TETRA TECH

BRINE DISPOSAL WELL PERMIT APPLICATION
SMITH-RAS UNIT #1

Bear Lake Properties, LLC

March 2015

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March 24, 2015

S. Stephen Platt
U.S. EPA Region III
Ground Water & Enforcement Branch (3WP22)
1650 Arch Street
Philadelphia, PA 19103

Subject: Application For Underground Injection Control Class II-D Brine Disposal Well Bear Lake Properties Smith-Ras Unit #1 Well, Warren County, Pennsylvania

Dear Mr. Platt:

Enclosed please find two (2) copies of the Underground Injection Control Class II-D Brine Disposal Well permit application for the Bear Lake Properties, LLC (Bear Lake Properties) Smith-Ras Unit #1 well located in Columbus Township, Warren County, Pennsylvania. As indicated in Section 10 "Necessary Resources", Bear Lake Properties will provide under separate cover the Certificate of Deposit to verify they have the necessary resources to properly plug and abandon the well.

Your prompt review of the application would be greatly appreciated. Please feel free to contact Karl Kimmich of Bear Lake Properties at (724) 444-7501 or me at (412) 921-4006 if you have questions or comments.

Sincerely,
Tetra Tech, Inc.

Dale E. Skoff

Dale E. Skoff, P.G.
Sr. Project Manager

cc: Dave Rectenwald – EPA
Karl Kimmich – Bear Lake Properties
John Holko – Bear Lake Properties

Tetra Tech NUS
661 Andersen Drive, Pittsburgh, PA 15220
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Underground Injection Control (UIC) Class II Well Permit Application
Bear Lake Properties, LLC
Smith-Ras Unit #1 Well
Columbus Township, Warren County, PA

OMB No. 2040-0042 Approval Expires 12/31/2011

United States Environmental Protection Agency

Underground Injection Control Permit Application

(Collected under the authority of the Safe Drinking Water Act. Sections 1421, 1422, 40 CFR 144)

I. EPA ID Number

		T/A	C
U			

Read Attached Instructions Before Starting

For Official Use Only

Application approved mo day year	Date received mo day year	Permit Number	Well ID	FINDS Number

II. Owner Name and Address

Owner Name: Bear Lake Properties, LLC

Street Address: 3000 Village Run Road, Unit 103, #223

Phone Number: (724) 444-7501

City: Wexford | State: PA | ZIP CODE: 15090

III. Operator Name and Address

Owner Name: Bear Lake Properties, LLC

Street Address: 3000 Village Run Road, Unit 103, #223

Phone Number: (724) 444-7501

City: Wexford | State: PA | ZIP CODE: 15090

IV. Commercial Facility

- [x] Yes
- [ ] No

V. Ownership

- [x] Private
- [ ] Federal
- [ ] Other

VI. Legal Contact

- [ ] Owner
- [x] Operator

VII. SIC Codes

1389 - Oil and Gas Field Services, Not Elsewhere Classified

VIII. Well Status *(Mark "x")*

- [ ] A. Operating — Date Started mo day year:
- [x] B. Modification/Conversion
- [ ] C. Proposed

IX. Type of Permit Requested *(Mark "x" and specify if required)*

- [x] A. Individual
- [ ] B. Area

Number of Existing Wells	Number of Proposed Wells	Name(s) of field(s) or project(s)
1		Smith-Ras Unit #1

X. Class and Type of Well *(see reverse)*

A. Class(es) (enter code(s))	B. Type(s) (enter code(s))	C. If class is "other" or type is code 'x,' explain	D. Number of wells per type (if area permit)
II	D		

XI. Location of Well(s) or Approximate Center of Field or Project

Latitude Deg	Min	Sec	Longitude Deg	Min	Sec	Township and Range Sec	Twp	Range	1/4 Sec	Feet From	Line	Feet From	Line
41	59	33.8	-79	32	41.8								

XII. Indian Lands *(Mark "x")*

- [ ] Yes
- [x] No

XIII. Attachments

(Complete the following questions on a separate sheet(s) and number accordingly; see instructions)

For Classes I, II, III, (and other classes) complete and submit on a separate sheet(s) Attachments A--U (pp 2-6) as appropriate. Attach maps where required. List attachments by letter which are applicable and are included with your application.

XIV. Certification

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

A. Name and Title *(Type or Print)*	B. Phone No. *(Area Code and No.)*
John C. Holko, Vice President	(724) 444-7501
C. Signature	D. Date Signed
	03/06/2015

EPA Form 7520-6 (Rev. 12-08)

Well Class and Type Codes

Class I Wells used to inject waste below the deepest underground source of drinking water.

Type **"I"** Nonhazardous industrial disposal well
"M" Nonhazardous municipal disposal well
"W" Hazardous waste disposal well injecting below USDWs
"X" Other Class I wells (not included in Type "I," "M," or "W")

Class II Oil and gas production and storage related injection wells.

Type **"D"** Produced fluid disposal well
"R" Enhanced recovery well
"H" Hydrocarbon storage well (excluding natural gas)
"X" Other Class II wells (not included in Type "D," "R," or "H")

Class III Special process injection wells.

Type **"G"** Solution mining well
"S" Sulfur mining well by Frasch process
"U" Uranium mining well (excluding solution mining of conventional mines)
"X" Other Class III wells (not included in Type "G," "S," or "U")

Other Classes Wells not included in classes above.
Class V wells which may be permitted under §144.12.
Wells not currently classified as Class I, II, III, or V.

Attachments to Permit Application

Class	Attachments
I new well	A, B, C, D, F, H – S, U
existing	A, B, C, D, F, H – U
II new well	A, B, C, E, G, H, M, Q, R; optional – I, J, K, O, P, U
existing	A, E, G, H, M, Q, R, – U; optional – J, K, O, P, Q
III new well	A, B, C, D, F, H, I, J, K, M – S, U
existing	A, B, C, D, F, H, J, K, M – U
Other Classes	To be specified by the permitting authority

INSTRUCTIONS - Underground Injection Control (UIC) Permit Application

Paperwork Reduction Act: The public reporting and record keeping burden for this collection of information is estimated to average 224 hours for a Class I hazardous well application, 110 hours for a Class I non-hazardous well application, 67 hours for a Class II well application, and 132 hours for a Class III well application. Burden means the total time, effort, or financial resource expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal Agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to the collection of information; search data sources; complete and review the collection of information; and, transmit or otherwise disclose the information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including the use of automated collection techniques to Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822), 1200 Pennsylvania Ave., NW, Washington, DC 20460. Include the OMB control number in any correspondence. Do not send the completed forms to this address.

This form must be completed by all owners or operators of Class I, II, and III injection wells and others who may be directed to apply for permit by the Director.

I. **EPA I.D. NUMBER** - Fill in your EPA Identification Number. If you do not have a number, leave blank.

II. **OWNER NAME AND ADDRESS** - Name of well, well field or company and address.

III. **OPERATOR NAME AND ADDRESS** - Name and address of operator of well or well field.

IV. **COMMERCIAL FACILITY** - Mark the appropriate box to indicate the type of facility.

V. **OWNERSHIP** - Mark the appropriate box to indicate the type of ownership.

VI. **LEGAL CONTACT** - Mark the appropriate box.

VII. **SIC CODES** - List at least one and no more than four Standard Industrial Classification (SIC) Codes that best describe the nature of the business in order of priority.

VIII. **WELL STATUS** - Mark Box A if the well(s) were operating as injection wells on the effective date of the UIC Program for the State. Mark Box B if wells(s) existed on the effective date of the UIC Program for the State but were not utilized for injection. Box C should be marked if the application is for an underground injection project not constructed or not completed by the effective date of the UIC Program for the State.

IX. **TYPE OF PERMIT** - Mark "Individual" or "Area" to indicate the type of permit desired. Note that area permits are at the discretion of the Director and that wells covered by an area permit must be at one site, under the control of one person and do not inject hazardous waste. If an area permit is requested the number of wells to be included in the permit must be specified and the wells described and identified by location. If the area has a commonly used name, such as the "Jay Field," submit the name in the space provided. In the case of a project or field which crosses State lines, it may be possible to consider an area permit if EPA has jurisdiction in both States. Each such case will be considered individually, if the owner/operator elects to seek an area permit.

X. **CLASS AND TYPE OF WELL** - Enter in these two positions the Class and type of injection well for which a permit is requested. Use the most pertinent code selected from the list on the reverse side of the application. When selecting type X please explain in the space provided.

XI. **LOCATION OF WELL** - Enter the latitude and longitude of the existing or proposed well expressed in degrees, minutes, and seconds or the location by township, and range, and section, as required by 40 CFR Part 146. If an area permit is being requested, give the latitude and longitude of the approximate center of the area.

XII. **INDIAN LANDS** - Place an "X" in the box if any part of the facility is located on Indian lands.

XIII. **ATTACHMENTS** - Note that information requirements vary depending on the injection well class and status. Attachments for Class I, II, III are described on pages 4 and 5 of this document and listed by Class on page 2. Place EPA ID number in the upper right hand corner of each page of the Attachments.

XIV. **CERTIFICATION** - All permit applications (except Class II) must be signed by a responsible corporate officer for a corporation, by a general partner for a partnership, by the proprietor of a sole proprietorship, and by a principal executive or ranking elected official for a public agency. For Class II, the person described above should sign, or a representative duly authorized in writing.

INSTRUCTIONS - Attachments

Attachments to be submitted with permit application for Class I, II, III and other wells.

A. **AREA OF REVIEW METHODS** - Give the methods and, if appropriate, the calculations used to determine the size of the area of review (fixed radius or equation). The area of review shall be a fixed radius of 1/4 mile from the well bore unless the use of an equation is approved in advance by the Director.

B. **MAPS OF WELL/AREA AND AREA OF REVIEW** - Submit a topographic map, extending one mile beyond the property boundaries, showing the injection well(s) or project area for which a permit is sought and the applicable area of review. The map must show all intake and discharge structures and all hazardous waste treatment, storage, or disposal facilities. If the application is for an area permit, the map should show the distribution manifold (if applicable) applying injection fluid to all wells in the area, including all system monitoring points. Within the area of review, the map must show the following:

Class I

The number, or name, and location of all producing wells, injection wells, abandoned wells, dry holes, surface bodies of water, springs, mines (surface and subsurface), quarries, and other pertinent surface features, including residences and roads, and faults, if known or suspected. In addition, the map must identify those wells, springs, other surface water bodies, and drinking water wells located within one quarter mile of the facility property boundary. Only information of public record is required to be included in this map;

Class II

In addition to requirements for Class I, include pertinent information known to the applicant. This requirement does not apply to existing Class II wells;

Class III

In addition to requirements for Class I, include public water systems and pertinent information known to the applicant.

C. **CORRECTIVE ACTION PLAN AND WELL DATA** - Submit a tabulation of data reasonably available from public records or otherwise known to the applicant on all wells within the area of review, including those on the map required in B, which penetrate the proposed injection zone. Such data shall include the following:

Class I

A description of each well's types, construction, date drilled, location, depth, record of plugging and/or completion, and any additional information the Director may require. In the case of new injection wells, include the corrective action proposed to be taken by the applicant under 40 CFR 144.55.

Class II

In addition to requirement for Class I, in the case of Class II wells operating over the fracture pressure of the injection formation, all known wells within the area of review which penetrate formations affected by the increase in pressure. This requirement does not apply to existing Class II wells.

Class III

In addition to requirements for Class I, the corrective action proposed under 40 CFR 144.55 for all Class III wells.

D. **MAPS AND CROSS SECTION OF USDWs** - Submit maps and cross sections indicating the vertical limits of all underground sources of drinking water within the area of review (both vertical and lateral limits for Class I), their position relative to the injection formation and the direction of water movement, where known, in every underground source of drinking water which may be affected by the proposed injection. (Does not apply to Class II wells.)

E. **NAME AND DEPTH OF USDWs (CLASS II)** - For Class II wells, submit geologic name, and depth to bottom of all underground sources of drinking water which may be affected by the injection.

F. **MAPS AND CROSS SECTIONS OF GEOLOGIC STRUCTURE OF AREA** - Submit maps and cross sections detailing the geologic structure of the local area (including the lithology of injection and confining intervals) and generalized maps and cross sections illustrating the regional geologic setting. (Does not apply to Class II wells.)

G. **GEOLOGICAL DATA ON INJECTION AND CONFINING ZONES (Class II)** - For Class II wells, submit appropriate geological data on the injection zone and confining zones including lithologic description, geological name, thickness, depth and fracture pressure.

H. **OPERATING DATA** - Submit the following proposed operating data for each well (including all those to be covered by area permits): (1) average and maximum daily rate and volume of the fluids to be injected; (2) average and maximum injection pressure; (3) nature of annulus fluid; (4) for Class I wells, source and analysis of the chemical, physical, radiological and biological characteristics, including density and corrosiveness, of injection fluids; (5) for Class II wells, source and analysis of the physical and chemical characteristics of the injection fluid; (6) for Class III wells, a qualitative analysis and ranges in concentrations of all constituents of injected fluids. If the information is proprietary, maximum concentrations only may be submitted, but all records must be retained.

I. **FORMATION TESTING PROGRAM** - Describe the proposed formation testing program. For Class I wells the program must be designed to obtain data on fluid pressure, temperature, fracture pressure, other physical, chemical, and radiological characteristics of the injection matrix and physical and chemical characteristics of the formation fluids.

For Class II wells the testing program must be designed to obtain data on fluid pressure, estimated fracture pressure, physical and chemical characteristics of the injection zone. (Does not apply to existing Class II wells or projects.)

For Class III wells the testing must be designed to obtain data on fluid pressure, fracture pressure, and physical and chemical characteristics of the formation fluids if the formation is naturally water bearing. Only fracture pressure is required if the program formation is not water bearing. (Does not apply to existing Class III wells or projects.)

J. **STIMULATION PROGRAM** - Outline any proposed stimulation program.

K. **INJECTION PROCEDURES** - Describe the proposed injection procedures including pump, surge, tank, etc.

L. **CONSTRUCTION PROCEDURES** - Discuss the construction procedures (according to §146.12 for Class I, §146.22 for Class II, and §146.32 for Class III) to be utilized. This should include details of the casing and cementing program, logging procedures, deviation checks, and the drilling, testing and coring program, and proposed annulus fluid. (Request and submission of justifying data must be made to use an alternative to packer for Class I.)

M. **CONSTRUCTION DETAILS** - Submit schematic or other appropriate drawings of the surface and subsurface construction details of the well.

N. **CHANGES IN INJECTED FLUID** - Discuss expected changes in pressure, native fluid displacement, and direction of movement of injection fluid. (Class III wells only.)

O. **PLANS FOR WELL FAILURES** - Outline contingency plans (proposed plans, if any, for Class II) to cope with all shut-ins or wells failures, so as to prevent migration of fluids into any USDW.

P. **MONITORING PROGRAM** - Discuss the planned monitoring program. This should be thorough, including maps showing the number and location of monitoring wells as appropriate and discussion of monitoring devices, sampling frequency, and parameters measured. If a manifold monitoring program is utilized, pursuant to §146.23(b)(5), describe the program and compare it to individual well monitoring.

Q. **PLUGGING AND ABANDONMENT PLAN** - Submit a plan for plugging and abandonment of the well including: (1) describe the type, number, and placement (including the elevation of the top and bottom) of plugs to be used; (2) describe the type, grade, and quantity of cement to be used; and (3) describe the method to be used to place plugs, including the method used to place the well in a state of static equilibrium prior to placement of the plugs. Also for a Class III well that underlies or is in an exempted aquifer, demonstrate adequate protection of USDWs. Submit this information on EPA Form 7520-14, Plugging and Abandonment Plan.

R. **NECESSARY RESOURCES** - Submit evidence such as a surety bond or financial statement to verify that the resources necessary to close, plug or abandon the well are available.

S. **AQUIFER EXEMPTIONS** - If an aquifer exemption is requested, submit data necessary to demonstrate that the aquifer meets the following criteria: (1) does not serve as a source of drinking water; (2) cannot now and will not in the future serve as a source of drinking water; and (3) the TDS content of the ground water is more than 3,000 and less than 10,000 mg/l and is not reasonably expected to supply a public water system. Data to demonstrate that the aquifer is expected to be mineral or hydrocarbon production, such as general description of the mining zone, analysis of the amenability of the mining zone to the proposed method, and time table for proposed development must also be included. For additional information on aquifer exemptions, see 40 CFR Sections 144.7 and 146.04.

T. **EXISTING EPA PERMITS** - List program and permit number of any existing EPA permits, for example, NPDES, PSD, RCRA, etc.

U. **DESCRIPTION OF BUSINESS** - Give a brief description of the nature of the business.

Section 1 – Area of Review Methods/Calculations

TETRA TECH

45610 Woodland Road, Suite 400, Sterling, VA 20166 703-444-7000 703-444-1685 (FAX)

TECHNICAL MEMORANDUM

TO: Dale Skoff, Tetra Tech OGA

FROM: Jeffrey Benegar

DATE: February 4, 2015

RE: Area of Review/Zone of Endangerment Analysis for Bittinger #3 and Smith-Ras #1 Wells – Bear Lake Properties

EXECUTIVE SUMMARY

This technical memorandum (TM) summarizes the analytical modeling we have performed for the area of review/zone of endangerment analysis for the Bittinger #3 and Smith-Ras #1 wells. The scenarios involved injecting simultaneously at existing Bear Lake Properties UIC Class IID brine disposal wells Bittinger #1, #4, and #2, all of which are located in Columbus Township, Warren County, Pennsylvania (the Bittinger #1 and Bittinger #4 wells received their final UIC Class IID (Commercial) well permits in November 2012 and Bittinger #2 in late 2014). The relevant parameters for our analysis were obtained from Bear Lake Properties, LLC or estimated in the absence of any information. Our analysis is described in more detail below.

OVERVIEW AND METHODOLOGY

There are several methods proposed for calculating the zone of endangerment of an injection well. The most simplistic method is the use of a fixed radius, based on the type of injection well being permitted. Other methods involve calculation of the radius based on well and formation properties. Most regulatory agencies require the use of calculations to determine the zone of endangerment. The method used here is the graphical method first used by US EPA Region 6. It involves the calculation of the increase of pressure in the formation due to injection, then converting that pressure into equivalent feet of head. The increase in head in the formation due to injection is then compared to the equivalent head of the lowest most underground source of drinking water (USDW). When plotted graphically, the intersection of those two curves at some distance, r, determines the radius of the zone of endangerment.

The increase in pressure in the formation due to injection depends on the properties of the injection fluid and the formation, the rate of fluid injection, and the length of time of injection. The most common mathematical expression to describe this increase in pressure was developed

by Matthews and Russell (1967). Matthews and Russell assume that, for a single well injecting into an infinite, homogeneous and isotropic, non-leaking formation, the increase in pressure (delta p) can be described as:

delta p = 162.6 $Q\mu$ / kh * [(log(kt / $\Phi\mu Cr^2$) – 3.23] where:

delta p = pressure change (psi) at radius, r and time, t
Q = injection rate (barrels/day)
μ = injectate viscosity (centipoise)
k = formation permeability (millidarcies)
h = formation thickness (feet)
t = time since injection began (hours)
C = compressibility (total, sum of water and rock compressibility) (psi^{-1})
r = radial distance from wellbore to point of investigation (feet)
Φ = average formation porosity (decimal)

PARAMETERS USED IN THE ANALYSIS

The following parameters were used in the zone of endangerment analysis. For injection rate, we used the average daily rate based on the permitted monthly rate for the three existing permitted Bear Lake Properties UIC Class IID wells, which is 30,000 bbls/month for each well, which averages approximately 1,000 bbls/day per well. For permeability, we used a value of 50 md, which we feel is conservative based on the injection rate sustainable for existing disposal wells at the site and the substantial volume of natural gas produced from the reservoir, both of which indicate significant permeability. The initial pressure at the top of the injection formation was based upon measurements taken prior to injection at the Bittinger #4 well.

Bittinger #3 Medina Group Well
Q = 1000 barrels/day
t = 10 years = 87,600 hours
μ = 1 centipoise
k = 50 md
h = 61 feet
C = 3.0e-06 psi^{-1}
Φ = 0.08
Specific gravity of injectate = 1.218
Surface elevation = 1638 feet
Depth to injection formation = 4260 feet
Base of lowest most USDW (MSL) = 1338 feet
Initial pressure at top of injection formation = 128 psi

Smith-Ras #1 Medina Group Well
Q = 1000 barrels/day
t = 10 years = 87,600 hours
μ = 1 centipoise
k = 50 md
h = 61 feet

C = 3.0e-06 psi^{-1}
Φ = 0.08
Specific gravity of injectate = 1.218
Surface elevation = 1575 feet
Depth to injection formation = 4222 feet
Base of lowest most USDW (MSL) = 1275 feet
Initial pressure at top of injection formation = 128 psi

Bittinger #2 Medina Group Well
Q = 1000 barrels/day
t = 10 years = 87,600 hours
μ = 1 centipoise
k = 50 md
h = 61 feet
C = 3.0e-06 psi^{-1}
Φ = 0.08
Specific gravity of injectate = 1.218
Surface elevation = 1621 feet
Depth to injection formation = 4279 feet
Base of lowest most USDW (MSL) = 1321 feet
Initial pressure at top of injection formation = 128 psi

Bittinger #1 Medina Group Well
Q = 1000 barrels/day
t = 10 years = 87,600 hours
μ = 1 centipoise
k = 50 md
h = 61 feet
C = 3.0e-06 psi^{-1}
Φ = 0.08
Specific gravity of injectate = 1.218
Surface elevation = 1518 feet
Depth to injection formation = 4210 feet
Base of lowest most USDW (MSL) = 1218 feet
Initial pressure at top of injection formation = 128 psi

Bittinger #4 Medina Group Well
Q = 1000 barrels/day
t = 10 years = 87,600 hours
μ = 1 centipoise
k = 50 md
h = 61 feet
C = 3.0e-06 psi^{-1}
Φ = 0.08
Specific gravity of injectate = 1.218
Surface elevation = 1561 feet

Depth to injection formation = 4285 feet
Base of lowest most USDW (MSL) = 1261 feet
Initial pressure at top of injection formation = 128 psi

RESULTS

The Matthews and Russell equation was solved for various distances from the wellbore based on the parameters listed above. The distance between each of the wells is:

Wells	Distance (ft)
Bittinger #3 to Bittinger #2	2,052
Bittinger #3 to Bittinger #4	3,566
Bittinger #3 to Bittinger #1	3,779
Smith-Ras #1 to Bittinger #2	1,714
Smith-Ras #1 to Bittinger #4	2,584
Smith-Ras #1 to Bittinger #1	2,180
Smith-Ras #1 to Bittinger #3	1,980
Bittinger #1 to Bittinger #4	1,300
Bittinger #1 to Bittinger #2	2,000
Bittinger #2 to Bittinger #4	1,600

The Matthews and Russell equation was used to calculate the increase in pressure in the formation with only one well injecting. This was done for all five wells. Then, the calculated pressures for each well were added together and this sum was added to the value of existing pressure in the injection formation to obtain the total pressure in the formation when all five wells are injecting.

These values were then converted to feet of head of formation brine. The values are plotted against distance from the wellbore and are shown in Figure 1 for the Bittinger #3 well and Figure 2 for the Smith-Ras #1 well. The plot shows the calculated pressure surface within the injection formation, measured as feet of head of formation brine above the top of the injection formation. Also shown is the head of the lowest most USDW. Where the two lines intersect, the radius of the zone of endangerment can be estimated. The results indicate that the increase in head in the formation due to injection will intersect the elevation of the lowestmost USDW at a distance of approximately 4 feet for the Bittinger #3 well and approximately 60 feet for the Smith-Ras #1 well. These distances are well within the ¼ mile standard fixed radius for area of review/zone of endangerment.

CONCLUSIONS

Our analysis of the area of review/zone of endangerment for the Bittinger #3 and Smith-Ras #1 wells (injecting together with the Bittinger #2, #4, and #1 wells) is based on a methodology typically used by US EPA. Based on the results, we believe the Bittinger #3 and Smith-Ras #1 wells are excellent candidates for use as brine disposal wells. The increase in head in the formation due to injection intersects the elevation of the lowestmost USDW well within ¼ mile

for each well. The standard fixed radius of ¼ mile can be used for the area of review/zone of endangerment for the Bittinger #3 and Smith-Ras #1 wells.

REFERENCES

Matthews, C.S., Russell, D.G., (1967) Pressure Buildup and Flow Tests in Wells, SPE Monograph Series, Volume 1, New York.

