C

CORRECTIVE ACTION PLAN & WELL DATA

UIC Permit App.

Attachment C: CORRECTIVE ACTION PLAN AND WELL DATA

Based on publically available oil and gas well records, there are no plugged or abandoned wells within the area of review. Additionally, there are no wells other than the Marjorie C. Yanity 1025 within the area of review that penetrate the proposed injection formation. Shown in the detailed map from Attachment B, there are three active shallow gas wells within the area of review. All three wells are owned and operated by EXCO Resources PA, INC and range from 3,402 to 3,560 feet in depth. The wells penetrate the Upper Devonian aged Elk group and are at least 3,984 feet shallower than the proposed injection interval. Since none of these wells penetrate the proposed injection zone, no corrective action plans are required.

It is believed that all of the wells within the area of review have been identified. In the event that old, unplugged and un-reported wells are located as a result of the injection process these wells will be plugged and abandoned in accordance with Pennsylvania Code under Title 25, Chapter 78, sections 92-98 and the Environmental Protection Agency's Plugging and Abandonment Plan, Form 7520-14.

Included in this section:

- Data sheet for all oil and gas wells within the area of review.

- Marjorie C. Yanity 1025 Well Data
    - Well Record & Completion Report
    - Well Location Plat
    - Drillers Log- Union Drill Well Record Book
    - PGE As Drilled Report – Wellbore sketch

- Well records and plats for all oil and gas wells within the area of review.

PGE

Landowners with Property within 1/4 mile of the Yanity 1025 Well

PARCEL	Sample Date	OWNER_NAME	OWNER_ADDR	OWNER_AD_1	TYPE_LAND
19-012-112.01	11/5/2012	BUTERBAUGH, RONALD	557 MILL RUN RD	MARION CENTER PA 15759	VAC - VACANT LOT
19-011-102.02	11/5/2012	YANITY, MICHAEL UX	31 MILL RUN RD	MARION CENTER PA 15759	HO - HOUSE
19-011-102.01	11/5/2012	SEBERING, JAMES UX	916 SEBRING RD	MARION CENTER PA 15759	HO - HOUSE
19-011-102.03	11/5/2012	YANITY, JOHN G UX	879 SEBRING RD SR	MARION CENTER PA 15759	HO - HOUSE
19-011-102	11/5/2012	YANITY, MICHAEL & MARJORIE C.	171 MILL RUN RD	MARION CENTER PA 15759	HO - HOUSE
19-011-107	11/9/2012	BURNS, WILLIAM NICK	339 BURNS RD	MARION CENTER PA 15759	HO - HOUSE
19-011-104	11/9/2012	DEGENKOLB, CATHY	315 SEBRING RD SR	MARION CENTER PA 15759	HO - HOUSE
19-011-105	11/9/2012	BAPTIST CHURCH CEMETARY		EAST MAHONING, PA 15728	OB - OUTBUILDING
19-012-114	11/9/2012	MUELLER, NORMAN UX.	121 MCELROY DR	TRAFFORD, PA 15085	HO - HOUSE
19-011-106	11/9/2012	SWEENEY, JEFFREY A.	780 SEBRING ROAD	MARION CENTER PA 15759	MT- TRAILER
19-011-100.01	11/9/2012	DAUGHERTY, JOSEPH C. Ux.	2290 EAST RUN ROAD	MARION CENTER PA 15759	HO - HOUSE
19-011-100.02	N/A	GREEN TREE SERVICING LLC	3 EXECUTIVE PARK DRIVE	BEDFORD NH 03110	HO - HOUSE
19-011-100	N/A	NICHOL, JOANNE & DELMONT	18770 ROUTE 286 HWY E. PO BOX 71	HILLSDALE PA 15746	VAC - VACANT LOT

Oil and Gas Well Data in Area of Review

API #	Current Operator	Name	Well No.	TD (ft)	Completion	Field	GL (ft)	Latitude 27	Longitude 27	Twp	Quadrangle
37-063-25377-00	EXCO Resources PA, Inc	Marjorie C. Yanity	5	3,475	4/2/1980	Purchase Line	1,628	40.7477	-78.9271	Grant	Commodore 2
37-063-25020-00	EXCO Resources PA, Inc	Marjorie C. Yanity	1	3,402	12/22/1979	Purchase Line	1,558	40.7473	-78.9228	Grant	Commodore 2
37-063-25021-00	EXCO Resources PA, Inc	Marjorie C. Yanity	2	3,560	12/2/1979	Purchase Line	1,588	40.7438	-78.9267	Grant	Commodore 2

1 In accordance with 25 Pa Code 78 122(a), a Well Record must be submitted to the Department within 30 calendar days of cessation of drilling or altering a well

2 In accordance with 25 Pa Code 78 122(b), a Completion Report must be submitted within 30 calendar days after completion of the well In addition, the information on land application of tophole water and disposal of residual waste (including contaminated drill cuttings) in a pit is to be filed with the Completion Report (see ER-OG-75)

Purchase Gene Field - East Mahoning Church (Discovery)

Well Operator: Pennsylvania General Energy, Corp			Telephone Number: (814) 723-3230
Address: 208 Liberty Street, Warren, PA 16365			Zip
Permit Number: 37-063-31807		Project Number	
Farm Name: Marjorie C Yanity	Farm Number: 1025	Serial Number: n/a	Acres: 130 18
Township: Grant		County: Indiana	
Type of Well: ■ Gas ☐ Oil ☐ Injection ☐ Storage ☐ Disposal ☐ Other (Specify)			

WELL RECORD
(Include Driller's Log on Reverse Side)

Drilling Method: Rotary (Air ■ Mud ☐) Cable Tool ☐ Other (Specify)	Date Drilling Started: 6/29/97	Date Drilling Completed: 7/14/97
Elevation: 1631' KB	Total Depth: 7795'	7½ Quadrangle: Commodore

CASING AND TUBING RECORD

Hole Size	Pipe Size	Amount In Well	Material Behind Pipe: Type and Amount	Packer/Hardware: Type	Size	Depth	Date Run
---	26"	17'	Cuttings / Driven				6/29/97
24"	16"	28 3'	Sanded In	Plain End			6/29/97
15"	11 3/4"	568 6'	320 sks Class A 3% $CaCl_2$	Guide Shoe	11 3/4	568 6'	6/30/97
11"	8 5/8"	1539 41'	250 sks Halliburton Light Cement 100 sks Class A 3% $CaCl_2$	Float Shoe	8 5/8	1539'	7/2/97
7 7/8"	4 1/2"	7788'	175 sks Class A 10% Salt 75 sks Onskany Flush Cement	Float Collar Float Shoe	4 1/2' 4 1/2'	7778' 7788'	7/15/97

Cement return on surface casing? ■ yes30 BBL ☐ no

COMPLETION REPORT

Perforation Record: Date	Interval Perforated: From	To	Stimulation Record: Date	Interval Treated	Fluid: Type	Amount	Propping Agent: Type	Amount	Average Injection Rate
7/23/97	7544'	7564'	7/25/97	7544-7564	Acid	10,000	0	0	30 BPM

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Oil & Gas Geology Division

Natural Open Flow: Not Measured	Natural Rock Pressure: Not Measured	Hours	Days
After Treatment Open Flow: Not Measured	After Treatment Rock Pressure: 4000#	Hours: 60	Days

Name	Top	Bottom	Gas At	Oil At	Water At (Fresh or Brine)	Source of Data
Strip Fill and Gray Shale	0'	27'				Drillers Log
Gray Shale and Coal	27'	83'				"
Sand, Shale and Coal	83'	127'			Fresh @ 83'	"
Shale (Coal @ 127')	127'	129'				"
Sand and Shale (Coal @ 152, 255')	129'	259'			Fresh @ 130'	"
Sand and Shale (Coal @ 255',338')	259'	440'				"
Sand and Shale	440'	1040'				"
Sand and Shale	1040'	1225'				"
Red Rock and Shale	1225'	1412'				"
Sand and Shale	1412'	1769'				"
Sand and Shale	1769'	2950'				"
Sand and Shale	2950'	3300'				"
Shale	3300'	4800'				"
Shale	4800'	6859'				"
Tully Limestone	6859'	6937'				Electric Log
Shale	6937'	7430'				"
Marcellus Shale	7430'	7522'				"
Onondaga Limestone	7522'	7532'				"
Huntersville Chert	7532'	7622'	7544'			"
Oriskany Sandstone	7622'	7630'				"
Limestone	7630'	7795'				"
T D		7795'				

Operator's Signature

Robert A Kuntz, Geologist
Title

8/25/97
Date

FOR OFFICIAL USE ONLY

GEO COPY

5500-PM-OG0002 Rev 3/97

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Oil and Gas Management Program
WELL LOCATION PLAT

DEP USE ONLY	DEP Application Tracking #	G:
	Permit #: 37-063-31807-00	C:
	Project # :	

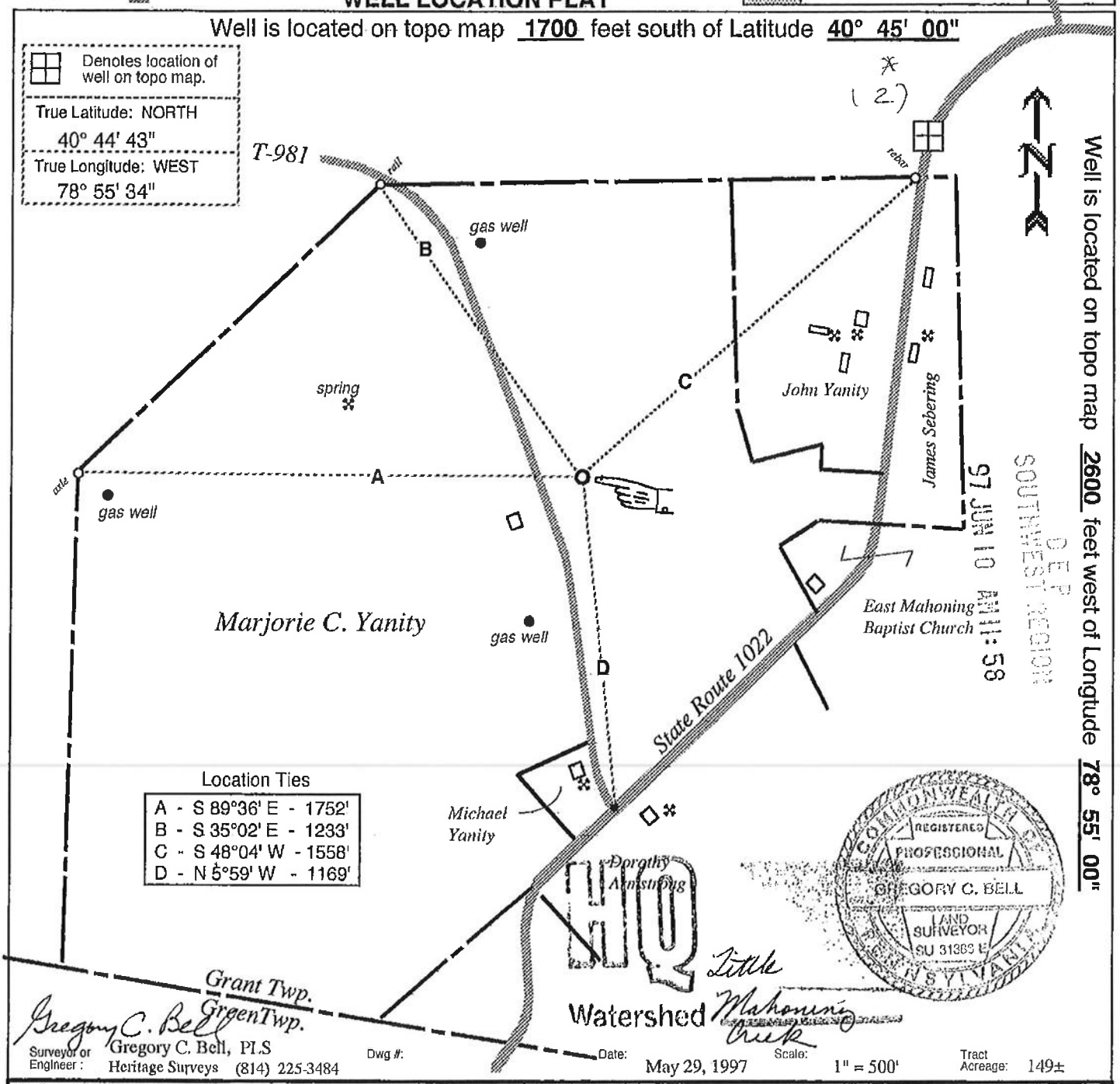
Well is located on topo map **1700** feet south of Latitude **40° 45' 00"**

Well is located on topo map **2600** feet west of Longitude **78° 55' 00"**

Denotes location of well on topo map.

True Latitude: NORTH
40° 44' 43"

True Longitude: WEST
78° 55' 34"



Location Ties

A	S 89°36' E - 1752'
B	S 35°02' E - 1233'
C	S 48°04' W - 1558'
D	N 5°59' W - 1169'

Surveyor or Engineer: Gregory C. Bell, P.L.S — Heritage Surveys (814) 225-3484 — Dwg #: — Date: May 29, 1997 — Scale: 1" = 500' — Tract Acreage: 149±

Applicant / Well Operator Name	DEP ID #	Well (Farm) Name	Well #	Serial #
Pennsylvania General Energy Corp.		Marjorie C. Yanity	1025	
Address: 208 Liberty Warren, PA 16365		County - Code: Indiana 32	Municipality: Grant Twp.	
Surface Landowner: Marjorie C. Yanity		USGS 7.5' Quadrangle Map Name: Commodore		Map Section: 2
Surface Lessee (if any)		Angle & Course of Deviation (Drilling): 0°	Surface Elevation: 1620	Anticipated Total Depth: 8000

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Surface Owner or Water Purveyor with a Water Supply within 1000 ft	Approximate Course and Distance to Water Supply	Owner, Lessee, or Operator of Workable Coal Seam	Name of Coal Seam Owned, Leased, or Operated
Marjorie C. Yanity	N 76°W - 840'±	PBS Coals, Inc.	Lower Kittanning - B seam
		AFC Coal Properties	all above B seam
		United Railroad System	all other seams
		Kraynak Coal Company	lessee

none operating

UNION DRILLING

DRAWER 40
BUCKHANNON, WV 26201

ROTARY DRILLING

WELL RECORD BOOK

JOB NO. 090343

WELL NO. 1025

ON Marjorie C. Family LEASE

COUNTY Indiana

STATE Pa.

Pa. General Energy Corp.
OWNED BY

Size 11 3/4 Pipe Tally 568.60 Feet

	Ft.	10th	Ft.	10th	Ft.	10th	Ft.	10th	Ft.	10th
1	43	20								
2	39	05								
3	42	05								
4	39	10								
5	31	50								
6	37	25								
7	44	65								
8	46	00								
9	44	00								
10	41	30								
11	42	35								
12	48	05								
13	41	20								
14	28	90								
OUT 15	24	35	Land Joint (OUT)							
16										
17										
18										
19										
20										

Cement 11 3/4 on 6-30-97
320 sks. By Halliburton
Circulated 30 BBL. Cemt
Plug Down @ 5:45 AM

1539.41

Size 8 5/8 Pipe Tally 1539.41 Feet

	Ft.	10th	Ft.	10th	Ft.	10th	Ft.	10th	Ft.	10th
1	44	14	44	03						
2	43	96	44	03						
3	44	14	43	84						
4	44	03	43	95						
5	42	80	43	82						
6	44	12	44	06						
7	43	93	44	21						
8	44	01	43	93						
9	44	02	44	04						
10	43	92	43	89						
11	43	85	43	81						
12	44	03	44	24						
13	43	91	44	15						
14	44	24	44	12						
15	44	12	44	04						
16	44	10								
17	43	84								
18	43	98								
19	44	03								
20	44	08								

CEMENT 8 5/8 7/2/97
850 SKS BY HALLIBURTON
CIRCULATED 20 BBL CEMENT
PLUG DOWN @ 3:15 AM

1539.41

Pennsylvania General Energy Company, LLC

Indiana County, Grant Township, Marjorie C. Yanity Well # 1025

API #: 37-063-31087-00

Yanity Well Construction Diagram

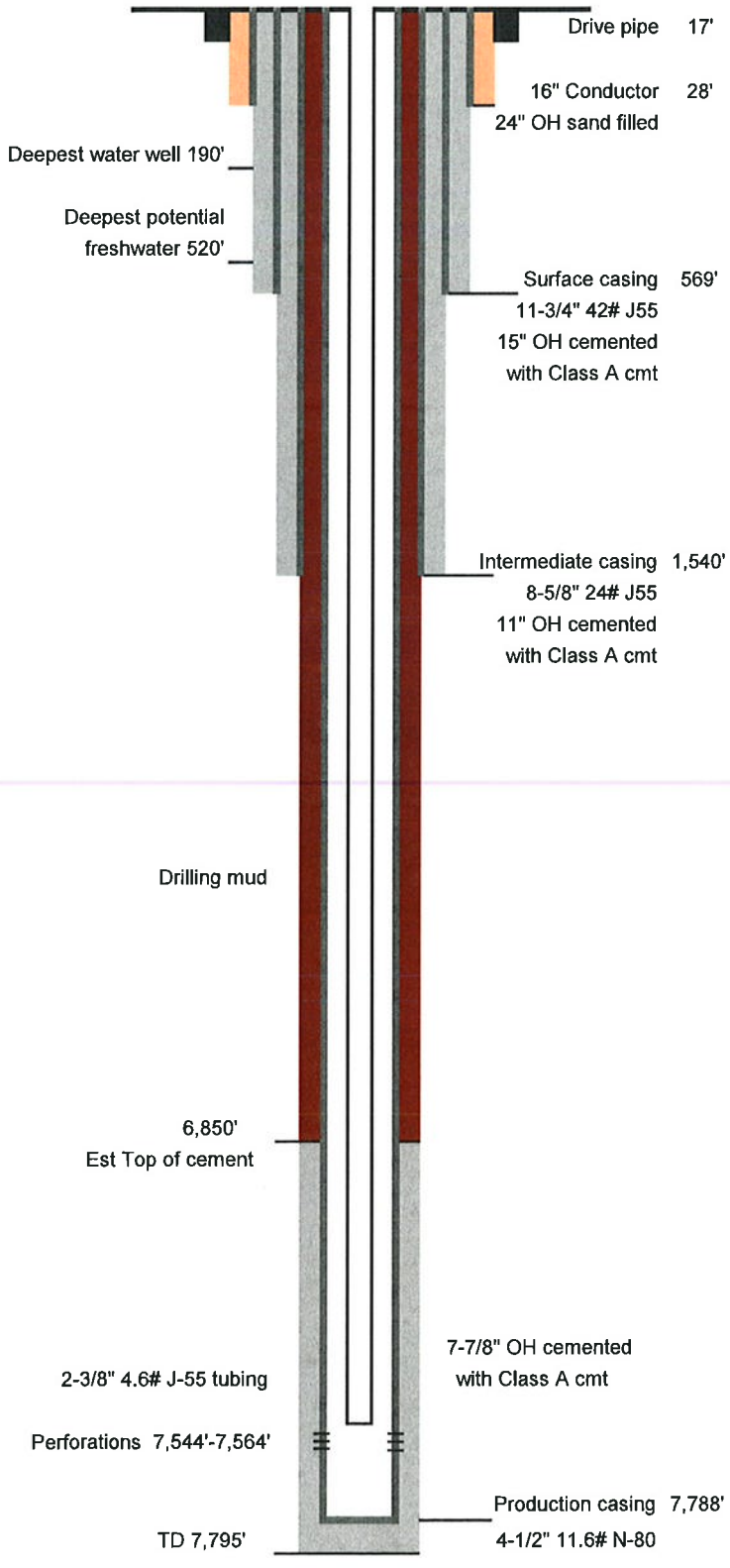
Longitude: 78° 55' 34"

Surface Elevation: 1,620 ft

Latitude: 40° 44' 43"

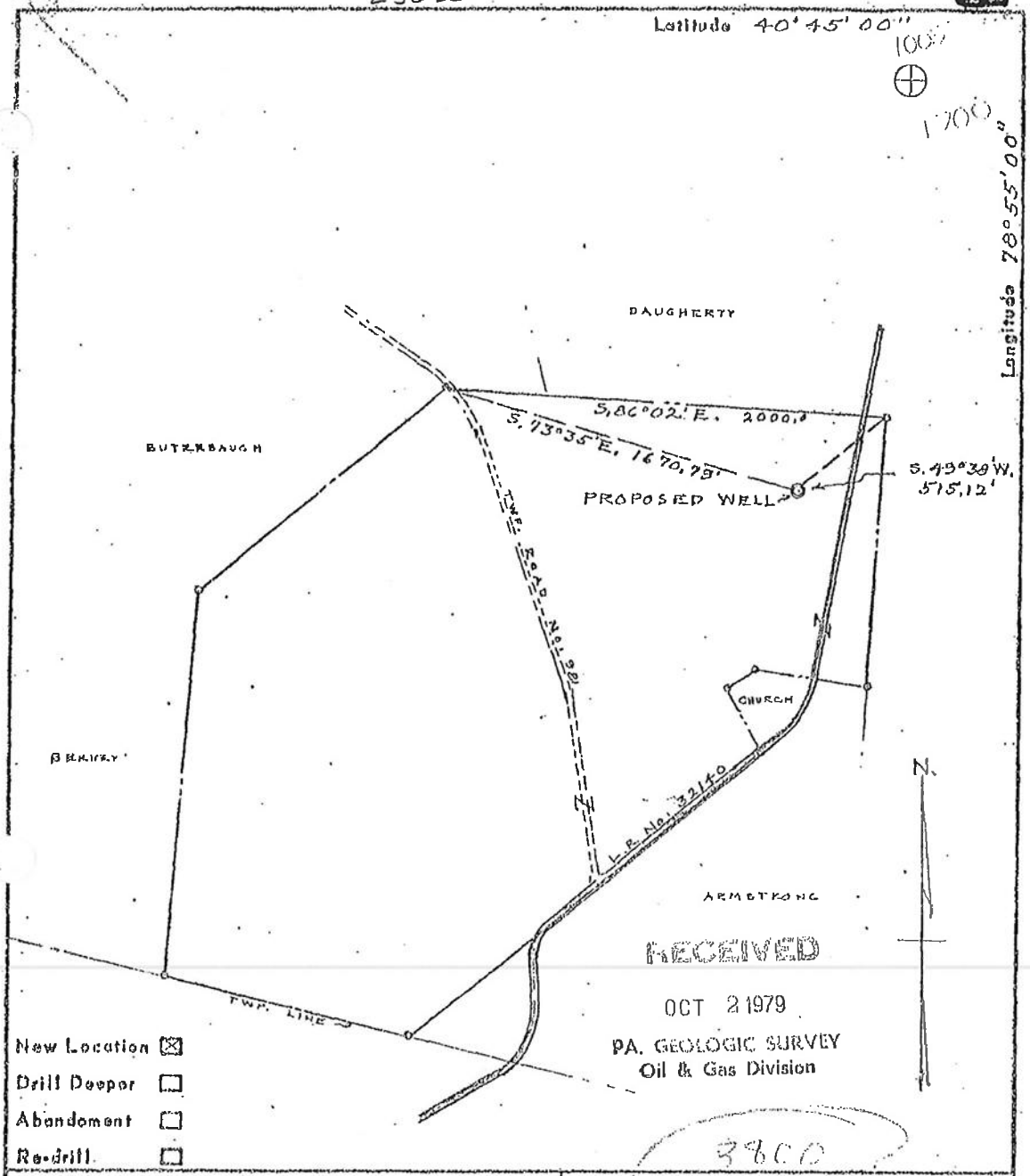
Log of formations

Formation Name	Top	Bottom	Oil/Gas	Water	Coal
Strip Fill & Gray Shale	0'	27'			
Gray Shale & Coal	27'	83'			
Sand, Shale, & Coal	83'	127'		83'	
Shale	127'	129'			127'
Sand & Shale	129'	259'		130'	152,255'
Sand & Shale	259'	440'			338'
Sand & Shale	440'	1,040'			
Sand & Shale	1,040'	1,225'			
Red Rock & Shale	1,225'	1,412'			
Sand & Shale	1,412'	1,769'			
Sand & Shale	1,769'	2,950'			
Sand & Shale	2,950'	3,300'			
Shale	3,300'	4,800'			
Shale	4,800'	6,859'			
Tully Limestone	6,859'	6,937'			
Shale	6,937'	7,430'			
Marcellus Shale	7,430'	7,522'			
Onondaga Limestone	7,522'	7,532'			
Huntersville Chert	7,532'	7,622'	7,544'		
Oriskany Sandstone	7,622'	7,630'			
Limestone	7,630'	7,795'			
TD		7,795'			



DM-OG-2-56

25020



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PA. GEOLOGIC SURVEY
Oil & Gas Division

New Location ☒
Drill Deeper ☐
Abandonment ☐
Re-drill ☐

3800

Company ATLAS RESOURCES, INC.
Address 311 ROUSER ROAD, CORAOPOLIS, PA. 15108
Farm MARJORIE C. YANITY, ET UX
Tract ____ Acres 142 Lease No. ____
Well (Farm) No. 1 Co. Serial No. ____
Angle of Deviation, if any ____
Elevation 1558 Quadrangle COMMODORE (2) (BARNES)
County INDIANA Township GRANT
Engineer PAUL L. BOTSFORD
Engineer's Registration No. 15062
File No. ____ Drawing No. 3901-E
Date AUG. 24, 1979 Scale 1"=600'

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF MINES
C
9-25-79 Oil and Gas Division
HARRISBURG

WELL LOCATION MAP
Dept. File No. IND-25020

⊕ Denotes Values of Well on United States Topographic Maps.

