)

ORDER NO. 15-70A

ADMINISTRATIVE

In this matter, Mesa Petroleum Company, applicant, seeks permission from the Commission to dispose of salt water produced in the Poplar Field, Roosevelt County, Montana. The application is dated June 16, 1970, and was received by the Commission on June 16, 1970.

The application is complete in all respects, and the same satisfies all of the provisions and requirements of Commission Rule No. 228.3 and all sub-paragraphs thereunder. All pertinent information concerning said application has been supplied to the Commission, and the same does not pertain to secondary recovery of a waterflood plan.

The applicant states that the proposed disposal well will be located 1750 feet from the south line and 140 feet from the west line of Section 22, Township 28 North, Range 51 East, Roosevelt County, Montana. The proposed formation of injection is the Judith River Zone. Applicant proposes to inject approximately 1,000 barrels of water per day.

Applicant states there are no drilling or producing wells or wells which have produced, other than applicant's Biere No. 1-22, within a one-half mile radius of the proposed salt water disposal well.

IT IS THEREFORE ORDERED by the Oil and Gas Conservation Commission of the State of Montana that the application of Mesa Petroleum Company to dispose of salt water produced in the Poplar Field, Roosevelt County, Montana, be, and the same is hereby approved, and that the applicant be permitted to dispose of said salt water by injection into its well as designated in the above order.

IT IS FURTHER ORDERED that at such time as injection is commenced, that the operator instigate its Report of Subsurface Injections, through the use of Commission Form No. 5 to be submitted to the Commission office in Helena, Montana.

Dated at Helena, Montana, this 22nd day of June, 1970.

OIL AND GAS CONSERVATION COMMISSION
OF THE STATE OF MONTANA

(SEAL)

Norman J. Beaudry
Executive Secretary

BEFORE THE OIL AND GAS CONSERVATION COMMISSION

OF THE STATE OF MONTANA

IN THE MATTER OF THE APPLICATION OF MESA PETROLEUM COMPANY FOR PERMIT TO INJECT WATER INTO THE JUDITH RIVER FORMATION, POPLAR FIELD, ROOSEVELT COUNTY, MONTANA.

A P P L I C A T I O N

COMES NOW the applicant, MESA PETROLEUM COMPANY, and in support of its application as above entitled, respectfully shows to the Oil and Gas Conservation Commission of Montana, that:

1. Mesa Petroleum Company has submitted to the Montana Oil and Gas Conservation Commission a Notice of Intent to drill a water injection well at the following location:

   1750' FSL and 140' FWL Sec. 22 T28N-R51E
   Roosevelt County, Montana.

2. Mesa Petroleum Company has completed a producing oil well known as the Biere No. 1-22, NW SW Section 22-Township 28 North, Range 51 East, Poplar Field, Roosevelt County, which will be served by the proposed water injection well.

3. The Biere No. 1-22 is completed in the Charles 'C' Formation with a notch in casing at 5790' and is presently shut-in pending installation of surface production equipment and salt water disposal facilities.

4. The proposed injection formation is the Judith River zone located at a depth of approximately 698' - 878' in the Mesa Petroleum Company Biere No. 1-22 and is described as a fine to medium grained sandstone.

5. The top of the Judith River Formation is found at +1388 feet above sea level in the Mesa Petroleum Company Biere No. 1-22.

6. Attached as Exhibit 'A' is a portion of the Laterolog-Gamma Ray Log of the Mesa Petroleum Company Biere No.

1-22 marked to show the approximate top and base of the Judith River Formation.

7. The proposed injection well will be drilled to a depth of approximately 1000', cased with 8-5/8" pipe and cemented to the surface. The lower portion of the Judith River Formation will be perforated and stimulated as necessary to obtain adequate injection rates.

8. It is anticipated that approximately 1000 barrels per day of produced water from the Charles 'C' formation in the Mesa Petroleum Company Biere No. 1-22 will be injected into the proposed input well.

9. Mesa Petroleum Company with Post Office address, Box 2009, Amarillo, Texas, is the operator of the Biere No. 1-22 producing well and will operate the proposed salt water disposal well and injection system.

10. Attached as Exhibit 'B' is a plat showing the proposed injection well location and the Mesa Petroleum Company Biere No. 1-22. There are no drilling or producing wells or wells which have produced, other than the Mesa Petroleum Company Biere No. 1-22, NW SW Section 22 - Township 28 North, Range 51 East, within the one-half mile radius of the proposed salt water disposal well.