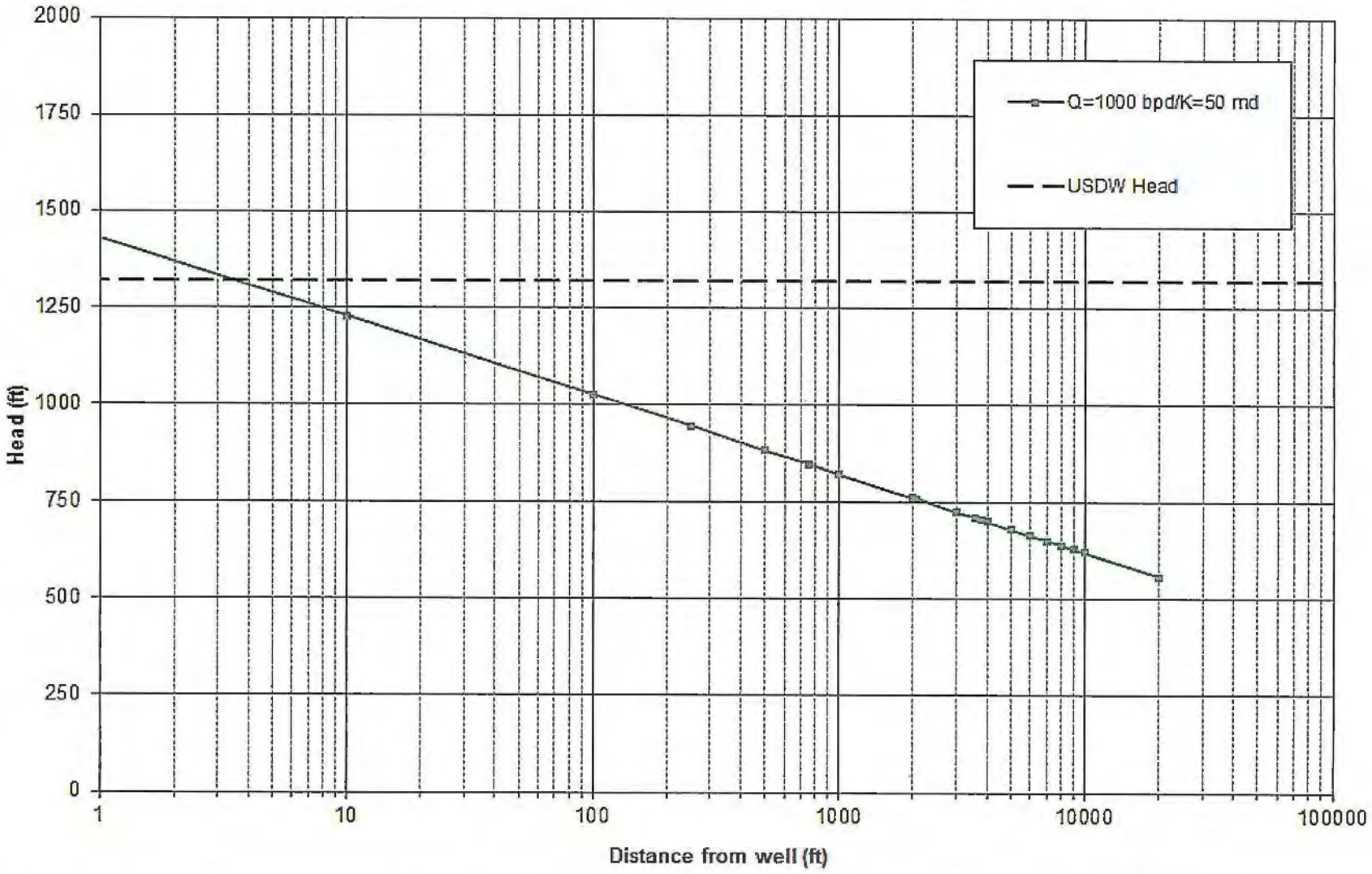

Figure 1. Feet of head of injection formation and USDW vs. distance for Bittinger #3 when all wells (Bittinger #2, #1, #4 and Smith-Ras #1) are injecting, K = 50 md

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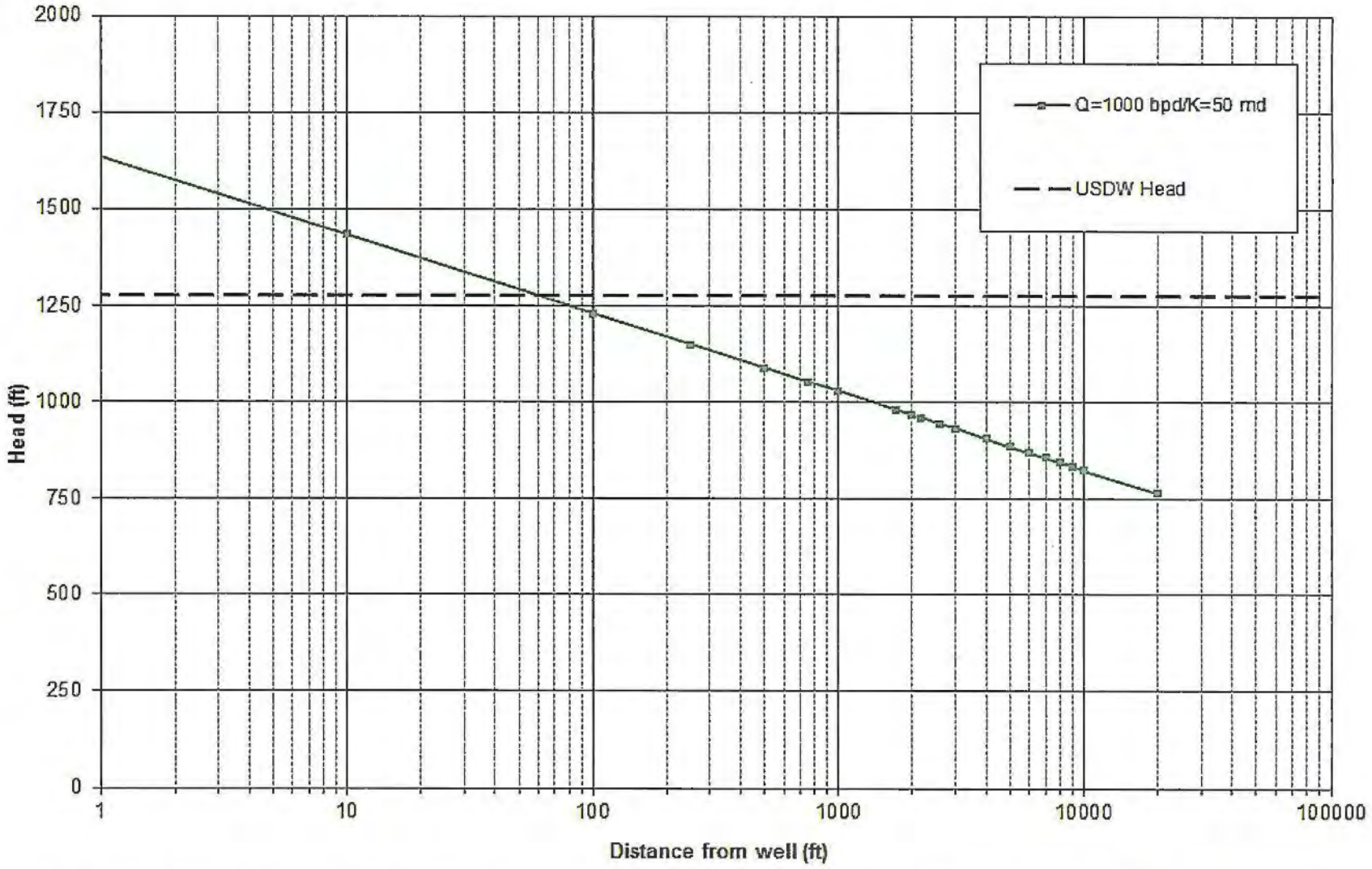

Figure 2. Feet of head of injection formation and USDW vs. distance for Smith-Ras #1 when all wells (Bittinger #2, #1, #4 and #3) are injecting, K = 50 md

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Section 2 – Maps of Well Area and Area of Review

Section 2 – Maps of Well Area and Area of Review

According to publicly available records in the area, there are no intake or discharge structures, hazardous waste treatment, storage, or disposal facilities, mines, or quarries within one mile of the Smith-Ras Unit #1 well. An intermittent unnamed tributary (UNT) to Tamarack Swamp is located approximately 0.5 mile west of the Smith-Ras Unit #1 well. Tamarack Swamp is located approximately 0.75 mile southwest, Brokenstraw Creek is located approximately 1 mile northwest, and an UNT to Pine Valley Creek is located approximately 0.25 miles east of the Smith-Ras Unit #1.

The Pennsylvania Geologic Survey "Ground Water Inventory System" (GWIS) database was accessed to determine whether there were any water wells listed for the site area. The review found that there were no water wells listed within the quarter mile AOR. It is noted that the well reporting requirement was established in 1968 and is not considered to be a complete record of water wells and other wells may be present. (Pennsylvania Topographic and Geologic Survey, September 15, 2010). One well was identified within the AOR based on public input and a foot survey by Bear Lake Properties staff. Attached are a map showing the location of the above-referenced well and a table summarizing information on the well.

The names and addresses of residents located within ¼ mile of the proposed injection well are provided in Appendix A.

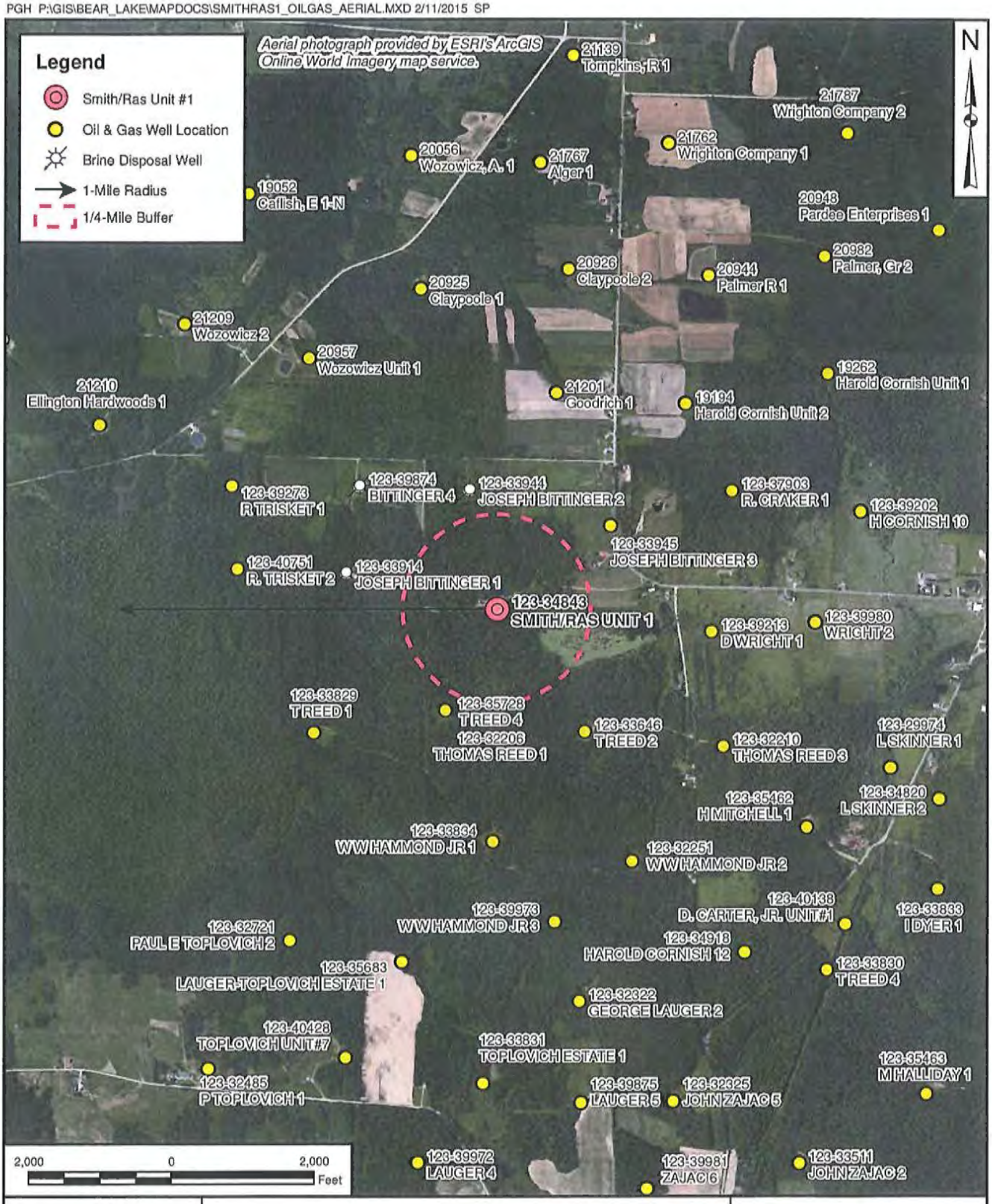
Wells Located Within the 1/4 Mile Radius Area of Review (AOR) For The Smith-Ras Unit #1 Well

Well Owner / Name	API #	Lat	Long	TD	Drilling Completed	Last Csg	Csg depth	Completion
Oil and Gas and Proposed Injection Wells								
Bear Lake Properties Smith-Ras Unit #1 (Proposed InjectionWell)	123-34843	41.992727	41.992727	4516 ft	3/26/1984	4.5 in	4493 ft	Perf'd and frac'd
Water Wells								
Jack McCoy	N/A	41.992867	-79.534883					

AREA OF REVIEW MAPS

OIL AND GAS WELLS

PGH P:\GIS\BEAR_LAKE\MAPDOCS\SMITHRAS1_OILGAS_AERIAL.MXD 2/11/2015 SP



TETRA TECH

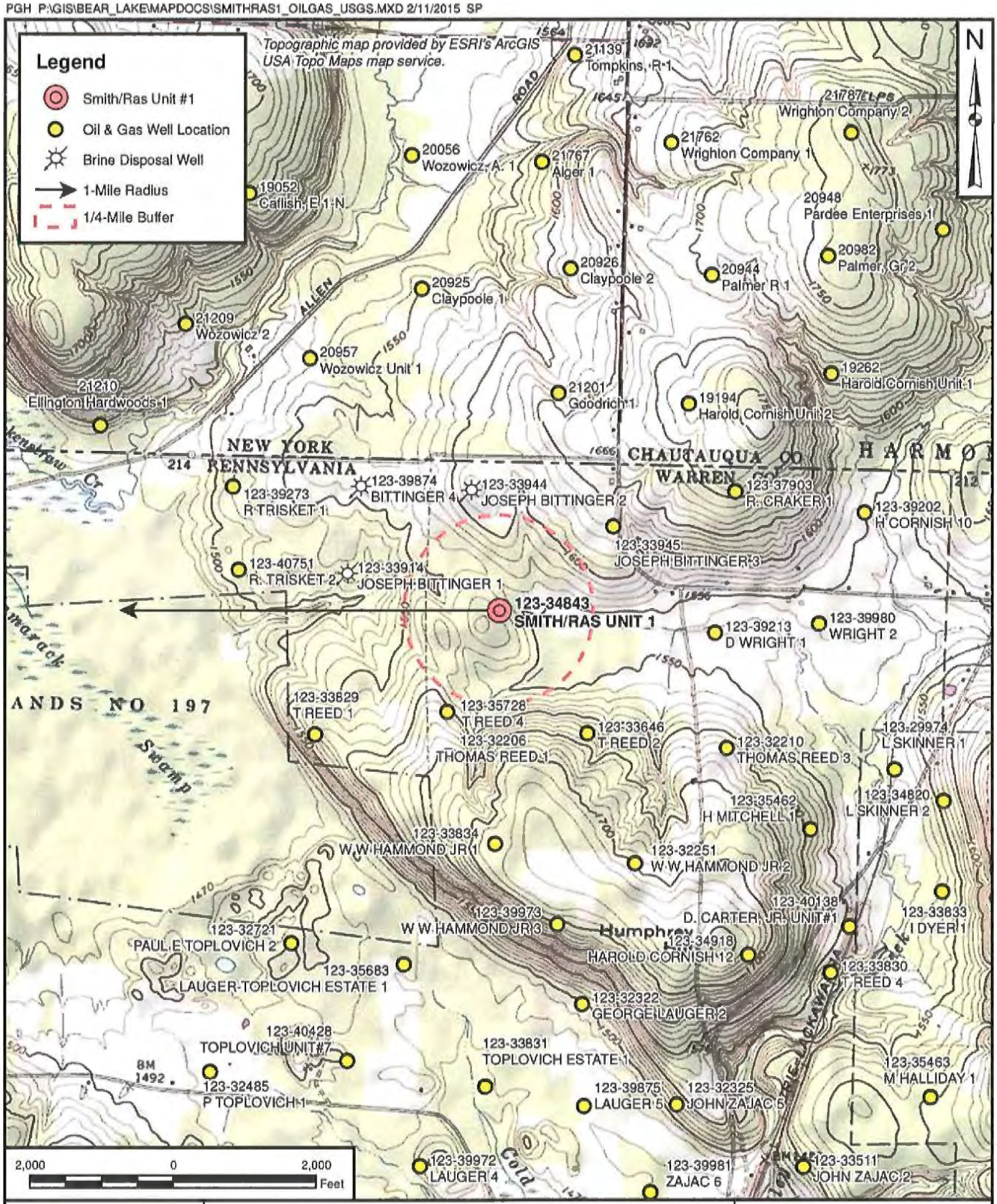
OIL & GAS WELL LOCATIONS
SMITH/RAS UNIT 1 WELL
BEAR LAKE PROPERTIES, LLC
WARREN COUNTY, PENNSYLVANIA

DRAWN BY: S. PAXTON 01/27/15
CHECKED BY: D. SKOFF 02/11/15
APPROVED BY:

CONTRACT NUMBER: 212C-PB-00103

FIGURE NUMBER	REV
1	0

PGH P:\GIS\BEAR_LAKE\MAPDOCS\SMITHRAS1_OILGAS_USGS.MXD 2/11/2015 SP



TETRA TECH

OIL & GAS WELL LOCATIONS
SMITH/RAS UNIT 1 WELL
BEAR LAKE PROPERTIES, LLC
WARREN COUNTY, PENNSYLVANIA

DRAWN BY: S. PAXTON 01/27/15
CHECKED BY: D. SKOFF 02/03/15
APPROVED BY:

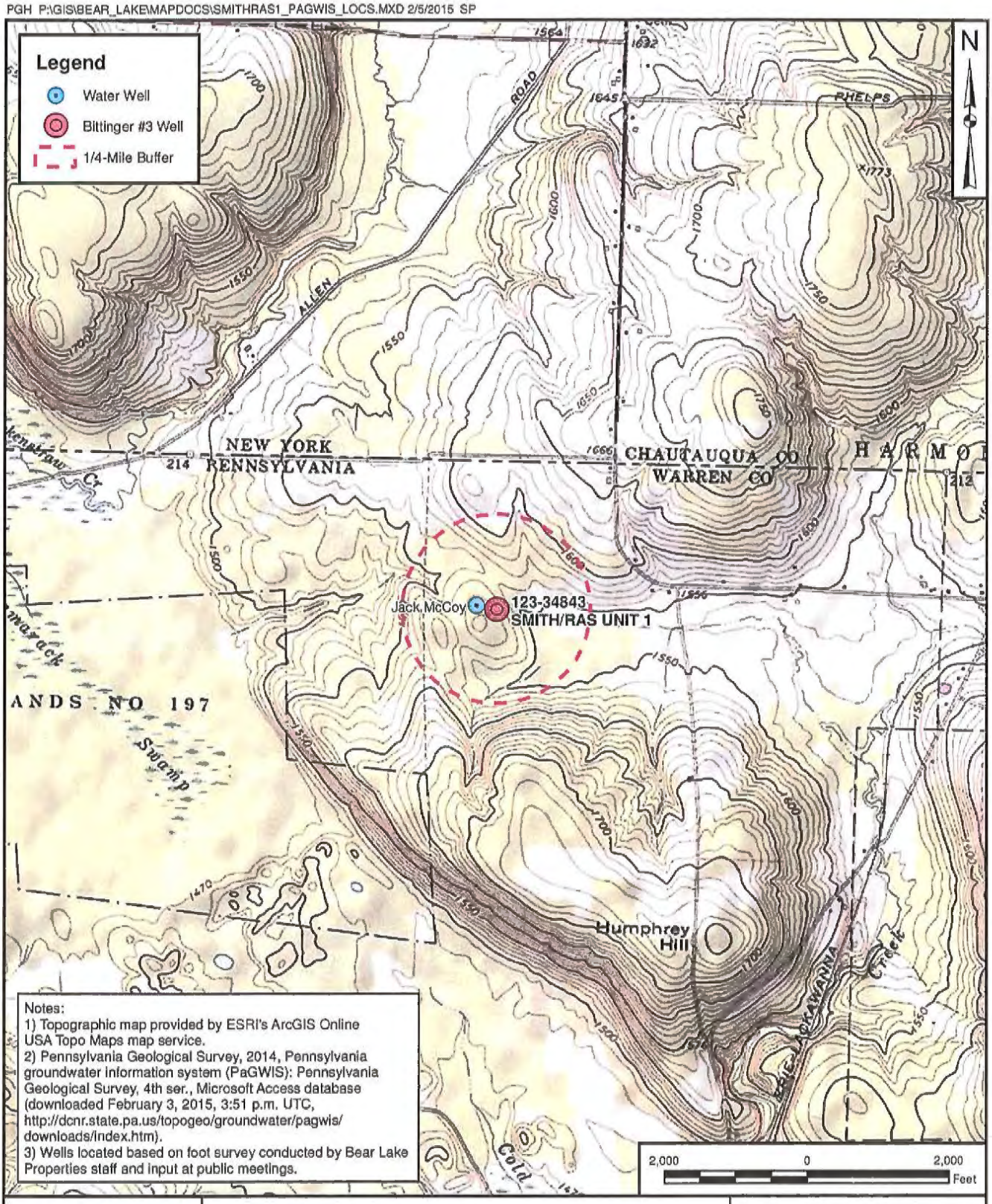
CONTRACT NUMBER: 212C-PB-00103

FIGURE NUMBER	REV
2	0

AREA OF REVIEW MAPS

GROUNDWATER WELLS

PGH P:\GIS\BEAR_LAKE\MAPDOCS\SMITHRAS1_PAGWIS_LOCS.MXD 2/5/2015 SP



Notes:
1) Topographic map provided by ESRI's ArcGIS Online USA Topo Maps map service.
2) Pennsylvania Geological Survey, 2014, Pennsylvania groundwater information system (PaGWIS): Pennsylvania Geological Survey, 4th ser., Microsoft Access database (downloaded February 3, 2015, 3:51 p.m. UTC, http://dcnr.state.pa.us/topogeo/groundwater/pagwis/downloads/index.htm).
3) Wells located based on foot survey conducted by Bear Lake Properties staff and input at public meetings.

TETRA TECH

WATER WELL LOCATIONS WITHIN AOR
SMITH/RAS UNIT 1 WELL
BEAR LAKE PROPERTIES, LLC
WARREN COUNTY, PENNSYLVANIA

DRAWN BY: S. PAXTON 02/03/15
CHECKED BY: D. SKOFF 02/05/15
APPROVED BY:

CONTRACT NUMBER: 212C-PB-00103

FIGURE NUMBER	REV
2	0

Section 3 – Corrective Action Plan and Well Data

Section 3 - Corrective Action Plan and Well Data

According to publicly available records of oil and gas wells and a survey conducted by foot, there are no existing, or plugged and abandoned wells within a ¼ mile radius AOR for the Smith-Ras Unit #1 well. The D. Wright #1 and the T. Reed #4 will be used as monitoring wells. If the fluid level in either monitoring well is observed to rise up to within 100 feet of the base of the USDW, disposal operations in the Smith-Ras Unit #1 well will be stopped immediately, EPA will be notified, and operating conditions will be evaluated in order to control the fluid levels.

Existing Oil and Gas Wells within the Area of Review

Well completion records are required to be submitted for all wells located within the area of review in order to evaluate the need for corrective action specific to each well. As indicated above, there are no oil and gas wells located within the AOR.

Plugged and Abandoned Wells

No plugged and abandoned wells have been identified within the ¼ mile AOR for the Smith-Ras Unit #1 well.

Section 4 – Name and Depth of USDWs

Section 4 - Underground Sources of Drinking Water (USDW)

The site lies within the Glaciated Plateau section of the Appalachian Plateaus Physiographic province. Both unconsolidated glacial units and bedrock are used for potable water. The uppermost unit at the site is mapped as Wisconsin age glacial kame deposits. Kame deposits consist primarily of sand and gravel interbedded with minor amounts of silt and clay (Pennsylvania Topographic and Geologic Survey, 1959). The well log for Smith-Ras #1 indicates that unconsolidated gravel is present from the surface to a depth of 120 feet below ground surface.