Scale 15' ☐ (7½) ☒

WORKABLE COAL SEAMS TO BE PENETRATED

Name of Seam	Owner of Seam
ALL MERCHANTABLE SEAMS	CLEARFIELD BIT. COAL CO.

AUG 1980

ER-OG-4: Rev. 2/77

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
DIVISION OF OIL AND GAS
PITTSBURGH, PENNSYLVANIA 15222

Office Use Only: C

1000 S 40°45'00"
1200 W/28"55'00" (B)

WELL RECORD

OSD. [redacted] 25020

PERMIT NO. IND 25020 PROJECT NO. TYPE OF WELL Gas

Purchase Line Field - Development

WELL OPERATOR: Atlas Resources, Inc.	TELEPHONE NO. 412-262-2830
ADDRESS: 311 Rouser Rd. Coraopolis, Pa.	ZIP 15108
FARM NAME: Marjorie C. Yanity	FARM NO. 1 · SERIAL NO. · ACRES 149
TOWNSHIP: Grant	COUNTY: Indiana
DRILLING COMMENCED: 12-17-79	DRILLING COMPLETED: 12-22-79
ELEVATION: 1558	QUADRANGLE: Commodore [redacted] ☒ 7½' ■ 15'

CASING AND TUBING RECORD

PIPE SIZE	AMOUNT IN WELL	MATERIAL BEHIND PIPE: CEMENT (SKS.)	MATERIAL BEHIND PIPE: GEL (SKS.)	PACKER: TYPE	PACKER: SIZE	PACKER: DEPTH	DATE RUN
11 3/4"	95'	None					12-18-79
8 5/8"	962'	200					12-20-79
4 1/2"	3302'	410					12-22-79

T.D.	D.D.	D.P.T.	Class	O	G	Lease
3402 Elk		3170 B	D		✓	1

PERFORATION RECORD / STIMULATION RECORD

DATE	INTERVAL PERFORATED FROM	INTERVAL PERFORATED TO	DATE	INTERVAL TREATED	AMOUNT FLUID	AMOUNT SAND	INJECTION RATE
1-8-80	2331	2375 gross	1-8-80	2331/2375	30,000gal	40,000	31 BPM
1-8-80	2531	2555	1-8-80	2531/2555	20,000	26,000	33 BPM
1-8-80	2714	2728	1-8-80	2724/2728	20,000	28,000	33 BPM
1-8-80	2956	2996 gross	1-8-80	2956/2996	24,000	32,000	32 BPM
1-8-80	3154	3170	1-8-80	3154/3170	20,000	30,000	33 BPM

NATURAL OPEN FLOW: N/A	NATURAL ROCK PRESSURE: N/A HRS. DAYS
AFTER TREATMENT OPEN FLOW: 1,760,000	AFTER TREATMENT ROCK PRESSURE: 1140# 48 HRS. ~~DAYS~~

REMARKS: Zone B Production

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(FORMATION ON REVERSE SIDE)

DER-TGS
1980 JUN -2 AM 11: 29
DIVISION OF OIL AND GAS REGULATION

DER-TGS
1980 MAY 23 PM 12 59
DIVISION OF OIL AND GAS REGULATION

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(pg. 2)

FORMATIONS

NAME	TOP	BOTTOM	GAS AT	OIL AT	WATER AT (FRESH OR SALT WATER)	SOURCE OF DATA
5th Sand	1718	1762				Electric Log
Warren	2314	2376				Electric Log
Speechley Stray	2452	2490				Electric Log
Speechley	2518	2560				Electric Log
Balltown	2659	2762 gross				Electric Log
Sheffield	2838	2862				Electric Log
Bradford 1	2950	3006				Electric Log
Bradford 2	3064	3100				Electric Log
Bradford 3	3140	3174				Electric Log
Kane	3242	3262				Electric Log
TD		3402				Electric Log

DATE 1/25, 19 80

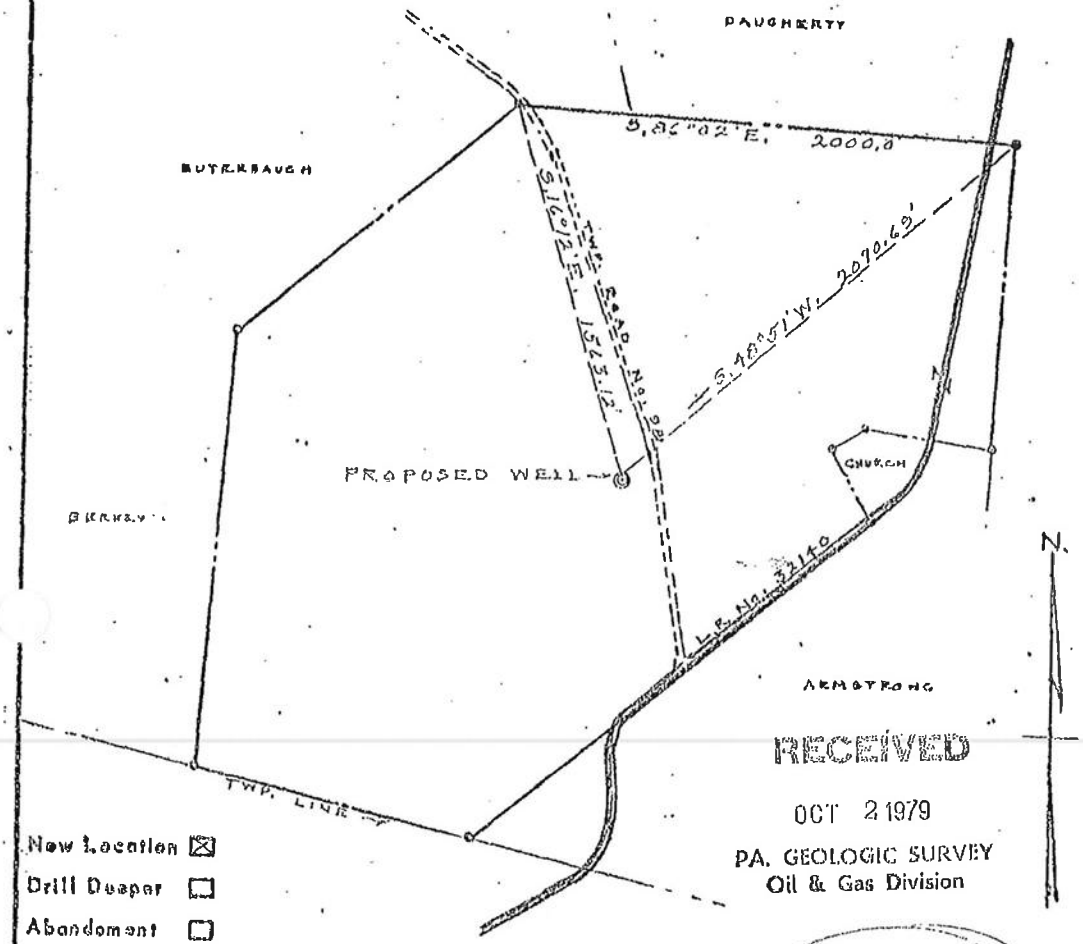
APPROVED BY [signature]

TITLE Geologist

DM-OG-2-56

Latitude 40°45'00"

Longitude 78°55'00"



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PA. GEOLOGIC SURVEY
Oil & Gas Division

New Location ☒
Drill Deeper ☐
Abandonment ☐
Re-drill ☐

3,600

Company ATLAS RESOURCES, INC.
Address 311 ROUSER ROAD, CORAOPOLIS, PA. 15108
Farm MARJORIE C. YANITY ET UX
Tract _____ Acres 149 Lease No. _____
Well (Farm) No. 2 Co. Serial No. _____
Angle of Deviation, if any _____
Elevation 1580 Quadrangle 2- (KARNES) COMMODORE
County INDIANA Township GRANT
Engineer PAUL L. BATSFORD
Engineer's Registration No. 15067
Id No. _____ Drawing No. 3901-F
Date AUG. 24, 1979 Scale 1" = 600'

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF MINES

C
9-25-79 Oil and Gas Division
HARRISBURG

WELL LOCATION MAP
Dept. File No. IND-25021

⊕ Denotes Values of Well on United States Topographic Maps.

Scale 15' ☐ (7½') ☒

WORKABLE COAL SEAMS TO BE PENETRATED

Name of Seam	Owner of Seam
ALL MERCHANTABLE SEAMS	CLEARFIELD BIT COAL CO.

ER OG 4: Rev. 2/77

AUG 1980

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
DIVISION OF OIL AND GAS
PITTSBURGH, PENNSYLVANIA 15222

Office Use Only

2,000 S 48°45'00" WELL RECORD
7,150 W 28°55'00" (B)

PERMIT NO. IND 25021 PROJECT NO. TYPE OF WELL Gas

PURCHASE LINE FIELD DEVELOPMENT

WELL OPERATOR Atlas Resources, Inc. TELEPHONE NO. 412-262-2830

ADDRESS 311 Rouser Rd. Coraopolis, Pa. ZIP 15108

FARM NAME	FARM NO.	SERIAL NO.	ACRES
Marjorie C. Yanity	2		149

TOWNSHIP	COUNTY
Grant	Indiana

DRILLING COMMENCED	DRILLING COMPLETED
11-27-79	12-2-79

ELEVATION	QUADRANGLE
1588	Commodore [redacted] 7½' 15'

CASING AND TUBING RECORD

PIPE SIZE	AMOUNT IN WELL	MATERIAL BEHIND PIPE CEMENT (SKS.)	MATERIAL BEHIND PIPE GEL (SKS.)	PACKER TYPE	PACKER SIZE	PACKER DEPTH	DATE RUN
11 3/4"	151'	100					11-28-79
8 5/8"	997'	230					11-30-79
4 1/2"	3278'	390					12-02-79
	T.D. 3560 ELK	D.V.	D.P.T. 3210	Class D	O	Lease UB	

PERFORATION RECORD

DATE	INTERVAL PERFORATED FROM	TO
12-6-79	1797	1809
12-6-79	2592	2600
12-6-79	2756	2885
12-6-79	2998	3007
12-6-79	3196	3210

STIMULATION RECORD

DATE	INTERVAL TREATED	AMOUNT FLUID	AMOUNT SAND	INJECTION RATE
12-6-79	1797/1809	18,000gal	22,000	33 BPM
12-6-79	2592/2600	14,000	18,000	28 BPM
12-6-79	2756/2885	18,000	22,000	30 BPM
12-6-79	2998/3007	16,000	20,000	31 BPM
12-6-79	3196/3210	16,000	20,000	34 BPM

NATURAL OPEN FLOW N/A

AFTER TREATMENT OPEN FLOW 2,000,000

NATURAL ROCK PRESSURE N/A HRS. DAYS

AFTER TREATMENT ROCK PRESSURE 920 48 HRS. XXXXX

REMARKS: E and D and B Productions

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PA. GEOLOGIC SURVEY
Oil & Gas Division

(79)

(FORMATION ON REVERSE SIDE

DER-TGS
1980 JUN -2 AM 11: 29
DIVISION OF OIL AND GAS REGULATION

DER-TGS
1980 MAY 23 AM 10 58
DIVISION OF OIL AND GAS REGULATION

ER-OG-4: Rev. 2/77
(pg. 2)

FORMATIONS

NAME	TOP	BOTTOM	GAS AT	OIL AT	WATER AT (FRESH OR SALT WATER)	SOURCE OF DATA
Bayard	1790	1812				Electric Log
Speechley Stray	2504	2548				Electric Log
Speechley	2562	2608				Electric Log
Balltown 1	2700	2718				Electric Log
Balltown 2	2746	2802				Electric Log
Sheffield	2862	2906				Electric Log
Bradford 1	2995	3054				Electric Log
Bradford 2	3106	3118				Electric Log
Bradford 3	3194	3212				Electric Log
Kane	3282	3289				Electric Log
T.D.		3560				Electric Log

1/25, 19 81
DATE

Timothy A. Mann
APPROVED BY

Geologist
TITLE

14206

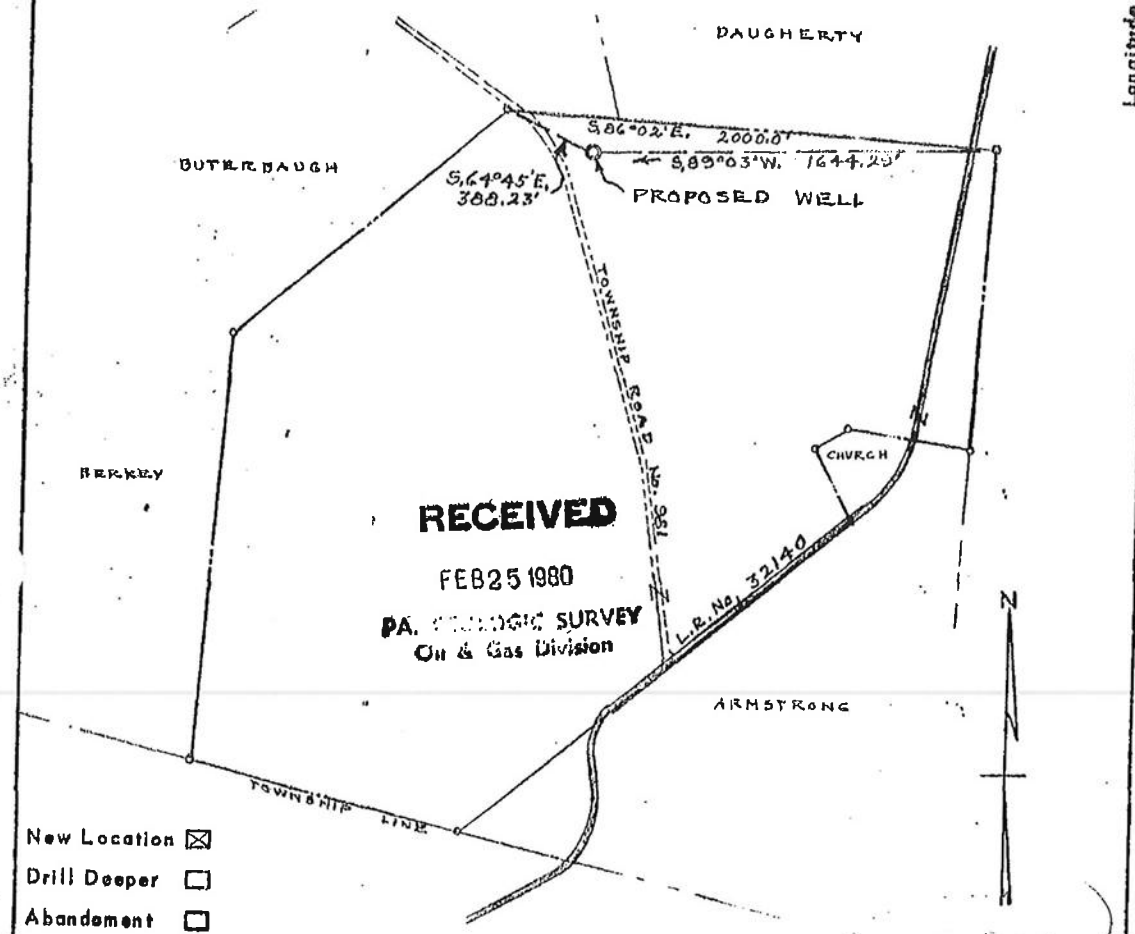
DM. 1-2-86

Latitude 40°45'00"

850

2900

Longitude 78°55'00"



RECEIVED
FEB 25 1980
PA. GEOLOGIC SURVEY
Oil & Gas Division

New Location ☒
Drill Deeper ☐
Abandonment ☐
Re-drill ☐

3,000

Company ATLAS RESOURCES, INC.
Address 311 ROUSER ROAD, CORAOPOLIS, PA. 15108
Farm MARJORIE C. YANITY, ET UX
Tract ____ Acres 149 Lease No. ____
Well (Farm) No. 5 Co. Serial No. ____
Angle of Deviation, if any ____
Elevation 1628 Quadrangle 2 (BARNES) COMMODORE
County INDIANA Township GRANT
Engineer PAUL L. BOTSFORD
Engineer's Registration No. 15067
File No. ____ Drawing No. 3501-1
Date FEB. 4, 1980 Scale 1" = 600'

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF MINES
Oil and Gas Division
HARRISBURG
C 2-22-80
WELL LOCATION MAP
Dept. File No. IND-25377

⊕ Denotes Values of Well on United States Topographic Maps.

Scale 15' ☐ (7½') ☒

WORKABLE COAL SEAMS TO BE PENETRATED

Name of Seam	Owner of Seam
ALL MERCHANTABLE SEAMS	CLEARFIELD BITUMINOUS COAL CORP'N.

119

(3)

AUG 1980

8500-4> Rev. 2/77

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
DIVISION OF OIL AND GAS
PITTSBURGH, PENNSYLVANIA 15222

Office Use Only

8.50 S 40°45'00"
2,900 W 78°55'00" (D)

WELL RECORD

PERMIT NO. IND 25377 PROJECT NO. TYPE OF WELL Gas

PURCHASE GAS FIELD - DELIVERABILITY

WELL OPERATOR Atlas Resources, Inc. TELEPHONE NO. 412-262-2830

ADDRESS 311 Rouser Road Coraopolis, PA ZIP 15108

FARM NAME	FARM NO.	SERIAL NO.	ACRES
Marjorie C. Yanity	5		149

TOWNSHIP	COUNTY
Grant	Indiana

DRILLING COMMENCED	DRILLING COMPLETED
3-29-80	4-2-80

ELEVATION 1628 QUADRANGLE Commodore 7½' 15'

CASING AND TUBING RECORD

PIPE SIZE	AMOUNT IN WELL	MATERIAL BEHIND PIPE CEMENT (SKS.)	MATERIAL BEHIND PIPE GEL (SKS.)	PACKER TYPE	PACKER SIZE	PACKER DEPTH	DATE RUN
11 3/4"	3190'	None					3-29-80
8 5/8"	784'	175 Sks.					3-31-80
4 1/2"	3315'	380 Sks.					4-02-80
	T.D. 3315	O.H.	D.P.T. 3231	Class D	O	7"	Case 1
		ELK				VB	

PERFORATION RECORD

DATE	INTERVAL PERFORATED FROM	TO
4-10-80	1809	1828 V
4-10-80	2580	2597 B
4-10-80	2904	2909
4-10-80	3015	3030
4-10-80	3221	3231

STIMULATION RECORD

DATE	INTERVAL TREATED	AMOUNT FLUID	AMOUNT SAND	INJECTION RATE
4-10-80	1809/1828	18,500 Gal.	26,000	26 BPM
4-10-80	2580/2597	14,000 Gal.	17,500	30 BPM
4-10-80	2904/2909	14,000 Gal.	17,500	26 BPM
4-10-80	3015/3030	18,000 Gal.	25,500	31 BPM
4-10-80	3221/3231	14,000 Gal.	17,500	27 BPM

NATURAL OPEN FLOW N.A.
AFTER TREATMENT OPEN FLOW 1 MMCF
NATURAL ROCK PRESSURE N.A. HRS. DAYS
AFTER TREATMENT ROCK PRESSURE 800 lbs. 72 HRS. DAYS

REMARKS: Clay Bond D

RECEIVED
AUG 11 1980
PA. GEOLOGIC SURVEY
Oil & Gas Division

(FORMATION ON REVERSE SIDE)

DIVISION OF OIL AND GAS CONSERVATION
1980 JUN -2 PM 2:05
DER-TGS

ER-OG-4: Rev. 2/77
(pg. 2)

FORMATIONS

NAME	TOP	BOTTOM	GAS AT	OIL AT	WATER AT (FRESH OR SALT WATER)	SOURCE OF DATA
1" stream fresh water					90 feet	Drillers Lo
1" stream fresh water					125 feet	Drillers Lo
Coal	175'	180'				Drillers Lo
Coal	335'	338'				Drillers Lo
Red Rock	1420'	1650'				Drillers Lo
Bayard	1806	1834				Electric Lo
Speechly	2526	2600				Electric Lo
Balltown (Gross)	2720	2816				Electric Lo
Sheffield	2882	2910				Electric Lo
1st Bradford	3012	3066				Electric Lo
2nd Bradford (Gross)	3106	3144				Electric Lo
3rd Bradford	3205	3234				Electric Lo
Kane (Gross)	3305	3340				Electric Lo
T.D. 3475'						

April 15, 1980
DATE

Donald P. Wagner
APPROVED BY

Operations Manager
TITLE

D

MAPS AND CROSS SECTIONS OF USDWs

UIC Permit App.

DOES NOT APPLY TO CLASS II WELLS

PGE

E

NAME & DEPTH OF USDWs

UIC Permit App.

Attachment E: NAME AND DEPTH OF USDWs (CLASS II)

The Marjorie C. Yanity 1025 well is located in Grant Township, Indiana County. The well site lies within the Pittsburgh low Plateau physiographic province which is characterized by smooth to irregular undulating surface, narrow valleys, strip mines and reclaimed land (Sevon, 2000). Indiana County has been unaffected by glacial activity and thus there is typically a relatively thin veneer of sediment above the underlying bedrock. The rock exposed at the surface within the area of review is the Pennsylvanian-aged Glenshaw Formation and the underlying Allegheny Group.

PGE contacted all landowners with any portion of their parcel located within the quarter mile area of review to determine the locations of drinking water sources. Twelve of the thirteen landowners within the area of review supplied information about each drinking water source on their property and allowed PGE to conduct a survey of each source to document the location. The remaining parcel was in foreclosure and PGE was not granted permission to survey the drinking water source. In lieu of a survey of the foreclosed property, PGE conducted surface inspection which indicates that the well is located outside the area of review. In total, nine water sources were identified within the area of review. The deepest water well identified in the area of review is 190 ft.