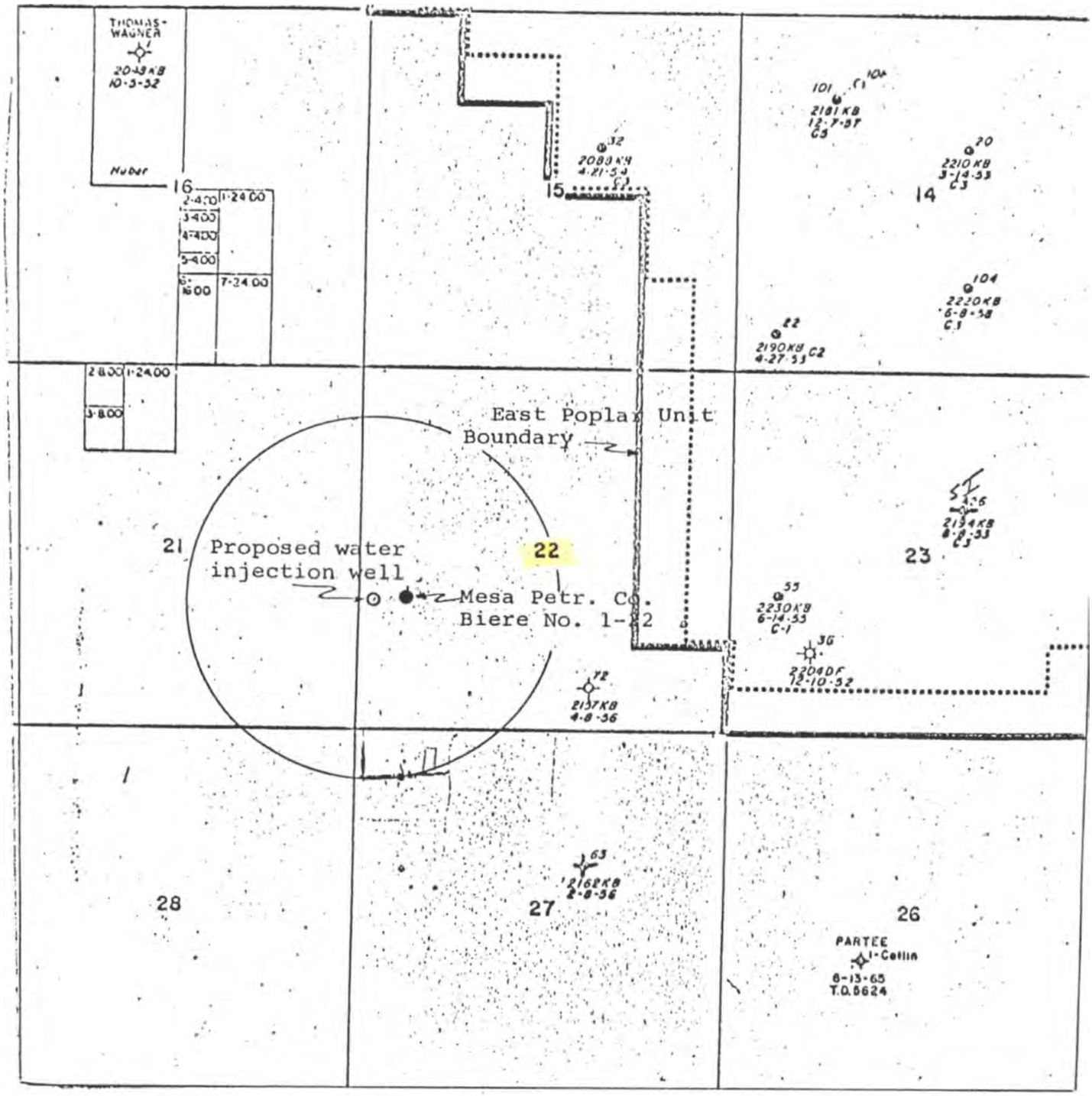
WHEREFORE, Mesa Petroleum Company requests that it be permitted to drill a water disposal well and inject produced salt water from the Charles 'C' zone into the Judith River Formation in said disposal well as heretofore set forth.

Respectfully submitted:

THE PETROLEUM ENGINEERING & MANAGEMENT CORPORATION

RONALD D. RAGLAND
Petroleum Engineer
Consultant for Applicant
250 Securities Building
Billings, Montana 59101

R 51 E



MESA PETROLEUM CO. PROPOSED WATER INJECTION SYSTEM

POPLAR FIELD

ROOSEVELT COUNTY, MONTANA

EXHIBIT 'B'

Ronald D. Ragland

6/16/70

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
999 18TH STREET - SUITE 500
DENVER, CO 80202-2466
http://www.epa.gov/region08

SEP 30 1999

Ref: 8ENF-T

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Pioneer Natural Resources Company
1400 Williams Square West
5205 North O'Connor Blvd.
Irving, TX 75039

Attention: Mr. Scott D. Sheffield
President and CEO

OCT 1999
RECEIVED

RE: Emergency Administrative Order under Section 1431 of the SDWA
Docket No. SDWA-8-99-68

Dear Mr. Sheffield:

Enclosed is an Emergency Administrative Order issued under Section 1431 of the Safe Drinking Water Act (SDWA), 40 U.S.C. § 300i. The Order is based on contamination of the ground water in and around the area of the East Poplar Oil Field within the boundary of the Fort Peck Indian Reservation in Roosevelt County, Montana. EPA has identified the presence of the contaminant benzene and a substantial increase in the total dissolved solids levels in the Quaternary Deposits. The presence of these contaminants in the Quaternary Deposits, an Underground Source of Drinking Water (USDW), may present an imminent and substantial endangerment to the health of local residents who drink and use this water. EPA has also determined that the Respondents of the Order, through the operations of their oil and gas production facilities in the East Poplar Oil Field, have caused or contributed and/or are continuing to cause and contribute to the endangerment of the USDW.

The enclosed Order sets forth the actions that you must take to, among other things, ensure that the people served by the USDW are provided with safe drinking water. You must immediately take the actions required by this Order and the penalties for failing to comply are set forth in the Order. The Order requires that you provide temporary safe drinking water to identified residences, submit cleanup and permanent alternative water supply proposals, submit well, tank, pipeline and pit information, and submit geologic and hydrologic field information.

Printed on Recycled Paper

The issuance of this Order is consistent with EPA's goal of protecting human health and the environment, and working to ensure the provision of safe drinking water to the affected residents. With regard to this Order, please contact Carol Bowden at 303 312-6485 or write Ms. Bowden at the address provided above, mail code 8-ENF-T.

Sincerely,

Connally E. Mears

Connally E. Mears, Director
Technical Enforcement Program
Office of Enforcement, Compliance
and Environmental Justice

Enclosure

cc: Ray K. Eder, Acting Chairman, Fort Peck Tribal Executive Board
Deb Madison, Assiniboine and Sioux Tribes Environmental Program Manager
Douglas Endreson, Tribal Counsel, Assiniboine and Sioux Tribes
George Hudak, Montana Board of Oil and Gas Conservation

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII

99 SEP 30 PM 12: 27

FILED
EPA REGION VIII
HEARING CLERK

IN THE MATTER OF Murphy Exploration & Production Company, Murphy Oil USA, Inc., Murphy Oil Corporation, Pioneer Natural Resources Company, W.R. Grace & Company-Conn., AMARCO Resources Corporation, EPEC-Altamount Corporation, Marathon Oil Company Respondents East Poplar Oil Field Fort Peck Indian Reservation Montana Proceedings under Section 1431(a) of the Safe Drinking Water Act, 42 U.S.C. §300g-i(a)	Docket No. SDWA-8-99-68 **EMERGENCY ADMINISTRATIVE ORDER**

STATUTORY AUTHORITY

1. The following Findings are made and Order issued under the authority vested in the Administrator of the U.S. Environmental Protection Agency (EPA) by Section 1431(a) of the Safe Drinking Water Act (the Act), 42 U.S.C. §300i(a). The authority to take this action has been properly delegated to the undersigned EPA program supervisors.

ENFORCEMENT RESPONSIBILITY

2. EPA has primary enforcement responsibility for the Act on the Lands within the exterior boundary of the Fort Peck Indian Reservation in Roosevelt County in the State of Montana.