The uppermost bedrock beneath the site is mapped as the Devonian age Venango formation. The Venango formation consists of interbedded pebble conglomerate, crossbedded sandstone, siltstone, and shale. This unit is up to 330 feet thick in Venango County; however, only a portion of the unit is present in the site area. This unit is used as an aquifer throughout Warren County. The well log for Smith-Ras #1 indicates that Devonian age shale is present from 120 ft to a depth of 2,768 ft below ground surface. This is believed to include the Venango Formation, the Chadokoin formation, and the underlying Bradford Group. Wells deeper than approximately 100 feet deep usually encounter salt water, which is supported by the generally shallow well depths in Columbus Township. (PADER, 1982, US Geologic Survey, 2007)

The Devonian age Chadakoin formation underlies Venango formation and consists of fine-grained marine clastics (siltstone and shale) and includes a purplish pink sequence which is often used as a marker unit. This unit is up to 450 thick in Warren County.

The Pennsylvania Geologic Survey "Ground Water Inventory System" (GWIS) database was accessed to determine whether there were groundwater wells included for the site area. This database did not contain any groundwater wells within a one-quarter mile radius of Smith-Ras #1 well. Although there are no wells listed, the well reporting requirement was established in 1968 is not considered to be a complete record of water wells and other wells may be present. (Pennsylvania Topographic and Geologic Survey, September 15, 2010). One water well was identified within the AOR based on public input and a foot survey by Bear Lake Properties staff. Section 2 of this application includes a map showing the location of the above-referenced well and a table summarizing information on the well.

Based on the available information, the glacial units and the top 100 feet of bedrock is considered the underground sources of drinking water in the site area. The well logs indicate that the glacial material is approximately 120 feet thick beneath the site. Freshwater is expected to be encountered to a depth of approximately 100 feet with increasing salinity beyond that depth. The Smith-Ras #1 well has 8 5/8 inch surface casing cemented to a depth of 406 feet below ground surface, providing a buffer of approximately 300 feet beyond the base of the underground sources of drinking water based on the well data in Columbus Township (maximum well depth of 130 feet) and the references indicating brine being encountered at depths over 100 feet within the bedrock units. In addition, production casing extends several thousands of feet below the drinking water source and is cemented approximately 1300 feet above the injection interval. (Injection well construction is described in detail in the "Well Construction" section.)

In calculating the depth to the base of the lowermost USDW, the depth of the deepest well in the area 130 feet (it is believed that the generally shallow well depth in the area was related to water quality issues based on the available literature) was doubled and rounded upward to the nearest

100 feet, providing a conservative maximum depth estimate of the underground source of drinking water of 300 feet.

References:

Pennsylvania Topographic and Geologic Survey, 1959. " Glacial Geology of Northwestern, PA." Bulletin G 32.

Pennsylvania Topographic and Geologic Survey, 1981. " Atlas of Preliminary Quadrangle Maps of Pennsylvania, PA." Map 61.

PADER, 1982. "Engineering Characteristics of the Rocks of Pennsylvania". Environmental Geology Report 1.

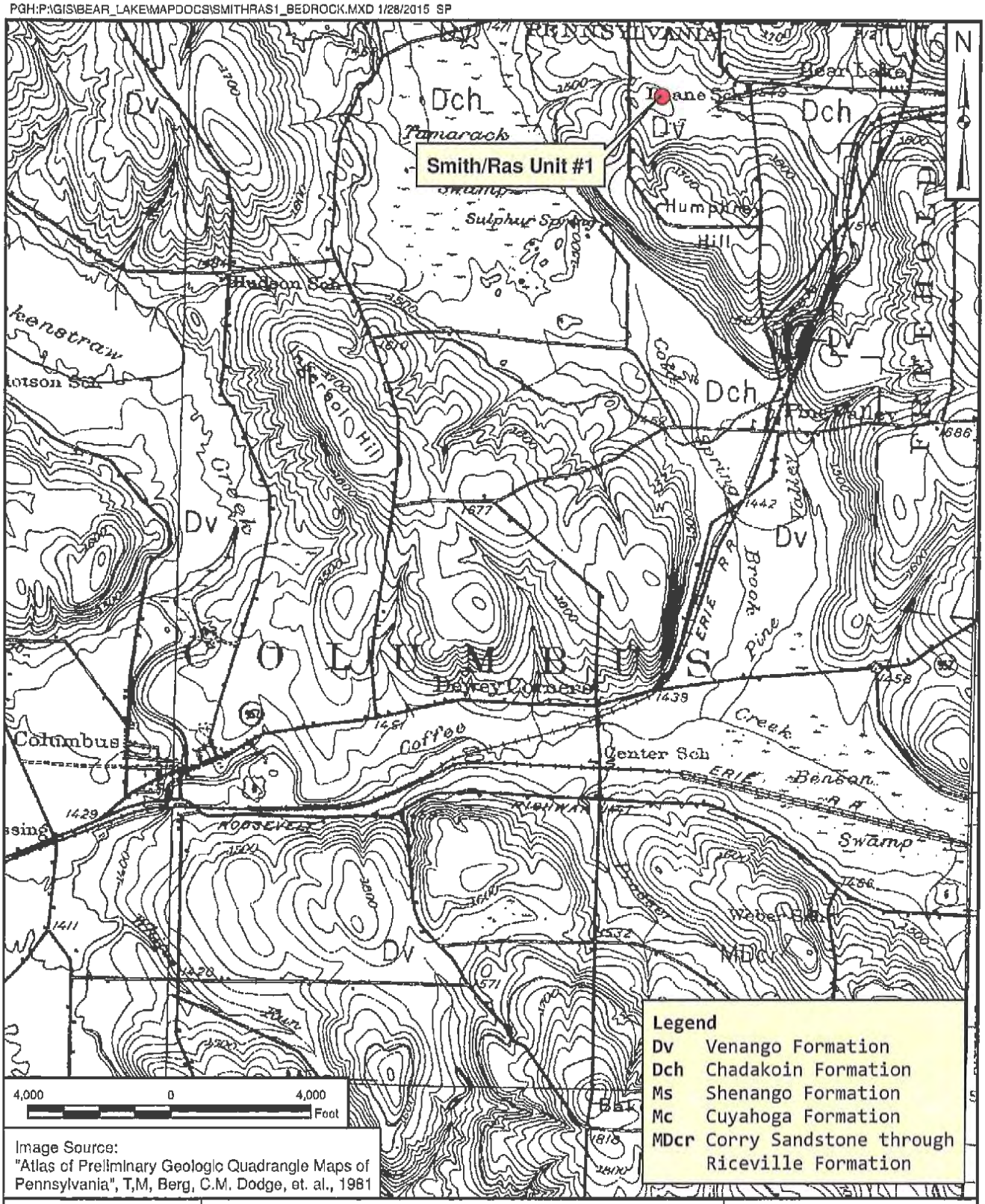
Pennsylvania Topographic and Geologic Survey, September 15/20, 2010. "Ground Water Inventory System". www.dcnr.state.pa.us/topogeo/groundwater/PAGWIS

US Geologic Survey, 2007. "Ground-Water Resources and the Hydrologic Effects of Petroleum Occurrence and Development, Warren County, Northwestern Pennsylvania." Scientific Investigations Report 2006-5263.

UNDERGROUND SOURCES OF DRINKING WATER

BEDROCK MAP

PGH:P:\GIS\BEAR_LAKE\MAPDOCS\SMITHRAS1_BEDROCK.MXD 1/28/2015 SP



TETRA TECH

BEDROCK MAP
SMITH/RAS UNIT 1 WELL
BEAR LAKE PROPERTIES, LLC
WARREN COUNTY, PENNSYLVANIA

DRAWN BY: S. PAXTON 01/28/15
CHECKED BY: D. SKOFF 01/29/15
APPROVED BY:

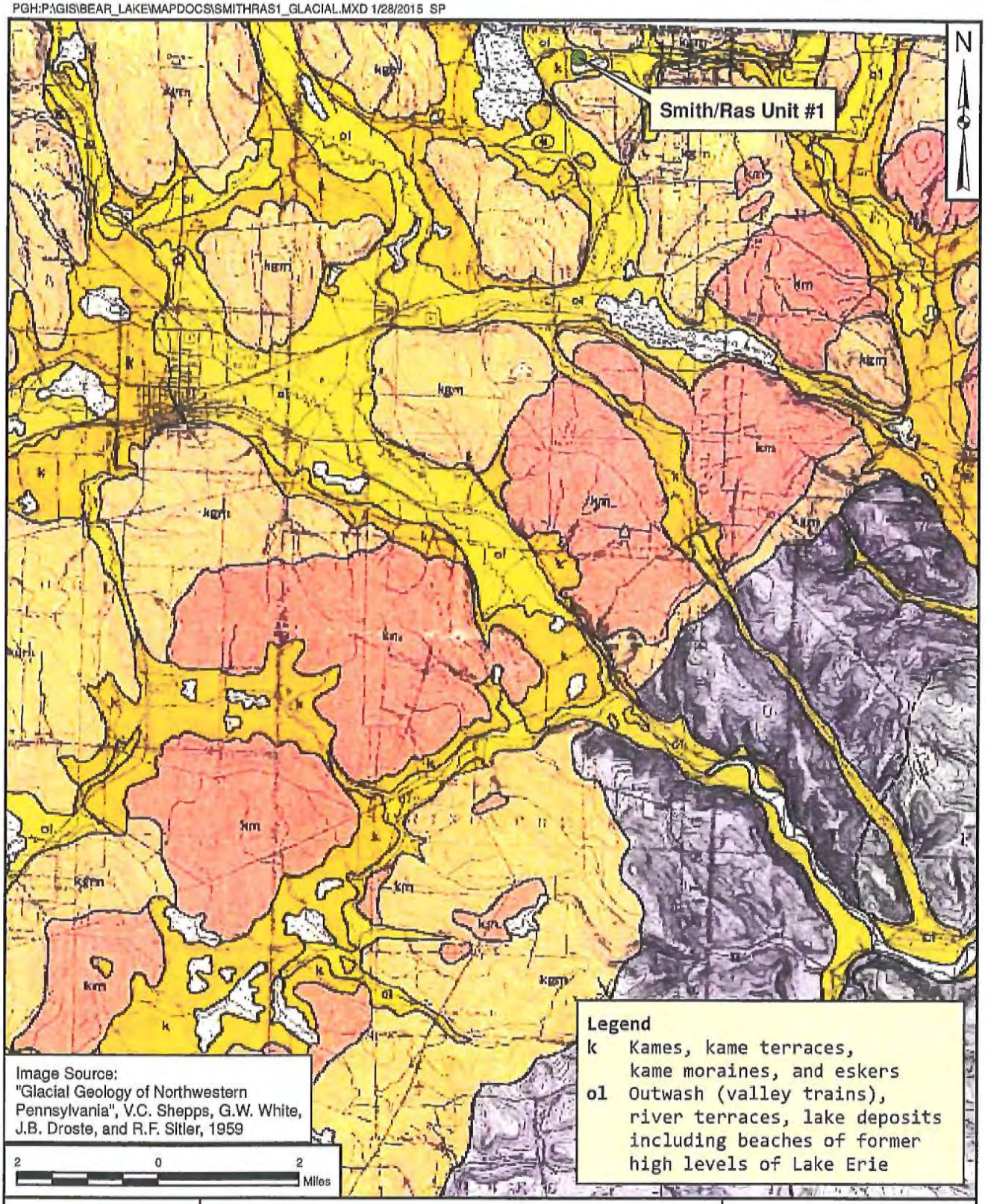
CONTRACT NUMBER: 212C-PB-00103

FIGURE NUMBER	REV
—	0

UNDERGROUND SOURCES OF DRINKING WATER

GLACIAL MAP

PGH:P:\GIS\BEAR_LAKE\MAPDOCS\SMITHRAS1_GLACIAL.MXD 1/28/2015 SP



TETRA TECH

GLACIAL MAP
SMITH/RAS UNIT 1 WELL
BEAR LAKE PROPERTIES, LLC
WARREN COUNTY, PENNSYLVANIA

DRAWN BY: S. PAXTON 01/28/15
CHECKED BY: D. SKOFF 01/28/15
APPROVED BY:

CONTRACT NUMBER: 212C-PB-00103

FIGURE NUMBER	REV
—	0

Section 5 – Geologic Data On Injection and Confining Zones

Section 5 – Geologic Data on Injection and Confining Zones

The well is designed to inject into the Grimsby and Whirlpool sandstone units of the Medina Group which occurs at depths between 4,222 and 4,396 feet below grade in the Smith-Ras Unit #1 well. The Medina is a depleted reservoir in this area.

As seen on the generalized stratigraphic column (attached), most of the geologic "groups" and "formations" overlying the Medina can be considered confining units totaling approximately 2,000 feet. Although many of these units are predominantly shale, they also contain reservoir rock and are shown with shading in confining unit column. Therefore, the Lockport and the Salina are seen as the most significant confining units and have a combined thickness of over 600 feet in the site area. As indicated, these units provide only a portion of the confining capacity and there are numerous other units that provide further protection.

The characteristics of the Medina Group formations including the Grimsby and Whirlpool are described in the attached report prepared by Billman Geologic Consultants entitled, "Geologic Review of the Bittinger Area, Planned SWD Site", dated August 2, 2010, and the cover letter dated April 5, 2014 discussing the Bittinger #2 well geologic characteristics. The subject report includes cross-sections in the vicinity of the Smith-Ras Unit #1 well. As demonstrated by the cross-sections, the formation characteristics (lithology, thickness, porosity, etc.) of the Medina Group rocks in the Smith-Ras Unit #1 well are very similar to those of the nearby wells including the three permitted brine disposal wells (Bittinger #1, #2 and #4 wells) operated by Bear Lake Properties.

Also attached are the following:

- Smith-Ras Unit #1 completion record and geophysical log,
- Maximum Injection Pressure (MIP) calculations based on Instantaneous Shut-In Pressure (ISIP) data for the Smith-Ras Unit #1 well
- Smith-Ras Unit #1 treatment reports.

Potential for Faults and Seismicity

As discussed in the attached Billman Geologic Consultants Report, geologic mapping performed at the Bear Lake Properties site as part of natural gas exploration and development in the Medina Group sandstone units has not identified evidence of significant faulting (e.g., duplicated intervals evident in log analysis, unusual thickening or thinning of intervals, etc.). Likewise the production of large volumes of natural gas from the Medina Group indicates the lack of significant faults which would allow for migration of the entrapped gas out of the Medina.

It is also noted that the Medina Group wells at the site are largely depleted resulting in lower than natural rock pressures. Production data for the Smith-Ras Unit #1 are summarized on the attached table along with six other nearby wells. Cumulative gas production from the Smith-Ras Unit #1 well is approximately 217 MMCF. Total production from all seven wells is over 1.75 BCF. The impact of removal of this large volume of gas is, as expected, a decrease in reservoir pressure. Injecting brine at or below the proposed maximum injection pressure would therefore not likely result in "overpressuring" faults (if any do exist in the area) and causing movement.

Finally, it is highly unlikely that injection at the site would engage any deep, Pre-Cambrian basement faults. According to the PA DCNR "Precambrian Basement Map of the Appalachian Basin and Piedmont Province in Pennsylvania" http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_016250.pdf) the depth to

basement in the site vicinity is estimated at approximately 2,500 meters (or 8,200 feet) below sea level. The base of the Medina Group at the Bear Lake Properties site is approximately 2,800 ft. below sea level, or approximately a mile above Pre-Cambrian basement.

A review of the PA DCNR "Earthquake Epicenters in and Near Pennsylvania" (attached) indicates that there have been no recorded seismic events within 25 miles of the disposal project area since 1724, the start of the reporting period.

In summary, a detailed review of the zone of injection and data on geologic strata surrounding the zone of injection for the proposed brine disposal well, indicates the following supporting evidence that seismicity is highly unlikely: 1) The detailed geologic cross-sections (Appendix 2 of the Billman Geologic Consultants Report) and isopach and structural mapping completed by Billman Geologic Consultants show no evidence of faulting in the study area. 2) Historic production of over 1.75 billion cubic feet of gas among the Bittinger #1, #2, #3 and #4, Smith Ras #1 and Trisket #1 and #2 wells and unknown volumes of formation brine from the proposed zone of injection near the Bittinger #3 has depleted the zone of almost 90% of its original reservoir pressure. The disposal operations will re-fill this void space over the life of the project. 3) There have been no recorded seismic events within 25 miles of the disposal project area since 1724, the start of the reporting period referenced in the PA DCNR earthquake epicenters map.

GEOLOGIC DATA

GENERALIZED STRATIGRAPHIC COLUMN

Generalized Stratigraphic Column
Smith-Ras Unit #1
Warren County, PA

Age	Group	Formation	Predominant Rock Type	Total Depth to Base(Feet)	Thickness Feet	Confining Zone
Glacial Units				120	120	
Upper Devonian	Venango		Shale/sandstone	2768	2648	
Upper Devonian		Chadakoin	Shale			
Upper Devonian	Bradford		Shale			
Upper Devonian	Elk		Shale			
Upper Devonian		Java	Shale			
Upper Devonian		West Falls	Shale			
Upper Devonian		Sonyea	Shale			
Upper Devonian		Genesee	Shale			
Upper Devonian		Tully Limestone	Limestone	2877	109	
Upper Devonian	Hamilton	Mahantango	Shale, some sandstone	3049	172	
Upper Devonian	Hamilton	Marcellus Shale	Shale			
Middle Devonian		Onondaga	Limestone	3218	169	
Unconformity Interval				3233	15	
Upper Silurian		Salina - including Akron-Berite, Camillus, Syracuse, Vernon	Evaporites/Dolomite	3785	552	
Upper Silurian		Lockport Dolomite	Dolomite	3861	76	
Lower Silurian	Clinton	Rochester Shale, Irondequoit-Reynales Dolomite	Sandstone	4222	122	
Lower Silurian		Medina, inlcuding the Grimsby and Whirlpool Sandstones	Sandstone/Shale	4396	174	

Notes

= Black shading Indicates that this unit is considered to be a confining zone
= Diagonal shading Indicates that this unit is a confining unit that also contains producing zones within it
= No shading indicates that this unit is a producing zone and is not considered to be a confining unit

GEOLOGIC DATA

BILLMAN GEOLOGIC CONSULTANTS REPORT

BILLMAN GEOLOGIC CONSULTANTS, INC.

TO: MR KARL KIMMICH, LION ENERGY COMPANY, LLC

FROM: DAN A. BILLMAN, PG, CPG, BILLMAN GEOLOGIC CONSULTANTS, INC.

SUBJECT: GEOLOGIC REVIEW OF THE BITTINGER #2, PROPOSED SWD WELL

DATE: 04/05/2014

CC:

This memo is to be read in conjunction with the report entitled, "Geologic Review of the Bittinger Area, Planned SWD Site", dated 8/2/2010., Written by Dan A. Billman of Billman Geologic Consultants, Inc.

Billman Geologic Consultants, Inc. (BGC) was requested by Lion Energy Company, LLC to review the geology of a proposed SWD well at the Bittinger #2 (123-33944). The well is located in Columbus Township, Warren County, Pennsylvania. Specifically, the area is located in and around the Bittinger, Smith and Reed properties; collectively referred to as the "Bittinger SWD site". Figure 1 depicts the well base map of the Bittinger #2 area.

The Bittinger #2 (123-33944) was initially drilled by U.S. Energy Development and later acquired by Lion Energy, when Lion Energy acquired the field from Belden and Blake, Corp. The well was originally drilled to a total depth of 4,574', into the Queenston Shale Formation. The well was naturally completed in the Medina Sandstone and Whirlpool Sandstone. The well had a natural reported open flow 554 mcf/d and a reported natural rock pressure of 1,100 psi, recorded after a buildup of 72 hours (refer to completion reports included as Appendix 1 of this memo).

Geologic Analysis of Data Associated with the Bittinger SWD Site

The initial report of the Bittinger SWD area discusses the geology of both the Medina Sandstone and Whirlpool Sandstone. The Bittinger #2 well is located approximately 1,200' west of the Bittinger #4 and located approximately 1,500' northeast of the Bittinger #1. After review of the logs and completion reports (Appendix 1) of the Bittinger #2, both the Medina (Grimsby) and Whirlpool Sandstones are similar to the correlative formations within the Bittinger #1 and Bittinger #4 wells.

BGC completed a review of the logs associated with the Bittinger #2 (123-33944), as well as the Bittinger #1 (123-33914), #4 (123-39874) and other wells in the immediate area (Table 1 of the original report). The Medina Sandstone (Grimsby Sandstone) has 38' of formation equal or greater than 6% porosity, while the average for the area was

39.2'. Likewise, The Whirlpool Sandstone has 12' of formation equal or greater than 6% porosity, while the average for the area was 11.1'. For both sandstone formations, the characteristics are very typical for the area.

In the Bittinger #2, there is approximately 625' between the top of the Medina (Grimsby) Sandstone and the top of the Upper Silurian Salina Formation. The Salina Formation is a series of evaporates (including salt and anhydrite), shale and carbonate formations, which based on lithology should have low permeability and have characteristics of a good confining interval. Given the ductile nature of the salt and anhydrite, natural fractures tend not to propagate vertically up to and through the Salina Formation. Also, between the Medina (Grimsby) Sandstone and the Salina Formation are other potential confining intervals, including the Vernon and Rochester Shales and the Packer Shell (Irondequoit and Reynales Dolomites). Another shale interval, the Power Glen Shale (occasionally referred to as the Cabot Head Shale) lies between the Medina (Grimsby) Sandstone and Whirlpool Sandstone.

Conclusions

The Bittinger #2 (123-33944) appears to have a very porous Whirlpool Sandstone interval to allow for saltwater injection and storage. The formation was naturally completed and therefore, it is assumed to have sufficient natural (unstimulated) porosity and permeability development. The Bittinger #2 SWD site is located in an area of minimal tectonic influence (i.e. folding and faulting of the rock), other than the gentle dip of the formation to the southeast (refer to mapping included in the original report). Given the nature of the Salina Formation (i.e. bedded salts and anhydrites) above the SWD interval, minimal through-going, vertical fractures are expected to exist in the Bittinger #2 SWD site area.

BGC has not verified ownership of Lion's properties or completed a site visit as part of the geologic review of the area.

Respectfully submitted by:

Dan A. Billman

Dan A. Billman, PG, CPG
President, Billman Geologic Consultants, Inc.

DISCLAIMER

This document includes forward-looking statements as well as historical information. Forward-looking statements include, but are not limited to statements relating to geological and seismic data interpretations, prospect reserve estimates and prospect risk. Although BGC believes that its expectations reflected in these forward-looking statements are reasonable, such statements involve risks and uncertainties, and no assurance can be given that actual results will be consistent with these forward-looking statements. Investment in oil and gas exploration is high risk by its very nature. Important factors that could cause actual results to differ from these forward-looking statements include, but are not limited to: erroneous interpretations of the seismic and geological data; the inability to acquire leases on identified prospects; mechanical problems while drilling and producing wells which prevent completion of a well or result in plugging of a well; dry holes; less reserves than originally estimated due to poor sand development or drainage by offsetting wells; non-commercial wells; and the variations in future gas pricing. BGC cannot and has not beyond normal due diligence care standards confirmed the accuracy and completeness of all the information we have reviewed in the course of this consulting engagement. Data for this review has been provided by Tetra Tech, NUS, Lion Energy, LLC or is publicly available and BGC, Inc. cannot be held responsible for errors in this provided data. Further, we express no opinion regarding any legal or securities issues. BGC shall assume no liability whatsoever for the use or reliance there upon by Tetra Tech, NUS, Lion Energy, LLC, their clients and/or their investors, of information, opinions and interpretations provided by BGC. BGC reserves the right to adjust these findings and interpretations with the discovery of relevant data or future production data.