The primary water bearing zone in the area of review is the Pennsylvanian-aged Allegheny Group as most of the Glenshaw Formation has be removed by erosion. The Allegheny Group consists of a series of Pennsylvanian cyclothems. The Allegheny Group ranges in thickness from 280 to 320 feet (Williams and McElroy, 1997). All water wells surveyed in the area of review were completed in the Allegheny Formation. Fresh water may also be encountered in the Pottsville Group which ranges in thickness from 175 to 200 feet (Williams and McElroy, 1997). Thus, the deepest USDW may be up to 520 feet below the ground surface.

The completion report from the Marjorie C. Yanity 1025 well found in Attachment C indicates that the surface casing was set 569 feet below ground level and was cemented back to surface with 30 barrels of cement returns. While not on the completion report, it is indicated in the original drillers log that the intermediate casing was set at 1,540 feet and cemented to surface with 20 barrels of cement returns. Thus, the casing program provides adequate protection of USDW's in the area of review.

Included in this section:

- Map of surveyed drinking water sources with description (parcel base map).
- Map of surveyed drinking water sources with description (topographic base map)
- Affidavit of surface inspection

References:

Sevon, W.D., 2000, Physiographic provinces of Pennsylvania (4th ed.) [online]: Pennsylvania Geologic Survey, map 13, scale 1:2,000,000 [accessed Jun. 15. 2012, at URL http://www.dcnr.state.pa.us/topogeo/field/map13/index.htm].

Williams D. R., & McElroy, T. A., 1997, Water Resources of Indiana County, Pennsylvania, U.S. Geological Survey Water-Resources Investigations Report 95-4164, 114 p.

PGE

INDIANA_PARCEL_ID	FULL_NAME	ADDRESS	CITY	STATE	ZIP_CODE	SITUS	Water Sources
20-021-122.01	ABM MINING CO	3330 JOHNSTON RD	SMICKSBURG	PA	16256	4498 Purchase Line Road	1 Spring
20-020-109	AHMED, SOHEL	2790 VANDERBILT ST	CLYMER	PA	15728	Unknown	1 Well - Depth Unknown
19-011-101	ANDRAY MINING COMPANY	240 WEST MAHONING ST	PUNXSUTAWNEY	PA	15767	Vacant	No Wells or Springs
20-020-151	BAKER, BRADLEY H UX	16632 RTE 286 HWY E	COMMODORE	PA	15729	16632 RTE 286 HWY E	1 Spring
20-020-152	BAKER, BRADLEY H UX	16632 RTE 286 HWY E	COMMODORE	PA	15729	16632 RTE 286 HWY E	No wells or springs - 1 Spring used from adjacent property (20-020-151)
19-011-110	BAKER, EDWARD C UX	25 ORCHARD LN	MARION CENTER	PA	15759	Vacant	No Wells or Springs
19-012-121	BANKS, PATRICIA C	3824 AIRPORT RD	INDIANA	PA	15701	Unknown	PGE and Surveyor Can't Contact: Many Attempts Made
19-012-108.01	BANKS, PATRICIA C	3824 AIRPORT RD	INDIANA	PA	15701	Unknown	PGE and Surveyor Can't Contact: Many Attempts Made
19-011-105	BAPTIST CHURCH + CEMETERY	504 SEBRING ROAD	504 SEBRING ROAD	PA	15728	504 Sebring Road	Cistern
20-021-121	BERKEY, HARRY L UX	4427 PURCHASE LINE RD	MARION CENTER	PA	15759	4427 PURCHASE LINE RD	3 Wells - 150 ft and 190 ft and 200 ft
19-012-109	BERKEY, HARRY L UX	142 HARTMAN RD	MARION CENTER	PA	15759	142 HARTMAN RD	No Wells or Springs
19-012-110	BERKEY, HARRY L UX	142 HARTMAN RD	MARION CENTER	PA	15759	Vacant	1 Spring
19-012-115.03	BROCIOUS, MICHAEL A UX. **New owner Gregory Stanford	1470 DECKERS POINT RD. New address is 1121 Hartman RD. Marion Center Pa. 15759	MARION CENTER	PA	15759	1121 HARTMAN RD	1 Well - Depth Unknown
20-021-124	BROWN, DONALD CLAIR	81-410 RIVERLANE DR	INDIO	CA	92201	Vacant	No Wells or Springs
19-011-107.01A	BURNS, DIANNA L	461 BURNS RD	MARION CENTER	PA	15759	461 BURNS RD	1 Well - Depth Unknown
19-010-112.03A	BURNS, WILLIAM NICK	339 BURNS RD	MARION CENTER	PA	15759	Vacant	No Wells or Springs
19-011-107	BURNS, WILLIAM NICK	339 BURNS RD	MARION CENTER	PA	15759	339 BURNS RD	1 Well - 80 ft

19-012-108	BUTERBAUGH, CATHERINE	378 BUTERBAUGH RD	MARION CENTER	PA	15759	378 BUTERBAUGH RD	3 Wells - all reported inactive
19-012-112	BUTERBAUGH, JOHN CARL	596 HARTMAN RD	MARION CENTER	PA	15759	596 HARTMAN RD	1 Well - Depth Unknown
19-012-109.01	BUTERBAUGH, R D + DONNA	431 HARTMAN RD	MARION CENTER	PA	15759	431 HARTMAN RD	1 Well - Depth Unknown
20-020-126	BUTERBAUGH, RICHARD G UX	120 SEBRING RD	COMMODORE	PA	15729	Vacant	No Wells or Springs
20-020-126.01	BUTERBAUGH, RICHARD GEORGE UX	120 SEBRING RD	COMMODORE	PA	15729	120 SEBRING RD	1 Well - 242 ft
19-012-112.01	BUTERBAUGH, RONALD	557 MILL RUN RD	MARION CENTER	PA	15759	Vacant	2 Well - 20 ft and 70 ft
19-010-114	DAUGHERTY, CLAIR E AL	737 EAST 34TH ST	ERIE	PA	16504	2345 EAST RUN RD	1 Well - Depth Unknown
19-010-120	DAUGHERTY, CLAIR E AL	737 EAST 34TH ST	ERIE	PA	16504	Vacant	1 Well - Capped / Inactive
19-011-100.01	DAUGHERTY, JOSEPH C UX	2290 EAST RUN RD	MARION CENTER	PA	15759	2290 EAST RUN RD	1 Spring
20-020-111	DAVIDSON, JOHN T UX	16236 RTE HWY E	COMMODORE	PA	15729	16236 RTE HWY E	1 Well - 85 ft
19-011-103	DEGENKOLB, CATHY A	315 SEBRING RD	MARION CENTER	PA	15759	Vacant	Surveyor Can't Contact: Many Attempts Made
19-011-104	DEGENKOLB, CATHY A	315 SEBRING RD	MARION CENTER	PA	15759	315 SEBRING RD	1 Well - 55 ft
19-011-103.01	DEGENKOLB, RANDAL UX	315 SEBRING RD SR	MARION CENTER	PA	15759	315 SEBRING RD SR	1 Well - 165 ft
20-020-105.01	DETWILER, BRENT A UX	27320 VANDERBILT ST	COMMODORE	PA	15729	27320 VANDERBILT ST	1 Well - Depth Unknown
20-020-119	DISHONG, BETH ANN AL	5046 PURCHASE LINE RD	COMMODORE	PA	15729	5046 PURCHASE LINE RD	Surveyor Can't Contact: Many Attempts Made
19-010-117.01	DONAHOO, WALTER C UX	2163 EAST RUN RD	MARION CENTER	PA	15759	2163 EAST RUN RD	1 Well - Depth Unknown (Guess made at 100 ft)
20-020-121	EAST MAHONING REGULAR	1599 HARTMAN RD	MARION CENTER	PA	15759	4988 PURCHASE LINE ROAD	1 Well - +150 ft (Didn't know exact depth)
19-010-111	EAST RUN SPORTSMANS CLUB	2477 EAST RUN RD	MARION CENTER	PA	15759	2477 EAST RUN RD	1 Well - 60 ft
19-010-112	EAST RUN SPORTSMANS CLUB	2477 EAST RUN RD, 2539 and 2527 East Run Rd.	MARION CENTER	PA	15759	2539 and 2527 East Run Rd.	1 Well - 50 ft
19-010-122	EAST RUN SPORTSMEN	130 PINEVALE RD	MARION CENTER	PA	15759	Unknown	1 Well used from adjacent property (19-010-111)
19-010-123	EAST RUN SPORTSMEN	130 PINEVALE RD	MARION CENTER	PA	15759	Vacant	No Wells or Springs
20-020-125.01	FILLER, THOMAS H UX	5077 PURCHASE LINE RD	COMMODORE	PA	15729	5077 PURCHASE LINE RD	1 Well - 54 ft
19-010-112.04	FULTON, DAVID UX	19 BURNS RD	MARION CENTER	PA	15759	19 BURNS RD	1 Spring
20-020-124	GESS, AMY L	5041 PURCHASE LINE RD	COMMODORE	PA	15729	5041 PURCHASE LINE RD	1 Well - 300 ft & 1 Spring/Pond
20-020-127	GESS, AMY L	5041 PURCHASE LINE RD	COMMODORE	PA	15729	Vacant	No water
19-011-100.02	GREEN TREE SERVICING LLC	3 EXECUTIVE PARK DR	BEDFORD	NH	3110	Unknown	1 Well - Depth Unknown
20-020-165	GULAS, JOHN UX	73 HARTMAN RD	MARION CENTER	PA	15759	73 HARTMAN RD	1 Well - 191 ft
19-010-110	HALDIN, ROBERT E UX	1813 SEBRING RD	MARION CENTER	PA	15759	1813 SEBRING RD	1 Spring
19-012-115.01	HANNAHS, JOHNNY W	1063 HARTMAN RD	MARION CENTER	PA	15759	1063 HARTMAN RD	1 Well - 58 ft

20-021-123	HENRY, KENNETH C	304 ABEL RD	MARION CENTER	PA	15759	304 ABEL RD	1 Well - Depth Unknown
19-012-108.02	HOOVER, JAMES L	405 BUTERBAUGH RD	MARION CENTER	PA	15759	405 BUTERBAUGH RD	1 Well - Depth Unknown (Guess made at 500 ft)
20-020-114.01	HORVATH, GARY J UX	3283 SEBRING RD	HILLSDALE	PA	15746	3283 SEBRING RD	1 Well - Depth Unknown
20-020-117	HOUCK, ERNEST F	5074 PURCHASE LINE RD	COMMODORE	PA	15729	5074 PURCHASE LINE RD	1 Well - Depth Unknown
20-020-118	HOUCK, ERNEST F UX	5074 PURCHASE LINE RD	COMMODORE	PA	15729	Vacant	Well not found - Inactive
20-020-116	HOUCK, ERNEST UX	5074 PURCHASE LINE RD	COMMODORE	PA	15729	Vacant	2 Wells - Depth Unknown
19-010-102.04	JARVIE, RONALD A UX	985 DEVEAUX ST	ELMORA	PA	15737	1788 MUMAU RD	1 Well - 81 ft
19-011-108.06	KING, MURRAY D	755 BURNS RD	MARION CENTER	PA	15759	755 BURNS RD	1 Well - 175 ft
20-020-114	KING, WILLIAM J II AL	162 RICE RD	COMMODORE	PA	15729	162 RICE RD	1 Well - Depth Unknown
19-012-119	LAWER, MICHAEL J UX	335 NORTH SIXTH ST	INDIANA	PA	15701	Vacant	PGE property access not granted by landowner (vacant land). Surveyor reports "no water sources within the buffer zone on any of the Lawer properties."
19-012-115.03	LAWER, MICHAEL J UX	335 N 6TH ST	INDIANA	PA	15701	Vacant	PGE property access not granted by landowner (vacant land). Surveyor reports "no water sources within the buffer zone on any of the Lawer properties."
19-010-118.02	LEWIS, JEFFREY T	2103 EAST RUN RD	MARION CENTER	PA	15759	Vacant	1 Spring
19-010-118	LEWIS, JEFFREY T	2103 EAST RUN RD	MARION CENTER	PA	15759	Vacant	No Wells or Springs
19-010-118.01	LEWIS, JEFFREY THOMAS	2103 EAST RUN RD	MARION CENTER	PA	15759	2103 EAST RUN RD	No Wells or Springs
19-010-108	LONG, MARK T UX	1900 MUMAU RD	GLEN CAMPBELL	PA	15742	1900 MUMAU RD	1 Spring & 1 Well - 200 ft
20-020-164	LYDICK, RAYMOND P UX	4751 PURCHASE LINE RD	MARION CENTER	PA	15759	4751 PURCHASE LINE RD	1 Well - Depth Unknown
20-020-133	MCADOO, BLAINE REVOC TR BY TR AL	963 EAST RUN RD	MARION CENTER	PA	15759	963 EAST RUN RD	1 Well - Depth Unknown
20-020-130	MCADOO, RAYMOND C TR BY TR	5024 PURCHASE LINE RD. Mrs McAdoo's CA address is 10315 Virginia Swan , Cupertino CA. 95014	COMMODORE	PA	15729	5024 PURCHASE LINE RD	1 Well - Depth Unknown
20-020-113	MCADOO, RAYMOND C TR BY TR	5024 PURCHASE LINE RD. Mrs McAdoo's CA address is 10315 Virginia Swan , Cupertino CA. 95014	COMMODORE	PA	15729	4995 PURCHASE LINE RD	2 Wells - 200 ft and 400 ft
20-020-132	MCADOO, RAYMOND C TR BY TR	5024 PURCHASE LINE RD. Mrs McAdoo's CA address is 10315 Virginia Swan , Cupertino CA. 95014	COMMODORE	PA	15729	Unknown	1 Well - Depth Unknown
20-020-115	MCCOY, WILLIAM R UX	5124 PURCHASE LINE RD	COMMODORE	PA	15729	5124 PURCHASE LINE RD	1 Cistern & 1 Well - +200 ft
19-011-108	MILOSER, JOHN AL	708 BURNS RD	MARION CENTER	PA	15759	708 BURNS RD	1 Well - 52 ft
20-020-133.01	MONTGOMERY CHURCH	RR 1 BOX 385	COMMODORE	PA	15729	Unknown	1 Well - Depth Unknown
19-012-114	MUELLER, NORMAN UX	121 MCELROY DR	TRAFFORD	PA	15085	Unknown	1 Well - Depth Unknown
19-012-115.02A	MUMAU, DOLORES	1599 HARTMAN RD	MARION CENTER	PA	15759	1413 HARTMAN RD	1 Well - 100 ft
19-012-111	MUMAU, DOLORES	1599 HARTMAN RD	MARION CENTER	PA	15759	1599 HARTMAN RD	1 Well - 96 ft

19-012-117	MUMAU, DOLORES J	1599 HARTMAN RD	MARION CENTER	PA	15759	1559 HARTMAN RD	2 Springs
19-010-112.06	MUMAU, MURRAY M UX	100 CARMALT AVE	PUNXSUTAWNEY	PA	15767	Vacant	No Wells or Springs
19-010-112.05	MUMAU, ROBERT A UX	2477 EAST RUN RD	MARION CENTER	PA	15759	2477 EAST RUN RD	1 Well - 52 ft
19-010-112.03	MUMAU, ROBERT ALLEN UX	2477 EAST RUN RD	MARION CENTER	PA	15759	Vacant	1 Spring
19-010-113.02	MUMAU, ROBERT UX	2477 E RUN RD	MARION CENTER	PA	15759	Vacant	Well and Spring on adjacent properties
19-013-117	MURRAY, ROBERT E JR	1732 EAST RUN RD	MARION CENTER	PA	15759	1732 EAST RUN RD	1 Spring & 1 Well - 50 ft
19-013-119	MUSSER FORESTS INC	1880 RTE 119 HWY N	INDIANA	PA	15701	Vacant	1 Spring
19-011-100	NICHOL, JOANNE VIR	BOX 71	HILLSDALE	PA	15746	Vacant	No Wells or Springs
20-020-125.02	PEARCE, MATTHEW W UX	5061 PURCHASE LINE RD	COMMODORE	PA	15729	5061 PURCHASE LINE RD	1 Well - +300 ft (Didn't know exact depth)
19-011-108.05	PENNINGTON, FRANK B UX	757 BURNS RD	MARION CENTER	PA	15759	757 BURNS RD	PGE property access not granted by landowner. One House reported from Indiana County assessment. PGE assumes water source on property but can't confirm due to access issue.
19-010-113.01	PERRY, JON AL	2416 EAST RUN RD	MARION CENTER	PA	15759	2416 EAST RUN RD	1 Well - 65
20-021-120	PHILLIPS PRODUCTION COMPANY	502 KEYSTONE DRIVE	WARRENDALE	PA	15086	Unknown	PGE property access not granted by landowner. Outbuilding structure reported from Indiana County assessment. Not surveyed, but Kevin Brucha of XTO reports no water wells on property.
20-020-107	PHILLIPS PRODUCTS COMPANY	502 KEYSTONE DRIVE	WARRENDALE	PA	15086	Vacant	PGE property access not granted by landowner. Vacnat Lot reported from Indiana County assessment. Not surveyed, but Kevin Brucha of XTO reports no water wells on property.
20-020-134.01	PURCHASE LINE SCHOOL DIS	16559 RT 286 HWY E	COMMODORE	PA	15729	16559 RT 286 HWY E	1 Well - 170 ft
20-020-134	PURCHASE LINE SCHOOL DIST	16559 RT 286 HWY E	COMMODORE	PA	15729	16559 RT 286 HWY E	1 Well - 143 ft
19-011-107.01	REED, CHARLES R UX	492 BURNS RD	MARION CENTER	PA	15759	492 BURNS RD	2 Wells - 75 ft
20-020-126.02	RICHARDS, MICHAEL P	97 PINE VALE RD	MARION CENTER	PA	15759	70 SEBRING RD	1 Well - 120
19-012-113	RUFFNER, CLIFFORD M UX	817 HARTMAN RD	MARION CENTER	PA	15759	817 HARTMAN RD	1 Spring
19-011-111	RUSHTON, CHARLES WILLIAM JR AL	BOX 152	DIXONVILLE	PA	15734	Vacant	No Wells or Springs
19-011-111.01	SARNOVSKY, MARTIN A UX	1786 SEBRING RD	MARION CENTER	PA	15759	1786 SEBRING RD	1 Spring
19-010-113	SAUCIER, LARRY G UX	2450 EAST RUN ROAD	MARION CENTER	PA	15759	2450 EAST RUN ROAD	1 Well - Depth Unknown

20-020-108	SCOTT, STEVEN EUGENE SR UX	2771 VANDERBILT ST	CLYMER	PA	15728	2771 VANDERBILT ST	1 Well - Depth Unknown
19-011-102.01	SEBERING, JAMES UX	916 SEBRING RD	MARION CENTER	PA	15759	916 SEBRING RD	1 Well - 50 ft
19-010-112.01	SEBRING, HAROLD J	1139 SEBRING RD	MARION CENTER	PA	15759	1139 SEBRING RD	1 Well - Depth Unknown
20-020-127.01	SERBALL, CHARLES J	5089 PURCHASE LINE RD	COMMODORE	PA	15729	5089 PURCHASE LINE RD	1 Well - 300 ft
19-011-108.01	SIPOS, ALLAN J UX	808 BURNS RD	MARION CENTER	PA	15759	808 BURNS RD	1 Spring & 1 Well - 90 ft
20-020-110	STIFFLER, BARRY	256 STIFFLER LN	CLYMER	PA	15728	256 STIFFLER LN	1 Well - Depth Unknown
20-020-151.01	STITT, TIMOTHY L UX	16578 RTE 286 HWY E	COMMODORE	PA	15729	16578 RTE 286 HWY E	2 Wells - 135 ft and 90 ft
20-020-131	STOVER, GARY C UX	157 SEBRING RD	COMMODORE	PA	15729	157 SEBRING RD	1 Well - approx 300 ft (Didn't know exact depth)
19-011-106	SWEENEY, JEFFERY A	780 SEBRING RD	MARION CENTER	PA	15759	780 SEBRING RD	1 Well - 190 ft
19-010-109	WANCHISN, PAUL UX	1287 SEBRING RD	MARION CENTER	PA	15759	Vacant	No Wells or Springs
2 Wells	WANCHISN, PAUL UX	1287 SEBRING RD	MARION CENTER	PA	15759	1287 SEBRING RD	2 Wells - Depths Unknown
20-020-129	WEAVER, BARRY L UX	5173 PURCHASE LINE RD	COMMODORE	PA	15729	5173 PURCHASE LINE RD	1 Well - Depth Unknown
19-012-115.04	WEAVER, BRIAN L UX	1143 HARTMAN RD	MARION CENTER	PA	15759	1143 HARTMAN RD	1 Well - 40 ft
20-020-112.02	WEAVER, GREGORY A	16136 RTE 286 HWY E	COMMODORE	PA	15729	16136 RTE 286 HWY E	1 Well - 74 ft
20-020-128	WEAVER, RAYBURN UX	5129 PURCHASE LINE RD	COMMODORE	PA	15729	5129 PURCHASE LINE RD	1 Well - Depth Unknown
20-020-112.01	WEAVER, REYBURN AL	5173 PURCHASE LINE RD	COMMODORE	PA	15729	5173 PURCHASE LINE RD	Uses Well on 20-020-128
20-020-112	WEAVER, REYBURN AL	5173 PURCHASE LINE RD	COMMODORE	PA	15729	Vacant	No Wells or Springs
19-012-113.01	WEAVER, TINA M	655 HARTMAN RD	MARION CENTER	PA	15759	655 HARTMAN RD	1 Well - 100 ft
20-021-124.01	WILHELM, RICHARD E	4251 PURCHASE LINE RD	CLYMER PA 15728	PA	15728	4251 PURCHASE LINE RD	Active Strip Mine - House and Well Removed
19-010-120.01	WILLIARD, RICHARD	467 TAYLOR ST	PITTSBURGH PA 15224	PA	15224	Vacant	No Wells or Springs
20-021-122	WITMER, JEFFREY M UX	4591 PURCHASE LINE RD	MARION CENTER	PA	15759	4591 PURCHASE LINE RD	1 Well - 175 ft
19-010-117	WOODROW, STEVEN D UX	2199 EAST RUN RD	MARION CENTER	PA	15759	2199 EAST RUN RD	1 Well - 30 ft
19-010-116	WOODROW, STEVEN D UX	2199 EAST RUN RD	MARION CENTER	PA	15759	Vacant	No Wells or Springs
19-011-102.03	YANITY JOHN G UX	879 SEBRING RD	MARION CENTER	PA	15759	879 SEBRING RD	3 Wells - 50 ft and 67 ft and unknown
19-011-102.02	YANITY, MICHAEL H UX	31 MILL RUN RD	MARION CENTER	PA	15759	31 MILL RUN RD	1 Well - 62 ft
19-011-102	YANITY, MICHAEL H UX	31 MILL RUN RD	MARION CENTER	PA	15759	31 MILL RUN RD	1 Spring & 1 Well - 66 ft
20-020-106	TMR REAL ESTATE LLC	15513 RTE 286 HWY E	COMMODORE	PA	15729	15513 RTE 286 HWY E	2 wells - depths unknown (1 active, 1 standby)
20-020-163	GUIDASH, DARIUS CEDRIC UX	2705 VANDERBILT ST	COMMODORE	PA	15729	2705 VANDERBILT ST	2 Wells - 40 ft and 60 ft
20-020-135	PURCHASE LINE UNITED METH	ODIST CHURCH, 17107 RTE 286 HWY E	COMMODORE	PA	15729	17107 RTE 286 HWY E	1 Well - Depth Unknown
20-020-134.02	MCADOO, BLAINE REVOC TR BY TR AL	963 EAST RUN RD	MARION CENTER	PA	15759	963 EAST RUN RD	No Wells or Springs

20-020-103	ROOF, GILBERT H UX	2438 VANDERBILT ST, PO Box 53	COMMODORE	PA	15729	2438 VANDERBILT ST	1 Well - approx 80 ft
19-011-108.03	COBLE, SAMUEL E UX	821 BURNS RD	MARION CENTER	PA	15759	821 BURNS RD	1 Well - Depth Unknown
19-010-101	CORNETTO, JOSEPH JOHN UX	1508 MAMAU RD	GLEN CAMPBELL	PA	15742	1508 MAMAU RD	Spring with Holding Tank
19-012-104	BUTERBAUGH, DONNA L	431 HARTMAN RD	MARION CENTER	PA	15759	431 HARTMAN RD	No Wells or Springs
19-011-108.04	OBER, DWIGHT D UX	878 BURNS RD	MARION CENTER	PA	15759	878 BURNS RD	1 Well - 65 ft
19-012-107	MCADOO, RAYMOND REVOC TR BY TR AL	5024 PURCHASE LINE RD. Mrs McAdoo's CA address is 10315 Virginia Swan , Cupertino CA. 95014	COMMODORE	PA	15729	Vacant	No Wells or Springs

PGE

F

MAPS AND CROSS SECTIONS OF GEOLOGIC STRUCTURE OF AREA

UIC Permit App.