DESCRIPTION OF RESPONDENTS

3. Murphy Exploration & Production Company is a Delaware corporation doing business in the State of Montana and therefore is a "person" within the meaning of 40 CFR §141.2 and §144.2 and Section 1401(12) of the Act, 42 U.S.C. §300f(12).

4. Murphy Oil USA, Inc. is a Delaware corporation and did business in the state of Montana until status was withdrawn in 1994, and therefore is a "person" within the meaning of 40 CFR §141.2 and §144.2 and Section 1401(12) of the Act, 42 U.S.C. §300f(12).

5. Murphy Oil Corporation is a Delaware corporation and did business in the state of Montana and therefore is a "person" within the meaning of 40 CFR §141.2 and §144.2 and Section 1401(12) of the Act, 42 U.S.C. §300f(12). Murphy Oil Corporation was a publicly held corporation until 1991, at which time the parent company Murphy Oil Corporation acquired all of the company's stock. The acquisition was completed by forming a new subsidiary of the parent Murphy Oil Corporation known as Murphy

Exploration & Production Company, which currently operates in the state of Montana.

6. Pioneer Natural Resources Company is a Delaware corporation and therefore a "person" within the meaning of 40 CFR §141.2 and §144.2 and Section 1401(12) of the Act, 42 U.S.C. §300f(12). Also known as Pioneer Natural Resources USA, Inc. Pioneer Natural Resources Company acquired the assets of Mesa Petroleum Co. Mesa Petroleum Co. did business in the state of Montana.

7. W.R. Grace & Co. is a Connecticut corporation and therefore a "person" within the meaning of 40 CFR §141.2 and §144.2 and Section 1401(12) of the Act, 42 U.S.C. §300f(12). Polumbus Petroleum Corporation in its merger with W.R. Grace & Co. became Grace Petroleum Corporation. Polumbus Petroleum Corporation merged with W.R. Grace & Co. a Connecticut corporation in 1976. Polumbus did business in the state of Montana.

8. AMARCO Resources Corporation is a Texas corporation and did business in the state of Montana and therefore is a "person" within the meaning of 40 CFR §141.2 and §144.2 and Section 1401(12) of the Act, 42 U.S.C. §300f(12). AMARCO Resources Corp. is also using the trade name Westdale, Inc. in Texas.

9. EPEC-Altamont Corporation is a Delaware corporation and did business in the state of Montana and therefore is a

"person" within the meaning of 40 CFR §141.2 and §144.2 and Section 1401(12) of the Act, 42 U.S.C. §300f(12). Tenneco Oil Company (Tenneco-Altamont Corporation) merged with EPEC-Altamont Corporation and did business in the State of Montana.

10. Marathon Oil Company is an Ohio corporation and therefore a "person" within the meaning of 40 CFR §141.2 and §144.2 and Section 1401(12) of the Act, 42 U.S.C. §300f(12). TXO Production Corp. a Delaware corporation merged with Marathon Oil Company. TXO Production Corp was a trade name for Texas Oil & Gas Corp. a Delaware corporation.

11. Respondents own and/or operate or did own and/or operate oil and gas production facilities, including but not limited to oil or gas production wells, produced brine disposal wells, secondary recovery injection wells, drilled and abandoned dry holes, production and waste pits, storage tanks, oil/water separators, and distribution pipelines and pumping facilities, in portions of the East Poplar Oil Field located within Township 28 North, Range 51 East on the Fort Peck Indian Reservation in Roosevelt County in the State of Montana.

FINDINGS

12. The Quaternary Deposits are the most recent geologic deposits of the Cenozoic Era, covering approximately the past 1.65 millions years. These Quaternary Deposits in the East Poplar Oil Field area consist mainly of the Winota Gravel, Sprole Silt, glacial till, fan alluvium and colluvium, and alluvium. The Pleistocene Wiota Gravel, Sprole Silt, glacial till, and dune sand are referred to as "glacial deposits". Lithologic logs from the monitoring wells drilled in the area show depths ranging from of 55 to 100 feet. The Pleistocene and Holocene fan alluvium and colluvium and Holocene alluvium are referred to as "alluvium" and overlie the glacial deposits in many areas with depths ranging from 20 to 56 feet. The alluvium underlies flood plain deposits. Water in Quaternary deposits east of the Poplar River generally moves westward toward the river where it merges with southward-flowing ground water in the Poplar River valley. Downward movement of water from the Quaternary deposits is not a significant problem, the underlying Bearpaw Shale is relatively impermeable and forms a confining layer.

13. These Quaternary glacial deposits and alluvium are the sole developed source of ground water for private resident wells in and around the East Poplar Oil Field

and the Poplar, Montana and tribally-owned Poplar Head Start Center public water supply systems. Depth to the water table below land surface in this area generally ranges from about 5 to 44 feet in the alluvium and 7 to 139 feet in the glacial deposits.

14. The Quaternary Deposits form an unconfined aquifer which contains a sufficient quantity of ground water to supply a public water system. A public water system (PWS), as defined by 40 C.F.R. § 141.2, means a system for the provision to the public of piped water for human consumption, if such system has at least fifteen service connections or regularly serves an average of at least twenty-five individuals daily at least 60 days out of the year.

15. The Quaternary Deposits are an underground source of drinking water (USDW). A USDW, as defined under 40 C.F.R. § 144.3, means an aquifer or its portion which supplies any PWS or which contains a sufficient quantity of ground water to supply a public water system; and currently supplies drinking water for human consumption or contains fewer than 10,000 mg/L total dissolved solids. Past sampling from private ground water wells in the area showed total dissolved solids content ranging from 427-2,680 mg/L (as discussed in the U.S. Geological Survey study below).

16. The United States Geological Survey (USGS) has conducted an extensive ground water investigation of saline-water contamination in and around the East Poplar Oil Field. The USGS reviewed ground water and surface water quality data from existing private water wells, new monitoring wells, oil wells, brine-injection wells, and the Poplar River in the East Poplar Oil Field area. Additionally, the USGS completed an electromagnetic geophysical survey, by measuring the electromagnetic apparent conductivity corrected for local anomalies (wells, pipelines, etc.), over a 21.6 square mile area to assist in the delineating the extent of the saline-water contamination plumes. Uncontaminated ground-water in the area had total dissolved solids content ranging from 427-2,680 mg/L. The areas delineated by the ground water study as part of the brine contaminated plumes contained total dissolved solid levels as high as 91,100 mg/L. In July 1999, EPA took ground water samples from the wells at private homes within the area shown by the USGS study to have brine contamination. EPA found TDS levels at these homes to range from 1850 to 4890 mg/L.

