

**Attachment "I"**  
**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

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

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

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

See "Attachment K" for operational details on monitoring of fluid density and corresponding surface pressures.

Zelman: Offset Fracture Pressure Calculations:

Well 37-033-30327:

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

Well 37-033-20333

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

**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

Pennsylvania - Driftwood Field  
Helvetia Pool

1,850' S 41° 05' 00"  
11,050' W 78° 42' 30" (4)

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF MINES

Oil and Gas Division  
HARRISBURG

033-20327

LUTHERSBURG  
QUADRANGLE: ~~Penfield~~

7 1/2'  15'

PERMIT NO. ~~GLE-327~~

MAP REFERENCE: 9S 17W S63 W117

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, Pittsburgh 22, Pa.	13-3/8"	59'	59'	
FARM: John R. Potter ACRES 68	9-5/8"	1251'	1251'	BHS @ 1248'
WELL(FARM)NO. 2 CO. SERIAL NO. N-790	7"	7305'	7305'	BHS @ 7234'
ELEVATION: 1640.60 LEASE: 58357				
TOWNSHIP: Brady COUNTY: Clearfield				
DRILLING COMMENCED: 8/31/60 COMPLETED: 9/29/60				
PRODUCTION: 30,370,000 cubic feet				PERFORATIONS AT:
ROCK PRESSURE: 3293 psig 4 days				
WELL TREATMENT: (Shooting, Acidizing, Fracturing Etc.)				
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.				
	CEMENTING DATA: (Size Pipe, Depth, No. Bags, Date)			
	8/31/60 - 13-3/8" cem. @ 70' w/50 sacks			
	9/4/60 - 9-5/8" cem @ 1248' w/50 sacks cem., 15 sacks acuagel, & 25 sacks quadroflos			
RESULTS AFTER TREATMENT:				
ROCK PRESSURE AFTER TREATMENT:	9/13/60 - 7" cem. @ 7234' w/125 sacks.			

REMARKS:

FORMATION	TOP	BOTTOM	GAS AT	OIL AT	WATER AT (Fresh or Salt Water)	REMARKS
Surface	0	15				
Sand & shale	15	143			FW 75	
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)

*File under:  
DuBois Nat'l Bank*

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF MINES

Oil and Gas Division  
HARRISBURG

083-20333

QUADRANGLE: Penfield  7 1/2'  15' PERMIT NO. CLE-393

MAP REFERENCE: 9S 17W S63 W117 & 118 KIND OF WELL: GAS  
(Oil, Gas, Other)

WELL RECORD

COMPANY: <u>New York State Natural Gas Corporation</u>	Size of Casing and Tubing	Used in Drilling	Left in Well	Packers: Type, Size and Depth
ADDRESS: <u>2 Gateway Center, Pgh. 22, Penna.</u>	<u>13 3/8"</u>	<u>96'</u>	<u>96'</u>	
FARM: <u>H. E. Ginter Est.</u> ACRES <u>172</u>	<u>9 5/8"</u>	<u>1285'</u>	<u>1285'</u>	<u>BHS @ 1287</u>
WELL (FARM) NO. <u>1</u> CO. SERIAL NO. <u>N-796</u>	<u>7"</u>	<u>7335'</u>	<u>7335'</u>	<u>BHS @ 7267</u>
ELEVATION: <u>1642.34</u> LEASE: <u>60986</u>				
TOWNSHIP: <u>Brady</u> COUNTY: <u>Clearfield</u>				
DRILLING COMMENCED: <u>12-1-60</u> DRILLING COMPLETED: <u>12-23-60</u>				
PRODUCTION: <u>10,504,000</u> cubic feet				PERFORATIONS AT:
ROCK PRESSURE: <u>2340</u> psig <u>70</u> hrs.				
WELL TREATMENT: (Shooting, Acidizing, Fracturing Etc.) <u>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 24 1/2 hrs. dead weight.</u>				
CEMENTING DATA: (Size Pipe, Depth, No. Bags, Date)				
	<u>12-3-60 - 13 3/8" cem. w/90 sax</u>			
	<u>12-7-60 - 9 5/8" cem. @ 1287 w/50 sax cem &amp;</u>			
RESULTS AFTER TREATMENT:	<u>20 sax aquagel</u>			
ROCK PRESSURE AFTER TREATMENT:	<u>12-16-60 - 7" cem @ 7267 w/125 sax</u>			

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. B. Raper TITLE  
Superintendent Operations