DOES NOT APPLY TO CLASS II WELLS

PGE

G

GEOLOGIC DATA ON INJECTION & CONFINING ZONES

UIC Permit App.

Attachment G: GEOLOGIC DATA ON INJECTION AND CONFINING ZONES

Geologic description

Marcellus Shale (7,443' – 7,522')

The Middle Devonian Marcellus Shale in this region consists of 92' of dark gray to black, calcareous and non-calcareous shales and mudstones as well as thin beds of medium gray, hard, blocky, micro-crystalline limestone. The shales and mudstones tend to be pyritic and contain black, calcareous concretions. The basal unit of the Marcellus is a low density, extremely organic rich mudstone.

Onondaga Limestone (7,522' – 7,532')

The Middle Devonian Onondaga Limestone in this region consists of 10' of interbedded limestones and shales. The limestones are generally light to medium gray, hard, blocky and micro-crystalline. The unit is fossiliferous toward the base. The interbedded shales are medium to dark gray to black in color, with the medium gray shales being more calcareous than the darker gray to black shales. The darker colored shales tend to be more carbonaceous and contain abundant pyrite.

Huntersville Chert (7,532' – 7,622')

The Middle Devonian Huntersville Chert in this region consists of 90' of interbedded chert and shales. The chert is medium to light gray in color and tends to be translucent in cuttings. It is hard, brittle and non-calcareous, and breaks with a conchoidal fracture. It is generally non-fossiliferous and is present both as bedded units and natural fracture cement. The shales tend to be medium to dark gray, hard, blocky and non-calcareous. Traces of pyrite have been identified. No fossils have been identified in cuttings. The chert beds tend to be thicker towards the top of the formation and become thinner and considerably more interbedded with the medium gray shales toward the base. Extensive natural fracturing has been identified within the chert beds of this formation. The Frac gradient in the Huntersville is 0.9188 psi/ft calculated using ISIP from the Yanity well 1025 stimulation.

Oriskany Sandstone (7,622' – 7,630')

The Lower Devonian Oriskany Sandstone in this region consists of 8' of sandstone. The sandstone is clear, sub-round to sub-angular, hard, well-sorted and well-cemented with calcite. There is no evidence of intergranular porosity or fossils.

Helderberg Limestone (7,630' – 7,795' Total Depth)

The Lower Devonian Helderberg Limestone in the Marjorie C. Yanity 1025 well consists of 165' of light to medium grayish brown limestone. It is microcrystalline to very fine crystalline, hard, dense with traces of pyrite and brachiopod fossils. The unit is slightly cherty at the top (Shriver Chert).

Included in this section:

- Seismic Narrative
- Schlumberger Litho-Density, Compensated Neutron, and Gamma Ray log of the Marjorie C. Yanity 1025 well.

PGE

December 14, 2012

United States EPA Region 3
Groundwater and Enforcement Branch (3WP22)
Office of Drinking Water and Source Water Protection
Attention: Mr. Steve Platt
1650 Arch Street
Philadelphia, PA 19103

Re: Yanity 1025 Seismic Narrative

Mr. Platt:

I respectfully submit the following review pertaining to the referenced subject:

Seismic Narrative

The proposed Yanity disposal zone is completely contained within the Middle to Lower Devonian sedimentary package between 7,544' and 7,620'. Available 2D seismic data in the vicinity of the Yanity well indicates that the crystalline basement ("Pre-Cambrian") rocks are located at least 10,000 feet beneath the proposed disposal zone. In addition, the 2D seismic data shows no evidence of deep, basement-involved faults or fracture systems in this area that would be associated in any way with the Devonian sedimentary rocks in the Yanity well. As a result, we are confident that water injected by PGE into the proposed Devonian disposal zone in the Yanity well will not come into contact with the underlying crystalline basement rocks at any time.

David W. Zwart

David W. Zwart
President and Chief Geophysicist
PreSeis Exploration Consultants, Inc.

PRE·SEIS
EXPLORATION
CONSULTANTS
INCORPORATED

P.O. Box 727
Lexington, VA 24450
540-464-4000

PGE

H

OPERATING DATA

UIC Permit App.

Attachment H: OPERATING DATA

Operations will be conducted continuously within the following parameters:

Average Injection Rate:	1,000	BPD
Maximum Injection Rate:	2,000	BPD
Average Daily Injection Volume:	1,000	Bbl
Maximum Daily Injection Volume:	2,000	Bbl
Average Injection Pressure:	1,500	psi
Maximum Surface Injection Pressure:	2,900	psi
Nature of Annulus Fluid:	Inhibited Freshwater	
Injection Fluids:	Flowback and production brine from unconventional formations, Oriskany production brine and Upper Devonian production brine. All injected fluid will be treated with corrosion inhibitor and biocide prior to injection.	

Included in this section:

- MASIP Calculations.
- Representative injection fluid sample analysis.
- Representative Corrosion Inhibitor MSDS
- Representative Biocide MSDS

PGE

Calculation of Maximum Allowable Surface Injection Pressure (MASIP):

ISIP from initial fracture stimulation: 3,665 psi

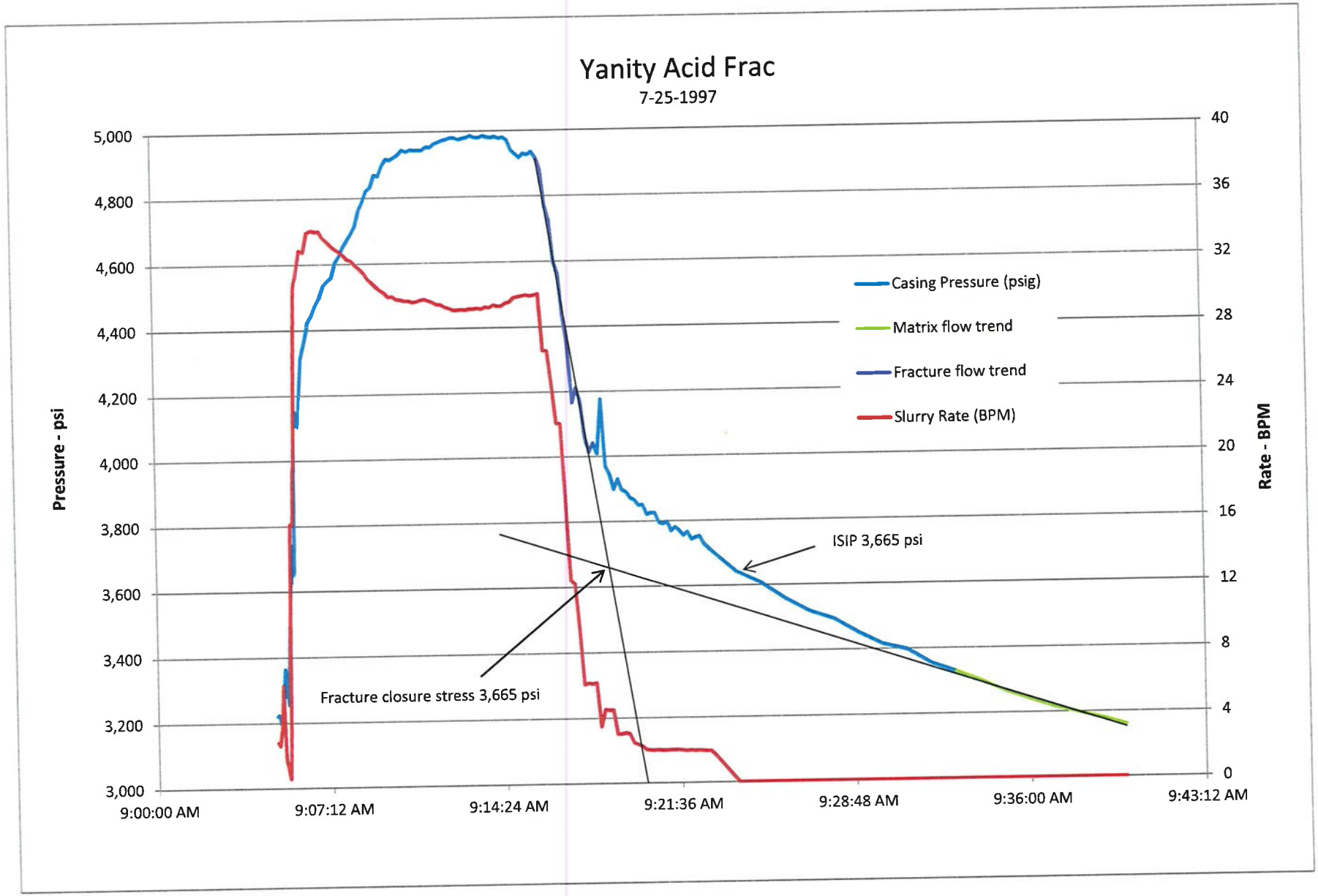
Fresh water pressure gradient: 0.433 psi/ft

Depth to top of perforations: 7,544 ft

Hydrostatic pressure	= Pressure gradient x Depth = 0.433 psi/ft x 7,544 ft = 3,267 psi
Fracture closure stress	= ISIP + Hydrostatic pressure = 3,665 psi + 3,267 psi = 6,932 psi

Using 10.2 pound per gallon Oriskany brine as the densest injection fluid :

Brine pressure gradient	= 10.2 ppg x 0.052 psi/ft/ppg = 0.53 psi/ft
Hydrostatic pressure of brine	= 0.53 psi/ft x 7,544 ft = 3,998 psi
MASIP	= Fracture closure stress – Hydrostatic pressure
MASIP	= 6,932 psi – 3,998 psi = 2,934 psi


Yanity Acid Frac
7-25-1997
Pressure - psi
Rate - BPM
5,000
4,800
4,600
4,400
4,200
4,000
3,800
3,600
3,400
3,200
3,000
40
36
32
28
24
20
16
12
8
4
0
9:00:00 AM
9:07:12 AM
9:14:24 AM
9:21:36 AM
9:28:48 AM
9:36:00 AM
9:43:12 AM
Casing Pressure (psig)
Matrix flow trend
Fracture flow trend
Slurry Rate (BPM)
ISIP 3,665 psi
Fracture closure stress 3,665 psi

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April 24, 2013

Mr. Nathan Harris
Pennsylvania General Energy (PGE)
120 Market Street
Warren, PA 16365

Certificate of Analysis

Project Name:	**2012-DRILL PIT WATER-FORM 26R**	Workorder:	**1016748**
Purchase Order:	**356 Pad J**	Workorder ID:	**COP Tract 356 Pad J Prod Brine**

Dear Mr. Harris,

Enclosed are the analytical results for samples received by the laboratory on Thursday, March 14, 2013.

The ALS Environmental laboratory in Middletown, Pennsylvania is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Shannon Butler (Project Coordinator) or Anna G Milliken (Technical Manager) at (717) 944-5541.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state requirements. The test results meet requirements of the current NELAP standards or state requirements, where applicable. For a specific list of accredited analytes, refer to the certifications section of the ALS website at www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads.

ALS York: 978 Loucks Mill Road, York, PA 17402 717-505-5280

ALS Spring City: 10 Riverside Drive, Spring City, PA 19475 610-948-4903

CC: Ms. Barbara Cook, , Ms. Amber Oyler, Mr. Jeff Young, Ms. Barb Cook, Ms. Marie Larson, Ms. Jennette Egger, Mr. Tom Bango

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.

Anna G Milliken
Technical Manager

ALS Environmental

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SAMPLE SUMMARY

Workorder: 1016748 COP Tract 356 Pad J Prod Brine

Discard Date: 05/08/2013

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
1016748001	COP Tract 356 Pad J-Prod Brine	Water	3/13/13 10:30	3/14/13 12:50	Todd Ulmer

Workorder Comments:

This work order was re-issued to correct the work order ID and PO per email request of Nathan Harris. SRB 04/24/13.

Notes

-- Samples collected by ALS personnel are done so in accordance with the procedures set forth in the ALS Field Sampling Plan (20 - Field Services Sampling Plan).
-- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
-- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
-- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
-- The Chain of Custody document is included as part of this report.
-- All Library Search analytes should be regarded as tentative identifications based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.
-- Parameters identified as "analyze immediately" require analysis within 15 minutes of collection. Any "analyze immediately" parameters not listed under the header "Field Parameters" are performed in the laboratory and are therefore analyzed out of hold time.

Standard Acronyms/Flags

J, B	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
N	Indicates presumptive evidence of the presence of a compound
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference

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ANALYTICAL RESULTS

Workorder: 1016748 COP Tract 356 Pad J Prod Brine

Lab ID: **1016748001** Date Collected: 3/13/2013 10:30 Matrix: Water

Sample ID: **COP Tract 356 Pad J-Prod Brine** Date Received: 3/14/2013 12:50

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
VOLATILE ORGANICS										
Acrolein	ND		ug/L	25.0	SW846 8260B			3/20/13 04:58	GLQ	O
Acrylonitrile	ND		ug/L	5.0	SW846 8260B			3/20/13 04:58	GLQ	O
Benzene	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
Bromodichloromethane	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
Bromoform	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
Bromomethane	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
2-Butanone	ND		ug/L	10.0	SW846 8260B			3/20/13 04:58	GLQ	O
Carbon Tetrachloride	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
Chlorobenzene	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
Chlorodibromomethane	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
Chloroethane	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
2-Chloroethylvinyl ether	ND	1	ug/L	2.0	SW846 8260B			3/20/13 04:58	GLQ	O
Chloroform	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
hloromethane	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
,1-Dichloroethane	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
1,2-Dichloroethane	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
1,1-Dichloroethene	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
trans-1,2-Dichloroethene	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
1,2-Dichloropropane	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
1,3-Dichloropropene, Total	ND		ug/L	2.0	SW846 8260B			3/20/13 04:58	GLQ	O
Ethylbenzene	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
Methylene Chloride	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
1,1,2,2-Tetrachloroethane	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
Tetrachloroethene	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
Toluene	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
1,1,1-Trichloroethane	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
1,1,2-Trichloroethane	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
Trichloroethene	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
Trichlorofluoromethane	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
Vinyl Chloride	ND		ug/L	1.0	SW846 8260B			3/20/13 04:58	GLQ	O
Surrogate Recoveries	*Results*	*Flag*	*Units*	*Limits*	*Method*	*Prepared*	*By*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	107		%	62-133	SW846 8260B			3/20/13 04:58	GLQ	O
4-Bromofluorobenzene (S)	92.5		%	79-114	SW846 8260B			3/20/13 04:58	GLQ	O
Dibromofluoromethane (S)	93.1		%	78-116	SW846 8260B			3/20/13 04:58	GLQ	O
Toluene-d8 (S)	83		%	76-127	SW846 8260B			3/20/13 04:58	GLQ	O
ALCOHOLS AND ACETATES										
2-Butoxyethanol	ND		mg/L	1.0	SW846 8015C			3/26/13 21:27	JJH	S

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ANALYTICAL RESULTS

Workorder: 1016748 COP Tract 356 Pad J Prod Brine

Lab ID: **1016748001** Date Collected: 3/13/2013 10:30 Matrix: Water

Sample ID: **COP Tract 356 Pad J-Prod Brine** Date Received: 3/14/2013 12:50

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
Surrogate Recoveries	*Results*	*Flag*	*Units*	*Limits*	*Method*	*Prepared*	*By*	*Analyzed*	*By*	*Cntr*
Amyl Alcohol (S)	87.2		%	41-134	SW846 8015C			3/26/13 21:27	JJH	S
GLYCOLS										
Ethylene Glycol	ND	2	mg/L	10.0	SW846 8015C			3/21/13 22:26	JJH	K
Surrogate Recoveries	*Results*	*Flag*	*Units*	*Limits*	*Method*	*Prepared*	*By*	*Analyzed*	*By*	*Cntr*
2-Butanone (S)	205	6	%	53-147	SW846 8015C			3/21/13 22:26	JJH	K
WET CHEMISTRY										
Acidity, Total	164		mg/L	5	SM20-2310B			3/21/13 13:00	NJA	E
Alkalinity, Total	137		mg/L	5	SM20-2320 B			3/15/13 04:17	MSA	F
Ammonia-N	104		mg/L	2.50	D6919-03			4/2/13 16:13	JWB	D
Biochemical Oxygen Demand	138	3	mg/L	2.0	SM20-5210 B			3/20/13 21:40	MLM	E
Bromide	610		mg/L	300	EPA 300			3/15/13 04:48	FSC	E
Chemical Oxygen Demand (COD)	2960		mg/L	300	EPA 410.4			3/25/13 10:45	LMM	D
Chloride	71000		mg/L	1000	EPA 300			3/15/13 04:48	FSC	E
Nitrate/Nitrite-N	ND	4	mg/L	100	EPA 300			3/15/13 04:48	FSC	E
Oil/Grease Hexane Extractable	ND		mg/L	2.0	EPA 1664B			3/19/13 10:56	MPP	H
pH	6.46		pH_Units		SM20-4500-H B			3/15/13 04:17	MSA	F
Phenolics	ND		mg/L	0.01	EPA 420.4	3/23/13	SYB	3/24/13 22:10	JPA	J
Specific Conductance	277000		umhos/cm	1	SM20-2510 B			3/16/13 10:26	MSA	F
Specific Gravity	1.09				SM20-2710 F			3/27/13 09:30	NJA	F
Sulfate	ND	4	mg/L	25.0	EPA 300			3/15/13 04:34	FSC	E
Surfactants (MBAS)	0.814		mg/L	0.025	SM20-5540 C			3/15/13 02:30	MBW	G
Total Dissolved Solids	128000		mg/L	5	SM20-2540 C			3/17/13 23:00	CF	E
Total Kjeldahl Nitrogen	95.2	5	mg/L	10.0	SM20-4500-N C	4/3/13	JJS	4/3/13 12:02	NJA	D
Total Organic Carbon (TOC)	103		mg/L	1.0	SW846 9060			4/8/13 13:00	LJF	A
Total Suspended Solids	850		mg/L	5	SM20-2540 D			3/19/13 12:00	RMR	E
METALS										
Hardness	24200		mg/L	73.0	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
Aluminum, Total	ND		mg/L	11.1	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
Antimony, Total	ND		mg/L	2.2	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
Arsenic, Total	ND		mg/L	0.90	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
Barium, Total	6300		mg/L	1.1	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
Beryllium, Total	ND		mg/L	0.44	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
Boron, Total	ND		mg/L	11.1	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2

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ANALYTICAL RESULTS

Workorder: 1016748 COP Tract 356 Pad J Prod Brine

Lab ID: **1016748001** Date Collected: 3/13/2013 10:30 Matrix: Water

Sample ID: **COP Tract 356 Pad J-Prod Brine** Date Received: 3/14/2013 12:50

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
Cadmium, Total	ND		mg/L	0.22	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
Calcium, Total	8650		mg/L	11.1	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
Chromium, Total	ND		mg/L	0.56	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
Cobalt, Total	ND		mg/L	0.56	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
Copper, Total	ND		mg/L	1.1	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
Iron, Total	71.3		mg/L	6.7	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
Iron, Dissolved	34.3		mg/L	12.0	SW846 6010C	3/20/13	JWK	3/20/13 13:52	JWK	B1
Lead, Total	ND		mg/L	0.67	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
Lithium, Total	116		mg/L	11.1	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
Magnesium, Total	642		mg/L	11.1	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
Manganese, Total	2.9		mg/L	0.56	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
Mercury, Total	ND		mg/L	0.00050	SW846 7470A	3/21/13	MNP	3/21/13 13:28	MNP	A1
Molybdenum, Total	ND		mg/L	2.2	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
Nickel, Total	ND		mg/L	2.2	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
`elenium, Total	ND		mg/L	2.2	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
,ilver, Total	ND		mg/L	0.44	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
Sodium, Total	28600		mg/L	55.6	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
Strontium, Total	3210		mg/L	0.56	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
Thallium, Total	ND		mg/L	2.2	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
Thorium, Total	ND		mg/L	11.0	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
Uranium, Total	ND		mg/L	22.0	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
Zinc, Total	ND		mg/L	2.2	SW846 6010C	3/21/13	KMK	3/25/13 15:51	SRT	A2
Sub'd to NELAP CERTIFIED Lab										
Gross Alpha	3380		pCi/L	310	EPA 900.0			3/26/13 16:42	ALSF	Q
Gross Alpha Uncertainty +/-	630		pCi/L		EPA 900.0			3/26/13 16:42	ALSF	Q
Gross Beta	1220		pCi/L	440	EPA 900.0			3/26/13 16:42	ALSF	Q
Gross Beta Uncertainty +/-	340		pCi/L		EPA 900.0			3/26/13 16:42	ALSF	Q
Radium 226	4400		pCi/L	0.00	EPA 903.0			4/9/13 11:01	ALSF	R
Radium 226 Uncertainty +/-	1100		pCi/L		EPA 903.0			4/9/13 11:01	ALSF	R
Radium 228	510		pCi/L	80.0	EPA 904.0			4/1/13 10:56	ALSF	R
Radium 228 Uncertainty +/-	130		pCi/L		EPA 904.0			4/1/13 10:56	ALSF	R

Sample Comments:

MBAS calculated as LAS molecular weight 342 g/mol.

Due to the barium and strontium content, this sample required a 1/200 dilution for the 6010C dissolved iron analysis. The detection limit was raised accordingly. 03/21/13 JWK

See attached subcontracted results from ALS-Fort Collins for gross alpha, gross beta, radium 226, and radium 228 results. SRB 04/12/13

ALS Environmental

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State Certifications: CT PH-0224 , DE ID 11 , GA 914 , MA PA0102 , MD 128 , LA 04162 , VA 421 , WY EPA Region 8 , WV 343

ANALYTICAL RESULTS

Workorder: 1016748 COP Tract 356 Pad J Prod Brine

Lab ID:	**1016748001**	Date Collected:	3/13/2013 10:30	Matrix:	Water
Sample ID:	**COP Tract 356 Pad J-Prod Brine**	Date Received:	3/14/2013 12:50		

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr

Anna G Milliken
Technical Manager

ANALYTICAL RESULTS QUALIFIERS\FLAGS

Workorder: 1016748 COP Tract 356 Pad J Prod Brine

PARAMETER QUALIFIERS\FLAGS

[1] The QC sample type LCS for method SW846 8260B was outside the control limits for the analyte 2-Chloroethylvinyl ether. The % Recovery was reported as 0 and the control limits were 1 to 150.

[2] Method criteria requires continuing calibration verification (CCV) standards be less than or equal to 20% of the initial calibration for the 8015 glycol analysis. This compound was biased low 95% in the bracketing CCV. This sample was run multiple times with similar results. Data for this compound may have been impacted.

[3] The sample was originally run within hold time, but required further analysis that exceeded hold time.