17. EPA collected water samples at several of the home sites in the contamination area to determine if any contamination by hydrocarbons or volatile organic compounds (VOCs) was also a concern. Brine

contamination plumes associated with oil and gas production operations will have remnants of hydrocarbons from the production formation. Samples taken by both EPA at the existing home sites and USGS at several monitoring wells showed benzene contamination. A sample taken at one home site had benzene contamination between 58-78 ug/L or 0.058-0.078 mg/L, while other samples taken at USGS monitoring wells in the field were between 1.58-4.86 ug/L or 0.00158-0.00486 mg/L.

18. Under the Primary Drinking Water Standards, the maximum contaminant level (MCL) for benzene, as set forth in 40 C.F.R. § 141.61, is 0.005 mg/L. Secondary Drinking Water Standards, as set out in 40 C.F.R. § 143.3, for dissolved-solids is 500 mg/L.

19. The presence and entry of benzene at levels as high as .078 mg/L in the Quaternary Deposits USDW may present an imminent and substantial endangerment to the health of persons.

20. Benzene is a known human carcinogen. A causal relationship between benzene exposure and leukemia has been clearly established. Benzene exposure has also been associated with cancer of the lymph system (lymphoma), lung cancer, and bladder (urothelial) cancer. Benzene may increase the risk of cancer in

humans who are exposed at lower levels over a long period of time.

21. The presence and entry of dissolved-solids at levels between 10,000 and 91,100 mg/L where found in the Quaternary Deposits USDW may present an imminent and substantial endangerment to the health of persons.

22. Total dissolved solids in excess of 1,000-2,000 mg/L is unpalatable and will not be voluntarily consumed by individuals. If an individual has no other source of water and is forced to consume water with TDS levels over 10,000 mg/L, the adverse health effects include severe osmotic diarrhea and severe dehydration. Continued consumption after the onset of the above conditions may result in death.

23. Contaminants, including dissolved-solids and benzene are present in, entering, and are likely to continue to enter the Quaternary Deposits.

24. Based upon the data obtained regarding the geology in the affected area, the general direction of groundwater migration in the USDW and water quality assessments from monitoring and private wells, and review of historical land use in the area, EPA has determined that Respondents' oil production practices and/or equipment have caused or contributed and/or are continuing to cause or contribute to the endangerment of a USDW.

25. EPA has consulted with the Assiniboine and Sioux Tribes of the Fort Peck Reservation prior to issuing this Order. The Tribes notified EPA that they have not taken an action to protect the health of persons from the contaminants that are likely to be present in the Quaternary Deposits USDW.

26. To date, no governmental action has been taken to protect the health of persons from the contaminants that are likely to be present in the Quaternary Deposits USDW due to Respondents' operations of their oil production operations. The State of Montana, which does not have jurisdiction in this case, has been contacted by EPA. The State notified EPA that it has not taken an action and does not intend to take an action in this case.

3. EPA, therefore, finds that the actions ordered below are authorized under Section 1431 of the Act, 42 U.S.C. §300(i), and are necessary in order to protect the health of persons.

EMERGENCY ADMINISTRATIVE ORDER

1. Based on the foregoing findings of fact, taking into account the imminent and substantial endangerment to the health of persons and other such matters as justice may require, including the administrative record, and under authority of §1431(i) of the Act, 42 U.S.C.

§300(i), compliance with the following provisions is hereby ordered:

A. PROVIDE TEMPORARY SAFE DRINKING WATER SOURCE TO IDENTIFIED RESIDENCES

The Respondents shall immediately provide an alternative source of water that meets the EPA drinking water standards (40 C.F.R. Part 142) for drinking and cooking to the residences of the contaminated area. The water shall be provided in the quantity of one gallon per person per day in each residence. This water is to be provided on a regular basis in an easily accessible manner to the residence. The residences known to have contaminated water or which have drinking water which is threatened with contamination at this time are listed below and on the attached map (Attachment #1) :

Current Resident	City	State	Residence Address	Sec	Twn	Rge
Kohl, Danny	Poplar	MT	5097 Road 251	15	29N	51E
Lien, Birdell	Poplar	MT	4849 Road 2050	20	29N	51E
Zimmerman, Bill	Poplar	MT	5448 Road 251	01	28N	51E
Abbott, Joe	Poplar	MT	5540 Road 75	04	28N	51E
Kirn, Audrey	Poplar	MT	5584 Road 75	08	28N	51E
Kirn, Michael	Poplar	MT	5632 Road 75	08	28N	51E
Gray Hawk, Rachel	Poplar	MT	5647 Road 75	16	28N	51E

Trottier, Tim & Donna	Poplar	MT	5713 Road 75	16	28N	51E
Lockman, William	Poplar	MT	5715 Road 75	16	28N	51E
Four Bears, Charles	Poplar	MT	5678 Road 75	17	28N	51E
Martell, Rene & Josi	Poplar	MT	5666 Road 75	17	28N	51E
Ricker Sr., George & Helen	Poplar	MT	5712 Road 75	17	28N	51E
Bleazard, Ross & Laura	Poplar	MT	5866 Road 150	29	28N	51E
Whitmer, Warren & Donna	Poplar	Mt	58702 Road 75	29	28N	51E
Loegering, Mavis	Poplar	MT	5910 Road 150	29	28N	51E
Kirn Sr., Jesse	Poplar	MT	6037 Road 150	32	28N	51E
Grandchamp, Denise	Poplar	MT	5947 Road 75	33	28N	51E
Grainger, Trivian	Poplar	MT	5957 Road 75	33	28N	51E

After further study there may be a need to supply other types of domestic water. Respondents, upon notification by EPA, shall deliver this alternative source of water until such time as the local water source has been deemed by EPA as safe for consumptive

use or a permanent alternative source of water is provided. As the contamination plume moves through the aquifer, other residence(s) or municipalities may be added to the list above, and this Order will be amended.

