

Formation Testing Program
Zelman#1 Injection Well

Maximum Allowable Bottom Hole Injection Pressure Request of 6575 psi.

Since the Facility will be receiving fluids with a specific gravity ranging from 1.0 to 1.26; we are requesting a maximum allowable bottom-hole pressure of 6575 psi based on our fracture gradient of 0.90 psi/ft.

$$\begin{aligned}\text{Fracture Pressure} &= \text{Fracture Gradient} \times \text{depth} \\ &= 0.90 \text{ psi/ft} \times 7306 \\ &= 6575 \text{ psi}\end{aligned}$$

The corresponding surface pressure range is from 3411 psi for 1.0 specific gravity fluids to 2589 psi for 1.26 specific gravity fluids as calculated below.

For: 1.0 SG Fluids

$$P_{\text{surface}} = P_{\text{btm}} - \text{Phydrostatic}$$

$$P_{\text{surface}} = ((.90) - (.433)(1.0))(7306)$$

$$P_{\text{surface}} = 3411 \text{ psi}$$

For: 1.26 SG Fluids

$$P_{\text{surface}} = P_{\text{btm}} - \text{Phydrostatic}$$

$$P_{\text{surface}} = ((.90) - (.433)(1.26))(7306)$$

$$P_{\text{surface}} = 2589 \text{ psi}$$

Zelman: Offset Fracture Pressure Calculations:

Well 37-033-30327:

$$\begin{aligned}\text{Fracture Gradient} &= (P_{\text{surf}} + P_{\text{hydrostatic}}) / \text{depth} \\ &= ((3800 + (0.052)(8.33)(7233)) / 7233) \\ &= .9585 \text{ psi/ft}\end{aligned}$$

Well 37-033-20333

$$\begin{aligned}\text{Fracture Gradient} &= (P_{\text{surf}} + P_{\text{hydrostatic}}) / \text{depth} \\ &= ((3750 + (0.052)(8.33)(7266)) / 7266) \\ &= .9493 \text{ psi/ft}\end{aligned}$$

Maximum injection Rate Requested is 2396 bbl/day.

This rate is based upon the data and calculations on the Green Glenn #1 injection test.

Average Injection Rate and Average Injection Pressure

The proposed average injection rate is 2000 bbls per day with an average bottom hole injection pressure of 5500 psi.

Fracture Gradient of Confining Zones

No fracture data is available in the area on the confining zones, the Onondago Limestone and the Helderberg Limestone. However, gas storage in the Chert/Oriskany formations throughout Pennsylvania confirms reservoir confinement by the Onondago and the Helderberg.

DM-OG-4-56

Punyslawney - Driftwood Field
Helvetia PoolEPA Permit# PAS2D020BLCE
DEP Permit# 37-033-27255-00-001,850' S 41° 05' 00"
11,050' W 78° 42' 30" (4)COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF MINESOil and Gas Division
HARRISBURG

083-20327

QUADRANGLE: Penfield☒ 7 1/2' ☒ 15'PERMIT NO. CLE 327MAP REFERENCE: 9S 17W S63 W117KIND OF WELL: Gas
(Oil, Gas, Other)

WELL RECORD

		Size of Casing and Tubing	Used in Drilling	Left in Well	Packers: Type, Size and Depth
COMPANY: <u>New York State Natural Gas Corporation</u>					
ADDRESS: <u>#2 Gateway Center, Pittsburgh 22, Pa.</u>		<u>13-3/8"</u>	<u>59'</u>	<u>59'</u>	
FARM <u>John R. Potter</u>	ACRES <u>68</u>	<u>9-5/8"</u>	<u>1251'</u>	<u>1251'</u>	<u>BHS @ 1248'</u>
WELL (FARM) NO. <u>2</u>	GO. SERIAL NO. <u>N-790</u>	<u>7"</u>	<u>7305'</u>	<u>7305'</u>	<u>BHS @ 7234'</u>
ELEVATION: <u>1640.60</u>		LEASE: <u>58357</u>			
TOWNSHIP: <u>Brady</u>		COUNTY: <u>Clearfield</u>			
DRILLING COMMENCED: <u>8/31/60</u>		COMPLETED: <u>9/29/60</u>			
PRODUCTION: <u>30,370,000</u> cubic feet		PERFORATIONS AT:			
ROCK PRESSURE: <u>3293</u> psig <u>4</u> days <u>max</u>					
WELL TREATMENT: (Shooting, Acidizing, Fracturing Etc.)					
<u>9/27/60 - Fractured w/20,500 gals. water, 1,000 gal. MCA, 150 lbs. gel and 20,000 lbs. sand. Breakdown pressure 2400 lbs.; maximum pressure 3800 lbs; minimum pressure. 2350 lbs.; final pressure 3800 lbs. Original open flow of 7,312,000 cubic feet increased to 30,370,000 cu. ft. a/f Rock pressure b/f 3318 lbs. in 11 days</u>					
		CEMENTING DATA: (Size Pipe, Depth, No. Bags, Date)			
		<u>8/31/60 - 13-3/8" cem. @ 70' w/50 sacks</u>			
		<u>9/4/60 - 9-5/8" cem @ 1248' w/50 sacks cem., 15 sacks acugel, & 25 sacks quadroflos</u>			
RESULTS AFTER TREATMENT:					
ROCK PRESSURE AFTER TREATMENT:		<u>9/13/60 - 7" cem. @ 7234' w/125 sacks.</u>			

REMARKS:

FORMATION	TOP	BOTTOM	GAS AT	OIL AT	WATER AT (Fresh or Salt Water)	REMARKS
Surface	0	15				
Sand & shale	15	143				
Red shale	143	146				
Sand & shale	146	205				
Coal	205	209				
Sand & shale	209	217				
Shale & sand	217	303				
Coal or black shale	303	306				
Shale & sand	306	320				
Shale	320	340				
Sand	340	550				
Shale & sand	550	580				
Sand	580	650				
Shale & sand	650	692				
Sand	692	733				
Red shale	733	735				

(Over)

Well N 790

FORMATION	TOP	BOTTOM	GAS AT	OIL AT	WATER AT (Fresh or Salt Water)	REMARKS
Sand & shale	735	1010				
Black shale	1010	1020				
Sand & shale	1020	2293				
Shale	2293	2295				
Shale & sand	2295	2601				
Sand & shale	2601	3415				
Shale & sand	3415	4015				
Sand & shale	4015	5025				
Shale & sand	5025	5475				
Sand & shale	5475	5680				
Shale & sand	5680	5857				
Sand & shale	5857	6030				
Lime & shale	6030	6137				
Lime	6137	6195				
Shale & shells	6195	6642				
Lime	6642	6750				
Shale & shells	6750	7219				
Onondaga lime	7219	7233				
Chert	7233	7288				
Sand	7288	7317	7291-7303			
Lime	7317					
Total Depth		7318				
Sample Study						
Tully	6642					
Onondaga	7219					
Chert	7233					
Oriakany	7288	7317	7291-7303			

RECEIVED
DEPT. OF MINES
& MINERAL IND.

NOV 29 AM 8:44

DATE October 28, 1960

APPROVED New York State Natural Gas Corporation

BY

D. E. Barger

TITLE

Superintendent of Operations

*File under Nat'l Bank
Dubois*

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF MINES

Oil and Gas Division
HARRISBURG

083-20333

QUADRANGLE:

W. H. Ginter
Penfield

☒ 7 1/2' ☐ 15'

PERMIT NO. CLE-999

MAP REFERENCE: 9S 17W S63 W17 & 118

KIND OF WELL: GAS
(Oil, Gas, Other)

WELL RECORD

COMPANY:	New York State Natural Gas Corporation	Size of Casing and Tubing	Used in Drilling	Left in Well	Packers: Type, Size and Depth
ADDRESS:	2 Gateway Center, Pgh. 22, Penna.	13 3/8"	96'	96'	
FARM:	H. E. Ginter Est. ACRES 172	9 5/8"	1285'	1285'	BHS @ 1287
WELL (FARM) NO.	1 CO. SERIAL NO. N-796	7"	7335'	7335'	BHS @ 7267
ELEVATION:	1642.34 LEASE: 60986				
TOWNSHIP:	Brady COUNTY: Clearfield				
DRILLING COMMENCED:	12-1-60 COMPLETED: 12-23-60				
PRODUCTION:	10,504,000 cubic feet				PERFORATIONS AT:
ROCK PRESSURE:	2340 psig 70 hrs.				
WELL TREATMENT:	(Shooting, Acidizing, Fracturing Etc.)				
12-22-60-Fractured w/20,000 gals. water, 200 lb. gel, 1,000 gal acid and 20,000 lb sand. Break-down pressure 3000 lbs; maximum pressure 3750 lbs. Original open flow of 48,000 cubic ft. in chert and 3825,000 cubic ft. in Oriskany increased to 10,405,000 cubic ft. A/F. R.P. b/f 2450 lbs 2 1/2 hrs. dead weight.		CEMENTING DATA: (Size Pipe, Depth, No. Bags, Date)			
		12-3-60 - 13 3/8" cem. w/90 sax			
		12-7-60 - 9 5/8" cem. @ 1287 w/50 sax cem &			
RESULTS AFTER TREATMENT:		20 sax aquagel			
ROCK PRESSURE AFTER TREATMENT:		12-16-60 - 7" cem @ 7267 w/125 sax			

REMARKS: * Well Permit Request and all initial Records Referred to this Well as "DuBois Deposit National Bank Trustee Etal". They are in fact Successor Trustee Under the Henry E. Ginter Deed of Trust. In the Interest of Brevity, We have Established and are Using the Farm Name as Recorded Above.

FORMATION	TOP	BOTTOM	GAS AT	OIL AT	WATER AT (Fresh or Salt Water)	REMARKS
Surface	0	5				
Sand & shale	5	105				
Shale & Sand	105	150				
Sand & Shale	150	340				
Coal	340	345				
Sand & Shale	345	375				
Shale & Sand	375	468				
Coal	468	474			458	
Shale & Sand	474	532				
Sand & Shale	532	735				
Sand	735	785				
Sand & Shale	785	1720				
Shale & Sand	1770	2165				
Sand & Shale	2165	4310	3385-92 (Show)			
Shale & sand	4310	5170				
Sand & Shale	5170	5405				

(Over)

FORMATION	TOP	BOTTOM	GAS AT	OIL AT	WATER AT (Fresh or Salt Water)	REMARKS
Shale & Shells	5405	6150				
Sand & Shale	6150	6425				
Shale & Shells	6425	6686				
Lime	6686	6784				
Shale & Shells	6784	7248				
Lime	7248	7266				
Chert	7266	7314	7267 & 7300			
Sand	7314	7343	7316-25			
Lime	7343					
Total Depth		7344				
<u>Sample Study</u>						
Tully	6686					
Onondaga	7248					
Chert	7266					
Oriskany	7314	7343				

DATE January 24, 1961

APPROVED New York State Natural Gas Corporation, OWNER

BY H. R. Raper TITLE
Superintendent Operations