[4] Due to sample matrix interferences, this analyte was analyzed at a dilution and the detection levels adjusted accordingly.

[5] The result reported for the ammonia-nitrogen analysis is higher than the result reported for the total kjeldahl nitrogen analysis. The results reported are within the precision limits associated with the methods.

[6] The surrogate 2-Butanone for method SW846 8015C was outside of control limits. The % Recovery was reported as 205 and the control limits were 53 to 147. This result was reported at a dilution of 1.

CHAIN OF CUSTODY / REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

COC ALSI

Generated by ALSI

1 of 2

Analytical Laboratory Services, Inc.
Environmental w/ Industrial Hygiene w/ Field Services
34 Dogwood Lane w Middletown, PA 17057 w 717.944.5541 w Fax: 717.944.1430

Client Name: IPGE (Profile #239473)
Address: 120 Market Street
Warren, PA 16365
Contact: Nathan Harris
Phone#: 814-723-3230
Project Name#: COP Tract 356 Pad J -Production Brine
Bill To: PGE
TAT [X] Normal-Standard TAT is 10-12 business days. [ ] Rush-Subject to ALSI approval and surcharges.
Approved By:
Date Required:
Email? [X]-Y nathanharris@penngeneralenergy.co
Fax? [ ]-Y No.:

	Sample Description/Location (as it will appear on the lab report)	Sample Date	Time	G or C	Matrix	Container type	Container Size	Preservative	Total Metals 500 mL P HNO3	Dissolved Fe (Lab Filtered) 500 mL P none	Oil & Grease 1 L Amber H2SO4	Acidity, Cl, NO2, NO3, SO4, SPC, TDS, pH, BOD, sp. gravity 2 L P none	COD, NH3, TKN 1 L P H2SO4	Phenolics 500 mL amber H2SO4	Glycols 40 mL vials none	8260 VOC 40 mL vials HCL	Alkalinity 500 P none	Hardness 500 mL P HNO3
									ANALYSES/METHOD REQUESTED									
1	COP Tract 356 Pad J -Prod. Brine	3/13/13	18:30	G	WT				1	1	2	1	1	1	2	1	1	1
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Enter Number of Containers Per Sample or Field Results Below.

Cooler Temp: 2C Therm ID: TH-215

	Y	N	Initial
No. of Coolers:			
Custody Seals Present? (If present) Seals Intact?			
Received on Ice?			
COC/Labels Complete/Accurate?			
Cont. in Good Cond.?			
Correct Containers?			
Correct Sample Volumes?			
Correct Preservation?			
Headspace/Volatiles?			

Courier/Tracking #: 045712915903

Sample/COC Comments

Data Deliverables: [ ] Standard [ ] CLP-like [ ] USACE

Reportable to PADEP? Yes [ ]

PWSID #

EDDS: Format Type

Special Processing: [ ] USACE [ ] Navy

ALSI Field Services: oPickup oLabor oComposite Sampling oRental Equipment

oOther:

Sample Disposal: [ ] Lab [ ] Special

State Samples Collected In: [ ] NY [ ] NJ [ ] PA [ ] NC

Metals: As, Ba, B, Co, Se, Al, Ba, Be, Cd, Cr
Pb, Ag, Cu, Fe, Mo, Ni, Zn, Ca, Li, Mg, Mn,
Na, Sr, Th, U, Tl, Sb

Project Comments: DT Same site as soil sample

LOGGED BY (signature):

REVIEWED BY (signature):

Relinquished By / Company Name	Date	Time	Received By / Company Name	Date	Time
1 Rachel Lilly / IHS	3/13/13		2 Fedex	3/13/13	
3 Fedex			4 Mc Kyle - ALS	3/14/13	1250
5			6		
7			8		
9			10		

*G=Grab; C=Composite **Matrix - Al=Air, DW=Drinking Water, GW=Groundwater, OI=Oil, OL=Other Liquid, SL=Sludge, SO=Soil, WP=Wipe, WW=Wastewater

Copies: WHITE - ORIGINAL CANARY - CUSTOMER MAILING PINK - FILE GOLDENROD - CUSTOMER COPY

Rev 8/04

ALS Environmental

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CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

COC #: 1016748 — 2 of 2

ALSI Quote #: 239473

Analytical Laboratory Services, Inc.
Environmental w/ Industrial Hygiene w/ Field Services
34 Dogwood Lane w Middletown, PA 17057 w 717.944.5541 w Fax 717.944.1430

Client Name: PGE (Profile #239473)

Address: 120 Market Street, Warren, PA 16365

Contact: Nathan Harris

Phone#: 814-723-3230

Project Name/#: COP Tract 356 Pad J -Production Brine

Bill To: PGE

TAT: [x] Normal-Standard TAT is 10-12 business days. [ ] Rush-Subject to ALSI approval and surcharges.

Date Required: Approved By:

Email? [x] Y nathanharris@pennenergyalenergy.co

Fax? [ ] Y No.:

Sample Description/Location (as it will appear on the lab report)	Sample Date	Time	G or C	Matrix**	Container Type	Container Size	Preservative	Surfactants (MBAS)	Gross Alpha/ Gross Beta	Radium 226/ Radium 228	2 - Butoxyethanol	40 mL
					2L	1L	4L					
					P	P	Cube					G
					none	HNO3	HNO3					none
1 - COP Tract 356 Pad J -Prod. Brine	3/3/13	10:30	G	WT	1	1	12	2				
2												
3												
4												
5												
6												
7												
8												
9												
10												

ANALYSES/METHOD REQUESTED

Enter Number of Containers Per Sample or Field Results Below.

Project Comments:

LOGGED BY(signature): [signature] Date: 3/3/13 Time: 1457

REVIEWED BY(signature): Date: Time:

Relinquished By / Company Name: Date: 3/3/13 Time: 1445 — Received By / Company Name: Fedex Date: 3/4/13 Time: 1230

Relinquished By / Company Name: Fedex — Received By / Company Name: Date: Time:

Receipt Information (completed by Receiving Lab)

Cooler Temp: ___ Therm ID: ___ Initial

No. of Coolers: ___ Y N

Custody Seals Present? (If present) Seals Intact? Received on Ice? COC/Labels Complete/Accurate? Cont. in Good Cond.? Correct Containers? Correct Sample Volumes? Correct Preservation? Headspace/Volatiles?

Courier Tracking #:

Sample/COC Comments

Data Deliverables: [ ] Standard [ ] CLP-like [ ] USACE

Reportable to PADEP? Yes [ ] PWSID #

ALSI Field Services: oPickup oLabor oComposite Sampling oRental Equipment oOther:

Special Processing: [ ] USACE [ ] Navy

Sample Disposal: [ ] Lab [ ] Special

State Samples Collected in: [ ] NY [ ] NJ [ ] PA [ ] NC

EDDS: Format Type:

Rev 8/04

*G=Grab; C=Composite **Matrix - Al=Air, DW=Drinking Water, GW=Groundwater, OI=Oil, OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater

Copies: WHITE - ORIGINAL CANARY - CUSTOMER MAILING PINK - FILE GOLDENROD - CUSTOMER COPY

DT Same site as soil sample — 5T 40 min

ALS Environmental

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Chain of Custody

Ship To	Mr. Jeff Kujawa ALS Environmental 225 Commerce Drive Fort Collins, CO 80524	**Report To**	Ms. Shannon Butler
		Email	shannon.butler@alsglobal.com
		Notes:	
Ship To Phone	970-490-1511 x 228	Results: 21-days from reciept	
Ship to Fax	970-490-1522	Sample Type: Production Brine	

#	1	Collect Date/Time	3/13/2013 10:30
Lab Sample	1016748001	Matrix	Water
Container	1016748001-Q	Preservative	Nitric Acid
		Container Type	PLASTIC

Analyses Requested:

Container Id	Method	Analyte
1016748001-Q	EPA 900.0	Gross Alpha
1016748001-Q	EPA 900.0	Gross Alpha Uncertainty +/-
1016748001-Q	EPA 900.0	Gross Beta
1016748001-Q	EPA 900.0	Gross Beta Uncertainty +/-

#	2	Collect Date/Time	3/13/2013 10:30
Lab Sample	1016748001	Matrix	Water
Container	1016748001-R	Preservative	Nitric Acid
		Container Type	PLASTIC

Analyses Requested:

Container Id	Method	Analyte
1016748001-R	EPA 903.0	Radium 226
1016748001-R	EPA 903.0	Radium 226 Uncertainty +/-
1016748001-R	EPA 904.0	Radium 228
1016748001-R	EPA 904.0	Radium 228 Uncertainty +/-

Transfers	Released By	Date/Time	Released To	Date/Time
1		3/13 16a		
2				
3				
4				

☐ Dispose of samples upon completion ☐ Return Containers

Friday, March 15, 2013 4:38:58 PM

Page 1 of 1

Chain Number HBN 513179_465674

ALS Environmental

1303321

Gross Alpha/Beta:
The sample was analyzed for gross alpha and beta activity by gas flow proportional counting according to the current revision of SOP 724. Gross alpha results are referenced to ^{241}Am. Gross beta results are referenced to $^{90}Sr/Y$.

All acceptance criteria were met.

Radium-228:
The sample was analyzed for the presence of ^{228}Ra by low background gas flow proportional counting of ^{228}Ac, which is the ingrown progeny of ^{228}Ra, according to the current revision of SOP 724.

All acceptance criteria were met.

Radium-226:
The sample was analyzed for the presence of ^{226}Ra according to the current revision of SOP 724.

All acceptance criteria were met.

ALS Environmental

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State Certifications: CT PH-0224 , DE ID 11 , GA 914 , MA PA0102 , MD 128 , LA 04162 , VA 421 , WY EPA Region 8 , WV 343

ALS Environmental -- FC

Sample Number(s) Cross-Reference Table

OrderNum: 1303321
Client Name: ALS Environmental
Client Project Name:
Client Project Number: 1016748
Client PO Number: 1016748

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
1016748001	1303321-1		WATER	13-Mar-13	10:30

130332 |

ALS Environmental

34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

Chain of Custody

Ship To	Mr. Jeff Kujawa ALS Environmental 225 Commerce Drive Fort Collins, CO 80524	**Report To**	Ms. Shannon Butler
		Email	shannon.butler@alsglobal.com
		Notes:	
		Results:	21-days from reciept
Ship To Phone	970-490-1511 x 228	**Sample Type:**	Production Brine
Ship to Fax	970-490-1522		

#	1	Collect Date/Time	3/13/2013 10:30
Lab Sample	1016748001	Matrix	Water
Container	1016748001-Q	Preservative	Nitric Acid
		Container Type	PLASTIC

1

Analyses Requested:

Container Id	Method	Analyte
1016748001-Q	EPA 900.0	Gross Alpha
1016748001-Q	EPA 900.0	Gross Alpha Uncertainty +/-
1016748001-Q	EPA 900.0	Gross Beta
1016748001-Q	EPA 900.0	Gross Beta Uncertainty +/-

#	2	Collect Date/Time	3/13/2013 10:30
Lab Sample	1016748001	Matrix	Water
Container	1016748001-R	Preservative	Nitric Acid
		Container Type	PLASTIC

Analyses Requested:

Container Id	Method	Analyte
1016748001-R	EPA 903.0	Radium 226
1016748001-R	EPA 903.0	Radium 226 Uncertainty +/-
1016748001-R	EPA 904.0	Radium 228
1016748001-R	EPA 904.0	Radium 228 Uncertainty +/-

Transfer	Released By	Date/Time	Released To	Date/Time
1	[signature]	3/13/13 16a	[signature]	3/21/13@1005
2				
3				
4				

☐ Dispose of samples upon completion ☐ Return Containers

Friday, March 15, 2013 4:38:58 PM

Page 1 of 1

Chain Number HBN 513179_485674

3 of 12

ALS Environmental

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State Certifications: CT PH-0224 , DE ID 11 , GA 914 , MA PA0102 , MD 128 , LA 04162 , VA 421 , WY EPA Region 8 , WV 343

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS PA Workorder No: 1303321

Project Manager: JRK Initials: LAS Date: 3/21/13

1. Does this project require any special handling in addition to standard ALS procedures?		YES	(NO)
2. Are custody seals on shipping containers intact?	(NONE)	YES	NO
3. Are Custody seals on sample containers intact?	(NONE)	YES	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		(YES)	NO
5. Are the COC and bottle labels complete and legible?		(YES)	NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		(YES)	NO
7. Were airbills / shipping documents present and/or removable?	DROP OFF	(YES)	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	(YES)	NO
9. Are all aqueous non-preserved samples pH 4-9?	(N/A)	YES	NO
10. Is there sufficient sample for the requested analyses?		(YES)	NO
11. Were all samples placed in the proper containers for the requested analyses?		(YES)	NO
12. Are all samples within holding times for the requested analyses?		(YES)	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		(YES)	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea	(N/A)	YES	NO
15. Do any water samples contain sediment? Amount Amount of sediment: ____ dusting ____ moderate ____ heavy	N/A	YES	(NO)
16. Were the samples shipped on ice?		YES	(NO)
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 #4	(RAD ONLY)	YES	(NO)

Cooler #:	1	2						
Temperature (°C):	AMB	AMB						
No. of custody seals on cooler:	Ø	Ø						
DOT Survey Acceptance Information: External µR/hr reading:	13	14						
Background µR/hr reading:	13							

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

If applicable, was the client contacted? YES / NO / (NA) Contact: _____ Date/Time: _____

Project Manager Signature / Date: 3-21-13

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

Page 1 of 1

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1303321

1303321
14
0

From (717) 944-5541
Steve Smith
34 DOGWOOD LANE
MIDDLETOWN, PA 17057

FedEx Ground

Ship Date: 18MAR13
ActWgt: 12.0 LB
CAD: 7121966/NET3370

Master#: 305815415141595

Invoice #
Reference #
PO #
Dept #
Ship ID

SHIP TO (970) 490-1511 X 288
Jeff Kujawa
ALS Environmental
225 COMMERCE DR
FORT COLLINS, CO 80524

(9612019) 3058164 15141601

GND 019 2 of 2
Prepaid

After printing this label:
1 Use the 'Print' button on this page to print your label to your laser or inkjet printer.
2 Fold the printed page along the horizontal line.
3 Place label in shipping pouch and affix it to your shipment so that the barcode portion of the label can be read and scanned.

Warning: IMPORTANT: TRANSMIT YOUR SHIPPING DATA AND PRINT A MANIFEST:
At the end of each shipping day, you should perform the FedEx Ground End of Day Close procedure to transmit your shipping data to FedEx. To do so, click on the Ground End of Day Close Button. If required, print the pickup manifest that appears. A printed manifest is required to be tendered along with your packages if they are being picked up by FedEx Ground. If you are dropping your packages off at a FedEx drop off location, the manifest is not required.
Use of this system constitutes your agreement to the service conditions in the current FedEx Service Guide and applicable tariff, available upon request. FedEx will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay, non-delivery, misdelivery, or misinformation, unless you declare a higher value, pay an additional charge, document your actual loss and file a timely claim. Limitations, including limitations on our liability, can be found in the current FedEx Service Guide and applicable tariff apply. In no event shall FedEx Ground be liable for any special, incidental, or consequential damages, including, without limitation, loss of profit, loss to the intrinsic value of the package, loss of sale, interest income or attorney's fees. Recovery cannot exceed actual documented loss. Items of extraordinary value are subject to separate limitations of liability set forth in the Service Guide and tariff. Written claims must be filed within strict time limits, see current FedEx Service Guide

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ALS Environmental -- FC

SAMPLE SUMMARY REPORT

Client: ALS Environmental
Project: 1016748
Sample ID: 1016748001
Legal Location:
Collection Date: 3/13/2013 10:30

Date: *10-Apr-13*
Work Order: 1303321
Lab ID: 1303321-1
Matrix: WATER
Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
GROSS ALPHA/BETA ANALYSIS BY GFPC			PAI 724		Prep Date: 3/25/2013	PrepBy: ANH
GROSS ALPHA	3380 (+/- 630)	M3	310	pCi/l	NA	3/26/2013 16:42
GROSS BETA	1220 (+/- 340)	M3	440	pCi/l	NA	3/26/2013 16:42
RADIUM-228 ANALYSIS BY GFPC			PAI 724		Prep Date: 3/28/2013	PrepBy: JTL
Ra-228	610 (+/- 130)	M3	80	pCi/l	NA	4/1/2013 10:56
Carr: BARIUM	*98.5*		*40-110*	*%REC*	NA	4/1/2013 10:56
TOTAL RADIUM ANALYSIS BY GFPC			PAI 724		Prep Date: 3/25/2013	PrepBy: JTL
Ra-226	4400 (+/- 1100)	M3	0	pCi/l	NA	4/9/2013 11:01
Carr: BARIUM	*96.1*		*40-110*	*%REC*	NA	4/9/2013 11:01

ALS Environmental

[illegible]4 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: CT PH-0224 , DE ID 11 , GA 914 , MA PA0102 , MD 128 , LA 04162 , VA 421 , WY EPA Region 8 , WV 343

ALS Environmental -- FC

SAMPLE SUMMARY REPORT

Client:	ALS Environmental	**Date:**	*10-Apr-13*
Project:	1016748	**Work Order:**	1303321
Sample ID:	1016748001	**Lab ID:**	1303321-1
Legal Location:		**Matrix:**	WATER
Collection Date:	3/13/2013 10:30	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

U or ND - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
# - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
G - Sample density differs by more than 15% of LCS density.
D - DER is greater than Control Limit
M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits
NC - Not Calculated for duplicate results less than 5 times MDC
B - Analyte concentration greater than MDC.
B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).
U or ND - Indicates that the compound was analyzed for but not detected.
E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
M - Duplicate injection precision was not met.
N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
* - Duplicate analysis (relative percent difference) not within control limits.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.
B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
E - Analyte concentration exceeds the upper level of the calibration range.
J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
A - A tentatively identified compound is a suspected aldol-condensation product.
X - The analyte was diluted below an accurate quantitation level.
* - The spike recovery is equal to or outside the control criteria used.
+ - The relative percent difference (RPD) equals or exceeds the control criteria.

Diesel Range Organics:

ALS Environmental

34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: CT PH-0224 , DE ID 11 , GA 914 , MA PA0102 , MD 128 , LA 04162 , VA 421 , WY EPA Region 8 , WV 343

ALS Environmental -- FC

SAMPLE SUMMARY REPORT

Client:	ALS Environmental	**Date:**	*10-Apr-13*
Project:	1016748	**Work Order:**	1303321
Sample ID:	1016748001	**Lab ID:**	1303321-1
Legal Location:		**Matrix:**	WATER
Collection Date:	3/13/2013 10:30	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

G - A pattern resembling gasoline was detected in this sample.
D - A pattern resembling diesel was detected in this sample.
M - A pattern resembling motor oil was detected in this sample.
C - A pattern resembling crude oil was detected in this sample.
4 - A pattern resembling JP-4 was detected in this sample.
5 - A pattern resembling JP-5 was detected in this sample.
H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

ALS Environmental

34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: CT PH-0224 , DE ID 11 , GA 914 , MA PA0102 , MD 128 , LA 04162 , VA 421 , WY EPA Region 8 , WV 343

ALS Environmental -- FC

Client: ALS Environmental
Work Order: 1303321
Project: 1016748

Date: 4/10/2013 1:17:

QC BATCH REPORT

Batch ID: AB130325-3-1 **Instrument ID:** LB4100-B **Method:** Gross Alpha/Beta Analysis by G

LCS **Sample ID:** AB130325-3 **Units:** pCi/l **Analysis Date:** 3/27/2013 14:35
Client ID: **Run ID:** AB130325-3A **Prep Date:** 3/25/2013 **DF:** NA

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	DER Ref Value	DER	DER Limit	Qual
GROSS ALPHA	255 (+/- 42)	4	221.3		115	70-130				P,M3
GROSS BETA	224 (+/- 36)	6	223.2		100	70-130				P,M3

MB **Sample ID:** AB130325-3 **Units:** pCi/l **Analysis Date:** 3/26/2013 16:42
Client ID: **Run ID:** AB130325-3A **Prep Date:** 3/25/2013 **DF:** NA

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	DER Ref Value	DER	DER Limit	Qual
GROSS ALPHA	ND	0.73								U
GROSS BETA	ND	1.02								U

The following samples were analyzed in this batch: 1303321-1

ALS Environmental

4 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: CT PH-0224 , DE ID 11 , GA 914 , MA PA0102 , MD 128 , LA 04162 , VA 421 , WY EPA Region 8 , WV 343

Client: ALS Environmental
Work Order: 1303321
Project: 1016748

QC BATCH REPORT

Batch ID: RA130328-1-2 **Instrument ID:** LB4100-B **Method:** Radium-228 Analysis by GFPC

LCS **Sample ID:** RA130328-1 **Units:** pCi/l **Analysis Date:** 4/1/2013 11:13
Client ID: **Run ID:** RA130328-1A **Prep Date:** 3/28/2013 **DF:** NA

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	DER Ref Value	DER	DER Limit	Qual
Ra-228	9.2 (+/- 2.2)	0.5	10.06		91.7	70-130				P
Carr: BARIUM	32700		33220		98.4	40-110				

MB **Sample ID:** RA130328-1 **Units:** pCi/l **Analysis Date:** 4/1/2013 11:13
Client ID: **Run ID:** RA130328-1A **Prep Date:** 3/28/2013 **DF:** NA

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	DER Ref Value	DER	DER Limit	Qual
Ra-228	ND	0.51								U
Carr: BARIUM	32840		33230		98.8	40-110				

The following samples were analyzed in this batch: 1303321-1

ALS Environmental

34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: CT PH-0224 , DE ID 11 , GA 914 , MA PA0102 , MD 128 , LA 04162 , VA 421 , WY EPA Region 8 , WV 343

Client: ALS Environmental
Work Order: 1303321
Project: 1016748

QC BATCH REPORT

Batch ID: TR130325-2-2 **Instrument ID:** LB4100-B **Method:** Total Radium Analysis by GFPC

LCS **Sample ID:** TR130325-2 **Units:** pCi/l **Analysis Date:** 4/9/2013 09:46
Client ID: **Run ID:** TR130325-2B **Prep Date:** 3/25/2013 **DF:** NA

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	DER Ref Value	DER	DER Limit	Qual
Ra-226	45 (+/- 11)	0	44.99		99.3	75-125				P
Carr: BARIUM	14970		15110		99	40-110				

MB **Sample ID:** TR130325-2 **Units:** pCi/l **Analysis Date:** 4/9/2013 09:46
Client ID: **Run ID:** TR130325-2B **Prep Date:** 3/25/2013 **DF:** NA

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	DER Ref Value	DER	DER Limit	Qual
Ra-226	ND	0.2								U
Carr: BARIUM	14570		15130		96.3	40-110				

The following samples were analyzed in this batch: 1303321-1

Product Data

Baker Petrolite

CRW9082
Corrosion Inhibitor

DESCRIPTION:

CRW9082 corrosion inhibitor is an amine-based corrosion inhibitor formulated for treatment of packer fluids. It protects against CO_2 and H_2S corrosion and contains a scavenger which removes oxygen from the brine. CRW9082 corrosion inhibitor is soluble in fresh water and brines typically used as packer fluids.

APPLICATION:

CRW9082 corrosion inhibitor should be mixed with the packer fluid prior to injection into the annulus. A concentration of 5,000 to 20,000 ppm (0.5-2.0%) provides effective corrosion protection. The actual amount will vary with the severity of the specific problem.