B. SUBMIT CLEANUP AND PERMANENT ALTERNATIVE WATER SUPPLY PROPOSALS

Respondents shall submit to EPA within 120 days of the receipt of this order a proposal for cleaning up the contamination plume(s) and a proposed plan for a permanent alternative water supply. The proposed plan for clean up of the contamination plume(s) shall include, but not be limited to, the information listed below:

1. Proposed method(s) to capture existing plume, to include:
   a. Containment
   b. Diversion of ground water
   c. Monitoring of Plume
2. Proposed method(s) to treat or dispose of captured plume, to include:
   a. Extraction of contaminants
   b. Disposal of contaminants
   c. Clean-up levels
3. Determination of lateral and vertical extent of ground water contamination, to include:
   a. Salinity determination
   b. Benzene determination
   c. Total organic carbon determination
   c. Cl:Br ratio
   d. Ground water flow direction
   e. Ground water flow rate
4. Proposed method(s) to prevent further contamination, to include:
   a. Containment at surface
   b. Corrective action on leaking wells
   c. Corrective action on leaking pits and ponds
   d. Corrective actions on leaking tanks

e. Corrective action on leaking transportation lines

The proposed plan for a permanent alternative water source shall be developed and approved by an independent engineer and shall take into consideration at least the factors listed below:

1. Water source
2. Source water yield
3. Source water quality (meets all EPA Drinking Water standards and if it meets criteria as a public water supply, must follow PWS regulatory requirements)
4. Long-term management of alternative water source

C. PREPARE AND SUBMIT WELL INFORMATION

The Respondents shall provide a historical record for each well listed and any other wells drilled, completed, reworked, converted, operated or plugged by Respondents within the sections of Township 28N and Range 51E, Sections 1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 15, 16, 21, 22, 23, and 24. Attached is a non-inclusive list of wells by Section, Township, and Range, and by company, for which the Respondents must provide the well information listed below (Attachment #2). The drilling, construction, well rework, conversion, plugging and other pertinent records submitted should include but not be limited to the information listed below. In each case service company records associated with each well activity shall be included. Respondents shall include information on

each instance of well integrity failures, that involved casing leaks, flow behind the casing and/or any fluids surfacing at or near the wellheads. Respondents shall include information listed below:

1. Well Name and API Identification Number
2. Well location
3. Current well status for each well.
   a. Active, Shut-in, Temporarily Abandoned, Plugged
4. Well Construction Information
   a. Date Well Drilled
   b. Date Well Completed
   c. Total Depth
   d. Plug Back Depth
   e. Drilling Record
   f. Completion Record (include diagram)
   g. Cementing Record (including estimated cement tops with assumptions for calculations and cement bond logs).
5. Well Rework Information
   a. Date of Well Rework
   b. Reason for Rework (If due to casing leak, location of leak if known)
   c. Records of Well Logs and Tests Performed
   d. Record of Rework
   e. Date Well Recommenced Injection or Production
6. Temporarily Abandoned (TA) or Shut-in Wells Information
   a. Date(s) Well Shut-in or TA
   b. Reason for TA or Shut-in of Well
   c. Was Well Shut-in or TA'd With the Equipment in the Well?
   d. If Not, What Equipment Was Removed and When, Provide a Record of Work if Possible
   e. Is the Well Capable of Resuming Injection or Production Without a Rework?
7. Well Conversion Information
   a. Date(s) Well Converted from Production to Injection:
   b. Date(s) Well Converted from Injection to Production
   c. Record of Conversion Activity

8. Plugging and Abandonment Information
   a. Plug and Abandonment Plan
   b. Plugging Record
   c. Were Any Problems Experienced During the Plugging Process, Involving Such Things as Pulling of Equipment, Setting Plugs, Water Flow to Surface?

D. PREPARE AND SUBMIT TANK AND PIPELINE INFORMATION

Respondents shall provide information on all current and past tanks, associated tank battery equipment, oil/water separators, and pipelines used in the East Poplar Oil Field for the production of oil and gas in the township, range, and sections listed Paragraph C above, including but not limited to: Tank Batteries 8-D, 80-D, South Central, A, C, D, F, G, H, K, and R. Respondents shall provide the information listed below:

1. Location of tank
2. Tank size and construction
3. Duration of tank use
4. Information on leaking tank bottoms or any other type of tank integrity failure(s)
5. Information on spill incidents at or near the tanks and tank batteries, including those from unloading transport trucks into the tanks.
6. Location of all pipelines (identify as surface or subsurface)
7. Information on any leaks or spills from pipelines leading to and from the tanks and wells
8. Information on pipeline failures on the surface and subsurface.

E. PROVIDE INFORMATION ON PIT(S) USED IN THE PRODUCTION OF OIL OR GAS

Respondents shall provide information on all current and abandoned pits used for well construction, oil and gas production, well workovers, product and waste storage, evaporation and disposal of fluid products and

wastes in the sections listed for in the East Poplar Oil Field for the production of oil and gas in the township, range, and sections listed in Paragraph C above.

Respondents shall include information on the construction for each pit, date pit constructed, duration of pit use, for what the pit was used, types of wastes placed in the pit, and, if abandoned, record of abandonment.

F. PROVIDE GEOLOGIC AND HYDROLOGIC FIELD INFORMATION

Respondents shall provide a formation depth cross section for the portion of the field drilled, constructed, operated, and/or plugged well(s) by each Respondent. Respondents shall provide information on all formations found to contain water above the injection or production formation being used by their wells. Respondents shall provide information on formation pressures for production and/or injection formations, over a time line from well construction to well plugging.

2. Unless otherwise specified, all reports and notifications herein required shall be submitted to:

Carol Bowden
U.S. Environmental Protection Agency
Office of Enforcement, Compliance
and Environmental Justice
Technical Enforcement Program (8ENF-T)
999 18th Street, Suite 500
Denver, Colorado 80202-2466
Telephone (303) 312-6485

3. Not more than 48 hours after receipt of this Order, Respondents shall contact Ms. Carol Bowden at the above address and telephone number to advise her of their intentions to comply with this Order. If that 48 hour time period occurs on a weekend or holiday, Respondents shall contact Ms. Bowden by 10:00 a.m. on the first EPA work day (Monday through Friday) after said holiday or weekend.

GENERAL PROVISIONS

1. The provisions of this order shall apply to and be binding upon Respondents, their officers, directors, agents, successors and assigns. Notice of this Order shall be given to any successors in interest prior to transfer of any of the oil and gas facilities or their operation. Action or inaction of any persons, firms, contractors, employees, agents, or corporations acting under, through or for Respondents, shall not excuse any failure of Respondents to fully perform their obligations under this Order.

2. This Order does not constitute a waiver, suspension, or modification of the requirements of any federal

statute, regulation, or condition of any permit issued thereunder, including the requirements of the Safe Drinking Water Act, which remain in full force and effect. Issuance of this Order is not an election by EPA to forgo any civil or any criminal action otherwise authorized under the Act.