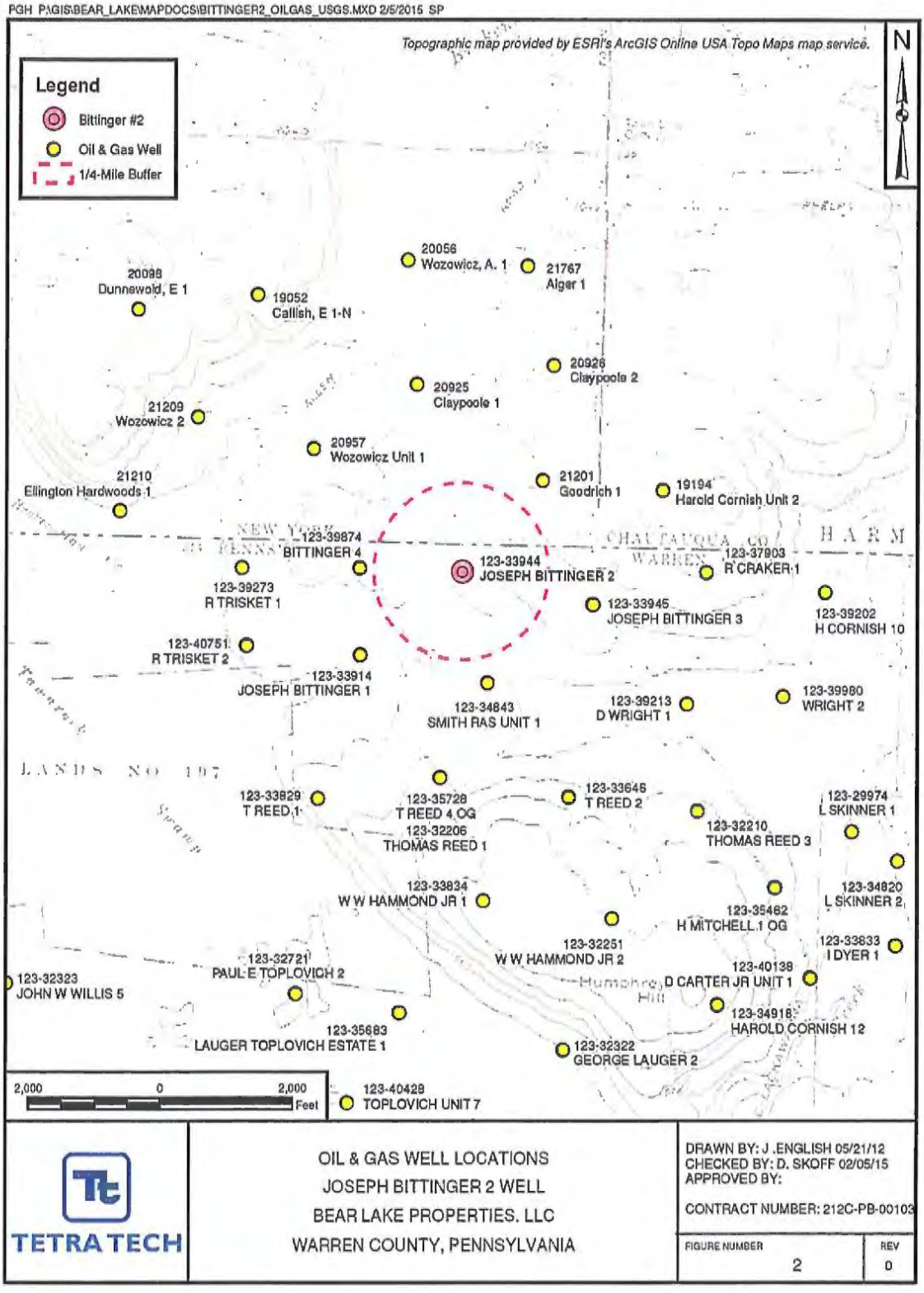
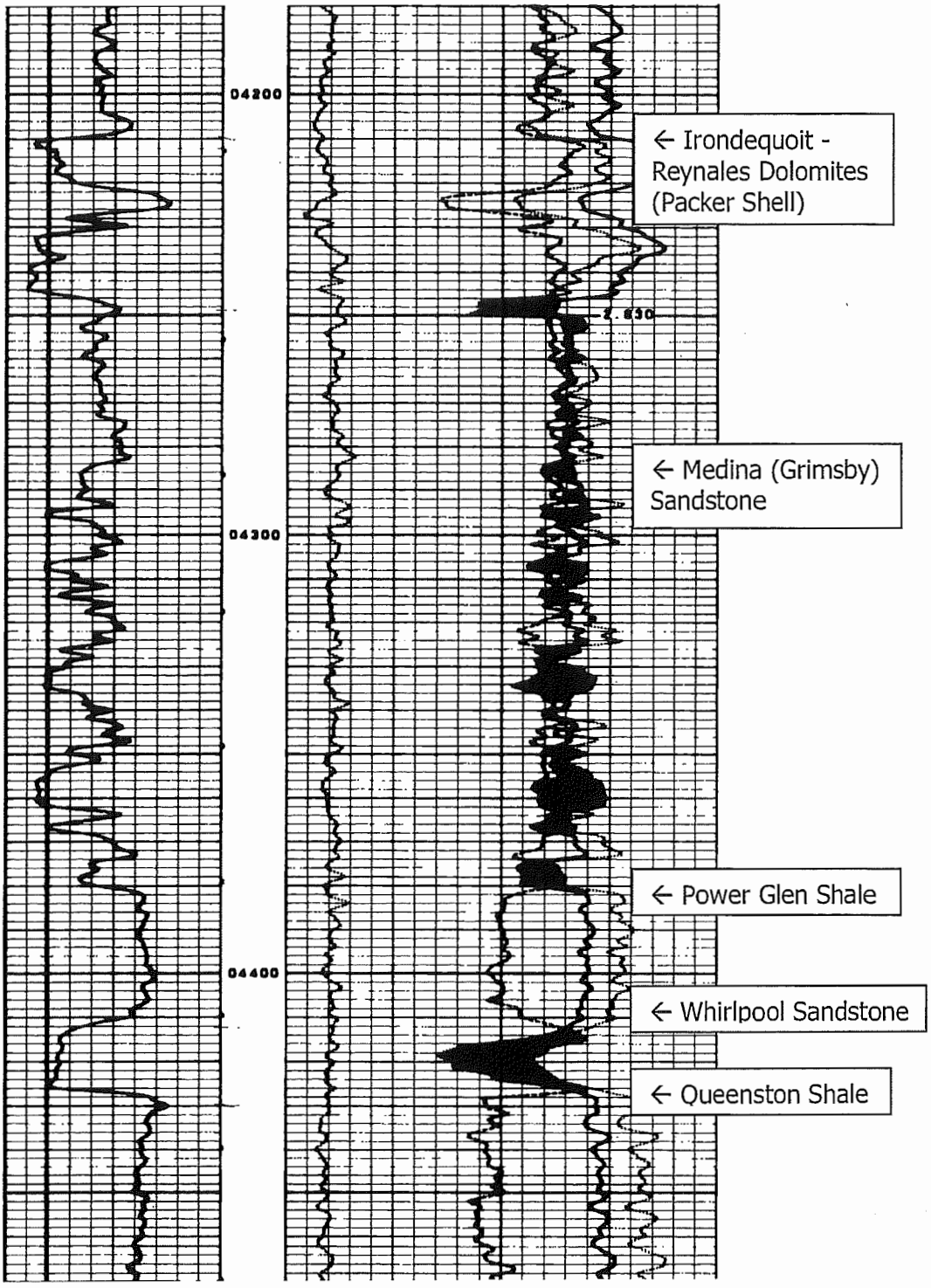


Figure 1: Well location map of the Bittinger SWD Site. Well being permitted for SWD Bittinger #2 (123-33944) centered in map.

Appendix 1:

Log Data and Completion Reports for the Bittinger #2 (123-33944)

Gamma Ray, Density Neutron Log -- Bittinger #2 (123-33944)



Completion Report (page 1) -- Bittinger #2 (123-33944)

Columbus

ER-OG-4: Rev. 2/80

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

123 33 944
Office Use Only

RE

(c) 990 S 42°00'00"
9700 W 79°30'00"

WELL RECORD

123-33944
CSO

PERMIT NO. WAR 33944 PROJECT NO. DEEP TYPE OF WELL GAS

COLUMBUS FIELD, DEWEY CORNERS POOL - DEV

WELL OPERATOR U.S. ENERGY DEVELOPMENT CORPORATION TELEPHONE NO. 716-856-9764

ADDRESS 670 STATLER BUILDING, BUFFALO, NEW YORK 14202-9990 ZIP

FARM NAME	FARM NO.	SERIAL NO.	ACRES
BITTENGER	#2		160

TOWNSHIP	COUNTY
COLUMBUS	WARREN

DRILLING COMMENCED	DRILLING COMPLETED
1/22/84	1-29-84

ELEVATION	QUADRANGLE
1621'	COLUMBUS ☒ 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
8 5/8"	428'	150					1/24/84
4 1/2"	4240'			Tension	4 1/2" x 7 5/8"	4240'	1/29/84

T.D.	D.D.	D.P.I.	Class	O	G	Loss
4588		4415	D	1	1	

PERFORATION RECORD

DATE	INTERVAL PERFORATED FROM	TO
not applicable		

STIMULATION RECORD

DATE	INTERVAL TREATED	AMOUNT FLUID	AMOUNT SAND	INJECTION RATE
not applicable				

NATURAL OPEN FLOW	NATURAL ROCK PRESSURE	HRS.
554 MCF	1100	72

AFTER TREATMENT OPEN FLOW	AFTER TREATMENT ROCK PRESSURE	HRS. DAYS
N/A		

REMARKS: DRILLER'S T.D. 4574' MEDINA

WOW LOGGER'S T.D. 4588'

AND GAS RICHARDSON

RECEIVED

OCT 1 1984

PA GEOLOGICAL SURVEY
(Oil & Gas Geology Division)

(FORMATION ON REVERSE SIDE)

C/A 0
7-15-84

Completion Report (page 2) -- Bittinger #2 (123-33944)

ER-OG-4: Rev. 2/80
(Pg 2)

FORMATIONS

NAME	TOP	BOTTOM	GAS AT	OIL AT	WATER AT (FRESH OR SALT WATER)	SOURCE OF DATA
UNCONSOLIDATED GRAVEL	0'	12'				Driller's
DEVONIAN SHALE	12'	2807'			FRESH @ 109'	RECORD
"TULLY" LS.	2807'	2915'				AND
HAMILTON SHALES	2915'	3084'				GEOPHYSICAL
ONONDAGA	3084'	3256'				LOGS
UNCONFORMITY INTERVAL	3256'	3270'				
AKRON-BERTIE	3270'	3357'				
CAMILLUS	3357'	3421'				
SYRACUSE	3421'	3639'				
SALT ZONE	3618'	3816'			SALT @ 3710'	
VERNON	3639'	3955'				
LOCKPORT	3955'	4123'				
ROCHESTER	4123'	4209'				
IRONDEQUOIT-REYNALES	4209'	4246'				
GRIMSBY	4246'	4362'				
POWER GLEN	4362'	4411'				
WHIRLPOOL	4411'	4427'	4415'			
QUEENSTON	4427'	T.D.				
T.D.	4574'					

MAY 25, 1984
DATE

Douglas K. Welch
APPROVED BY

GEOPHYSICIST
TITLE

BILLMAN GEOLOGIC CONSULTANTS, INC.

TO: MR KARL KIMMICH, LION ENERGY COMPANY, LLC

FROM: DAN A. BILLMAN, PG, CPG, BILLMAN GEOLOGIC CONSULTANTS, INC.

SUBJECT: GEOLOGIC REVIEW OF THE BITTINGER AREA, PLANNED SWD SITE

DATE: 08/02/2010

CC:

Billman Geologic Consultants, Inc. (BGC) was requested by Lion Energy Company, LLC to review the geology of a planned salt water disposal (SWD) site in Columbus Township, Warren County, Pennsylvania. Specifically, the area is located in and around the Bittinger, Smith and Reed properties; collectively referred to as the "Bittinger SWD site". Figure 1 depicts the wellbase map of the Bittinger SWD site area. The wells being permitted include the 123-33914 (Bittinger #1) and the 123-39874 (Bittinger #4).

Both the Bittinger #1 and Bittinger #4 were initially drilled by U.S. Energy Development and later acquired by Lion Energy, when Lion Energy acquired the field from Belden and Blake, Corp. In both the Bittinger #1 and Bittinger #4, the perforated and hydraulically fracture treated interval includes both the Lower Silurian Medina Sandstone and Lower Silurian Whirlpool Sandstone. These formations have been produced, commingled, since 1983 and 1987, respectfully (refer to completion reports, Appendix 1).

Geologic Analysis of Data Associated with the Bittinger SWD Site

BGC completed an analysis of the logs in the Bittinger SWD site area and the porosity per foot data is included in Table 1. Within the Whirlpool Sandstone, the Bittinger #1 (123-33914) encountered 10' of sand greater or equal to 6% (log measured) porosity and 8' of sand greater or equal to 10% (log measured) porosity. Within the Medina Sandstone, the Bittinger #1 (123-33914) encountered 23' of sand greater or equal to 6% (log measured) porosity and 0' of sand greater or equal to 10% (log measured) porosity. Within the Whirlpool Sandstone, the Bittinger #4 (123-39874) encountered 11' of sand greater or equal to 6% (log measured) porosity and 7' of sand greater or equal to 10% (log measured) porosity. Within the Medina Sandstone, the Bittinger #4 (123-39874) encountered 38' of sand greater or equal to 6% (log measured) porosity and 0' of sand greater or equal to 10% (log measured) porosity.

The Whirlpool Sandstone across the producing Medina/Whirlpool trend is interpreted as a bar sand system and where it is present, it is often been a prolific hydrocarbon producer. Initial analysis of the Bittinger SWD site data indicates that the Whirlpool

Sandstone is a consistently porous formation with a significant footage of porosity greater than 10% porosity. Gamma Ray, Density Neutron logs of the Medina/Whirlpool section of the Bittinger #1 and Bittinger #4 are included in Appendix 1. The Bittinger #1 has a peak, logged porosity of approximately 16% and the Bittinger #4 has a peak, logged porosity of approximately 18%. Cross-sections, oriented along regional strike (southwest – northeast) and regional dip (northwest – southeast) were constructed across the Bittinger SWD site and are included as an attachment to this report. The consistency of thickness and porosity of the Whirlpool Sandstone is evident in the cross-sections (Appendix 2).

The Medina Sandstone is interpreted as a braided channel system and therefore porous, reservoir quality Medina Sandstone typically is a very discontinuous across even short distances. As expected, within the logs of the Bittinger #1 and Bittinger #4 (Appendix 1) the Medina Sandstone is a series of interbedded sandstones, silts and shales and has a discontinuous nature from well to well. In the Bittinger #1 and Bittinger #4, porosities average 8% and lower, from sand body to sand body within the Medina interval in each well.

Both the Whirlpool and Medina Sandstones were mapped using footage at 8% porosity or greater cut-off. These maps are included, with this report, as Appendix 2.

Figure 2 depicts the structure on top of the Packer Shell (dolomites above the Medina Formation) in the Bittinger SWD site area. The structural mapping shows a very consistently dipping formation from the northeast to the southwest across the Bittinger SWD site. No obvious faulting or "deviations" from regional dip are evident on the structural top of the Packer Shell dolomites. Figure 3 depicts the structure on top of the Queenston Shale (Base of the Whirlpool Sandstone) in the Bittinger SWD site area. The structural mapping shows a very consistently dipping formation from the northeast to the southwest across the Bittinger SWD site. No obvious faulting or "deviations" from regional dip are evident on the structural top of the Queenston Shale. Both formations appear to show a fairly tectonically inactive situation exists in the Medina/Whirlpool interval at the Bittinger SWD site.

Approximately 850' above the top of the Medina Sandstone is the top of the Upper Silurian Salina Formation, a series of evaporates (including salt and anhydrite), shale and carbonate formations. The top of the Salina Salt (the evaporites within the Salina Formation) occurs approximately 650' above the top of the Medina Sandstone. Given the ductile nature of the salt and anhydrite, natural fractures tend not to propagate vertically up to and through the Salina Formation.

Conclusions

The Bittinger #1 and Bittinger #4 appear to have a very porous Whirlpool Sandstone interval to allow for saltwater injection and storage and was previously hydraulic fractured, allowing for increased permeability. The Bittinger SWD site is located in an area of minimal tectonic influence (i.e. folding and faulting of the rock), other than the gentle dip of the formation to the southeast (mapping included in Appendix 2). Given the nature of the Salina Formation above the SWD interval, minimal through-going, vertical fractures are expected to exist in the Bittinger SWD site area.

As a disclaimer, BGC has not had access to seismic data in and around the Bittinger SWD site and any observations or conclusions made are not made with the knowledge of seismic data. BGC has not verified ownership of Lion's properties or completed a site visit as part of the geologic review of the area.

Respectfully submitted by:

Dan A. Billman

Dan A. Billman, PG, CPG
President, Billman Geologic Consultants, Inc.

DISCLAIMER

This document includes forward-looking statements as well as historical information. Forward-looking statements include, but are not limited to statements relating to geological and seismic data interpretations, prospect reserve estimates and prospect risk. Although BGC believes that its expectations reflected in these forward-looking statements are reasonable, such statements involve risks and uncertainties, and no assurance can be given that actual results will be consistent with these forward-looking statements. Investment in oil and gas exploration is high risk by its very nature. Important factors that could cause actual results to differ from these forward-looking statements include, but are not limited to: erroneous interpretations of the seismic and geological data; the inability to acquire leases on identified prospects; mechanical problems while drilling and producing wells which prevent completion of a well or result in plugging of a well; dry holes; less reserves than originally estimated due to poor sand development or drainage by offsetting wells; non-commercial wells; and the variations in future gas pricing. BGC cannot and has not beyond normal due diligence care standards confirmed the accuracy and completeness of all the information we have reviewed in the course of this consulting engagement. Data for this review has been provided by Lion Energy, LLC or is publicly available and BGC, Inc. cannot be held responsible for errors in this provided data. Further, we express no opinion regarding any legal or securities issues. BGC shall assume no liability whatsoever for the use or reliance there upon by Lion Energy, LLC, their clients and/or their investors, of information, opinions and interpretations provided by BGC. BGC reserves the right to adjust these findings and interpretations with the discovery of relevant data or future production data.

Figure 1: Well location map of the Bittinger SWD Site. Wells being permitted for SWD include the 123-33914 (Bittinger #1) and the 123-39874 (Bittinger #4).

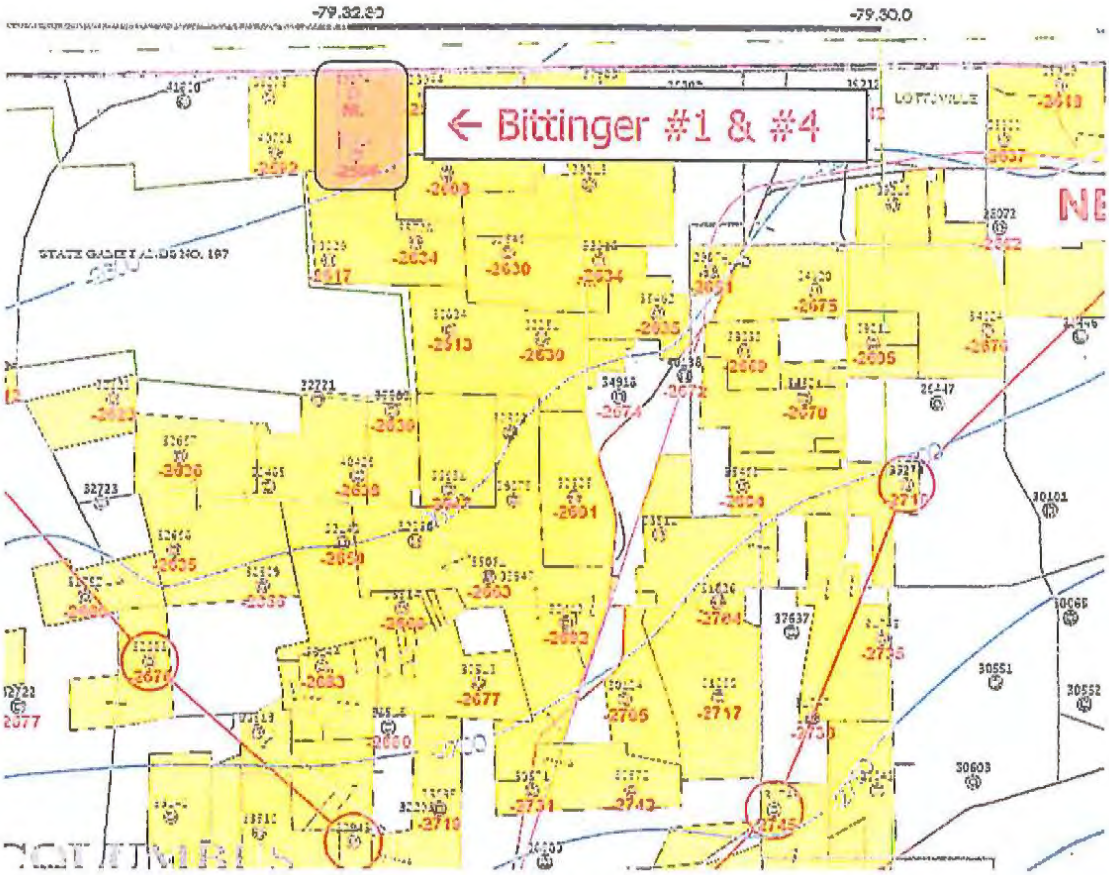


Figure 2: Map of the structure on top of the Packer Shell (above the Medina Sandstone). Structure on top of the Packer Shell is very consistently dipping to the southeast. The 123-33914 (Bittinger #1) and the 123-39874 (Bittinger #4) highlighted in orange.

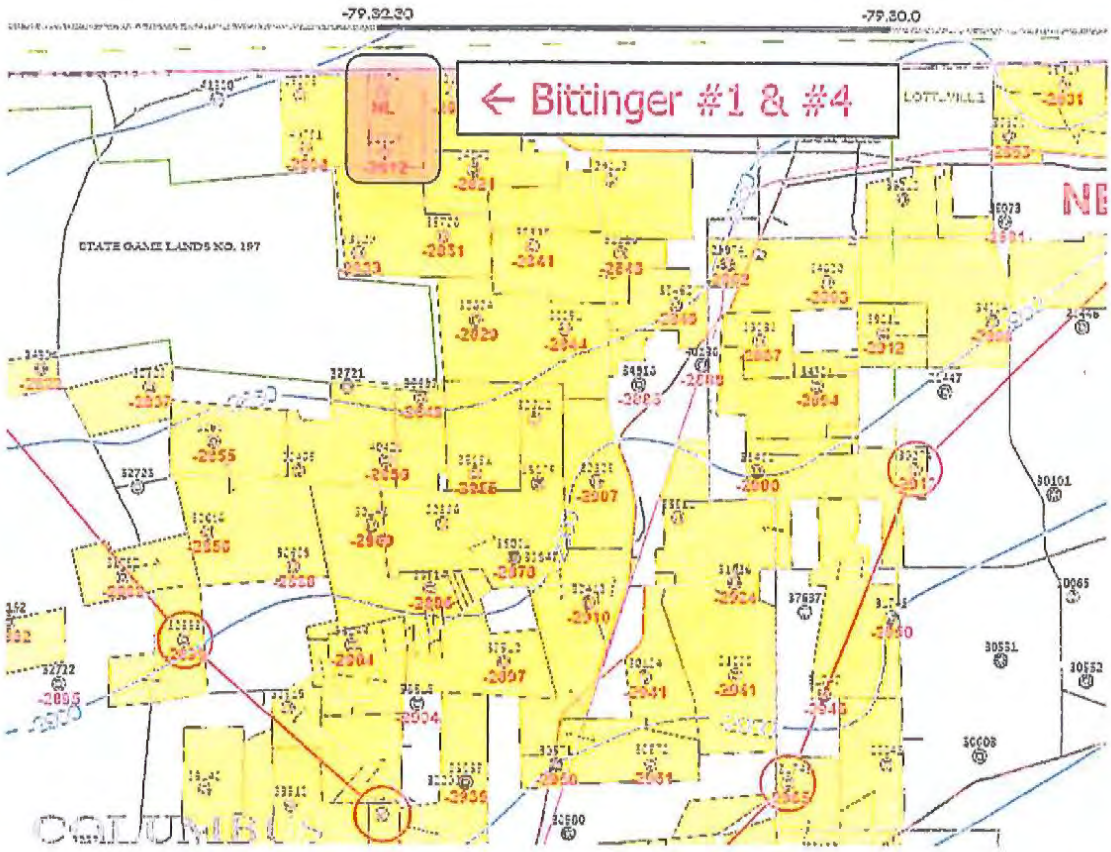


Figure 3: Map of the structure on top of the Queenston Shale (base of the Whirlpool Sandstone). Structure on top of the Queenston Shale is very consistently dipping to the southeast. The 123-33914 (Bittinger #1) and the 123-39874 (Bittinger #4) highlighted in orange.