TYPICAL PROPERTIES:

Form	Liquid
Specific Gravity @ 72°F	1.015
Specific Weight @ 72°F	8.46 lbs/US gal
Flash Point	125°F
Pour Point	30°F
Solubility (water)	soluble
Solubility (brine)	soluble
pH	7.0 – 8.0

FEATURES AND BENEFITS:

Feature:
- Exhibits strong surfactant properties

Benefit:
- Helps keep systems clean

Feature:
- Excellent thermal stability

Benefit:
- Has been used in systems up to 350°F

Feature:
- Strong affinity for the water phase

Benefit:
- Very cost effective for specific systems

MATERIALS COMPATILIBITY:

Suitable:

Metals:	admiralty brass, aluminum, copper, 304 stainless steel, 316 stainless steel
Plastics:	HD polyethylene, fiberglass
Elastomers:	TELFON®

Not Suitable:

Plastics:	PLEXIGLAS®, HD polypropylene, PVC
Elastomers:	Bune N (rubber), neoprene, HYPALON®, VITON®

SAFETY AND HANDLING:

Before handling, storage or use, see the Material Safety Data Sheet (MSDS) for details.

Baker Petrolite 24 Hour Emergency Hotline:
1-800-424-9300 (CHEMTREC) U.S.A.
1-613-996-6666 (CANUTEC) Canada
Baker Petrolite Customer Care Hotline:
1-800-872-1916 (8 a.m. to 5 p.m. CST)

Responsible Care® Good Chemistry at Work

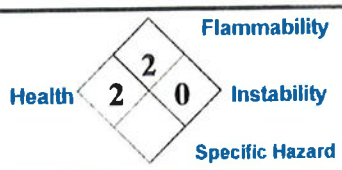
BAKER HUGHES
Baker Petrolite

Material Safety Data Sheet

Section 1. Chemical Product and Company Identification

Product Name	**CRW9082 CORROSION INHIBITOR**	**Code**	CRW9082
Supplier	Baker Petrolite A Baker Hughes Company 12645 W. Airport Blvd. (77478) P.O. Box 5050 Sugar Land, TX 77487-5050 For Product Information/MSDSs Call: 800-231-3606 (8:00 a.m. - 5:00 p.m. cst, Monday - Friday) 281-276-5400	**Version**	8.0
Material Uses	Corrosion Inhibitor	**Effective Date**	**1/22/2009**
24 Hour Emergency Numbers	CHEMTREC 800-424-9300 (U.S. 24 hour) Baker Petrolite 800-231-3606 (001)281-276-5400 CANUTEC 613-996-6666 (Canada 24 hours) CHEMTREC Int'l 01-703-527-3887 (International 24 hour)	**Print Date**	1/22/2009

National Fire Protection Association (U.S.A.)



Section 2. Hazards Identification

Physical State and Appearance	State: Liquid., Color: Amber., Odor: Mild.
CERCLA Reportable Quantity	Ammonium hydroxide, 9236 gal. of this product. Hydrazine, 46 gal. of this product.
Hazard Summary	WARNING. May cause chronic effects. Combustible liquid. At elevated temperatures, vapors can form an ignitable or explosive mixture with air. Can form explosive mixtures at temperatures at or above the flash point. Vapors can flow along surfaces to distant ignition sources and flash back. Static discharges can cause ignition or explosion when container is not bonded. May be irritating to eyes, skin and respiratory tract. Contains a component that may cause cancer. May cause central nervous system (CNS) effects if inhaled.
Routes of Exposure	Skin (Contact), Eyes, Inhalation.
Potential acute health effects	
Eyes	May cause eye irritation.
Skin	May be irritating to skin.
Inhalation	May cause central nervous system (CNS) effects if inhaled. May be irritating to lungs.
Ingestion	Not considered a likely route of exposure, however, may be harmful or cause irritation if swallowed.
Medical Conditions aggravated by Exposure	Exposure to this product may aggravate medical conditions involving the following: blood system, kidneys, nervous system, liver, respiratory tract, skin/epithelium, eyes.
See Toxicological Information (section 11)	
Additional Hazard Identification Remarks	Repeated or prolonged contact may cause dermatitis (inflammation) and defatting of the skin (dryness).

Continued on Next Page

Section 3. Composition/Information on Ingredients

Name	CAS #	% by Weight
Oxyalkylated fatty amine	Trade secret.	5 - 10
Isopropanol	67-63-0	1 - 5
Ammonium hydroxide	1336-21-6	1 - 5
Hydrazine	302-01-2	0.1 - 1

See Section 8 for information on permissible exposure limits and threshold limit values.

Section 4. First Aid Measures

Eye Contact	Flush eyes with plenty of water for 15 minutes, occasionally lifting upper and lower eyelids. Get medical attention immediately.
Skin Contact	Remove and launder or clean contaminated clothing and shoes. Wash with soap and water for at least 15 minutes or until no evidence of material remains. Get medical attention if irritation occurs.
Inhalation	Remove to fresh air. Oxygen may be administered if breathing is difficult. If not breathing, administer artificial respiration and seek medical attention. Get medical attention if symptoms appear.
Ingestion	If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never induce vomiting or give anything by mouth to a victim who is unconscious or having convulsions. Get medical attention if symptoms appear.
Notes to Physician	Not available.
Additional First Aid Remarks	Not available.

Section 5. Fire Fighting Measures

Flammability of the Product	Combustible liquid. At elevated temperatures, vapors can form an ignitable or explosive mixture with air. Can form explosive mixtures at temperatures at or above the flash point. Vapors can flow along surfaces to distant ignition sources and flash back. Static discharges can cause ignition or explosion when container is not bonded.
OSHA Flammability Class	II
Products of Combustion	These products are carbon oxides (CO, CO_2) nitrogen oxides (NO, NO_2 etc.).
Fire Hazards in Presence of Various Substances	Open Flames/Sparks/Static. Heat.
Fire Fighting Media and Instructions	In case of fire, use foam, dry chemicals, or CO2 fire extinguishers. Evacuate area and fight fire from a safe distance. Water spray may be used to keep fire-exposed containers cool. Keep water run off out of sewers and public waterways. Note that flammable vapors may form an ignitable mixture with air. Vapors may travel considerable distances and flash back if ignited.
Protective Clothing (Fire)	Do not enter fire area without proper personal protective equipment, including NIOSH approved self-contained breathing apparatus.
Special Remarks on Fire Hazards	Not available.

Continued on Next Page

Section 6. Accidental Release Measures

Spill	Put on appropriate personal protective equipment. Keep personnel removed and upwind of spill. Shut off all ignition sources; no flares, smoking, or flames in hazard area. Approach release from upwind. Shut off leak if it can be done safely. Contain spilled material. Keep out of waterways. Dike large spills and use a non-sparking or explosion-proof means to transfer material to an appropriate container for disposal. For small spills add absorbent (soil may be used in the absence of other suitable materials) scoop up material and place in a sealed, liquid-proof container. Note that flammable vapors may form an ignitable mixture with air. Vapors may travel considerable distances from spill and flash back, if ignited. Waste must be disposed of in accordance with federal, state and local environmental control regulations.
Other Statements	If RQ (Reportable Quantity) is exceeded, report to National Spill Response Office at 1-800-424-8802.
Additional Accidental Release Measures Remarks	Not available.

Section 7. Handling and Storage

Handling and Storage	Put on appropriate personal protective equipment. Avoid contact with eyes, skin, and clothing. Avoid breathing vapors or spray mists. Use only with adequate ventilation. Store in a dry, cool and well ventilated area. Keep away from heat, sparks and flame. Keep away from incompatibles. Keep container tightly closed and dry. To avoid fire or explosion, ground container equipment and personnel before handling product.
Additional Handling and Storage Remarks	Not available.

Section 8. Exposure Controls/Personal Protection

Exposure Limits	Oxyalkylated fatty amine	Not available.
	Isopropanol	**ACGIH (United States).** TWA: 490 mg/m^3 8 hours. STEL: 980 mg/m^3 15 minute(s). TWA: 200 ppm 8 hours. STEL: 400 ppm 15 minute(s). **OSHA PEL 1989 (United States).** TWA: 400 ppm 8 hours. STEL: 500 ppm 15 minute(s). TWA: 980 mg/m^3 8 hours. STEL: 1225 mg/m^3 15 minute(s).
	Ammonium hydroxide	**ACGIH (United States).** TWA: 25 ppm 8 hours. Form: As ammonia, NH3 **ACGIH (United States). Notes: The exposure limits listed for ammonium hydroxide are for ammonia (CAS Number 7664-41-7).** STEL: 35 ppm 15 minute(s). Form: As ammonia, NH3 **OSHA (United States). Notes: The exposure limits listed for ammonium hydroxide are for ammonia (CAS**

Continued on Next Page

	Number 7664-41-7). TWA: 50 ppm 8 hours. Form: As ammonia, NH3 STEL: 35 mg/m³ 15 minute(s). Form: As ammonia, NH3
Hydrazine	**ACGIH (United States). Skin** TWA: 0.013 mg/m³ 8 hours. TWA: 0.01 ppm 8 hours. **OSHA PEL 1989 (United States). Skin** TWA: 1 ppm 8 hours. TWA: 1.3 mg/m³ 8 hours.

Additional Information on Exposure Limits The OSHA permissible exposure levels shown above are the OSHA 1989 levels or from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Petrolite Corporation recommends that these lower exposure levels be observed as reasonable worker protection.

Engineering Controls Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors or particles below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection

Personal Protective Equipment recommendations are based on anticipated known manufacturing and use conditions. These conditions are expected to result in only incidental exposure. A thorough review of the job tasks and conditions by a safety professional is recommended, however, to determine the level of personal protective equipment appropriate for these job tasks and conditions.

Eyes Chemical safety goggles.

Body Wear long sleeves to prevent repeated or prolonged skin contact.

Respiratory Respirator use is not expected to be necessary under normal conditions of use. In poorly ventilated areas, emergency situations or if exposure levels are exceeded, use NIOSH approved full face respirator.

Hands Chemical resistant gloves. Nitrile or Neoprene gloves.

Feet Chemical resistant boots or overshoes.

Other information Not available.

Additional Exposure Control Remarks Not available.

Section 9. Physical and Chemical Properties

Physical State and Appearance	Liquid.	**Odor**	Mild.
pH	10.4 - 10.6 (Neat - without dilution.)	**Color**	Amber.
Specific gravity	0.998 - 1.01 @ 16°C (60°F)		
Density	8.31 - 8.41 lbs/gal @ 16°C (60°F)		
Flash Points	Closed cup: 49.4°C (121°F). (TCC)		
Flammable Limits	L.E.L. Not available. U.E.L. Not available.		
Autoignition Temperature	Not available.		
Initial Boiling Point	Not available.		
Boiling Point	Not available.		
Vapor Density	>1 (Air = 1)		

Continued on Next Page

Vapor Pressure	Not Available or Not Applicable for Solids.
Evaporation Rate	Not Available or Not Applicable for Solids.
VOC	Not available.
Viscosity	Not available.
Pour Point	Not available.
Solubility (Water)	Soluble
Physical Chemical Comments	Not available.

Section 10. Stability and Reactivity

Stability and Reactivity	The product is stable.
Conditions of Instability	Not available.
Incompatibility with Various Substances	Oxidizing material.
Hazardous Decomposition Products	Not applicable.
Hazardous Polymerization	Hazardous polymerization is not expected to occur.
Special Stability & Reactivity Remarks	Not available.

Section 11. Toxicological information

Component Toxicological Information

Acute Animal Toxicity

Oxyalkylated fatty amine	Not available.
Isopropanol	ORAL (LD50): Acute: 5045 mg/kg [Rat]. 3600 mg/kg [Mouse]. 4710 mg/kg [Male rat]. DERMAL (LD50): Acute: 12800 mg/kg [Rabbit]. VAPOR (LC50): Acute: 16970 ppm 4 hours [Rat]. 12000 ppm 8 hours [Rat].
Ammonium hydroxide	ORAL (LD50): Acute: 350 mg/kg [Rat].
Hydrazine	ORAL (LD50): Acute: 60 mg/kg [Rat]. 59 mg/kg [Mouse]. DERMAL (LD50): Acute: 91 mg/kg [Rabbit]. VAPOR (LC50): Acute: 252 ppm 4 hours [Mouse]. 570 ppm 4 hours [Rat].

Chronic Toxicity Data

1) Oxyalkylated fatty amine

Not available.

2) Isopropanol

Isopropanol is a component of this product. Ingestion has produced hyperglycemia (high blood sugar) in humans

Continued on Next Page

(Lacouture, P, et al, 1983, "American Journal of Medicine" and Chan K-M, et al, 1993, "Clinical Chemistry"). Also, ingestion can produce Central Nervous System effects and gastointestinal symptoms. [IPCS (1990) Environmental Health Criteria 103: 2-propanol. International Program on Chemical Safety, WHO Geneva.]

In a four month study, inhalation of isopropanol vapors for 20 hours per week by laboratory animals produced bronchitis, pneumonia, and blood effects (International Program of Chemical Safety, 1990, Environmental Health Criteria 103: 2-propanol, World Health Organization). Ataxia (a jerky or shaky movement that occurs during voluntary muscle movement) and microscopic hyaline droplets (fungal or branched structures) in the kidneys were seen in rats exposed to isopropanol at concentrations up to 5000 ppm for 6 hours per day, 5 days per week, for 13 weeks (Burleighflayer et al, 1994). Inhalation of high levels of isopropanol (4,000 and 8,000 ppm for 8 hours) has produced congestion in the liver, lungs, and spleen of laboratory animals (Laham S, et al, 1980, "Drug and Chemical Toxicology).

Oral and inhalation animal studies isopropanol has been shown to cause fetotoxic and reproductive effects at levels which did not show any maternal toxicity. These effects include reductions in fetal litter weight, reductions in live births and significant skeletal malformations in rats. [Nelson, BK et al (1988), Food and Chemical Toxicology, 26(3), pps 247-254], [Tyl, R.W. et al (1994), Fundamental and Applied Toxicoology, 22, pps 139-151], [Bevan, C., et al (1995), Journal of Applied Toxicology, 15(2), pps 117-123. Chronic inhalation has produced testicular effects in laboratory animals. (Kapp, Jr., R.W., et al, 1996, Regulatory Toxicology and Pharmacology 23:183-192, and Burleigh-Flayer, H., et al, 1997, Fundamental and Applied Toxicology: 36:95-111)

3) Ammonium hydroxide

Ammonium hydroxide is a component of this product. Prolonged or chronic inhalation of extremely high concentrations may cause bronchitis and/or pneumonia with some residual reduction in pulmonary function.

Ammonium hydroxide was mutagenic in the Salmonella/microsome assay (Ames test) and in E. coli (HSDB). However, false positive mutagenicity data might have been obtained due to artifacts of pH.

There are unconfirmed reports that exposure to ammonia and other chemicals can cause reproductive problems in women.

4) Hydrazine

Hydrazine is component of this product. Repeated exposure of experimental animals to hydrazine can cause hemolytic anemia and fatty degeneration of the liver, hypoglycemia and convulsions.

In laboratory studies, hydrazine is carcinogenic to mice after oral administration, producing lung, liver and mammary tumors. In a study reported as an abstract, rats and male hamsters exposed daily by inhalation to 5 ppm hydrazine in air developed nasal tumors. After repeated exposure by inhalation to 1 ppm hydrazine, rats developed nasal turbinate tumors (growths on the bony structure of the nasal cavity), and female mice developed pulmonary adenomas (a usually benign abnormal tissue growth in the lungs). The incidence of nasal turbinate tumors in rats was dose related. The increased tumor incidences in mice and hamsters occurred only with the maximum tolerated dose levels. Hydrazine is classified as an "anticipated carcinogen" by NTP. Hydrazine is recognized as a cancer causing agent in animals by IARC and OSHA. OSHA and IARC also consider it to be a suspect carcinogen in humans,

Hydrazine has been shown to produce embrolethality and fetal malformations in laboratory animals only at high doses that resulted in significant effects to the mother.

Hydrazine has been shown to cause DNA and chromosomal damages in a number of test systems. Therefore, it is considered to be mutagenic.

Product Toxicological Information	
Acute Animal Toxicity	Not available.
Target Organs	blood system, kidneys, nervous system, liver, respiratory tract, skin/epithelium, eyes.
Other Adverse Effects	Not available.

Continued on Next Page

Section 12. Ecological Information

Ecotoxicity	Not available.
BOD5 and COD	Not available.
Biodegradable/OECD	Not available.
Toxicity of the Products of Biodegradation	Not available.
Special Remarks	Not available.

Section 13. Disposal Considerations

Responsibility for proper waste disposal rests with the generator of the waste. Dispose of any waste material in accordance with all applicable federal, state and local regulations. Note that these regulations may also apply to empty containers, liners and rinsate. Processing, use, dilution or contamination of this product may cause its physical and chemical properties to change.

Additional Waste Remarks	Not available.

Section 14. Transport Information

DOT Classification	FLAMMABLE LIQUID, N.O.S. (Contains: Isopropanol), 3, UN1993, III	
DOT Reportable Quantity	Ammonium hydroxide, 9236 gal. of this product. Hydrazine, 46 gal. of this product.	
Marine Pollutant	Not applicable.	
Additional DOT Information	Not available.	
Emergency Response Guide Number	128	

Section 15. Regulatory Information

HCS Classification	Target organ effects. Combustible liquid. Irritant. Contains a component that may cause cancer..
U.S. Federal Regulations	
Environmental Regulations	Extremely Hazardous Substances: Hydrazine; SARA 313 Toxic Chemical Notification and Release Reporting: Ammonium hydroxide; Hydrazine; SARA 302/304 Emergency Planning and Notification substances: Hydrazine; Hazardous Substances (CERCLA 302): Ammonium hydroxide, 9236 gal. of this product.; SARA 311/312 MSDS distribution - chemical inventory - hazard identification: fire; immediate health hazard; delayed health hazard; Clean Water Act (CWA) 307 Priority Pollutants: Not applicable to any components in this product. Clean Water Act (CWA) 311 Hazardous Substances: Ammonium hydroxide; Clean Air Act (CAA) 112(r) Accidental Release Prevention Substances: Hydrazine;

Continued on Next Page

Threshold Planning Quantity (TPQ)	Not applicable.
TSCA Inventory Status	All components are included or are exempted from listing on the US Toxic Substances Control Act Inventory. This product does not contain any components that are subject to the reporting requirements of TSCA Section 12(b) if exported from the United States.
State Regulations	State specific information is available upon request from Baker Petrolite.
International Regulations	
Canada	All components are compliant with or are exempted from listing on the Canadian Domestic Substance List.
WHMIS (Canada)	B-3, D-1B, D-2A, E
European Union	All components are included or are exempted from listing on the European Inventory of Existing Commercial Chemical Substances or the European List of Notified Chemical Substances.
	International inventory status information is available upon request from Baker Petrolite for the following countries: Australia, China, Korea (TCCL), Philippines (RA6969), or Japan.
Other Regulatory Information	No further regulatory information is available.

Section 16. Other Information

Other Special Considerations	2361 07/01/03 - Changes to Sections 2, 3, 5 and 8. 12/17/03 - Changes to Sections 3, 5, 9 and 15. 12/29/03 - Changes to Section 15. 06/10/04 - Changes to Sections 8 and 15. 02/23/05 - Changes to Sections 3, 9 and 14. 01/22/09 - Changes to Sections 2, 3, 5, 8, 9 and 15.

Baker Petrolite Disclaimer

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Petrolite, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

Product Data

Baker Petrolite

X-CIDE® 107W
Industrial Bactericide

DESCRIPTION:

X-CIDE® 107W Industrial Bactericide is a winterized blend of an acidic aldehyde with quaternary amine and nonionic surfactants. It is designed for bacterial control in waters associated with petrochemical and oil field operations.

APPLICATION:

X-CIDE 107W is recommended for use in industrial, non-potable waters where a bactericidal problem is clearly demonstrated. It is particularly effective for bacterial control in tank bottom water where petroleum hydrocarbons are stored.

X-CIDE 107W can be applied via slug treatments or by continuous application. For slug treatments, add 500 ppm of the product to the water system at the appropriate intervals to establish control and to prevent re-growth of bacterial slime. Slug treatments are particularly suited for control of bacteria in storage tank bottom sediments. For continuous treatment applications, inject 20 to 200 ppm of X-Cide 107W at a point where good mixing can be assured. Technical advice can be obtained from your Baker Petrolite representative.

TYPICAL PROPERTIES:

Form	Liquid
Color	amber
Solubility	Water soluble
Ionic character	Cationic
Specific Gravity @ 60°F (16°C)	0.974
Specific Weight @ 60°F (16° C)	7.87 lbs/US gal
Flash Point, SFCC	80°F (27°C)
Pour Point	<-40°F
Viscosity @ 60°F (16°C)	50cps
pH	2.5-3.5

FEATURES AND BENEFITS:

Feature:
- Not effected by total dissolved solids and high brine composition

Benefit:
- Can be used in a wide range of brines

Feature:
- Will not react with H_2S

Benefit:
- Can be used in sour water

Feature:
- Effective against sulfate reducing bacteria at low concentrations

Benefit:
- Reduces microbially influenced corrosion and biogenic H_2S production

Feature:
- Highly surface active

Benefit:
- Cleans lines and penetrates biofilms

Feature:
- Excellent cold weather handling properties

Benefit:
- Flexible application in cold climates

MATERIAL COMPATIBILITY:

Suitable:

Metals:	admiralty brass, aluminum, copper, mild steel, 304 stainless steel, 316 stainless steel
Plastics:	HD polyethylene, HD polypropylene, PVC, fiberglass
Elastomers:	TEFLON

Not Suitable:

Metals:	
Plastics:	PLEXIGLAS, polyurethane
Elastomers:	BUNA N, neoprene, E.P., HYPALON, VITON

(continued)

BPPD2240 (09/98)

Product Data

BAKER HUGHES

Baker Petrolite

(X-CIDE® 107W Industrial Bactericide, continued)

SAFETY AND HANDLING:

X-CIDE 107W is a registered biocide (EPA Registration Number 10707-29). Refer to the container label for precautionary, environmental, first aid, handling, storage and disposal information. This biocide should only be applied as specified. Goggles and impermeable gloves should be worn when handling this product. Contaminated skin or eyes should be flushed with water.

Empty drums should not be reused. They should be returned to drum reconditioners; or destroyed, by perforating or crushing, and buried in a safe place away from water supplies.

This biocide is toxic to fish and wildlife. Avoid contamination of water sources by cleaning of equipment or disposal of wastes. Treated effluent should not be discharged into lakes, streams, ponds or public waters unless in accordance with and NPDES permit. For guidance, contact your Regional Office of the EPA.

Before handling, storage or use, see the Material Safety Data Sheet (MSDS) for details.

Baker Petrolite 24 Hour Emergency Hotline:
1-800-424-9300 (CHEMTREC) U.S.A.
1-613-996-6666 (CANUTEC) Canada
Baker Petrolite Customer Care Hotline:
1-800-872-1916 (8 a.m. to 5 p.m. CST)

Material Safety Data Sheet

1. Product and company identification

Product name : X-CIDE™ 107W INDUSTRIAL BACTERICIDE
™ a trademark of Baker Hughes, Inc.

Supplier : Baker Petrolite
A Baker Hughes Company
12645 W. Airport Blvd.
Sugar Land, TX 77478
For Product Information/MSDSs Call: 800-231-3606
(8:00 a.m. - 5:00 p.m. cst, Monday - Friday) 281-276-5400

Material Uses : Special: Industrial Bactericide

Code : XC107W

Validation date : 7/17/2012.

Print date : 7/17/2012.

Version : 5

Responsible name : Global Regulatory Affairs - Telephone 281-276-5400 or 800-231-3606

In case of emergency : CHEMTREC: 800-424-9300 (U.S. 24 hour)
Baker Petrolite: 800-231-3606
(001)281-276-5400
CANUTEC: 613-996-6666 (Canada 24 hours)
CHEMTREC Int'l 01-703-527-3887 (International 24 hour)

2. Hazards identification

Physical state : Liquid.

Odor : Alcohol-like. [Strong]

Color : Amber.

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : DANGER!