3. Violation of any term of this Order may subject Respondents to an administrative civil penalty of up to $15,000 for each day in which such violation occurs or failure to comply continues pursuant to §1431(b) of the Act, 42 U.S.C. §300i(b). In addition, actions or omissions which violate any requirements of the SDWA or its implementing regulations may subject Respondents to a civil penalty of not more than $27,500 per day per violation pursuant to §1423 of the Act, 42 U.S.C. §300h-2.

4. This Emergency Administrative Order is a final agency action by EPA.

5. This Emergency Administrative Order is binding on all Respondents, and each Respondent is jointly and severally liable hereunder.

6. The effective date of this Order shall be the date of issuance.

Issued this 30th day of September, 1999.

Connally E. Mears

Connally E. Mears, Director
Technical Enforcement Program
Office of Enforcement, Compliance,
and Environmental Justice
United States Environmental Protection
Agency, Region 8

Michael T. Risner, Director
David J. Janik, Senior Attorney
Legal Enforcement Program
Office of Enforcement, Compliance,
and Environmental Justice
United States Environmental Protection
Agency, Region 8

Attachment #1

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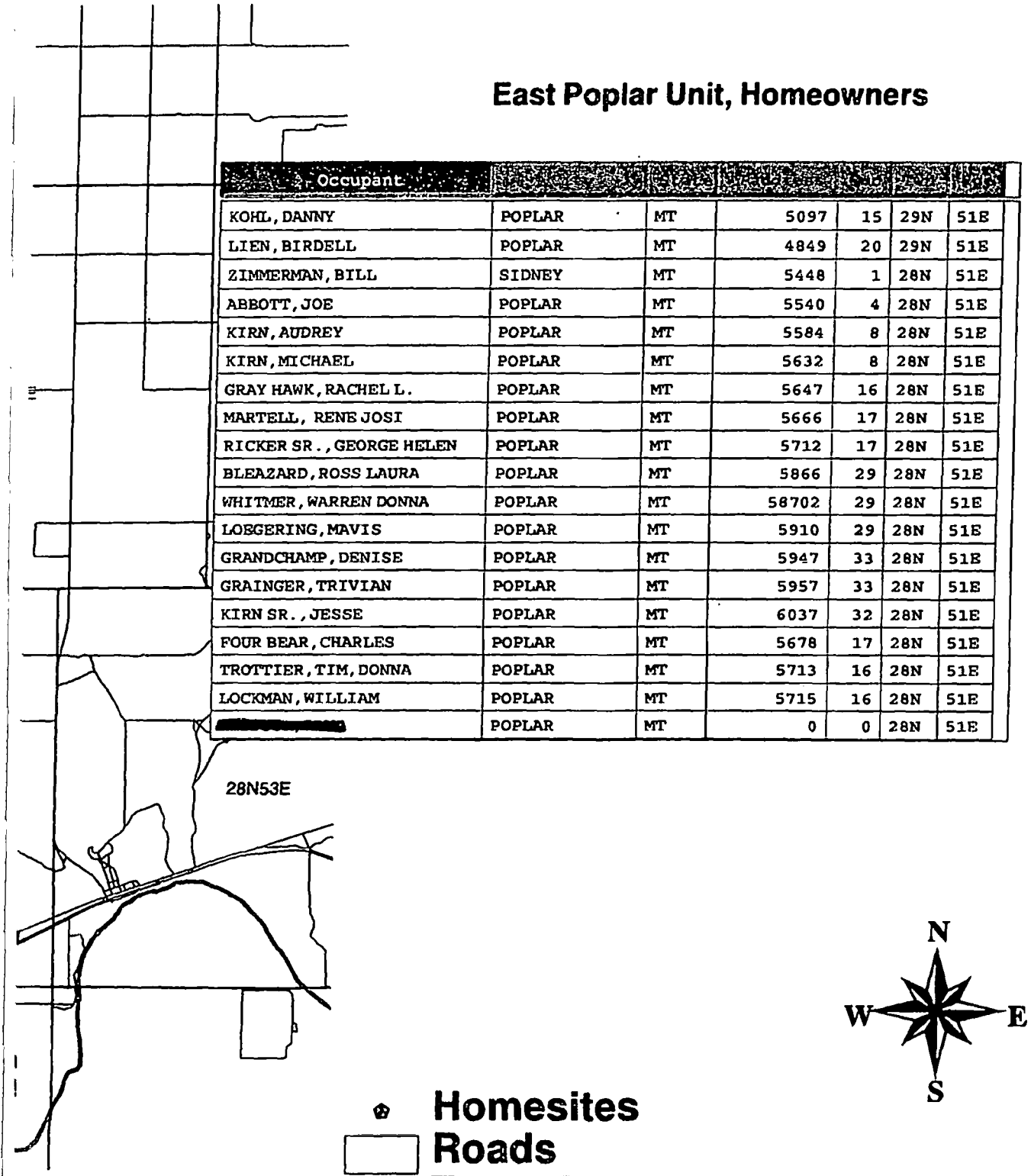
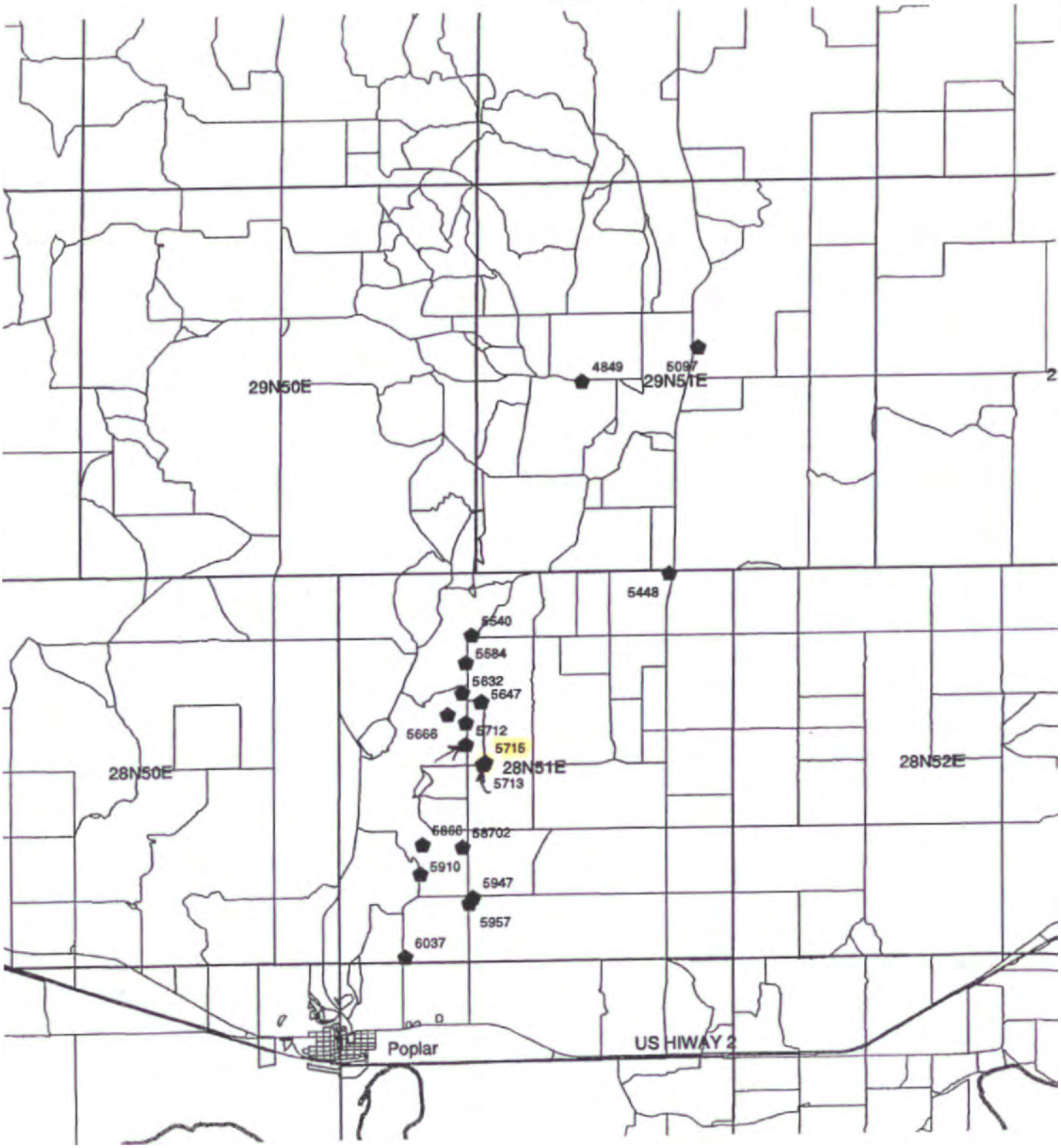
East Poplar Unit, Homeowners