Table 1:

Log Data from Wells in the Area of Study

API#	Whirlpool 6%	Whirlpool 8%	Whirlpool 10%	Medina 6%	Medina 8%	Medina 10%
123-33914	10	9	8	23	9	0
123-33944	12	10	9	38	7	0
123-33945	13	11	8	54	9	0
123-39874	11	10	7	38	6	0
123-34843	12	10	7	25	2	0
123-33829	11	9	8	42	7	0
123-35728	14	12	11	57	33	10
123-33646	8	5	3	47	10	1
123-32210	9	7	4	29	3	0

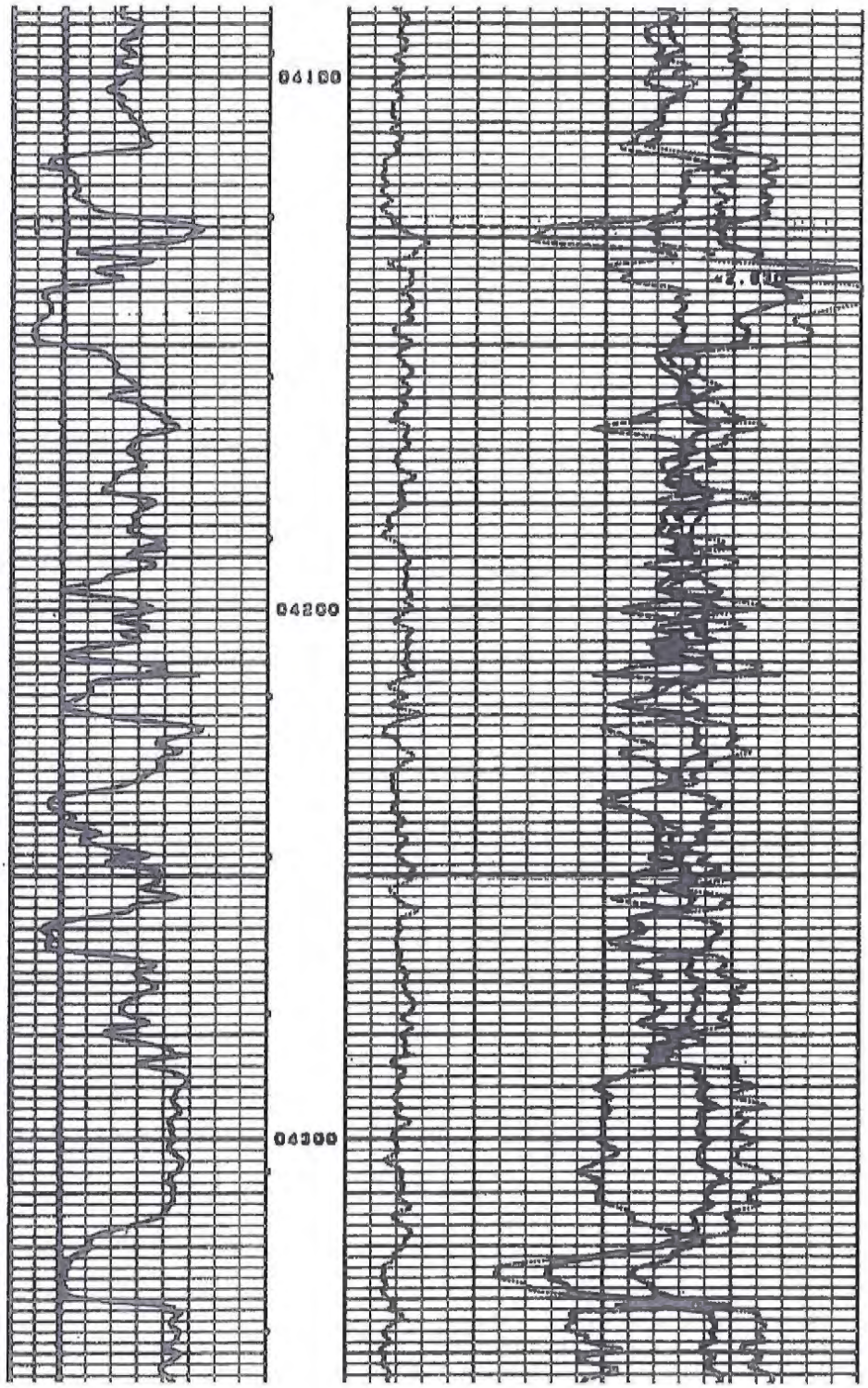
Average: 11.1

Average: 39.2

Appendix 1:

Log Data and Completion Reports for the Wells Being Permitted as Salt Water Disposal Wells

Gamma Ray, Density Neutron Log -- Bittinger #1 (123-33914)



ER-OG-4: Rev. 2/80

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

123-33914 (c) Office Use Only

WELL RECORD

2260 S 42°00'00"
1205" W 79°30'00"

PERMIT NO. WAR-33914 PROJECT NO. PEEP TYPE OF WELL gas

COLUMBUS FIELD, DEWEY CORNERS POOL - DEV

WELL OPERATOR	U.S. ENERGY DEVELOPMENT CORPORATION	TELEPHONE NO.	(716) 856-9764
ADDRESS	670 Statler Building, Buffalo, New York	ZIP	14202
FARM NAME	BITTINGER	FARM NO. #1	SERIAL NO. / / ACRES 60
TOWNSHIP	Columbus	COUNTY	Warren
DRILLING COMMENCED	12-20-83	DRILLING COMPLETED	12-29-83
ELEVATION	1518'	QUADRANGLE	Columbus ☑ 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
8-5/8"	401'	225					12/22/83
4-1/2"	4416'	150	150				12/26/83

T.D.	D.D.	D.P.I.	Class	O	G	Lease
4467		4327	D	1		7

PERFORATION RECORD

DATE	INTERVAL PERFORATED FROM	TO
3/8/84	4210'	4327'

STIMULATION RECORD

DATE	INTERVAL TREATED	AMOUNT FLUID	AMOUNT SAND	INJECTION RATE
3/9/84	4210-4327'	897 bbls	70000#	17 BPM

NATURAL OPEN FLOW	300 MCF	NATURAL ROCK PRESSURE: Not taken HRS. DAYS
AFTER TREATMENT OPEN FLOW	5,680 MCF	AFTER TREATMENT ROCK PRESSURE: 1250 HRS. 72 DAYS

REMARKS: MEDINA

Driller's TD 4467'

Logger's TD 4431'

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OCT 1 1984
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(Oil & Gas Geology Division)

(FORMATION ON REVERSE SIDE)

GAO 8-21-84

Completion Report (page 2) -- Bittinger #1 (123-33914)

GR-OG-4: Rev. 2/00
(pg 2)

FORMATIONS

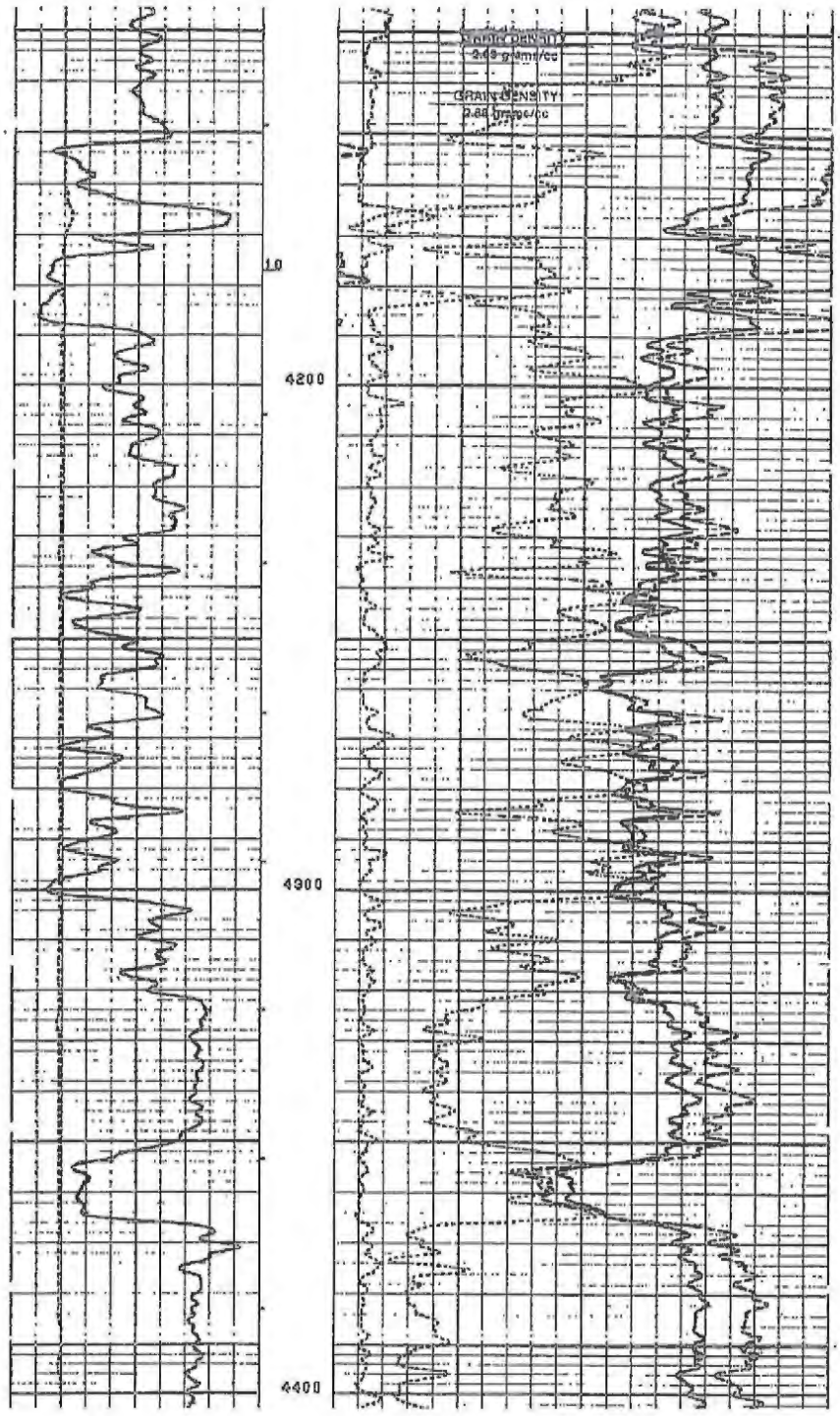
NAME	TOP	BOTTOM	GAS AT	OIL AT	WATER AT (FRESH OR SALT WATER)	SOURCE OF DATA
Unconsolidated Gravel	0'	37'			Fresh @ 25'	Driller's record and geophysical logs
Devonian Shale	37'	2679'				
"Tully" Ls	2679'	2785'				
Hamilton Shales	2785'	2955'				
Onondaga	2955'	3129'				
Unconformity Interval	3129'	3145'				
Akron-Bertie	3145'	3220'			Salt @ 3935'	
Camillus	3220'	3298'				
Syracuse	3298'	3525'				
Vernon	3525'	3784'				
Salt Zone	3504'	3709'	4430'			
Lockport	3784'	4009'				
Rochester	4009'	4113'				
Irondequoit-Reynales	4113'	4150'				
Grimsby	4150'	4265'				
Power Glen	4265'	4316'				
Whirlpool	4316'	4331'				
Queenston	4331'	TD				
TD	4431					

June 21, 1984
DATE

Douglas K. Walch
APPROVED BY Douglas K. Walch

Geophysicist
TITLE

Gamma Ray, Density Neutron Log -- Bittinger #4 (123-39874)



Completion Report (page 1) -- Bittinger #4 (123-39874)

COLUMBUS

ER-OG-1, Rev. 3/82 PB

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

REG-I/NLH

Office Use Only

970' S 42°00'00"
1240' W 79°30'00"
(E)

WELL RECORD

123-39874-74
71275

PERMIT NO 37-123-39074-00 PROJECT NO DEEP TYPE OF WELL Gas

COLUMBUS FIELD, DEWEY CORNERS POOL DEV

WELL OPERATOR
U. S. Energy Development Corporation

TELEPHONE NO
(716)856-9764

ADDRESS
670 Statler Towers, Buffalo, NY 14202-9990

ZIP

FARM NAME	FARM NO	SERIAL NO	ACRES
Bittinger	4		62

TOWNSHIP	COUNTY
Columbus	Warren

DRILLING COMMENCED	DRILLING COMPLETED
8/11/87	8/15/87

ELEVATION	QUADRANGLE
1561'	Columbus ☒ 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
13 3/8"	30'	NA					8/11/87
8 5/8"	506'	220	5				8/12/87
4 1/2"	4454.9'	265					11/5/87

T.D.	D.D.	D.P.I.	Class	Q	G	Lease
4496		4362	D	01	1	7

PERFORATION RECORD

DATE	INTERVAL PERFORATED: FROM	INTERVAL PERFORATED: TO
8/19	4459'	4362'

STIMULATION RECORD

DATE	INTERVAL TREATED	AMOUNT FLUID	AMOUNT SAND	INJECTION RATE
8/20/87	Same	840bbls.	67,000#	20.7

NATURAL OPEN FLOW	NATURAL ROCK PRESSURE	HRS / DAYS
300MCF	NA	
AFTER TREATMENT OPEN FLOW	AFTER TREATMENT ROCK PRESSURE	HRS / DAYS
6,000MCFD	1100	72 / 3

REMARKS: MEDINA

RECEIVED
SEP 30 1988
PA GEOLOGICAL SURVEY
Oil & Gas Section Library

(FORMATION ON REVERSE SIDE)

A WELL RECORD SHALL BE FILED WITHIN 30 DAYS OF CESSATION OF DRILLING. IF THE WELL IS NOT COMPLETED WITHIN 30 DAYS OF CESSATION OF DRILLING, AN UPDATED WELL RECORD MUST BE SUBMITTED UPON COMPLETION OF THE WELL.

COM
3-18-88

ER-OG-4r Rev. 10/82
(pg 2)

123-39874

FORMATIONS

NAME	TOP	BOTTOM	GAS AT	OIL AT	WATER AT (FRESH OR SALT WATER)	SOURCE OF DATA
Unconsolidated Gravel	0	18'				Driller's Record & Geophysical Logs
Devonian Shale	18'	2741'				
Tully Limestone	2741'	2848'				
Hamilton Shale	2848'	3018'				
Onondaga Limestone	3018'	3182'				
Bois Blanc	3182'	3211'				
Akron Dol	3211'	3292'				
Camillus	3292'	3366'				
Syracuse	3366'	3547'				
Salt	3547'	3896'				
Lockport Dol	3896'	4067'			Salt water	
Rochester Shale	4067'	4151'				
Packer Shell	4151'	4189'				
Grimsby Sandstone	4189'	4304'	Gas			
Power Glen Shale	4304'	4350'				
Whirlpool Sandstone	4350'	4367'	Gas			
Queenston Shale	4367'	4496'				
		T.D.				

August 30, 1987
DATE

[signature]
APPROVED BY

[signature]
TITLE

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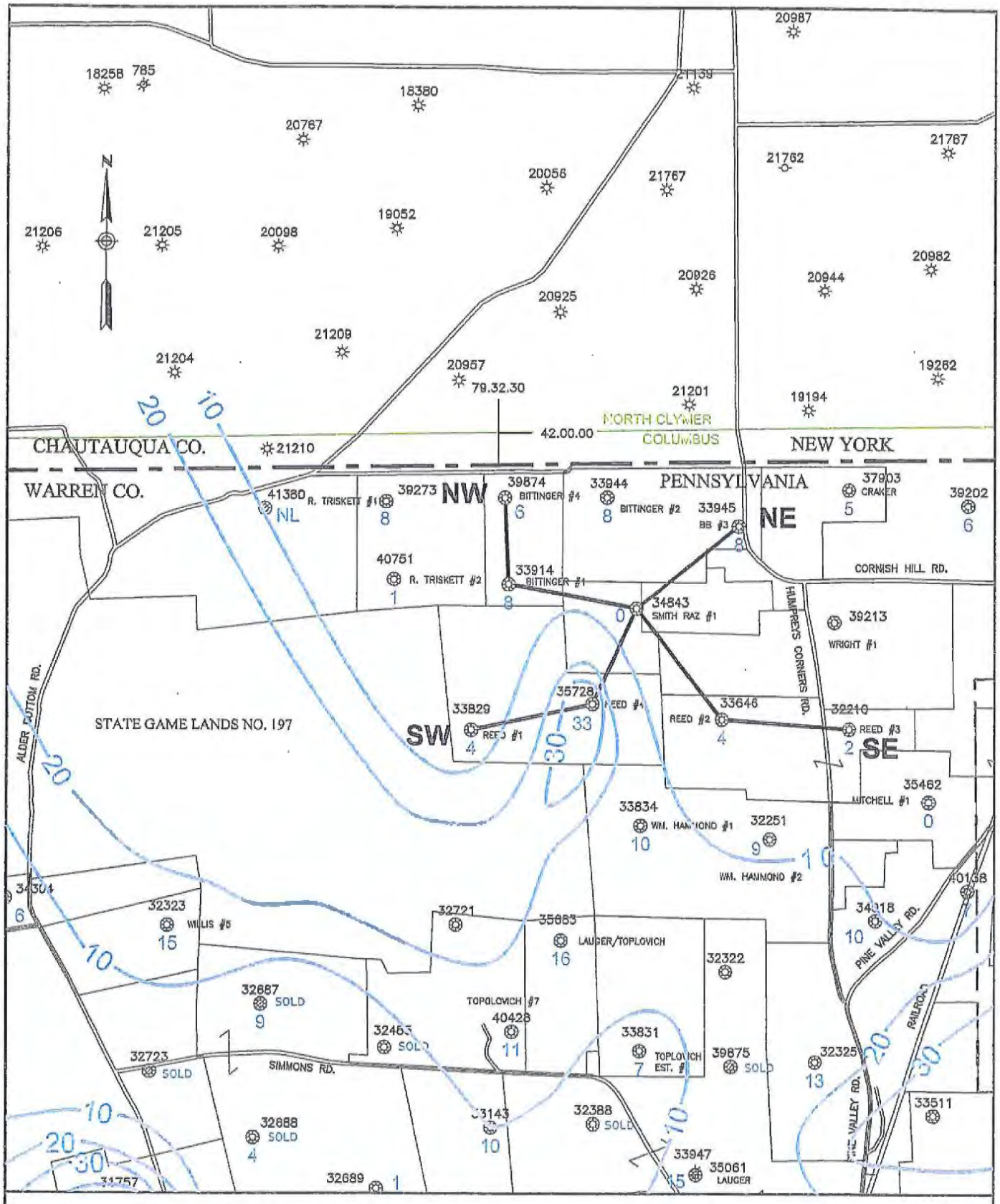
SEP 30 1988
PA GEOLOGICAL SURVEY

Appendix 2:

Cross-sections, Isopach and Structural Mapping

Bittinger SWD Site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COLUMBUS
CHAUTAUQUA CO.
21210
NEW YORK
WARREN CO.
PENNSYLVANIA
41380
R. TRISKETT #1
NL
39273
NW
39874
BITTINGER #4
33944
BITTINGER #2
33945
BB #3
NE
37903
CRAKER
39202
40751
R. TRISKETT #2
33914
BITTINGER #1
CORNISH HILL RD.
34843
SMITH RAZ #1
HUMPREYS CORNERS RD.
39213
WRIGHT #1
ALDER BOTTOM RD.
STATE GAME LANDS NO. 197
33829
REED #1
SW
35728
REED #4
33646
REED #2
32210
REED #3
SE
35462
MITCHELL #1
33834
WM. HAMMOND #1
32251
WM. HAMMOND #2
34304
32323
WILLIS #5
32721
35883
LAUGER/TOPLOVICH
34318
PINE VALLEY RD.
40138
32322
32887
SOLD
TOPOLOVICH #7
40428
32465
SOLD
33831
TOPLOVICH EST. #
39875
SOLD
32325
RAILROAD
32723
SOLD
SIMMONS RD.
33511
32688
SOLD
33143
32388
SOLD
33947
35061
LAUGER
32689
31757
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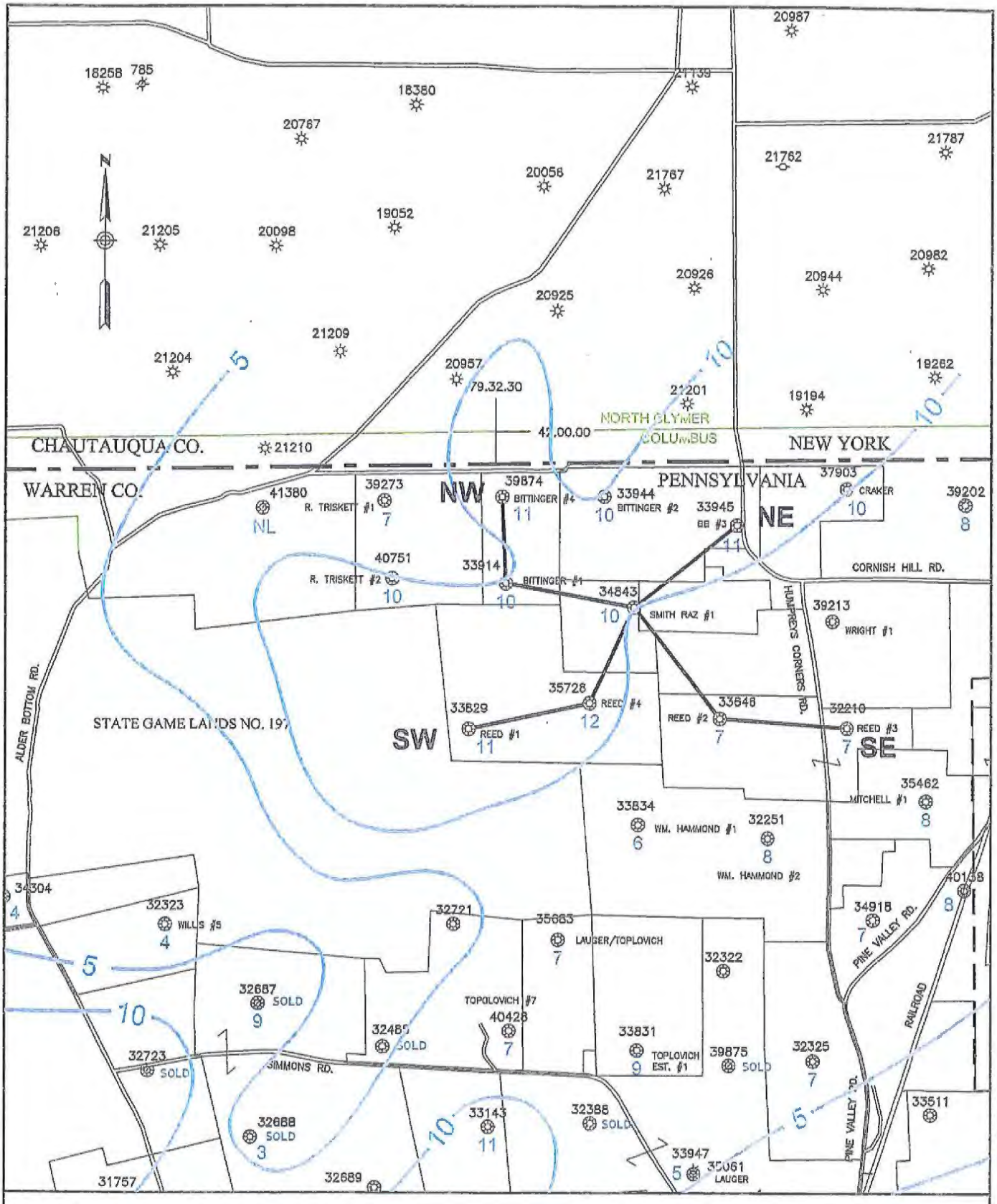
1 MILE
SCALE
LION ENERGY CO., LLC
Columbus Twp., Warren Co., Pennsylvania
USGS 7 1/2' Quadrangle Columbus, PA
Isopach Medina SS 8% Log Porosity
Contour Interval = 10 Ft.
Date: 12/27/2010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PENNSYLVANIA
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BITTINGER #2
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CRAKER
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R. TRISKETT #2
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SMITH RAZ #1
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ALDER BOTTOM RD.
STATE GAME LANDS NO. 197
35728
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MITCHELL #1
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WM. HAMMOND #1
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WM. HAMMOND #2
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WILLS #5
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LAUGER/TOPLOVICH
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PINE VALLEY RD.
RAILROAD
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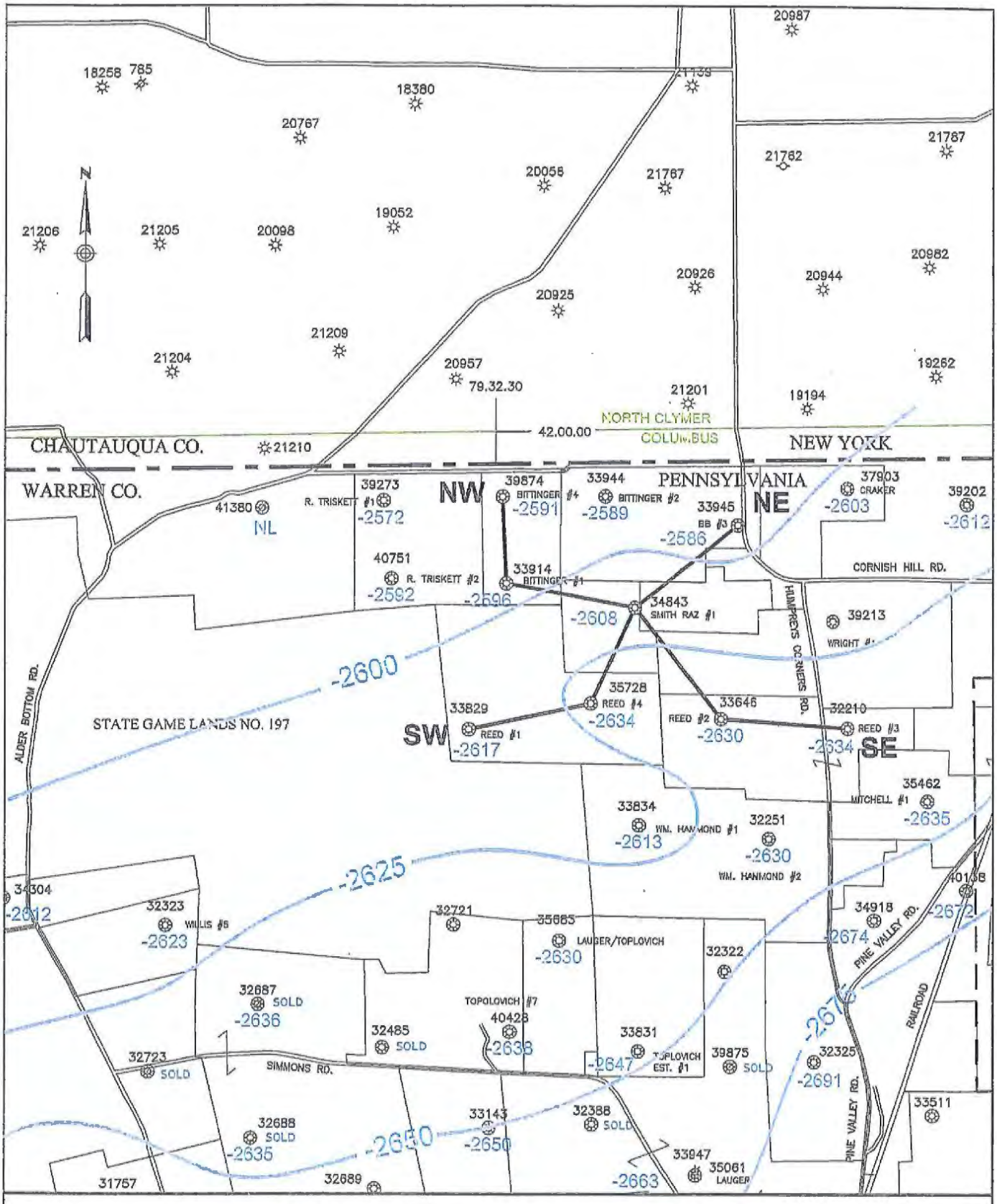
4
7
7
32322
32687
SOLD
9
TOPOLOVICH #7
40428
7
32485
SOLD
33831
TOPLOVICH EST. #1
9
39875
SOLD
32325
7
32723
SOLD
SIMMONS RD.
32688
SOLD
3
33143
11
32388
SOLD
33511
PINE VALLEY RD.
33947
35061
LAUGER
5
31757
32689
5
10
10
5
0
4000 FEET
0
1/2
1 MILE
SCALE
LION ENERGY CO., LLC
Columbus Twp., Warren Co., Pennsylvania
USGS 7 1/2' Quadrangle Columbus, PA
Isopach Whirlpool SS 8% Log Porosity
Contour Interval = 5 Ft.
Date: 12/27/2010