FLAMMABLE LIQUID AND VAPOR. CAUSES EYE AND SKIN BURNS. CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE ALLERGIC SKIN REACTION. MAY BE HARMFUL IF SWALLOWED. PROLONGED OR REPEATED CONTACT MAY DRY SKIN AND CAUSE IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.

Keep away from heat, sparks and flame. Do not breathe vapor or mist. Do not ingest. Do not get in eyes or on skin or clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling. Vapors may form explosive mixtures with air. Vapors can travel to a source of ignition and flashback. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material.

Routes of entry : Dermal contact. Eye contact. Inhalation.

Potential acute health effects

Inhalation : Irritating to respiratory system.

Ingestion : Harmful if swallowed. May cause burns to mouth, throat and stomach.

Skin : Corrosive to the skin. Causes burns. May cause sensitization by skin contact.

Eyes : Corrosive to eyes. Causes burns.

Potential chronic health effects

Chronic effects : Contains material that may cause target organ damage, based on animal data. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels. Prolonged or repeated contact can defat the skin and lead to irritation, cracking and/or dermatitis.

2 . Hazards identification

Target organs : Contains material which may cause damage to the following organs: kidneys, the nervous system, liver, gastrointestinal tract, upper respiratory tract, skin, central nervous system (CNS), eye, lens or cornea.

Over-exposure signs/symptoms

Inhalation : respiratory tract irritation, coughing

Ingestion : stomach pains

Skin : pain or irritation, redness, dryness, cracking, blistering may occur

Eyes : pain, watering, redness

Medical conditions aggravated by over-exposure : Pre-existing skin disorders and disorders involving any other target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (Section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Isopropanol	67-63-0	30 - 60
Glutaraldehyde	111-30-8	10 - 30
Oxydiethylene bis(alkyl* dimethyl ammonium chloride)	68607-28-3	5 - 10
Methanol	67-56-1	1 - 5
Polyoxyalkylene	Trade secret.	1 - 5

4 . First aid measures

Eye contact : Get medical attention immediately. Immediately flush the eye(s) continuously with lukewarm, gently flowing water for at least 20-60 minutes while holding the eyelid(s) open.

Skin contact : Wash affected area with soap and mild detergent for at least 20 - 60 minutes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wear suitable protective clothing and gloves. Remove contaminated clothing and shoes.

5 . Fire-fighting measures

Flammability of the product : Flammable liquid. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard.

Extinguishing media

Suitable : Use dry chemical, CO_2, water spray (fog) or foam.

Not suitable : Do not use water jet.

5 . Fire-fighting measures

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Hazardous thermal decomposition products : carbon dioxide,carbon monoxide,nitrogen oxides,halogenated compounds

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Absorb with an inert material. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

If RQ (Reportable Quantity) is exceeded, report to National Spill Response Office at 1-800-424-8802.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Persons with a history of skin sensitization problems should not be employed in any process in which this product is used. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a segregated and approved area. Store in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredients:	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
Glutaraldehyde	US ACGIH	-	-	-	-	-	-	0.05	-	-	[3]
	OSHA PEL 1989	-	-	-	-	-	-	0.2	0.8	-	
Isopropanol	US ACGIH	200	-	-	400	-	-	-	-	-	
	OSHA PEL	400	980	-	-	-	-	-	-	-	
	OSHA PEL 1989	400	980	-	500	1225	-	-	-	-	
Methanol	US ACGIH	200	262	-	250	328	-	-	-	-	[1]
	OSHA PEL	200	260	-	-	-	-	-	-	-	
	OSHA PEL 1989	200	260	-	250	325	-	-	-	-	[1]

[1]Absorbed through skin. [3]Skin sensitization

Consult local authorities for acceptable exposure limits.

Only components of this product with established exposure limits appear in the box above.

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before reuse.

Personal protection

Respiratory : If a risk assessment indicates it is necessary, use a properly fitted supplied air respirator complying with an approved standard. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant gloves: Nitrile or Neoprene gloves.

Eyes : Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.

Skin : Wear long sleeves and chemical resistant apron to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state : Liquid.

Flash point : Closed cup: 27°C (80.6°F) [SFCC]

Auto-ignition temperature : Not available.

Flammable limits : Not available.

Color : Amber.

Odor : Alcohol-like. [Strong]

pH : 2.5 to 3.5 [Conc. (% w/w): 1%]

: 5% of product in 75%IPA / 25% water mixture

Boiling/condensation point : Not available.

Initial Boiling Point : Not available.

Melting/freezing point : Not available.

Relative density : 0.934 to 0.946 (15.6°C)

Density : 7.87 (lbs/gal)

9 . Physical and chemical properties

Vapor density	:	>1 [Air = 1]
Odor threshold	:	Not available.
Evaporation rate	:	Not available.
VOC	:	Not available.
Viscosity	:	Dynamic (15.6°C): 50 cP
Solubility (Water)	:	Soluble
Vapor pressure	:	11.1 kPa (83.1 mm Hg)
Pour Point	:	<-40°C (<-40°F)
Partition coefficient (LogKow)	:	Not available.

10 . Stability and Reactivity

Chemical stability	:	The product is stable.
Possibility of hazardous reactions	:	Under normal conditions of storage and use, hazardous reactions will not occur.
Hazardous polymerization	:	Under normal conditions of storage and use, hazardous polymerization will not occur.
Conditions to avoid	:	Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.
Materials to avoid	:	Reactive or incompatible with the following materials: oxidizing materials, reducing materials, acids and alkalis.
Hazardous decomposition products	:	Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Conditions of reactivity	:	Highly flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Glutaraldehyde	LD50 Dermal	Rat	>2500 mg/kg	-
	LD50 Dermal	Rabbit	560 uL/kg	-
	LD50 Oral	Rat	140 mg/kg	-
	LD50 Oral	Rat	134 mg/kg	-
	LC50 Inhalation Vapor	Rat	480 mg/m3	4 hours
Isopropanol	LD50 Dermal	Rabbit	6.29 g/kg	-
	LD50 Dermal	Rabbit	12800 mg/kg	-
	LD50 Oral	Rabbit	6410 mg/kg	-
	LD50 Oral	Rat	5045 mg/kg	-
	LD50 Oral	Rat	5000 mg/kg	-
	LD50 Oral	Male rat	4710 mg/kg	-
	LC50 Inhalation Vapor	Rat - Female	19000 ppm	8 hours
	LC50 Inhalation Gas.	Rat	16000 ppm	8 hours
	LC50 Inhalation Vapor	Rat	12000 ppm	8 hours
Methanol	LD50 Dermal	Rabbit	15800 mg/kg	-
	LD50 Oral	Rabbit	14200 mg/kg	-
	LD50 Oral	Rat	5600 mg/kg	-
	LC50 Inhalation Gas.	Rat	145000 ppm	1 hours
	LC50 Inhalation	Rat	64000 ppm	4 hours

11 . Toxicological information

	Gas.			
	LC50 Inhalation Vapor	Mouse	50000 ppm	4 hours

Carcinogenicity Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Isopropanol	A4	3	-	-	-	-
Glutaraldehyde	A4	-	-	-	-	-

Chronic toxicity Remarks

1) Isopropanol

Isopropanol is a component of this product. Ingestion has produced hyperglycemia (high blood sugar) in humans (Lacouture, P, et al, 1983, "American Journal of Medicine" and Chan K-M, et al, 1993, "Clinical Chemistry"). Also, ingestion can produce Central Nervous System effects and gastointestinal symptoms. [IPCS (1990) Environmental Health Criteria 103: 2-propanol. International Program on Chemical Safety, WHO Geneva.]

In a four month study, inhalation of isopropanol vapors for 20 hours per week by laboratory animals produced bronchitis, pneumonia, and blood effects (International Program of Chemical Safety, 1990, Environmental Health Criteria 103: 2-propanol, World Health Organization). Ataxia (a jerky or shaky movement that occurs during voluntary muscle movement) and microscopic hyaline droplets (fungal or branched structures) in the kidneys were seen in rats exposed to isopropanol at concentrations up to 5000 ppm for 6 hours per day, 5 days per week, for 13 weeks (Burleighflayer et al, 1994). Inhalation of high levels of isopropanol (4,000 and 8,000 ppm for 8 hours) has produced congestion in the liver, lungs, and spleen of laboratory animals (Laham S, et al, 1980, "Drug and Chemical Toxicology).

Oral and inhalation animal studies isopropanol has been shown to cause fetotoxic and reproductive effects at levels which did not show any maternal toxicity. These effects include reductions in fetal litter weight, reductions in live births and significant skeletal malformations in rats. [Nelson, BK et al (1988), Food and Chemical Toxicology, 26(3), pps 247-254], [Tyl, R.W. et al (1994), Fundamental and Applied Toxicoology, 22, pps 139-151], [Bevan, C., et al (1995), Journal of Applied Toxicology, 15(2), pps 117-123. Chronic inhalation has produced testicular effects in laboratory animals. (Kapp, Jr., R.W., et al, 1996, Regulatory Toxicology and Pharmacology 23:183-192, and Burleigh-Flayer, H., et al, 1997, Fundamental and Applied Toxicology: 36:95-111)

2) Glutaraldehyde

Glutaraldehyde is a component of this product. In long-term experimental animal studies, glutaraldehyde caused liver damage in mice (ACGIH, 1992), but it was not neurotoxic in rats (Spencer et al, 1978).

Female rats had increased large granular lymphocytic leukemias after receiving glutaraldehyde in the drinking water at levels up to 1,000 ppm for 2 years (Andersen, 1996).

The results of genetic studies have been mixed with no conclusive evidence of positive effects.

In 2-year inhalation studies, there was no evidence of carcinogenic activity in male or female rats exposed to 250, 500 or 750 ppb, or in male or female mice exposed to 62.5, 125, or 250 ppb glutaraldehyde. Incidences of nasal and respiratory lesions were increased in both male/female rats and mice. Reduction in body weight, as compared to the controls was also noted.

3) Oxydiethylene bis(alkyl* dimethyl ammonium chloride)

Not available.

4) Methanol

Methanol is a component of this product. Because methanol is eliminated from the body more slowly than ethanol, it can have cumulative toxicity with repeated exposures (ACGIH, 1992).

Acute dermal, oral, and inhalation exposure to methanol can cause Central Nervous System effects, optic nerve effects, diminished vision, and brain effects (necrosis and hemorrhaging). (Bennett, I.L. et al, 1953)

11 . Toxicological information

Ingestion of methanol can cause Central Nervous System depression, metabolic acidosis, blurred vision and blindness, gastrointestinal effects, and coma and death. (Clayton, G.D. and Clayton, F.E., 1982, Patty's Industrial Hygiene and Toxicology, Vol2C) Dermal exposure to methanol can cause Central Nervous System depression, blurred vision, and gastrointestinal effects. (Downie, A et al, 1992, Occupational Medicine, 42, pp 47-9) Chronic inhalation of methanol can cause Central Nervous System depression, blurred vision, and gastrointestinal effects. (Frederick, L.J. et al, 1984, AIHA Journal, 45, pp 51-5) Chronic inhalation of methanol has caused liver effects in laboratory animals. (Poon, R et al, 1994, Toxocology and Industrial Health 10: 231-245) Chronic oral exposure has caused Central Nervous System effects and eye effects in laboratory animals. [Youssef, A. F. et al (1993) Neurotoxicology and Teratology 15: 223-227; Baumbach, G.L. et al (1977) Archives of Ophthalmology 95: 1859-1865; Hayreh, M.S. et al (1977) Archives of Ophthalmology 95: 1851-1858; Hayreh, M.S. et al (1980) Ocular toxicity of methanol: An experimental study – Raven Press, New York, pages 35-53; and Martin-Amat, G. et al (1977) Archives of Ophthalmology 95: 1847-1850]

Methanol has produced in vivo mutagenicity in animal studies. (Pereira, M.A. et al, 1982) and (Ward, J. B. et al, 1983)

Methanol was mutagenic in yeast (RTECS). Methanol has caused chromosome aberrations in yeast (RTECS) and grasshoppers (Saha & Khudabaksh, 1974).

Methanol has caused birth defects in rats exposed by the oral (Infurna et al, 1981) and inhalation (Nelson et al, 1984; Nelson et al, 1985) routes. Exencephaly (a defect in the skull bone structure that leaves the brain exposed) and cleft palate (a fissure or unformed bone structure in the roof of the mouth (palate), lip, or facial area, occurring during the embryonic stage of development) were increased in fetal mice exposed to methanol at an airborne concentration of 5,000 ppm or higher for 7 hours/day on days 6 to 15 of gestation.

Embryotoxicity and fetotoxicity were seen with maternal exposure to airborne concentrations of 7,500 ppm and above, and reduced fetal weights with concentrations of 10,000 ppm or greater. The NOAEL was 1,000 ppm. Effects similar to those seen in the 10,000 ppm dosage group were also seen in offspring of mice given a dose of 4 g/kg orally (Rogers et al, 1993).

5) Polyoxyalkylene

Not available.

12 . Ecological information

Aquatic ecotoxicity

Product/ingredient name	Result	Species	Exposure
Glutaraldehyde	Acute EC50 0.75 to 1 ppm Fresh water	Daphnia - Water flea - Daphnia magna - <20 hours	48 hours
	Acute LC50 3.5 to 4.8 ppm Fresh water	Fish - Rainbow trout,donaldson trout - Oncorhynchus mykiss	96 hours
Isopropanol	Acute LC50 1400000 to 1950000 ug/L Marine water	Crustaceans - Common shrimp, sand shrimp - Crangon crangon	48 hours
	Acute LC50 >1400000 ug/L	Fish - Western mosquitofish - Gambusia affinis - 20 to 30 mm	96 hours
Methanol	Acute LC50 2500000 ug/L Marine water	Crustaceans - Common shrimp, sand shrimp - Crangon crangon - Adult	48 hours
	Acute LC50 3289 to 4395 mg/L Fresh water	Daphnia - Water flea - Daphnia magna - Neonate - <24 hours	48 hours
	Acute LC50 >100000 ug/L Fresh water	Fish - Fathead minnow - Pimephales promelas - Juvenile (Fledgling, Hatchling, Weanling) - 0.2 to 0.5 g	96 hours

Conclusion/Summary : Not available.

Biodegradability

12 . Ecological information

Conclusion/Summary : Not available.

13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	UN2924	FLAMMABLE LIQUID, CORROSIVE, N.O.S. (Contains: Methanol, Glutaraldehyde)	3 (8)	III		-
TDG Classification	UN2924	FLAMMABLE LIQUID, CORROSIVE, N.O.S. (Contains: Methanol, Glutaraldehyde)	3 (8)	III		-
IMDG Class	UN2924	FLAMMABLE LIQUID, CORROSIVE, N.O.S. (Contains: Methanol, Glutaraldehyde)	3 (8)	III		Emergency schedules (EmS) F-E S-C
IATA-DGR Class	UN2924	FLAMMABLE LIQUID, CORROSIVE, N.O.S. (Contains: Methanol, Glutaraldehyde)	3 (8)	III		-

PG* : Packing group

DOT Reportable Quantity Methanol, 13181 gal of this product.

14 . Transport information

arine pollutant Not applicable.

North-America NAERG : 153

15 . Regulatory information

HCS Classification : Flammable liquid
Corrosive material
Sensitizing material
Target organ effects

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Methanol; Isopropanol; glutaraldehyde
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: X-CIDE™ 107W INDUSTRIAL BACTERICIDE: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard

CERCLA: Hazardous substances.: Potassium hydroxide: 1000 lbs. (454 kg); Methanol: 5000 lbs. (2270 kg);

Clean Water Act (CWA) 307: No products were found.

Clean Water Act (CWA) 311: Potassium hydroxide

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) :
Listed

SARA 313

Product name	CAS number	Concentration
Methanol	67-56-1	1 - 5

Supplier notification

United States inventory (TSCA 8b) : All components are listed or exempted.

Canada

WHMIS (Canada) : Class B-2: Flammable liquid
Class D-1B: Material causing immediate and serious toxic effects (Toxic).
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).
Class E: Corrosive material

Canada (CEPA DSL): : All components are listed or exempted.

16 . Other information

Label requirements : FLAMMABLE LIQUID AND VAPOR. CAUSES EYE AND SKIN BURNS. CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE ALLERGIC SKIN REACTION. MAY BE HARMFUL IF SWALLOWED. PROLONGED OR REPEATED CONTACT MAY DRY SKIN AND CAUSE IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.

National Fire Protection Association (U.S.A.) :

16 . Other information

ate of printing : 7/17/2012.

✓ Indicates information that has changed from previously issued version.

Notice to reader

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Hughes, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

Product Data

Baker Petrolite

X-CIDE® 207
Industrial Bactericide

DESCRIPTION:

This product is a granular isothiazoline used to control bacterial degradation of fracturing and drilling fluids.

APPLICATION:

This biocide must only be applied as specified on the label.

X-CIDE® 207 bactericide is used to control a broad spectrum of microorganisms in water-based drilling, completion, fracturing and packer fluids. A typical application in drilling fluids is 6 to 36 pounds per 400 barrels depending upon the severity of contamination. This product should be added through the mud hopper or in the vortex formed by a paddle agitator.

A typical application in fracturing fluids is 6 pounds per 20,000 gallons water.

TYPICAL PROPERTIES:

Specific Gravity @ 60°F (16°C)	0.72
Density @ 60°F (16°C)	6.00 lbs/US gal (0.72 kg/L)
Flash Point, SFCC	>200°F (>93°C)
Pour Point, ASTM D-97	-20°F (-29°C)
Solubility, 1% in water	Soluble

FEATURES AND BENEFITS:

Feature:
- Granular formulation

Benefits:
- Easier to apply than liquids
- Minimizes exposure during handling
- Unaffected by temperature

Feature:
- Non-formaldehyde formulation

Benefit:
- Environmentally better alternative than many other products

Feature:
- Preservative chemistry

Benefit:
- Maintains fluid integrity for extended periods

Feature:
- Broad spectrum activity

Benefit:
- Effective against sulfate reducing, acid producing, anaerobic and general aerobic bacteria

SAFETY AND HANDLING:

X-CIDE 207 industrial bactericide is available in 1-gallon jugs with each jug containing 6 pounds of product. Available in 6-jug cases.

X-CIDE 207 bactericide is a registered biocide (EPA Registration Number 10707-44). See the container label for precautionary, environmental, first aid, handling, storage and disposal information.

Before handling, storage or use, see the Material Safety Data Sheet (MSDS) for details.

Baker Petrolite 24 Hour Emergency Hotline:
1-800-424-9300 (CHEMTREC) U.S.A.
1-613-996-6666 (CANUTEC) Canada
Baker Petrolite Customer Care Hotline:
1-800-872-1916 (8 a.m. to 5 p.m. CST)

X-CIDE is a registered trademark of Baker Hughes Incorporated.

BAKER HUGHES
Baker Petrolite

Material Safety Data Sheet

Section 1. Chemical Product and Company Identification

Product Name	**X-CIDE® 207 INDUSTRIAL MICROBIOCIDE**	**Code**	XC207
Supplier	Baker Petrolite A Baker Hughes Company 12645 W. Airport Blvd. (77478) P.O. Box 5050 Sugar Land, TX 77487-5050 For Product Information/MSDSs Call: 800-231-3606 (8:00 a.m. - 5:00 p.m. cst, Monday - Friday) 281-276-5400	**Version**	3.0
Material Uses	Microbiocide	**Effective Date**	**4/24/2006**
24 Hour Emergency Numbers	CHEMTREC 800-424-9300 (U.S. 24 hour) Baker Petrolite 800-231-3606 (001)281-276-5400 CANUTEC 613-996-6666 (Canada 24 hours) CHEMTREC Int'l 01-703-527-3887 (International 24 hour)	**Print Date**	4/24/2006
			® a trademark of Baker Hughes, Inc.

National Fire Protection Association (U.S.A.)

Section 2. Hazards Identification

Physical State and Appearance	State: Granular. Solid., Color: Tan. Red., Odor: Mild.
CERCLA Reportable Quantity	Not applicable.
Hazard Summary	DANGER. May cause chronic effects. May be corrosive to eyes, skin and respiratory tract. Contains a component that may cause cancer. May cause skin sensitization (allergic reaction).
Routes of Exposure	Skin (Contact), Eyes, Inhalation.
Potential acute health effects	
Eyes	May be corrosive to the eyes. May cause eye burns and permanent eye injury.
Skin	May be corrosive. Skin contact may produce burns. Skin sensitizer. May cause allergic skin reactions with repeated exposure.
Inhalation	May be irritating to lungs.
Ingestion	Not considered a likely route of exposure, however, may be corrosive if swallowed.
Medical Conditions aggravated by Exposure	Exposure to this product may aggravate medical conditions involving the following: respiratory tract, skin/epithelium, eyes.
See Toxicological Information (section 11)	
Additional Hazard Identification Remarks	Not available.

Continued on Next Page

Section 3. Composition and Information on Ingredients

Name	CAS #	% by Weight
Diatomaceous earth, calcined	91053-39-3	30 - 60
Magnesium nitrate	10377-60-3	5 - 10
5-chloro-2-methyl-4-isothiazolin-3-one	26172-55-4	5 - 10
Magnesium chloride	7786-30-3	1 - 5
2-Methyl-4-isothiazolin-3-one	2682-20-4	1 - 5
Crystalline silica: cristobalite	14464-46-1	0.1 - 1
Crystalline silica: Quartz (SiO2)	14808-60-7	0.1 - 1

See Section 8 for information on permissible exposure limits and threshold limit values.

Section 4. First Aid Measures

Eye Contact	Immediately flush the eye(s) continuously with lukewarm, gently flowing water for at least 20-60 minutes while holding the eyelid(s) open. Get medical attention immediately.
Skin Contact	Remove contaminated clothing and shoes immediately. Wash affected area with soap and mild detergent and large amounts of lukewarm, gently flowing water until no evidence of chemical remains (for at least 20-60 minutes). Get medical attention if irritation occurs.
Inhalation	Remove to fresh air. Oxygen may be administered if breathing is difficult. If not breathing, administer artificial respiration and seek medical attention. Get medical attention if symptoms appear.
Ingestion	Get medical attention immediately. If swallowed, do not induce vomiting unless directed to do so by medical personnel. Wash out mouth with water if person is conscious. Never induce vomiting or give anything by mouth to a victim who is unconscious or having convulsions.
Notes to Physician	Not available.
Additional First Aid Remarks	Not available.

Section 5. Fire Fighting Measures

Flammability of the Product	Not regulated as flammable or combustible.
OSHA Flammability Class	IIIB
Products of Combustion	These products are carbon oxides (CO, CO_2), Hydrogen chloride fumes, nitrogen oxides (NO, NO_2 etc.), Oxides of silicon, Oxides of magnesium, sulfur oxides (SO_2, SO_3 etc.), Aluminum oxides (AlOx), Oxides of iron..
Fire Hazards in Presence of Various Substances	Open Flames/Sparks/Static. Heat.
Fire Fighting Media and Instructions	In case of fire, use foam, dry chemicals, or CO2 fire extinguishers. Evacuate area and fight fire from a safe distance. Water spray may be used to keep fire-exposed containers cool. Keep water run off out of sewers and public waterways.
Protective Clothing (Fire)	Do not enter fire area without proper personal protective equipment, including NIOSH approved self-contained breathing apparatus.
Special Remarks on Fire Hazards	Avoid temperature extremes. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Hazardous combustion products may include hydrogen chloride, carbon monoxide, carbon dioxide and oxides of nitrogen and sulfur.

Continued on Next Page

Section 6. Accidental Release Measures

Spill	Put on appropriate personal protective equipment. Evacuate surrounding areas, if necessary. Vacuum or carefully scoop up spilled materials and place in an appropriate container for disposal. Waste must be disposed of in accordance with federal, state and local environmental control regulations.
Other Statements	Not applicable.
Additional Accidental Release Measures Remarks	Not available.