Occupant						
KOHL, DANNY	POPLAR	MT	5097	15	29N	51E
LIEN, BIRDELL	POPLAR	MT	4849	20	29N	51E
ZIMMERMAN, BILL	SIDNEY	MT	5448	1	28N	51E
ABBOTT, JOE	POPLAR	MT	5540	4	28N	51E
KIRN, AUDREY	POPLAR	MT	5584	8	28N	51E
KIRN, MICHAEL	POPLAR	MT	5632	8	28N	51E
GRAY HAWK, RACHEL L.	POPLAR	MT	5647	16	28N	51E
MARTELL, RENE JOSI	POPLAR	MT	5666	17	28N	51E
RICKER SR., GEORGE HELEN	POPLAR	MT	5712	17	28N	51E
BLEAZARD, ROSS LAURA	POPLAR	MT	5866	29	28N	51E
WHITMER, WARREN DONNA	POPLAR	MT	58702	29	28N	51E
LOEGERING, MAVIS	POPLAR	MT	5910	29	28N	51E
GRANDCHAMP, DENISE	POPLAR	MT	5947	33	28N	51E
GRAINGER, TRIVIAN	POPLAR	MT	5957	33	28N	51E
KIRN SR., JESSE	POPLAR	MT	6037	32	28N	51E
FOUR BEAR, CHARLES	POPLAR	MT	5678	17	28N	51E
TROTTIER, TIM, DONNA	POPLAR	MT	5713	16	28N	51E
LOCKMAN, WILLIAM	POPLAR	MT	5715	16	28N	51E
[redacted]	POPLAR	MT	0	0	28N	51E



Ft.Peck Indian Rese



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ATTACHMENT 2

WELL LIST BY COMPANY

Murphy Oil Corporation

Murphy Oil USA, Inc.

Murphy Exploration & Production Company

Provide the information required above for those wells listed below and all other wells constructed, operated, or plugged in the sections listed below:

East Poplar Oil Field Near Poplar, Montana in T28N R51E Sections 1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 15, 16, 21, 22, 23, and 24.

LOCATION	WELL NAME
Sec 1 T28N R51E	
C SW NW	Murphy 3
C SW NE	Murphy 99
NE SE	Murphy 76
Sec 2 T28N R51E	
SW NE	Murphy 1
C SE NW	Murphy 18 Also known as: Zimmerman EPU #18 or the 7-B Well
SW NE	Murphy 2-D Also known as: EPU 2-D
SE SE	Zimmerman EPU 116 - New Well
C SW SW	Zimmerman EPU #5 Also known as Murphy #5 or the 7-A Well
C SE SE	Murphy 17
Sec 3 T28N R51E	
SW NW	Murphy 80-D Also known as: Tribal Unit #80-D
	Murphy 82
C SW SE	Murphy 12

C SE SE	Murphy 14
SEC 4 T28N R51E	
SW NW	Murphy 59-D
C SW NE	Murphy 45
Sec 9 T28N R51E	
SE NE	Murphy 67
Sec 10. T28N R51E	
NW NW	Murphy 11
NW NE	Polumbus (Huber) 4
NW NE (50 feet east of Huber #4)	Polumbus (Huber) 4-A
NE	Polumbus (Huber) 1-W
NE NE	Polumbus (Huber) 3
SE NW	Murphy 13
SW NE	Polumbus (Huber) 2
SE SW NE	Murphy 5
SW NW	Polumbus (Huber) 1
C NW SE	Murphy 8-D
E SW NE	(Murphy) Huber 5 SWD Previously known as the Huber 5 (Production)
NE SE	Murphy 6
Sec. 11 T28N R51E	
NWNW	Murphy 15
SW NW	Murphy 7 also known as EPU #7
SW NE	Murphy 68
C SW SW	Murphy 9
SW SE	Murphy 100
Sec. 12 T28N R51E	
SW SW	Murphy 24
SW NE	Murphy 61