LION ENERGY CO., LLC

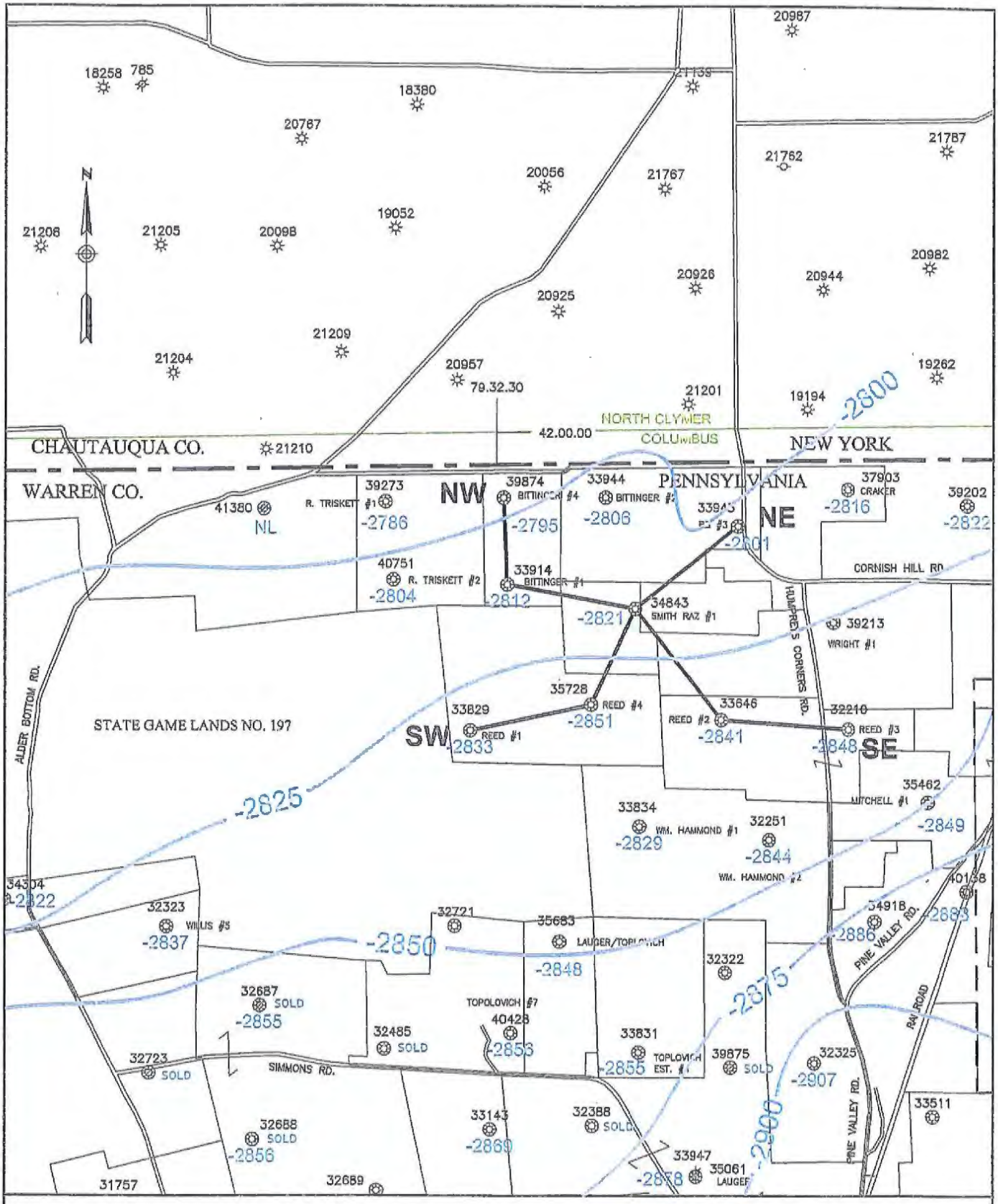
Columbus Twp., Warren Co., Pennsylvania

USGS 7 1/2' Quadrangle Columbus, PA

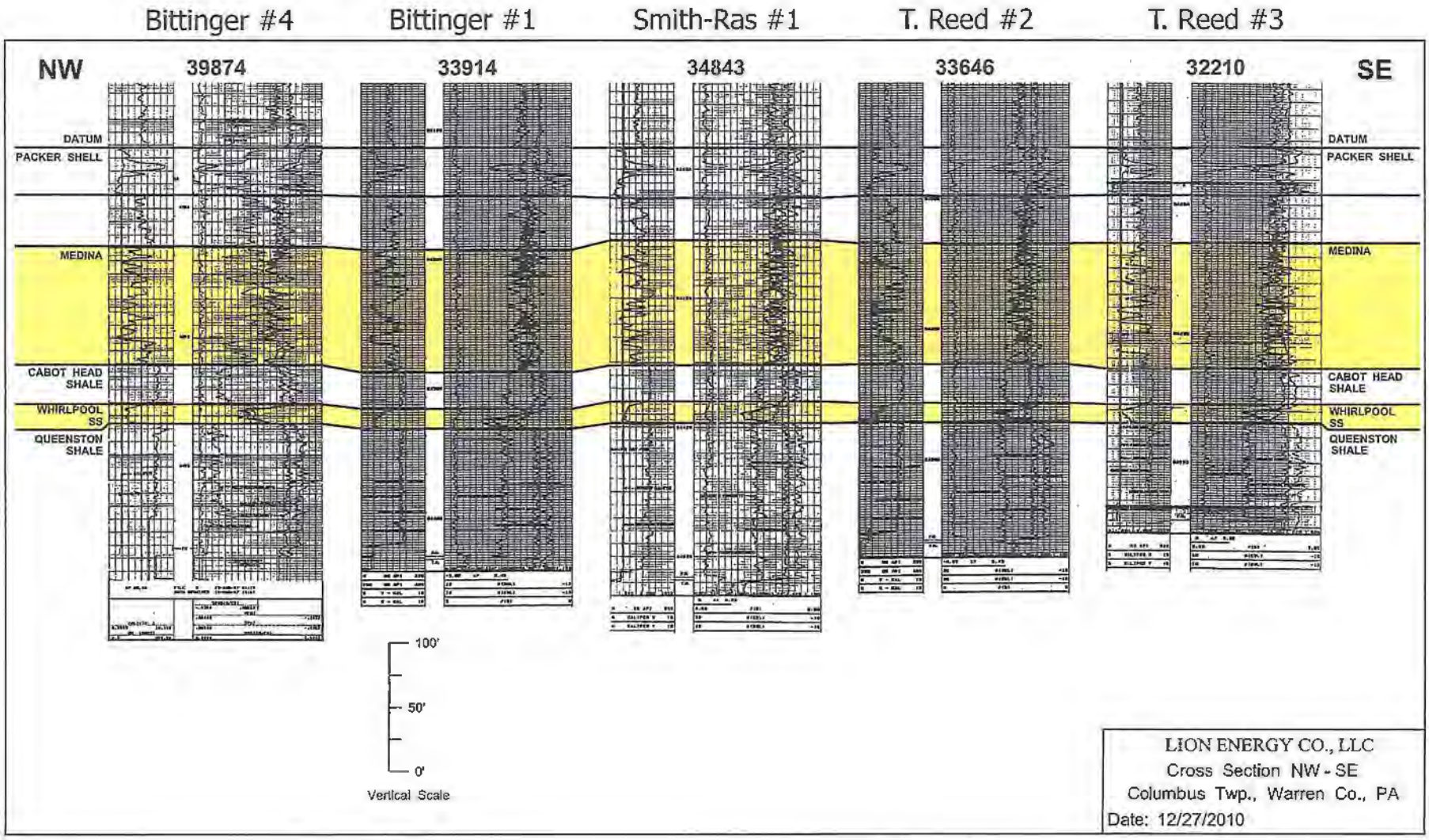
Subsea Structure Contour Top of Packer Shell

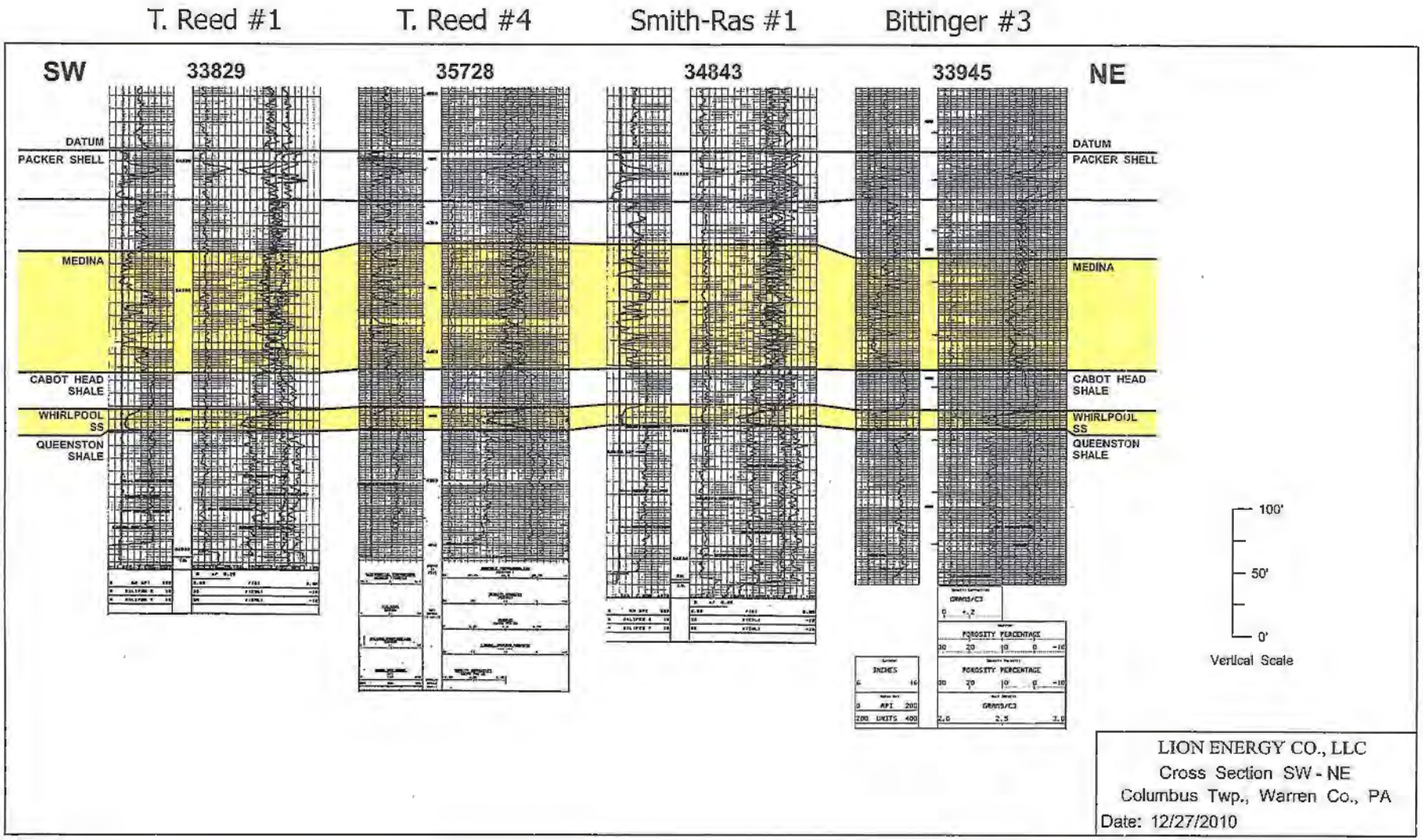
Contour Interval = 50 Ft.

Date: 12/27/2010



LION ENERGY CO., LLC
Columbus Twp., Warren Co., Pennsylvania
USGS 7 1/2' Quadrangle Columbus, PA
Subsea Structure Contour Top of Queenston Shale
Contour Interval = 50 Ft.
Date: 12/27/2010


Bittinger #4
Bittinger #1
Smith-Ras #1
T. Reed #2
T. Reed #3
NW
39874
33914
34843
33646
32210
SE
DATUM
PACKER SHELL
MEDINA
CABOT HEAD SHALE
WHIRLPOOL SS
QUEENSTON SHALE
100'
50'
0'
Vertical Scale
LION ENERGY CO., LLC
Cross Section NW - SE
Columbus Twp., Warren Co., PA
Date: 12/27/2010


T. Reed #1
T. Reed #4
Smith-Ras #1
Bittinger #3
SW
33829
35728
34843
33945
NE
DATUM
PACKER SHELL
MEDINA
CABOT HEAD SHALE
WHIRLPOOL SS
QUEENSTON SHALE
100'
50'
0'
Vertical Scale
LION ENERGY CO., LLC
Cross Section SW - NE
Columbus Twp., Warren Co., PA
Date: 12/27/2010

GEOLOGIC DATA

SMITH-RAS UNIT #1 COMPLETION RECORD

ER-OG-4 Rev. 2/80

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

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WELL RECORD

PERMIT NO. WAR-34843 | PROJECT NO. | TYPE OF WELL Gas

WELL OPERATOR U.S. Energy Development Corporation | TELEPHONE NO. (716)856-9764

ADDRESS 670 Statler Building; Buffalo, NY | ZIP 14202

FARM NAME	FARM NO.	SERIAL NO.	ACRES
Smith/Ras Unit	#1		72

TOWNSHIP	COUNTY
Columbus	Warren

DRILLING COMMENCED	DRILLING COMPLETED
3/21/84	3/26/84

ELEVATION 1575' | QUADRANGLE Columbus | ☒ 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
8 5/8"	406'	150					3/22/84
4 1/2"	4493'	75	150				3/26/84

PERFORATION RECORD

DATE	INTERVAL PERFORATED FROM	INTERVAL PERFORATED TO
6/27/84	4269	4383
	Driller's TD	
	Logger's TD	

STIMULATION RECORD

DATE	INTERVAL TREATED	AMOUNT FLUID	AMOUNT SAND	INJECTION RATE
6/27/84	4269-4383	674 bbls	58,000#	21 BPM

NATURAL OPEN FLOW	NATURAL ROCK PRESSURE	HRS. DAYS
N/A	Not Taken	
AFTER TREATMENT OPEN FLOW 5,208 MMCF	AFTER TREATMENT ROCK PRESSURE 1240 PSI	HRS. DAYS XXXX

REMARKS:

Driller's TD 4525'

Logger's TD 4518'

(FORMATION ON REVERSE SIDE)

8424

FORMATIONS

NAME	TOP	BOTTOM	GAS AT	OIL AT	WATER AT (FRESH OR SALT WATER)	SOURCE OF
Unconsolidated Gravel	0'	120'			Fresh @ 105'	Drillers records a geophysic logs
Devonian Shale	120'	2768'				
"Tully" Limestone	2768'	2877'				
Hamilton Shales	2877'	3049'				
Onondaga	3049'	3218'				
Unconformity Interval	3218'	3233'				
Akron-Bertie	3233'	3317'				
Camillus	3317'	3389'				
Syracuse	3389'	3597'				
Vernon	3597'	3861'				
Salt Zone	3579'	3785'				
Lockport	3861'	4065'			Salt @ 3910'	
Rochester	4065'	4184'				
Irondequoit-Reynales	4184'	4222'				
Grimsby	4222'	4351'				
Power Glen	4351'	4383'				
Whirlpool	4383'	4396'				
Queenston	4396'	TD				
TD	4516'					

July 17, 1984
DATE

Douglas K Welch
APPROVED BY

Douglas K. Welch, Geophysicist
TITLE

Well Name & No. SMITH/RAS #1 Loc. _____

Permit No. _____ COLUMBUS Twp.: WARREN Co.: [redacted] PA

PERFORATION RECORD

Company N. S. McCullough Formation Mottles/Whirlpool Date 6/26/86

Pumped in 500 gal. acid and 500 gal. water, ran Gamma Ray and collar log. PBTD 4487 ft. Perf. as follows:

4279	- 4316 w/	shots	-	4387	- 4391 w/		shots
4305	- 4318 w/	shots	-	4399	- w/		shots
4309	- 4334 w/	shots	-	4391	- w/		shots

Size of shots .42 Total Shots 10

FRAC JOB

Company Dowell Schlumberger Date 6/27/86

Loaded hole. Broke formation @ 2100 # Back to 950 #. Pumped in 500 gals. 15% HCL Acid @ 20 BPM @ 3300 #, waited 5 min. & frac'd as follows:

	BBLS./GAL.		SAND # Per Gal.	SAND Size	BPM	Press.
1.	0-144		PAD	- - - -	20	3400
2.	144-339		2#	20/50	21	3350
3.	339-420		3#	20/50	21	3250
4.	420-611		4#	20/50	20	3500
5.	611-675		Flush	- - - -	14.5	3500
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						
19.						
20.						

ISIP 2260 # 5 MIN. 1950 # Job complete 12:36 P.M.

Open to pit 1:26 P.M. Flowed back 24 hrs. Total water 675 bbls.

52,000 # 20/50 & - - - - # 80/100. Avg. pump rate 21 BPM @ 3369 # Press.

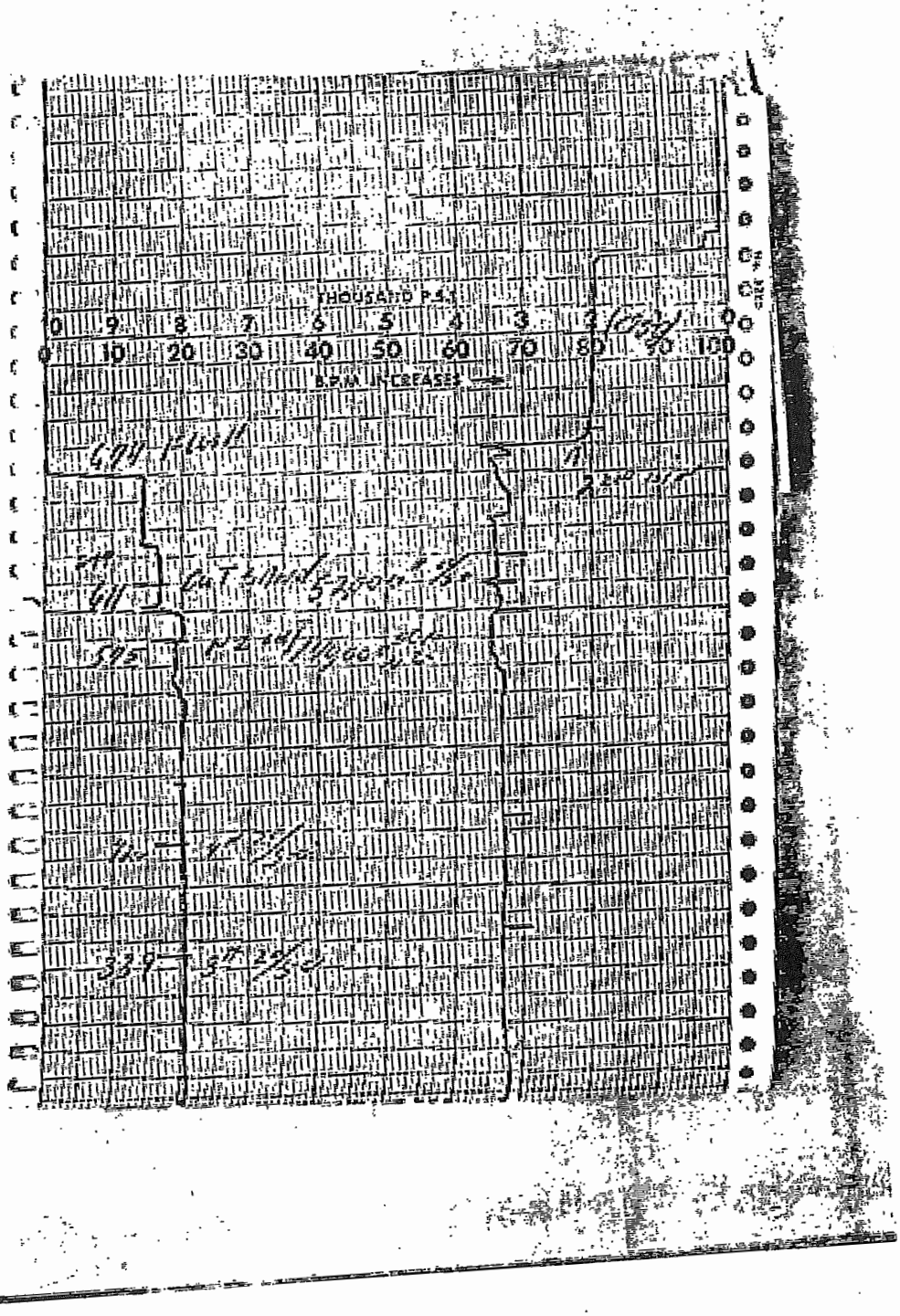
HHP used 1734. Nitrogen used 140,000.

REMARKS: At 340 BBLS cut N, due to high pressure - at 611 BBLS cut sand due to high pressure - well screened off - 4 BBLS short of flush to perfs.