Section 7. Handling and Storage

Handling and Storage	Put on appropriate personal protective equipment. Avoid contact with eyes, skin, and clothing. Avoid breathing vapors or dusts. Use only with adequate ventilation. Store in a dry, cool and well ventilated area. Keep away from incompatibles. Keep container tightly closed and dry.
Additional Handling and Storage Remarks	Not available.

Section 8. Exposure Controls/Personal Protection

Exposure Limits	Diatomaceous earth, calcined	**ACGIH (United States).** TWA: 10 mg/m^3 TWA: 3 mg/m^3 **OSHA (United States).** TWA: 15 mg/m^3 TWA: 5 mg/m^3
	Magnesium nitrate	Not available.
	5-chloro-2-methyl-4-isothiazolin-3-one	**Manufacturer. (United States).** TWA: 0.076 mg/m^3 STEL: 0.23 mg/m^3
	Magnesium chloride	Not available.
	2-Methyl-4-isothiazolin-3-one	**Manufacturer. (United States).** TWA: 1.5 mg/m^3 STEL: 4.5 mg/m^3
	Crystalline silica: cristobalite	**ACGIH (United States). Notes: Respirable** TWA: 0.025 mg/m^3 8 hour/hours. **OSHA PEL 1989 (United States).** TWA: 0.05 mg/m^3 8 hour/hours.
	Crystalline silica: Quartz (SiO2)	**ACGIH (United States). Notes: Respirable** TWA: 0.025 mg/m^3 8 hour/hours. **OSHA PEL 1989 (United States).** TWA: 0.1 mg/m^3 8 hour/hours.

Continued on Next Page

Additional Information on Exposure Limits	The OSHA Exposure Limit for cristobalite has been revoked. The OSHA Exposure Limit for quartz has been revoked. The OSHA permissible exposure levels shown above are the OSHA 1989 levels or from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Petrolite Corporation recommends that these lower exposure levels be observed as reasonable worker protection.
Engineering Controls	Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors or particles below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection

Personal Protective Equipment recommendations are based on anticipated known manufacturing and use conditions. These conditions are expected to result in only incidental exposure. A thorough review of the job tasks and conditions by a safety professional is recommended, however, to determine the level of personal protective equipment appropriate for these job tasks and conditions.

Eyes	Chemical safety goggles. Use full face shield if splashes could occur.
Body	Wear long sleeves and chemical resistant apron to prevent repeated or prolonged skin contact.
Respiratory	Respirator use is not expected to be necessary under normal conditions of use. In poorly ventilated areas, emergency situations or if exposure levels are exceeded, use NIOSH approved full face respirator.
Hands	Chemical resistant gloves. Nitrile gloves. Butyl rubber gloves.
Feet	Chemical resistant boots or overshoes.
Other information	Not available.

Additional Exposure Control Remarks	Substance may be harmful if swallowed. In extreme cases (ingestion) may cause liver and/or kidney damage.

Section 9. Physical and Chemical Properties

Physical State and Appearance	Granular. Solid.	**Odor**	Mild.
pH	Not available.	**Color**	Tan. Red.
Specific gravity	0.714 - 0.726		
Density	5.95 - 6.05 lbs/gal		
Flash Points	Closed cup: >93.4°C (200°F). (SFCC)		
Flammable Limits	L.E.L. Not available. U.E.L. Not available.		
Autoignition Temperature	Not available.		
Initial Boiling Point	Not available.		
Boiling Point	Not available.		
Vapor Density	>1 (Air = 1)		
Vapor Pressure	15.8 - mm Hg @ 21°C (70°F) Calculated Value for all Components.		
Evaporation Rate	Not Available or Not Applicable for Solids.		
VOC	Not available.		
Viscosity	Not available.		
Pour Point	-20ºF (-29ºC)		
Solubility (Water)	Dispersible		
Physical Chemical Comments	Not available.		

Continued on Next Page

Section 10. Stability and Reactivity

Stability and Reactivity	The product is stable.
Conditions of Instability	Not available.
Incompatibility with Various Substances	Oxidizing material.
Hazardous Decomposition Products	Not applicable.
Hazardous Polymerization	Hazardous polymerization is not expected to occur.
Special Stability & Reactivity Remarks	Not available.

Section 11. Toxicological information

Component Toxicological Information

Acute Animal Toxicity

Diatomaceous earth, calcined	Not available.
Magnesium nitrate	ORAL (LD50): Acute: 500 to 5000 mg/kg [Human].
5-chloro-2-methyl-4-isothiazolin-3-one	Not available.
Magnesium chloride	ORAL (LD50): Acute: 4700 mg/kg [Mouse]. 2800 mg/kg [Rat].
2-Methyl-4-isothiazolin-3-one	Not available.
Crystalline silica: cristobalite	Not available.
Crystalline silica: Quartz (SiO2)	Not available.

Chronic Toxicity Data

1) Diatomaceous earth, calcined

Not available.

2) Magnesium nitrate

Repeated small oral doses of nitrate may cause weakness, depression, headache and mental impairment. Magnesium nitrate is a methemoglobin-forming agent, chronic exposure may effect the ability of the blood carry oxygen causing the lips and skin to turn blue. Magnesium nitrate has not been evaluated for its carcinogenicity in humans or animals. Generally, nitrates can be reduced to nitrites, under anaerobic conditions (without oxygen), and nitrites can react with amines to form carcinogenic N-nitrosamines (Reprotext).

3) 5-chloro-2-methyl-4-isothiazolin-3-one

Not available.

4) Magnesium chloride

Continued on Next Page

Magnesium chloride is a component of this product. Magnesium chloride has caused chromosome abberrations in human cells, but was not mutagenic in mouse or hamster cells. Magnesium chloride was inactive for inducing DNA damage in the B. subtillis rec assay. (Micromedex)

5) 2-Methyl-4-isothiazolin-3-one

Not available.

6) Crystalline silica: cristobalite

Silica crystalline as Cristobalite is a component of this product. Cristobalite is listed by NTP as a suspect carcinogen, by OSHA as a possible carcinogen, and by IARC as a possible carcinogen. Silica exists in several forms, but only the crystalline materials produce the chronic pulmonary condition termed specifically silicosis. Chronic inhalation of airborne crystalline silica dust may lead to fibrotic lung disease, silicosis or cancer (based on animal studies and limited evidence of carcinogenicity in humans).

An inhalation study in humans at a dose of 16 mppcf/8H/17.9Y intermittent produced toxic effects to the lungs, thorax, or respiration resulting in fibrosis, focal (pneumoconiosis), cough and dyspnea (RTECS).

An intratracheal (inside the airway tube between the voice box and chest cavity) dose of 200 mg/kg in rats produced lung, thorax, or respiration effects resulting in fibrosis, focal (pneumoconiosis).(RTECS) An intrapleural (inside the membrane lining of the lung cavity) dose of 90, and 100 mg/kg in rats produced tumors, and blood lymphomas (malignant but treatable cancer) including Hodgkin's disease (a type of lymphoma cancer). (RTECS)

7) Crystalline silica: Quartz (SiO2)

Crystalline silica as quartz is a component of this product. Prolonged inhalation of respirable crystalline quartz may cause delayed chronic lung injury - silicosis. Silicosis is a form of disabling pulmonary fibrosis which can be progressive and may lead to death. Silicosis may progress without further exposure to silica (Hathaway et al, 1991). Chronic inhalation of silica dust suppressed the immune response in mice (Scheuchenzuber et al, 1985), and a decreased immune response has also been shown in silicotics (Barlogova et al, 1981). The effect of silica on the immune mechanism may be mediated by its toxicity to pulmonary macrophages, a critical component of the immune response, and may have implications for the increased susceptibility of silicotics to respiratory infections, particularly tuberculosis. Inhaled crystalline silica particles induced several signs of pulmonary injury and inflammation in rats exposed to an airborne concentration of 50 mg/m3 for 6 hours per day for 5 days (Driscoll et al, 1991).

IARC (International Agency for Research on Cancer) rates crystalline silica as a "Probable Human Carcinogen" (Group 2A). The US NTP (National Toxicology Program) rates respirable crystalline silica as an "Anticipated Carcinogen".

Silica has been inactive for inducing DNA damage in the B. subtilis rec assay (Kanematsu et al, 1980), chromosome damage or sister chromatid exchanges in hamster cells (Price-Jones et al, 1980), chromosome damage in human cells (Oshimura et al, 1984), in vitro oncogenic transformation of hamster cells into cancer cells (Oshimura et al, 1984), and induction of micronuclei in mouse bone marrow (Vanchugova et al, 1985). Crystalline silica has caused DNA strand breaks in vitro; etching the surface with hydrofluoric acid reduced this activity.

At the time of this review, no reproductive studies were found for silica in humans. Few reproductive data are available for silica. As a component of welding fume, it caused infertility and fetal death in rats (Dabrowski et al, 1966). Intratracheal instillation of silica prolonged the estrus cycle in rats (Parsadanian, 1967). So-called "soluble silica" was tested for reproductive effects in rats, but the results were not available at the time of this review (Smith et al, 1973).

Product Toxicological Information

Acute Animal Toxicity	DERMAL (LD50): Acute: >5000 mg/kg [Rabbit].
Target Organs	respiratory tract, skin/epithelium, eyes.

Continued on Next Page

Other Adverse Effects	Eye Irritation Score = 4 (Extreme Irritant/Corrosive). Skin Irritation Score = 4 (Extreme Irritant/Corrosive). Prolonged exposure to silica may cause a lung disease called silicosis. Symptoms of silicosis include pain in the chest, coughing and tiring after slight excursions.

Section 12. Ecological Information

Ecotoxicity	X-CIDE® 207 INDUSTRIAL MICROBIOCIDE	Sheepshead minnow (LC50)	96 hour/hours 9.2 mg/l
BOD5 and COD	Not available.		
Biodegradable/OECD	Not available.		
Toxicity of the Products of Biodegradation	Not available.		
Special Remarks	An EcoTox™ Report, and/or the material's environmental fate is available upon request at the following number: 1-800-235-4249, then press 4.		

Section 13. Disposal Considerations

Responsibility for proper waste disposal rests with the generator of the waste. Dispose of any waste material in accordance with all applicable federal, state and local regulations. Note that these regulations may also apply to empty containers, liners and rinsate. Processing, use, dilution or contamination of this product may cause its physical and chemical properties to change.

Additional Waste Remarks	Not available.

Section 14. Transport Information

DOT Classification	CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S. (Contains: 5-Chloro-2-methyl-4-isothiazolin-3-one, 2-Methyl-4-isothiazolin-3-one), 8, UN3261, II	
DOT Reportable Quantity	Not applicable.	
Marine Pollutant	Not applicable.	
Additional DOT Information	Not available.	
Emergency Response Guide Page Number	154	

Section 15. Regulatory Information

HCS Classification	Target organ effects. Corrosive. Sensitizer. Contains a component that may cause cancer..
U.S. Federal Regulations	

Continued on Next Page

Environmental Regulations	Extremely Hazardous Substances: Not applicable to any components in this product. SARA 313 Toxic Chemical Notification and Release Reporting: Magnesium nitrate; SARA 302/304 Emergency Planning and Notification substances: Not applicable to any components in this product. Hazardous Substances (CERCLA 302): Not applicable to any components in this product. SARA 311/312 MSDS distribution - chemical inventory - hazard identification: immediate health hazard; delayed health hazard; Clean Water Act (CWA) 307 Priority Pollutants: Not applicable to any components in this product. Clean Water Act (CWA) 311 Hazardous Substances: Not applicable to any components in this product. Clean Air Act (CAA) 112(r) Accidental Release Prevention Substances: Not applicable to any components in this product.
Threshold Planning Quantity (TPQ)	Not applicable.
TSCA Inventory Status	All components are included or are exempted from listing on the US Toxic Substances Control Act Inventory. This product contains the following components that are subject to the reporting requirements of TSCA Section 12(b) if exported from the United States: 5-chloro-2-methyl-4-isothiazolin-3-one; 2-Methyl-4-isothiazolin-3-one.
State Regulations	State specific information is available upon request from Baker Petrolite.
International Regulations	
Canada	All components are compliant with or are exempted from listing on the Canadian Domestic Substance List.
WHMIS (Canada)	D-2A, E
European Union	All components are included or are exempted from listing on the European Inventory of Existing Commercial Chemical Substances or the European List of Notified Chemical Substances.
	International inventory status information is available upon request from Baker Petrolite for the following countries: Australia, China, Korea (TCCL), Philippines (RA6969), or Japan.
Other Regulatory Information	This product is subject to regulation under the US Federal Insecticide, Fungicide and Rodenticide ACT (FIFRA) and is therefore exempt from US Toxic Substance Control Act (TSCA) Inventory listing requirements. EPA Registration No. 10707-44. Offshore Chemical Notification Scheme (OCNS) rating: Group A O-VII

Section 16. Other Information

Other Special Considerations	File 59 07/16/03 - Change to Section 15. 04/12/06 - Changes to Sections 2, 3, 5, 8, 9 and 15 04/24/06 - Change to Section 8.

In April, 2005, a number of format changes were made. The most notable of these were switching Sections 2 and 3, moving the exposure limits to Section 8, and moving the flash point from Section 5 to Section 9.

Baker Petrolite Disclaimer

Continued on Next Page

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Petrolite, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

PGE

I

FORMATION TESTING PROGRAM

UIC Permit App.

Attachment I: FORMATION TESTING PROGRAM

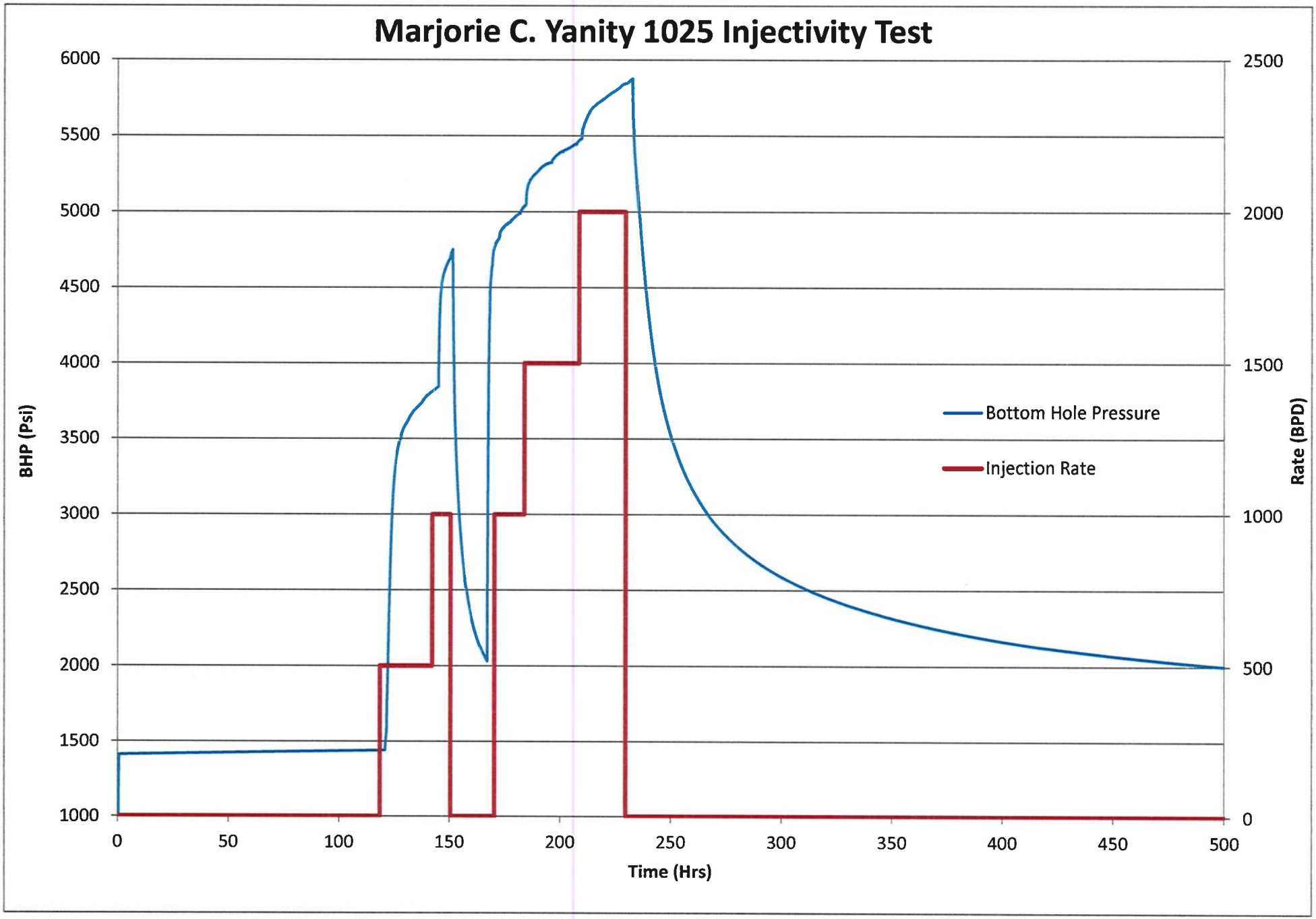
A five day step-rate test was conducted between Nov 12th and Nov 16th, 2012 to evaluate the Huntersville formation's capacity to accept injection fluids. Injection rate and surface pressure were monitored and recorded during the test. Bottom hole pressure and temperature were recorded from Nov 8th thru Nov 26th. The testing indicated that the Marjorie C. Yanity 1025 well may be capable of sustaining injection rates on the order of 2 Bbl/min or approximately 2,800 Bbl/day on a short-term basis. Considering the duration of the test, a maximum injection rate of 2,000 Bbl/day is proposed for the operation of the facility, with an average injection rate of 1,000 Bbl/day expected.

The Marjorie C. Yanity 1025 was initially completed by perforating and stimulating with acid. Based on the closure stress determined from the original completion an MASIP of 2,934 psi for a 10.2 ppg injected fluid was calculated (see Attachment H). An MASIP of 2,900 psi is proposed for the operation of the well.

Included in this section:

- Plot of injectivity test data.

PGE


Marjorie C. Yanity 1025 Injectivity Test
BHP (Psi)
Rate (BPD)
Time (Hrs)
Bottom Hole Pressure
Injection Rate
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
2500
2000
1500
1000
500
0
0
50
100
150
200
250
300
350
400
450
500

PGE

J

STIMULATION PROGRAM

UIC Permit App.

Attachment J: STIMULATION PROGRAM

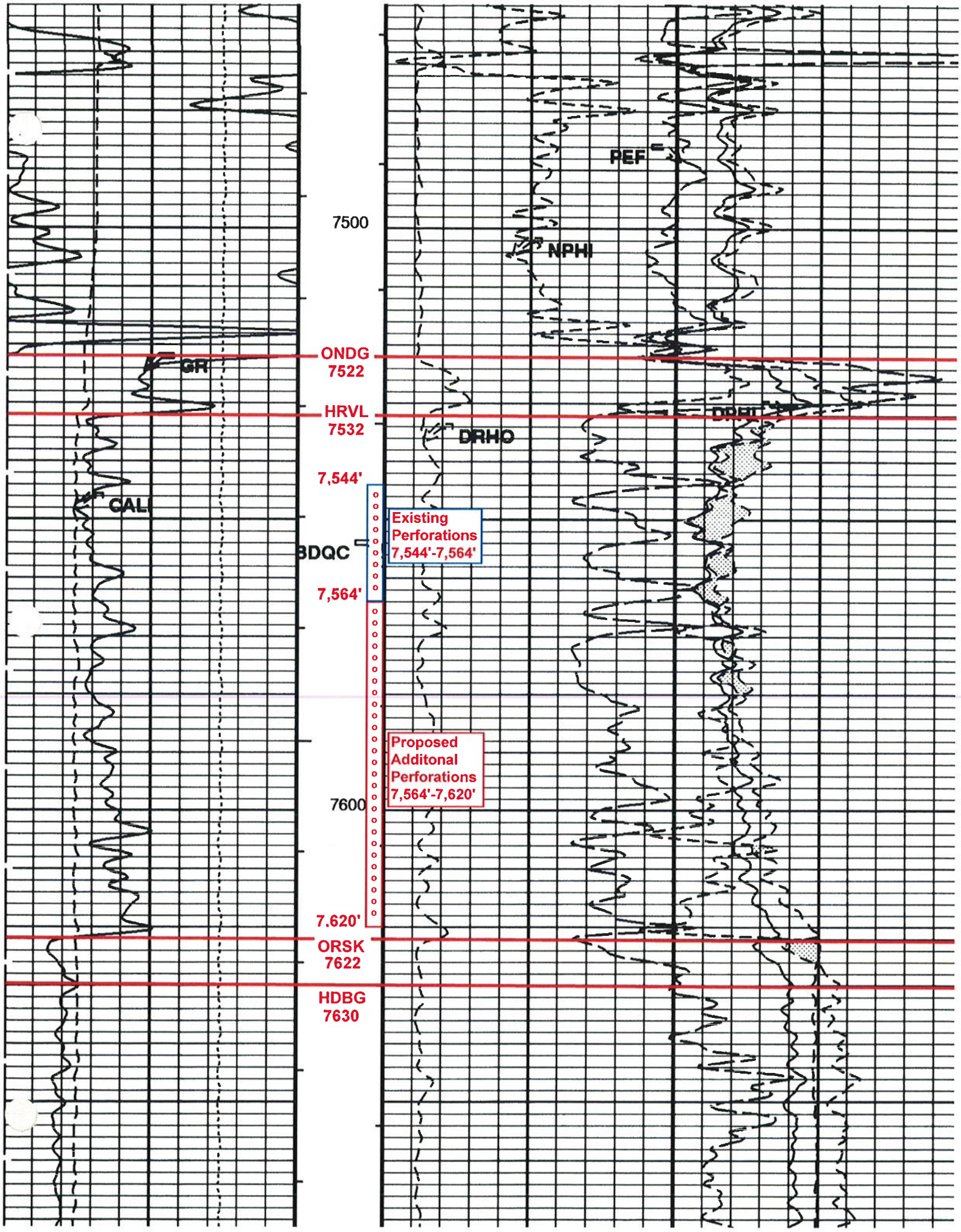
Additional perforations will be added to the Marjorie C. Yanity 1025 from 7,564' to 7,620'. Perforations will be shot at six shots per foot and will be treated with acid. Periodic acid washes will be performed as needed during the life of the well to remove scale build-up and maintain injectivity.

If necessary to increase future injectivity, the well may be hydraulically fractured in the Huntersville Chert. Should it be determined that stimulation is needed, a plan for the stimulation will be submitted.

Included in this section:

- Diagram highlighting proposed additional perforations from 7,564' to 7,620'.

PGE


PEF
NPHI
7500
ONDG
7522
GR
HRVL
7532
DRHO
7,544'
CALI
Existing
Perforations
7,544'-7,564'
BDQC
7,564'
Proposed
Additonal
Perforations
7,564'-7,620'
7600
7.620'
ORSK
7622
HDBG
7630

K

INJECTION PROCEDURES

UIC Permit App.

Attachment K: INJECTION PROCEDURES

Injection will be conducted using a positive displacement pump and are expected to operate 24 hours a day. The positive displacement pump will be equipped with an automatic shutdown set to maximum tubing and casing pressures. Facilities will include 4,000 Bbls of storage capacity and monitoring equipment designed to meter injection rate and tank levels. Tubing and production casing pressures, injection rate, and tank levels will be continuously monitored with a SCADA system that can be accessed remotely.

L

CONSTRUCTION PROCEDURES

UIC Permit App.

Attachment L: CONSTRUCTION PROCEDURES

Included in this section for the Marjorie C. Yanity 1025 well are the following:

- Litho-Density/Compensated Neutron/Gamma Ray Log.
- Cement Bond/Gamma Ray/CCL Log.