Sec. 13 T28N R51E	
SE SW	Murphy 74
Sec. 14 T28N R51E	
C NW	Murphy 101 Also called the Tribal 101
SW SW NE	Murphy 20 Also called the Unit 20
SW SE	Murphy 104 Also called the Tribal 104
SW SW SW	Murphy 22 Also known as the Tribal Unit 22 and EPU 22
Sec. 15 T28N R51E	
C SW NE	Murphy 32 Also known as EPU32
Sec. 22 T28N R51E	
C NW NE	TXO -1 Also known as Buckles "B" #1
NW SE NW	Buckles SWD #1 Also known as TXO-SWD-1
C SE NW	Buckles A-1
SW SE	Tribal Unit #72 Also known as Murphy 72
Sec. 23 T28N R51E	
C SW NE	Murphy 26 (Also known as Fed. Unit #26)
C NW SW	Fed. Unit 55 Also known as Murphy 55

NE NE SW	Fed. Unit 3-G Also known as Murphy 3-G
Sec. 24 T28N R51E	
SW SW	Murphy 44
Sec. 27 T28N R51E	
C SW NE	Federal unit #63 Also known as EPU 63 or Murphy 63

Pioneer Natural Resources Company

for Mesa Petroleum Co.

Provide the information required above for those well(s) listed below and all other wells constructed, operated, or plugged in the sections listed below:

East Poplar Oil Field Near Poplar, Montana in T28N R51E Sections 1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 15, 16, 21, 22, 23, and 24.

(Respondent must also provide information on the **relief well** drilled near the Mesa Biere 1-22. Respondent must submit information on its location, depth, type of use, duration of use, and the plugging records.)

Sec. 22 T28N R51E	
C NW SW	Biere 1-22 Also know as: Mesa Biere 1-22
SW NW SW	Biere 1-W SWD Also known as: Mesa 1-W(Biere)

AMARCO Resources Company

Provide the information required above for those well(s) listed below and all other wells constructed, operated, or plugged in the sections listed below:

East Poplar Oil Field Near Poplar, Montana in T28N R51E Sections 1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 15, 16, 21, 22, 23, and 24.

(Respondent must also provide information on the **relief well** drilled near the Mesa Biere 1-22. Respondent must submit information on its location, depth, type of use, duration of use, and the plugging records.)

Sec. 22 T28N R51E	
C NW SW	Biere 1-22 Also known as: Mesa Biere 1-22
Sec. 27 T28N R51E	
C NW NW	Federal 1-27 Also known as: AMARCO Schmidt 1-27

W.R. Grace & Co.-Conn.

For: **Polumbus Corporation/Polumbus Company**

Provide the information required above for those well(s) listed below and all other wells constructed, operated, or plugged in the sections listed below:

East Poplar Oil Field Near Poplar, Montana in T28N R51E Sections 1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 15, 16, 21, 22, 23, and 24.

Sec. 10 T28N R51E	
NW NE	Polumbus (Huber) 4
NW NE (50 east of Polumbus 4)	Polumbus (Huber) 4-A
NE	Polumbus (Huber) 1-W
NE NE	Polumbus (Huber) 3
SE NW	Polumbus 13 Also known as: Murphy 13
SW NE	Polumbus (Huber) 2
SE SW NE	Polumbus 5 Also known as: Murphy 5
E SW NE	Huber 5 SWD Known as: Murphy 5 SWD Huber 5 Production well
SE NE SE	Grace 110x Also known as: EPU 110x-D

Marathon Oil Company

For: Texas Oil & Gas Corp.
Trade name TXO Production Corp.

Provide the information required above for those well(s) listed below and all other wells constructed, operated, or plugged in the sections listed below:

East Poplar Oil Field Near Poplar, Montana in T28N R51E Sections 1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 15, 16, 21, 22, 23, and 24.

Sec. 22 T28N R51E	
C NW NE	TXO -1 Also known as Buckles "B" #1
NW SE NW	Buckles SWD #1 Also known as TXO-SWD-1
C SE NW	Buckles A-1

EPEC-Altamont Corporation

For: Tenneco Oil Company Inc./ Tenneco-Altamont Corporation

Provide the information required above for those well(s) listed below and all other wells constructed, operated, or plugged in the sections listed below:

East Poplar Oil Field Near Poplar, Montana in T28N R51E Sections 1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 15, 16, 21, 22, 23, and 24.

Sec. 25 T28N R51E	
NW SW NE	Tenneco 1 Also known as G. Morse #1

CERTIFICATE OF SERVICE
Docket No. SDWA-8-99-68

I hereby certify that the original and a true copy of this Emergency Administrative Order was hand-carried to the Regional Hearing Clerk, EPA Region 8, 999 18th Street, Denver, Colorado, and that a true copy of the same was sent via Certified Mail Return Receipt Requested mail to:

Murphy Exploration & Production Company
CT Corporation System
40 West Lawrence, Suite A
Post Office Box 1166
Helena, Montana 59624-1166;

Murphy Oil USA, Inc.
CT Corporation System
40 West Lawrence, Suite A
Post Office Box 1166
Helena, Montana 59624-1166;

Murphy Oil Corporation
Corporation Trust Company
Corporation Trust Center
1209 Orange Street
Wilmington, Delaware 19801;

Pioneer Natural Resources Company
1400 Williams Square West
5205 North O'Connor Blvd.
Irving, TX 75039;

Pioneer Natural Resources Company
c/o Pioneer Natural Resources USA, Inc.
CT Corporation System
40 West Lawrence, Ste A
Post Office Box 1166
Helena, Montana 59624-1166;

W.R. Grace & Company- Conn.
Prentice-Hall Corporation System Inc.
Post Office Box 1691
Helena, Montana 59624-1691;

CERTIFICATE OF SERVICE
Docket No. SDWA-8-99-68

AMARCO Resources Corporation
S.O.S.
2920 One Main Place
Dallas, TX 75250;

EPEC-Altamont Corporation
CT Corporation System
40 West Lawrence, Suite A
Post Office Box 1166
Helena, Montana 59624-1166; and

Marathon Oil Company
CT Corporation System
40 West Lawrence, Suite A
Post Office Box 1166
Helena, Montana 59624-1166

Dated: September 30, 1999

By: Judith McTernan
Judith McTernan

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DESCRIPTION OF BUSINESS