[redacted]

ENGINEER

7-6-84


THOUSAND P.S.I.
9
8
7
6
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4
3
10
20
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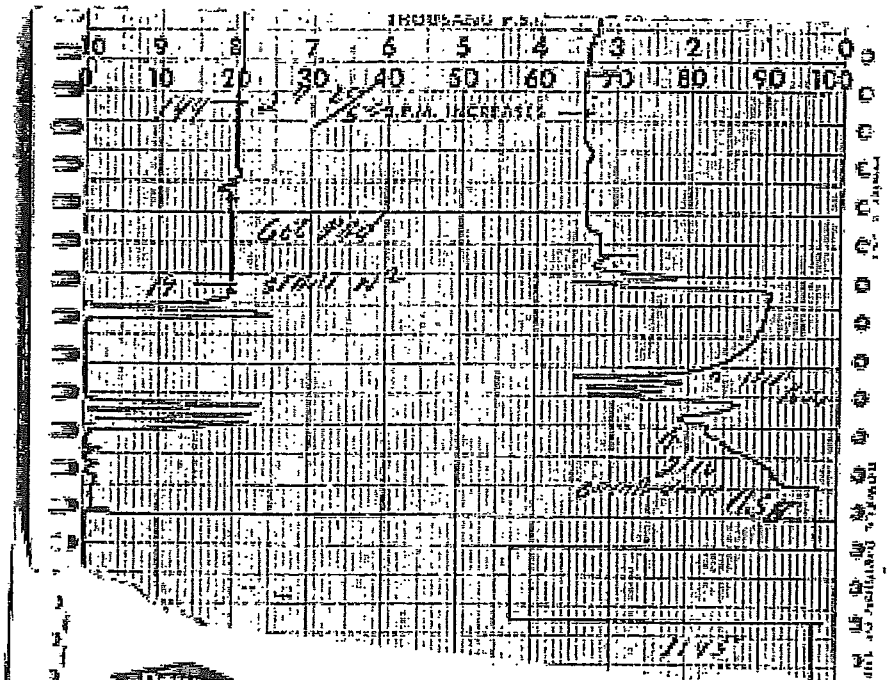
50
60
70
80
90
100
B.P.M. INCREASES



DOWELL DIVISION OF DOW CHEMICAL U.S.A.

RECORDED SERVICE

TREATMENT NO. 01-H- 9044

TYPE OF SERVICE: WF 30 & C.

DATE: 6/27/84

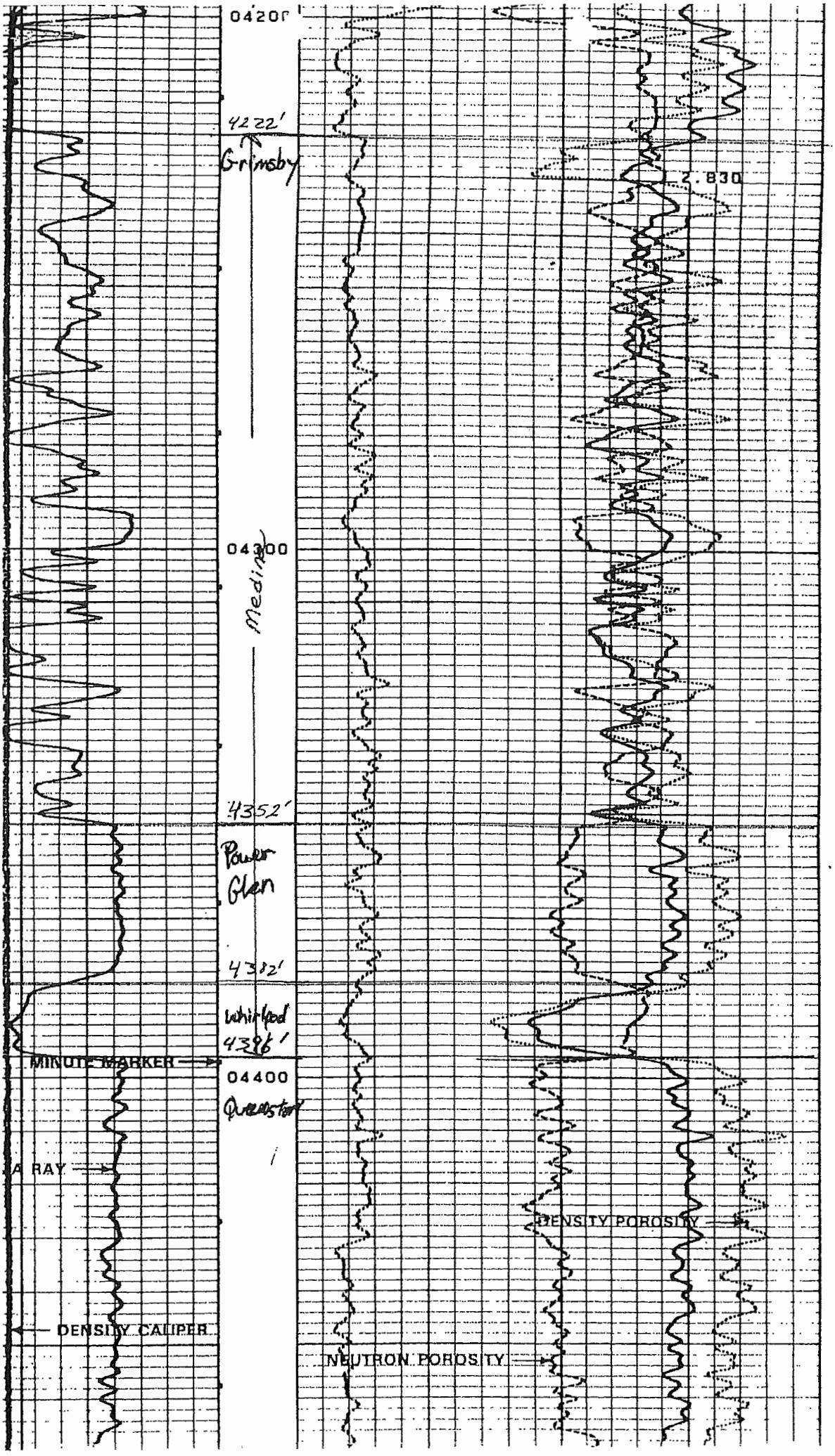
U. S. Cowdy

Smith-Marz #1

W. D. Otis

D. Tucker

REMARKS: [illegible]


Smith Rees Unit #1
04200'
4222'
Grimsby
2.830
04300
Medina
4352'
Power Glen
4382'
Whirlpool
4396'
MINUTE MARKER
04400
Queenston
A RAY
DENSITY CALIPER
NEUTRON POROSITY
DENSITY POROSITY

GEOLOGIC DATA

MAXIMUM INJECTION PRESSURE CALCULATIONS

Maximum Injection Pressure (MIP) Calculations for Bear Lake Properties Smith-Ras Unit #1 Well
Warren County, PA

1) Frac Gradient (FG) Based on Smith-Ras Unit #1 Well Frac

FG = [ISIP + (.433 X SG X D)] /D
Where:
ISIP = 2200 psi
SG = 1.0 (frac fluid)
D = 4391

ISIP (psi)	Hydrostatic Factor (psi/ft)	SG	D (ft)	Fracture Gradient (psi/ft)
2200	0.433	1	4391	0.934

2) Maximum Injection Pressure (MIP) Calculation for Smith-Ras Unit #1 Well

MIP = [FG - (.433XSG)] X D
FG = 0.934
SG = 1.218 (brine)

Depth:
Medina Top 4222

Hydrostatic Factor (psi/ft)	SG	D (ft)	Fracture Gradient (psi/ft)	**MIP (Surface)**
0.433	1.218	4222	0.934	**1717**

GEOLOGIC DATA

MEDINA WELL GAS PRODUCTION SUMMARY

Permit	Company	Year	Product	Quantity (MCF)	Brine	Days	County	Municipality	Farm_Name	Farm_Well_No	Field	Pool	Completion Date
123-33944	US ENERGY DEV CORP	1984	GAS	5,812		0	WARREN	COLUMBUS	JOSEPH BITTINGER	2	COLUMBUS	DEWEY CORNERS	29-Jan-84
123-33944	US ENERGY DEV CORP	1985	GAS	22,275		0	WARREN	COLUMBUS	JOSEPH BITTINGER	2	COLUMBUS	DEWEY CORNERS	29-Jan-84
123-33944	US ENERGY DEV CORP	1986	GAS	30,101		336	WARREN	COLUMBUS	JOSEPH BITTINGER	2	COLUMBUS	DEWEY CORNERS	29-Jan-84
123-33944	US ENERGY DEV CORP	1987	GAS	23,479		336	WARREN	COLUMBUS	JOSEPH BITTINGER	2	COLUMBUS	DEWEY CORNERS	29-Jan-84
123-33944	US ENERGY DEV CORP	1988	GAS	47,976		347	WARREN	COLUMBUS	JOSEPH BITTINGER	2	COLUMBUS	DEWEY CORNERS	29-Jan-84
123-33944	US ENERGY DEV CORP	1989	GAS	50,332		352	WARREN	COLUMBUS	JOSEPH BITTINGER	2	COLUMBUS	DEWEY CORNERS	29-Jan-84
123-33944	US ENERGY DEV CORP	1990	GAS	39,609		346	WARREN	COLUMBUS	JOSEPH BITTINGER	2	COLUMBUS	DEWEY CORNERS	29-Jan-84
123-33944	US ENERGY DEV CORP	1991	GAS	21,121		347	WARREN	COLUMBUS	JOSEPH BITTINGER	2	COLUMBUS	DEWEY CORNERS	29-Jan-84
123-33944	US ENERGY DEV CORP	1992	GAS	6,351		323	WARREN	COLUMBUS	JOSEPH BITTINGER	2	COLUMBUS	DEWEY CORNERS	29-Jan-84
123-33944	US ENERGY DEV CORP	1993	GAS	3,039		339	WARREN	COLUMBUS	JOSEPH BITTINGER	2	COLUMBUS	DEWEY CORNERS	29-Jan-84
123-33944	US ENERGY DEV CORP	1994	BRINE		22		WARREN	COLUMBUS	JOSEPH BITTINGER	2	COLUMBUS	DEWEY CORNERS	29-Jan-84
123-33944	US ENERGY DEV CORP	1994	GAS	1,402		319	WARREN	COLUMBUS	JOSEPH BITTINGER	2	COLUMBUS	DEWEY CORNERS	29-Jan-84
123-33944	BELDEN & BLAKE CORP	2000	GAS	698		366	WARREN	COLUMBUS	JOSEPH BITTINGER	2	COLUMBUS	DEWEY CORNERS	29-Jan-84
123-33944	BELDEN & BLAKE CORP	2001	GAS	67		365	WARREN	COLUMBUS	JOSEPH BITTINGER	2	COLUMBUS	DEWEY CORNERS	29-Jan-84
123-33944	BELDEN & BLAKE CORP	2002	GAS	0		0	WARREN	COLUMBUS	JOSEPH BITTINGER	2	COLUMBUS	DEWEY CORNERS	29-Jan-84
123-33944	BELDEN & BLAKE CORP	2002	OIL	0		0	WARREN	COLUMBUS	JOSEPH BITTINGER	2	COLUMBUS	DEWEY CORNERS	29-Jan-84
123-33944	RANGE RESOURCES APPALACHIA LLC	2002	GAS	5		31	WARREN	COLUMBUS	JOSEPH BITTINGER	2	COLUMBUS	DEWEY CORNERS	29-Jan-84
123-33944	RANGE RESOURCES APPALACHIA LLC	2003	GAS	701		334	WARREN	COLUMBUS	JOSEPH BITTINGER	2	COLUMBUS	DEWEY CORNERS	29-Jan-84
123-33944	RANGE RESOURCES APPALACHIA LLC	2004	GAS	718		365	WARREN	COLUMBUS	JOSEPH BITTINGER	2	COLUMBUS	DEWEY CORNERS	29-Jan-84
123-33944	RANGE RESOURCES APPALACHIA LLC	2005	GAS	670		334	WARREN	COLUMBUS	JOSEPH BITTINGER	2	COLUMBUS	DEWEY CORNERS	29-Jan-84
123-33944	RANGE RESOURCES APPALACHIA LLC	2006	GAS	374		334	WARREN	COLUMBUS	JOSEPH BITTINGER	2	COLUMBUS	DEWEY CORNERS	29-Jan-84
123-33944	TRINITY ENERGY CORP	2007	GAS	102		122	WARREN	COLUMBUS	JOSEPH BITTINGER	2	COLUMBUS	DEWEY CORNERS	29-Jan-84
123-33944	LION ENERGY CO LLC	2008	GAS	193		365	WARREN	COLUMBUS	JOSEPH BITTINGER	2	COLUMBUS	DEWEY CORNERS	29-Jan-84
123-33944	LION ENERGY CO LLC	2009	GAS	30		30	WARREN	COLUMBUS	JOSEPH BITTINGER	2	COLUMBUS	DEWEY CORNERS	29-Jan-84
			Total	**255,055**	**22**								

Permit	Company	Year	Product	Quantity		Days	County	Municipality	Farm_Name	Farm_Well_No	Field	Pool	Completion Date
123-33945	US ENERGY DEV CORP	1986	GAS	32,248		336	WARREN	COLUMBUS	JOSEPH BITTINGER	3	COLUMBUS	DEWEY CORNERS	19-Oct-84
123-33945	US ENERGY DEV CORP	1987	GAS	36,330		336	WARREN	COLUMBUS	JOSEPH BITTINGER	3	COLUMBUS	DEWEY CORNERS	19-Oct-84
123-33945	US ENERGY DEV CORP	1988	GAS	48,995		345	WARREN	COLUMBUS	JOSEPH BITTINGER	3	COLUMBUS	DEWEY CORNERS	19-Oct-84
123-33945	US ENERGY DEV CORP	1989	GAS	42,806		332	WARREN	COLUMBUS	JOSEPH BITTINGER	3	COLUMBUS	DEWEY CORNERS	19-Oct-84
123-33945	US ENERGY DEV CORP	1990	GAS	26,642		343	WARREN	COLUMBUS	JOSEPH BITTINGER	3	COLUMBUS	DEWEY CORNERS	19-Oct-84
123-33945	US ENERGY DEV CORP	1991	GAS	13,848		347	WARREN	COLUMBUS	JOSEPH BITTINGER	3	COLUMBUS	DEWEY CORNERS	19-Oct-84
123-33945	US ENERGY DEV CORP	1992	GAS	5,278		315	WARREN	COLUMBUS	JOSEPH BITTINGER	3	COLUMBUS	DEWEY CORNERS	19-Oct-84
123-33945	US ENERGY DEV CORP	1993	GAS	4,826		360	WARREN	COLUMBUS	JOSEPH BITTINGER	3	COLUMBUS	DEWEY CORNERS	19-Oct-84
123-33945	US ENERGY DEV CORP	1994	BRINE		73		WARREN	COLUMBUS	JOSEPH BITTINGER	3	COLUMBUS	DEWEY CORNERS	19-Oct-84
123-33945	US ENERGY DEV CORP	1994	GAS	1,810		363	WARREN	COLUMBUS	JOSEPH BITTINGER	3	COLUMBUS	DEWEY CORNERS	19-Oct-84
123-33945	BELDEN & BLAKE CORP	2001	GAS	66		365	WARREN	COLUMBUS	JOSEPH BITTINGER	3	COLUMBUS	DEWEY CORNERS	19-Oct-84
123-33945	BELDEN & BLAKE CORP	2002	GAS	40		365	WARREN	COLUMBUS	JOSEPH BITTINGER	3	COLUMBUS	DEWEY CORNERS	19-Oct-84
123-33945	BELDEN & BLAKE CORP	2002	OIL	0		0	WARREN	COLUMBUS	JOSEPH BITTINGER	3	COLUMBUS	DEWEY CORNERS	19-Oct-84
123-33945	BELDEN & BLAKE CORP	2005	GAS	0		0	WARREN	COLUMBUS	JOSEPH BITTINGER	3	COLUMBUS	DEWEY CORNERS	19-Oct-84
123-33945	BELDEN & BLAKE CORP	2005	OIL	0		0	WARREN	COLUMBUS	JOSEPH BITTINGER	3	COLUMBUS	DEWEY CORNERS	19-Oct-84
123-33945	BELDEN & BLAKE CORP	2006	GAS	0		0	WARREN	COLUMBUS	JOSEPH BITTINGER	3	COLUMBUS	DEWEY CORNERS	19-Oct-84
123-33945	BELDEN & BLAKE CORP	2006	OIL	0		0	WARREN	COLUMBUS	JOSEPH BITTINGER	3	COLUMBUS	DEWEY CORNERS	19-Oct-84
123-33945	BELDEN & BLAKE CORP	2008	GAS	0		0	WARREN	COLUMBUS	JOSEPH BITTINGER	3	COLUMBUS	DEWEY CORNERS	19-Oct-84
123-33945	BELDEN & BLAKE CORP	2008	OIL	0		0	WARREN	COLUMBUS	JOSEPH BITTINGER	3	COLUMBUS	DEWEY CORNERS	19-Oct-84
			Total	**212,890**	**73**								

Permit	Company	Year	Product	Quantity		Days	County	Municipality	Farm_Name	Farm_Well_No	Field	Pool	Completion Date
123-39273	US ENERGY DEV CORP	1985	GAS	23,500		0	WARREN	COLUMBUS	R TRISKET	1	COLUMBUS	DEWEY CORNERS	14-Dec-84

123-39273	US ENERGY DEV CORP	1986	GAS	29,581		308	WARREN	COLUMBUS	R TRISKET	1		COLUMBUS	DEWEY CORNERS	14-Dec-84
123-39273	US ENERGY DEV CORP	1987	GAS	26,012		322	WARREN	COLUMBUS	R TRISKET	1		COLUMBUS	DEWEY CORNERS	14-Dec-84
123-39273	US ENERGY DEV CORP	1988	GAS	34,866		307	WARREN	COLUMBUS	R TRISKET	1		COLUMBUS	DEWEY CORNERS	14-Dec-84
123-39273	US ENERGY DEV CORP	1989	GAS	60,104		352	WARREN	COLUMBUS	R TRISKET	1		COLUMBUS	DEWEY CORNERS	14-Dec-84
123-39273	US ENERGY DEV CORP	1990	GAS	29,211		335	WARREN	COLUMBUS	R TRISKET	1		COLUMBUS	DEWEY CORNERS	14-Dec-84
123-39273	US ENERGY DEV CORP	1991	GAS	6,338		293	WARREN	COLUMBUS	R TRISKET	1		COLUMBUS	DEWEY CORNERS	14-Dec-84
123-39273	US ENERGY DEV CORP	1992	GAS	3,309		321	WARREN	COLUMBUS	R TRISKET	1		COLUMBUS	DEWEY CORNERS	14-Dec-84
123-39273	US ENERGY DEV CORP	1993	GAS	1,474		165	WARREN	COLUMBUS	R TRISKET	1		COLUMBUS	DEWEY CORNERS	14-Dec-84
123-39273	US ENERGY DEV CORP	2000	GAS	519		240	WARREN	COLUMBUS	R TRISKET	1		COLUMBUS	DEWEY CORNERS	14-Dec-84
123-39273	US ENERGY DEV CORP	2001	GAS	1,166		365	WARREN	COLUMBUS	R TRISKET	1		COLUMBUS	DEWEY CORNERS	14-Dec-84
123-39273	BELDEN & BLAKE CORP	2001	GAS	15		365	WARREN	COLUMBUS	R TRISKET	1		COLUMBUS	DEWEY CORNERS	14-Dec-84
123-39273	US ENERGY DEV CORP	2002	GAS	684		365	WARREN	COLUMBUS	R TRISKET	1		COLUMBUS	DEWEY CORNERS	14-Dec-84
123-39273	US ENERGY DEV CORP	2003	GAS	527		365	WARREN	COLUMBUS	R TRISKET	1		COLUMBUS	DEWEY CORNERS	14-Dec-84
123-39273	US ENERGY DEV CORP	2004	GAS	1,073		365	WARREN	COLUMBUS	R TRISKET	1		COLUMBUS	DEWEY CORNERS	14-Dec-84
123-39273	US ENERGY DEV CORP	2005	GAS	1,485		365	WARREN	COLUMBUS	R TRISKET	1		COLUMBUS	DEWEY CORNERS	14-Dec-84
123-39273	US ENERGY DEV CORP	2006	BRINE		5		WARREN	COLUMBUS	R TRISKET	1		COLUMBUS	DEWEY CORNERS	14-Dec-84
123-39273	US ENERGY DEV CORP	2006	GAS	1,068		365	WARREN	COLUMBUS	R TRISKET	1		COLUMBUS	DEWEY CORNERS	14-Dec-84
123-39273	US ENERGY DEV CORP	2007	BRINE		5		WARREN	COLUMBUS	R TRISKET	1		COLUMBUS	DEWEY CORNERS	14-Dec-84
123-39273	US ENERGY DEV CORP	2007	GAS	398		240	WARREN	COLUMBUS	R TRISKET	1		COLUMBUS	DEWEY CORNERS	14-Dec-84
123-39273	LION ENERGY CO LLC	2008	GAS	201		365	WARREN	COLUMBUS	R TRISKET	1		COLUMBUS	DEWEY CORNERS	14-Dec-84
123-39273	LION ENERGY CO LLC	2009	GAS	596		365	WARREN	COLUMBUS	R TRISKET	1		COLUMBUS	DEWEY CORNERS	14-Dec-84
			Total	222,127	10									

Permit	Company	Year	Product	Quantity		Days	County	Municipality	Farm_Name	Farm_Well_No	Field	Pool	Completion Date
123-39874	US ENERGY DEV CORP	1987	GAS	11,653		112	WARREN	COLUMBUS	BITTINGER	4	COLUMBUS	DEWEY CORNERS	20-Aug-87
123-39874	US ENERGY DEV CORP	1988	GAS	100,800		352	WARREN	COLUMBUS	BITTINGER	4	COLUMBUS	DEWEY CORNERS	20-Aug-87
123-39874	US ENERGY DEV CORP	1989	GAS	100,330		355	WARREN	COLUMBUS	BITTINGER	4	COLUMBUS	DEWEY CORNERS	20-Aug-87
123-39874	US ENERGY DEV CORP	1990	GAS	60,844		342	WARREN	COLUMBUS	BITTINGER	4	COLUMBUS	DEWEY CORNERS	20-Aug-87
123-39874	US ENERGY DEV CORP	1991	GAS	35,401		324	WARREN	COLUMBUS	BITTINGER	4	COLUMBUS	DEWEY CORNERS	20-Aug-87
123-39874	US ENERGY DEV CORP	1992	GAS	13,041		315	WARREN	COLUMBUS	BITTINGER	4	COLUMBUS	DEWEY CORNERS	20-Aug-87
123-39874	US ENERGY DEV CORP	1993	GAS	6,946		360	WARREN	COLUMBUS	BITTINGER	4	COLUMBUS	DEWEY CORNERS	20-Aug-87
123-39874	US ENERGY DEV CORP	1994	BRINE		137		WARREN	COLUMBUS	BITTINGER	4	COLUMBUS	DEWEY CORNERS	20-Aug-87
123-39874	US ENERGY DEV CORP	1994	GAS	5,778		361	WARREN	COLUMBUS	BITTINGER	4	COLUMBUS	DEWEY CORNERS	20-Aug-87
123-39874	BELDEN & BLAKE CORP	2000	GAS	92		365	WARREN	COLUMBUS	BITTINGER	4	COLUMBUS	DEWEY CORNERS	20-Aug-87
123-39874	BELDEN & BLAKE CORP	2001	GAS	21		365	WARREN	COLUMBUS	BITTINGER	4	COLUMBUS	DEWEY CORNERS	20-Aug-87
123-39874	BELDEN & BLAKE CORP	2002	GAS	551		273	WARREN	COLUMBUS	BITTINGER	4	COLUMBUS	DEWEY CORNERS	20-Aug-87
123-39874	BELDEN & BLAKE CORP	2002	OIL	0		0	WARREN	COLUMBUS	BITTINGER	4	COLUMBUS	DEWEY CORNERS	20-Aug-87
123-39874	RANGE RESOURCES APPALACHIA LLC	2003	GAS	5		62	WARREN	COLUMBUS	BITTINGER	4	COLUMBUS	DEWEY CORNERS	20-Aug-87
123-39874	RANGE RESOURCES APPALACHIA LLC	2004	GAS	79		242	WARREN	COLUMBUS	BITTINGER	4	COLUMBUS	DEWEY CORNERS	20-Aug-87
123-39874	RANGE RESOURCES APPALACHIA LLC	2005	GAS	308		214	WARREN	COLUMBUS	BITTINGER	4	COLUMBUS	DEWEY CORNERS	20-Aug-87
123-39874	TRINITY ENERGY CORP	2007	GAS	32		122	WARREN	COLUMBUS	BITTINGER	4	COLUMBUS	DEWEY CORNERS	20-Aug-87
123-39874	LION ENERGY CO LLC	2008	BRINE		38		WARREN	COLUMBUS	BITTINGER	4	COLUMBUS	DEWEY CORNERS	20-Aug-87
123-39874	LION ENERGY CO LLC	2008	GAS	388		365	WARREN	COLUMBUS	BITTINGER	4	COLUMBUS	DEWEY CORNERS	20-Aug-87
123-39874	LION ENERGY CO LLC	2009	GAS	219		180	WARREN	COLUMBUS	BITTINGER	4	COLUMBUS	DEWEY CORNERS	20-Aug-87
			Total	336,487	175								

Permit	Company	Year	Product	Quantity		Days	County	Municipality	Farm_Name	Farm_Well_No	Field	Pool	Completion Date
123-40751	US ENERGY EXPLORATION CORP	1990	GAS	41,981		315	WARREN	COLUMBUS	R. TRISKET	2	COLUMBUS	DEWEY CORNERS	5-Jan-90
123-40751	US ENERGY DEV CORP	1991	GAS	47,292		357	WARREN	COLUMBUS	R. TRISKET	2	COLUMBUS	DEWEY CORNERS	5-Jan-90
123-40751	US ENERGY DEV CORP	1992	GAS	25,943		322	WARREN	COLUMBUS	R. TRISKET	2	COLUMBUS	DEWEY CORNERS	5-Jan-90
123-40751	US ENERGY DEV CORP	1993	GAS	17,584		359	WARREN	COLUMBUS	R. TRISKET	2	COLUMBUS	DEWEY CORNERS	5-Jan-90

123-40751	US ENERGY DEV CORP	1994	BRINE		137		WARREN	COLUMBUS	R. TRISKET	2	COLUMBUS	DEWEY CORNERS	5-Jan-90
123-40751	US ENERGY DEV CORP	1994	GAS	19,177		363	WARREN	COLUMBUS	R. TRISKET	2	COLUMBUS	DEWEY CORNERS	5-Jan-90
123-40751	BELDEN & BLAKE CORP	2000	BRINE		5		WARREN	COLUMBUS	R. TRISKET	2	COLUMBUS	DEWEY CORNERS	5-Jan-90
123-40751	BELDEN & BLAKE CORP	2000	GAS	5,514		366	WARREN	COLUMBUS	R. TRISKET	2	COLUMBUS	DEWEY CORNERS	5-Jan-90
123-40751	BELDEN & BLAKE CORP	2001	BRINE		17		WARREN	COLUMBUS	R. TRISKET	2	COLUMBUS	DEWEY CORNERS	5-Jan-90
123-40751	BELDEN & BLAKE CORP	2001	GAS	4,531		365	WARREN	COLUMBUS	R. TRISKET	2	COLUMBUS	DEWEY CORNERS	5-Jan-90
123-40751	BELDEN & BLAKE CORP	2002	GAS	2,340		273	WARREN	COLUMBUS	R. TRISKET	2	COLUMBUS	DEWEY CORNERS	5-Jan-90
123-40751	BELDEN & BLAKE CORP	2002	OIL	0		0	WARREN	COLUMBUS	R. TRISKET	2	COLUMBUS	DEWEY CORNERS	5-Jan-90
123-40751	RANGE RESOURCES APPALACHIA LLC	2002	GAS	205		31	WARREN	COLUMBUS	R. TRISKET	2	COLUMBUS	DEWEY CORNERS	5-Jan-90
123-40751	RANGE RESOURCES APPALACHIA LLC	2003	BRINE		45	365	WARREN	COLUMBUS	R. TRISKET	2	COLUMBUS	DEWEY CORNERS	5-Jan-90
123-40751	RANGE RESOURCES APPALACHIA LLC	2003	GAS	1,594		365	WARREN	COLUMBUS	R. TRISKET	2	COLUMBUS	DEWEY CORNERS	5-Jan-90
123-40751	RANGE RESOURCES APPALACHIA LLC	2004	GAS	1,422		365	WARREN	COLUMBUS	R. TRISKET	2	COLUMBUS	DEWEY CORNERS	5-Jan-90
123-40751	RANGE RESOURCES APPALACHIA LLC	2005	GAS	1,554		365	WARREN	COLUMBUS	R. TRISKET	2	COLUMBUS	DEWEY CORNERS	5-Jan-90
123-40751	RANGE RESOURCES APPALACHIA LLC	2006	GAS	1,414		365	WARREN	COLUMBUS	R. TRISKET	2	COLUMBUS	DEWEY CORNERS	5-Jan-90
123-40751	TRINITY ENERGY CORP	2007	GAS	278		122	WARREN	COLUMBUS	R. TRISKET	2	COLUMBUS	DEWEY CORNERS	5-Jan-90
123-40751	LION ENERGY CO LLC	2008	GAS	869		365	WARREN	COLUMBUS	R. TRISKET	2	COLUMBUS	DEWEY CORNERS	5-Jan-90
123-40751	LION ENERGY CO LLC	2009	GAS	1,506		365	WARREN	COLUMBUS	R. TRISKET	2	COLUMBUS	DEWEY CORNERS	5-Jan-90
			Total	173,205	204								

Permit	Company	Year	Product	Quantity	Days	County	Municipality	Farm_Name	Farm_Well_No	Field	Pool	Completion Date
123-34843	US ENERGY DEV CORP	1985	GAS	17,683	0	WARREN	COLUMBUS	SMITH- RAS	1	COLUMBUS	DEWEY CORNERS	26-Mar-84
123-34843	US ENERGY DEV CORP	1986	GAS	31,402	336	WARREN	COLUMBUS	SMITH- RAS	1	COLUMBUS	DEWEY CORNERS	26-Mar-84
123-34843	US ENERGY DEV CORP	1987	GAS	29,357	322	WARREN	COLUMBUS	SMITH- RAS	1	COLUMBUS	DEWEY CORNERS	26-Mar-84
123-34843	US ENERGY DEV CORP	1988	GAS	50,639	338	WARREN	COLUMBUS	SMITH- RAS	1	COLUMBUS	DEWEY CORNERS	26-Mar-84
123-34843	US ENERGY DEV CORP	1989	GAS	52,016	344	WARREN	COLUMBUS	SMITH- RAS	1	COLUMBUS	DEWEY CORNERS	26-Mar-84
123-34843	US ENERGY DEV CORP	1990	GAS	21,148	330	WARREN	COLUMBUS	SMITH- RAS	1	COLUMBUS	DEWEY CORNERS	26-Mar-84
123-34843	US ENERGY DEV CORP	1991	GAS	8,423	327	WARREN	COLUMBUS	SMITH- RAS	1	COLUMBUS	DEWEY CORNERS	26-Mar-84
123-34843	US ENERGY DEV CORP	1992	GAS	1,513	291	WARREN	COLUMBUS	SMITH- RAS	1	COLUMBUS	DEWEY CORNERS	26-Mar-84
123-34843	US ENERGY DEV CORP	1993	GAS	2,088	268	WARREN	COLUMBUS	SMITH- RAS	1	COLUMBUS	DEWEY CORNERS	26-Mar-84
123-34843	US ENERGY DEV CORP	1994	GAS	1,781	363	WARREN	COLUMBUS	SMITH- RAS	1	COLUMBUS	DEWEY CORNERS	26-Mar-84
123-34843	LION ENERGY CO LLC	2008	GAS	270	365	WARREN	COLUMBUS	SMITH- RAS	1	COLUMBUS	DEWEY CORNERS	26-Mar-84
123-34843	LION ENERGY CO LLC	2009	GAS	644	365	WARREN	COLUMBUS	SMITH- RAS	1	COLUMBUS	DEWEY CORNERS	26-Mar-84
			Total	216,965								

123-33914	US ENERGY DEV CORP	1984	GAS	5893	0	WARREN	COLUMBUS	JOSEPH BITTINGER	1	COLUMBUS	DEWEY CORNERS	29-Dec-83
123-33914	US ENERGY DEV CORP	1985	GAS	14431.49	0	WARREN	COLUMBUS	JOSEPH BITTINGER	1	COLUMBUS	DEWEY CORNERS	29-Dec-83
123-33914	US ENERGY DEV CORP	1986	GAS	44172.28	336	WARREN	COLUMBUS	JOSEPH BITTINGER	1	COLUMBUS	DEWEY CORNERS	29-Dec-83
123-33914	US ENERGY DEV CORP	1987	GAS	21594.73	336	WARREN	COLUMBUS	JOSEPH BITTINGER	1	COLUMBUS	DEWEY CORNERS	29-Dec-83
123-33914	US ENERGY DEV CORP	1988	GAS	51243.65	356	WARREN	COLUMBUS	JOSEPH BITTINGER	1	COLUMBUS	DEWEY CORNERS	29-Dec-83
123-33914	US ENERGY DEV CORP	1989	GAS	67741.18	364	WARREN	COLUMBUS	JOSEPH BITTINGER	1	COLUMBUS	DEWEY CORNERS	29-Dec-83
123-33914	US ENERGY DEV CORP	1990	GAS	66748.67	352	WARREN	COLUMBUS	JOSEPH BITTINGER	1	COLUMBUS	DEWEY CORNERS	29-Dec-83
123-33914	US ENERGY DEV CORP	1991	GAS	38209	350	WARREN	COLUMBUS	JOSEPH BITTINGER	1	COLUMBUS	DEWEY CORNERS	29-Dec-83
123-33914	US ENERGY DEV CORP	1992	GAS	13492	320	WARREN	COLUMBUS	JOSEPH BITTINGER	1	COLUMBUS	DEWEY CORNERS	29-Dec-83
123-33914	US ENERGY DEV CORP	1993	GAS	6206	352	WARREN	COLUMBUS	JOSEPH BITTINGER	1	COLUMBUS	DEWEY CORNERS	29-Dec-83
123-33914	US ENERGY DEV CORP	1994	GAS	2570	341	WARREN	COLUMBUS	JOSEPH BITTINGER	1	COLUMBUS	DEWEY CORNERS	29-Dec-83
123-33914	BELDEN & BLAKE CORP	2000	GAS	559	366	WARREN	COLUMBUS	JOSEPH BITTINGER	1	COLUMBUS	DEWEY CORNERS	29-Dec-83
123-33914	BELDEN & BLAKE CORP	2001	GAS	438	365	WARREN	COLUMBUS	JOSEPH BITTINGER	1	COLUMBUS	DEWEY CORNERS	29-Dec-83
123-33914	BELDEN & BLAKE CORP	2002	GAS	372	273	WARREN	COLUMBUS	JOSEPH BITTINGER	1	COLUMBUS	DEWEY CORNERS	29-Dec-83
123-33914	BELDEN & BLAKE CORP	2002	OIL	0	0	WARREN	COLUMBUS	JOSEPH BITTINGER	1	COLUMBUS	DEWEY CORNERS	29-Dec-83
123-33914	RANGE RESOURCES APPALACHIA LLC	2002	GAS	46	31	WARREN	COLUMBUS	JOSEPH BITTINGER	1	COLUMBUS	DEWEY CORNERS	29-Dec-83
123-33914	RANGE RESOURCES APPALACHIA LLC	2003	GAS	257.85	182	WARREN	COLUMBUS	JOSEPH BITTINGER	1	COLUMBUS	DEWEY CORNERS	29-Dec-83

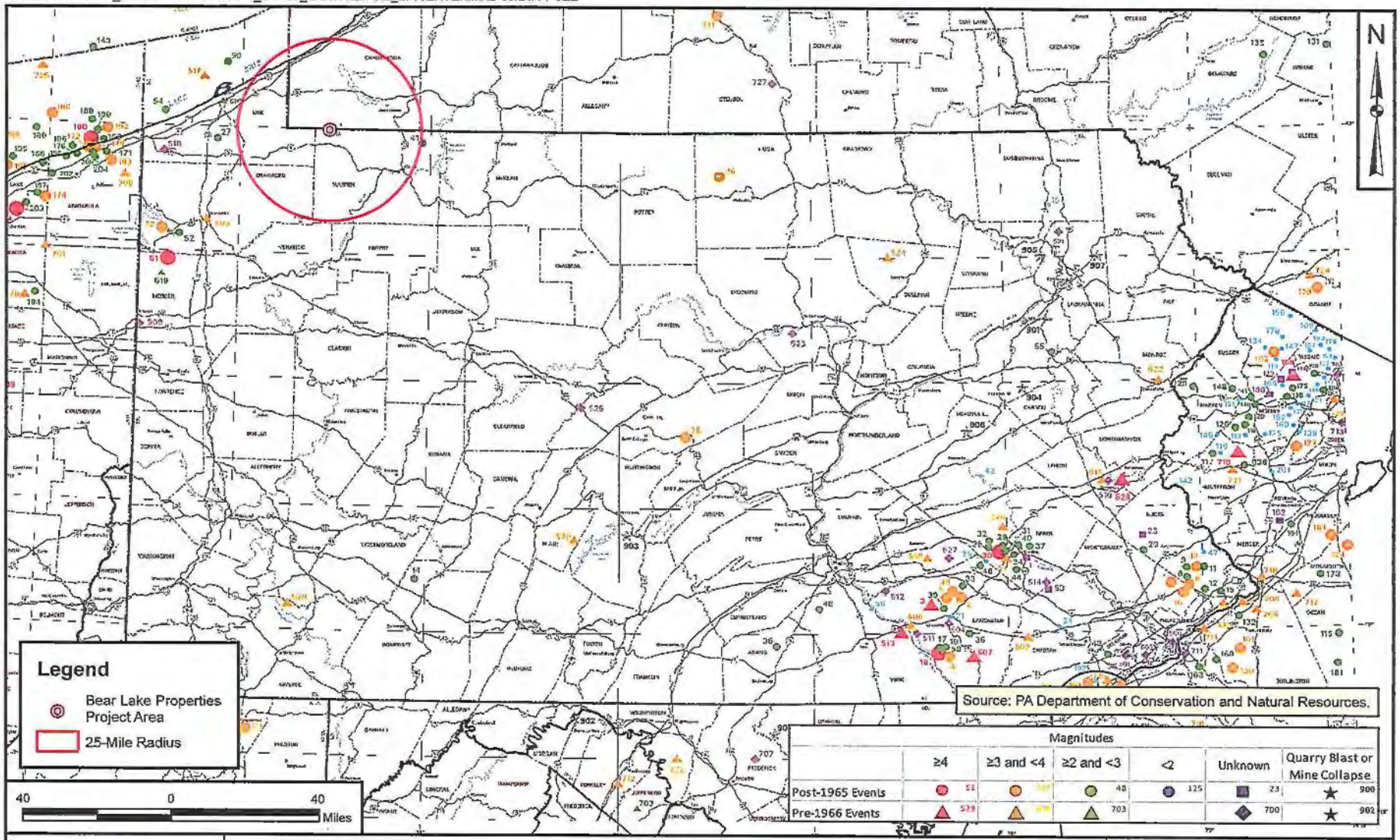
123-33914	RANGE RESOURCES APPALACHIA LLC	2004	GAS	313.84		244	WARREN	COLUMBUS	JOSEPH BITTINGER	1		COLUMBUS	DEWEY CORNERS	29-Dec-83
123-33914	RANGE RESOURCES APPALACHIA LLC	2005	GAS	47.28		212	WARREN	COLUMBUS	JOSEPH BITTINGER	1		COLUMBUS	DEWEY CORNERS	29-Dec-83
123-33914	RANGE RESOURCES APPALACHIA LLC	2006	GAS	4.33		151	WARREN	COLUMBUS	JOSEPH BITTINGER	1		COLUMBUS	DEWEY CORNERS	29-Dec-83
123-33914	TRINITY ENERGY CORP	2007	GAS	64		365	WARREN	COLUMBUS	JOSEPH BITTINGER	1		COLUMBUS	DEWEY CORNERS	29-Dec-83
123-33914	LION ENERGY CO LLC	2008	BRINE		38		WARREN	COLUMBUS	JOSEPH BITTINGER	1		COLUMBUS	DEWEY CORNERS	29-Dec-83
123-33914	LION ENERGY CO LLC	2008	GAS	392		365	WARREN	COLUMBUS	JOSEPH BITTINGER	1		COLUMBUS	DEWEY CORNERS	29-Dec-83
123-33914	LION ENERGY CO LLC	2009	GAS	90		120	WARREN	COLUMBUS	JOSEPH BITTINGER	1		COLUMBUS	DEWEY CORNERS	29-Dec-83
			Total	334,886	38									

Total All 7 wells **1,751,614**

GEOLOGIC DATA

EARTHQUAKE EPICENTERS MAP (PA DCNR)

PGH P:\GIS\BEAR_LAKE\MAPDOCS\BEAR_LAKES_EARTHQUAKE_EPICENTER.MXD 03/21/14 JEE



TETRA TECH

EARTHQUAKE OCCURRENCES IN PENNSYLVANIA

BEAR LAKE PROPERTIES, LLC

WARREN COUNTY, PENNSYLVANIA

DRAWN BY: J. ENGLISH 03/19/14
CHECKED BY: D. SKOFF 03/21/14
APPROVED BY:

CONTRACT NUMBER: 112C02984

FIGURE NUMBER: FIGURE 1

REV: 0

Section 6 – Operating Data

Section 6 - Operating Data

The proposed commercial brine disposal well will primarily be utilized to inject produced and flowback water from wells completed in the Marcellus Shale, the Medina Group and other natural gas and oil producing formations. Other oil and gas related wastewaters associated with the production of oil and natural gas or natural gas storage operations, which are approved by EPA for injection under a UIC Class II D injection well, may also be injected. According to Title 40 Chapter I Sec. 144.6 (b)(1), such fluids include those "Which are brought to the surface in connection with natural gas storage operations, or conventional oil or natural gas production and may be commingled with waste waters from gas plants which are an integral part of production operations, unless those waters are classified as a hazardous waste at the time of injection."

Injection Rate

Injection rate and pressure data collected to date for the nearby Bittinger #4 permitted brine disposal well indicate the well is capable of a sustainable injection rate of approximately 1,000 bbls/day while operating within the maximum injection pressure permit limit. This is consistent with the permitted injection volume of 30,000 bbls/month for this well. (The 2014 Annual Disposal/Injection Well Monitoring Report for Bittinger #4 is attached.) Considering the proximity of the Smith-Ras #1 well to the Bittinger #4 well (which is located approximately 0.5 mile to the northwest) and the similarity in the injection interval based on log analysis, it is anticipated that the Smith-Ras #1 well can also be operated at this injection rate while staying below the proposed MIP. (Please see the attached Billman Geologic Consultants report and included geologic cross-sections.) An injection rate of 30,000 bbls/month is therefore also proposed for the Smith-Ras #1 well.

Maximum Allowable Surface Injection Pressure (MASIP) and Average Surface Injection Pressure

MASIP calculations based on EPA approved equations are included in the "Geologic Data" section of this application. Based on these calculations, the proposed MASIP is 1717 psi. It is estimated that the average surface injection pressure will be approximately 1000 psi.

Laboratory Analysis of Injection Fluid Samples

Laboratory analytical results for samples representative of the types of brine which will be injected into the proposed injection well are attached. Samples were collected from produced water generated from gas wells in the vicinity of the injection well as well as Marcellus brine from a brine processing facility.

Monitoring of Injection Fluid Samples and Well

The following identifies the UIC Class II underground injection well regulatory requirements and operational procedures which will be conducted to meet the subject requirements:

1. **Monitoring of the nature of injected fluids at time intervals sufficiently frequent to yield data representative of their characteristics.** An initial sample of fluid will be collected and analyzed from initial loads proposed for disposal from new disposal customers. In addition, samples will be collected for analysis from new types of sources (e.g., from different geologic formations, geographic regions, etc.) which would be expected to differ significantly from brine previously characterized for disposal at the facility. Samples will be analyzed for the following parameters at a minimum: specific gravity, total dissolved solids and pH.

2. **Observation of injection pressure, flow rate, and cumulative volume at least weekly based on the regulatory requirements for produced fluid disposal operations.** Injection pressures,

annular pressure, injection rate, and cumulative volume will be continuously monitored and recorded electronically.

3. **A demonstration of mechanical integrity pursuant to 40 CFR Sec. 146.8 at least once every two years during the life of the injection well.** A mechanical integrity test will be performed prior to initiating injection and at least once every two years.

4. **Maintenance of the results of all monitoring until the next permit review.** All monitoring records will be maintained throughout the life of the well.

Reporting requirements consist of the following:

An annual report will be submitted to EPA summarizing the results of the required monitoring, including monthly records of injected fluids, and any major changes in characteristics or sources of injected fluid.

Proposed Annulus Fluid

The proposed annulus fluid for the proposed injection well will consist of fresh water and a water soluble corrosion inhibitor. The corrosion inhibitor will be mixed in accordance with the manufacturer's recommendations then loaded into the well annulus prior to conducting injection operations. Product information for the type of corrosion inhibitor which will be utilized is attached. A similar type product may be used instead of the example product referenced.

Facility Layout and Operation

The attached drawing shows the following elements of the existing Bear Lake Properties brine disposal well facility including the recently permitted and constructed brine storage area. The brine storage facility was permitted as a residual waste transfer facility under PADEP residual waste regulations. The following key elements of the brine disposal facility are shown on the attached drawing:

- Existing permitted brine offloading facility located at the corner of State Route 4004 and State Line Road;
- The brine storage facility (located near the Bittinger #2 well) which is connected to the unloading area by underground double-walled piping; and,
- The three existing permitted UIC Class IID wells (Bittinger #1, #2 and #4) plus proposed UIC Class IID wells (Bittinger #3 and Smith-Ras Unit #1).

The brine storage facility has a capacity of 3,000 barrels and is anticipated to be operational during the First Quarter of 2015. A drawing showing details of the brine storage facility is attached.

Once the brine storage facility is operational, brine will be pumped from the offload station via the dual (secondary containment) pipeline to the storage tanks at the brine storage facility. The brine will then be pumped from the brine storage facility via high pressure dual (secondary containment) pipelines to the permitted brine disposal wells for injection.

The storage tanks in the brine storage area are located within a diked containment area with the containment area sized to account for the entire volume of the largest container, plus 10%. Automatic shut-off valves are incorporated into the tank design to prevent overflow during filling operations. The facility is surrounded by a fence having locking entrance and exit gates. A security camera is also strategically situated on the site.

OPERATING DATA

TYPICAL BRINE LABORATORY ANALYSIS

8353

®Microbac Laboratories, Inc.
BRADFORD DIVISION
P.O. BOX 489
BRADFORD PA 16701
(814)368-6087
http://www.microbac.com

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CERTIFICATE OF ANALYSIS

KCS LENAPE RESOURCES CORP.

9489 ALEXANDER ROAD

ALEXANDER NY 14005

LAUGER - TOPLANICH

Permit No
Cust P.O.

Date Reported 8/10/01
Date Received 7/13/01
Order No 9931-00207
Invoice No 008010
Cust # K011
Sampled Date 7/09/01
Sampled Time 00:00
Sample Id

Subject: LION ENERGY - BRINE SAMPLE SUBMITTED 7/13/01

IMP	TEST	METHOD	RESULT	UNITS	DATE	TECH
	LION ENERGY - BRINE SAMPLE					
	BY WGT SALTS IN BRINE				7/23/01	ERI
	CIUM		33,600	MG/L	7/23/01	ERI
	CHLORIDE		195,000	MG/L	7/23/01	ERI
	POTASSIUM		1910	MG/L	7/23/01	ERI
	MAGNESIUM		3330	MG/L	7/23/01	ERI
	SODIUM		80,700	MG/L	7/23/01	ERI
	SPECIFIC GRAVITY		1.216		7/23/01	ERI
	CALCIUM CHLORIDE		7.65	% BY WGT.	7/23/01	ERI
	SODIUM CHLORIDE		16.82	% BY WGT.	7/23/01	ERI
	POTASSIUM CHLORIDE		0.30	% BY WGT.	7/23/01	ERI
	MAGNESIUM CHLORIDE		1.07	% BY WGT.	7/23/01	ERI
	TOTAL CHLORIDES		25.84	% BY WGT.	7/23/01	ERI
	CALCIUM CHLORIDE		0.776	LBS/GAL.	7/23/01	ERI
	SODIUM CHLORIDE		1.707	LBS/GAL.	7/23/01	ERI
	POTASSIUM CHLORIDE		0.030	LBS/GAL.	7/23/01	ERI
	MAGNESIUM CHLORIDE		0.109	LBS/GAL.	7/23/01	ERI
	TOTAL CHLORIDES		2.62	LBS/GAL	7/23/01	ERI
	WEIGHT OF 1 GALLON OF BRINE		10.15	LBS/GAL	7/23/01	ERI

ANALYSIS BY NYS LAB: 10121

$S.G. = \frac{10.15\ \#/GAL}{8.33\ \#/GAL} = 1.218$

Certificate Of Analysis Continued On Next Page

Client Sample Results

Client: Bear Lake Properties, LLC
Project/Site: Injection Well Permitting

TestAmerica Job ID: 180-17986-1

Client Sample ID: CW 011013
Date Collected: 01/10/13 13:30
Date Received: 01/11/13 09:30

Lab Sample ID: 180-17986-1
Matrix: Water

Method: 200.8 - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Barium	5200000	B	5000	44	ug/L		01/16/13 09:44	01/16/13 18:31	5
Iron	1600	J B	5000	230	ug/L		01/12/13 12:22	01/14/13 21:03	100
Magnesium	2300000	B	10000	200	ug/L		01/12/13 12:22	01/14/13 21:03	100
Manganese	10000	B	500	3.7	ug/L		01/12/13 12:22	01/14/13 21:03	100
Sodium	32000000	B	10000	270	ug/L		01/12/13 12:22	01/14/13 21:03	100

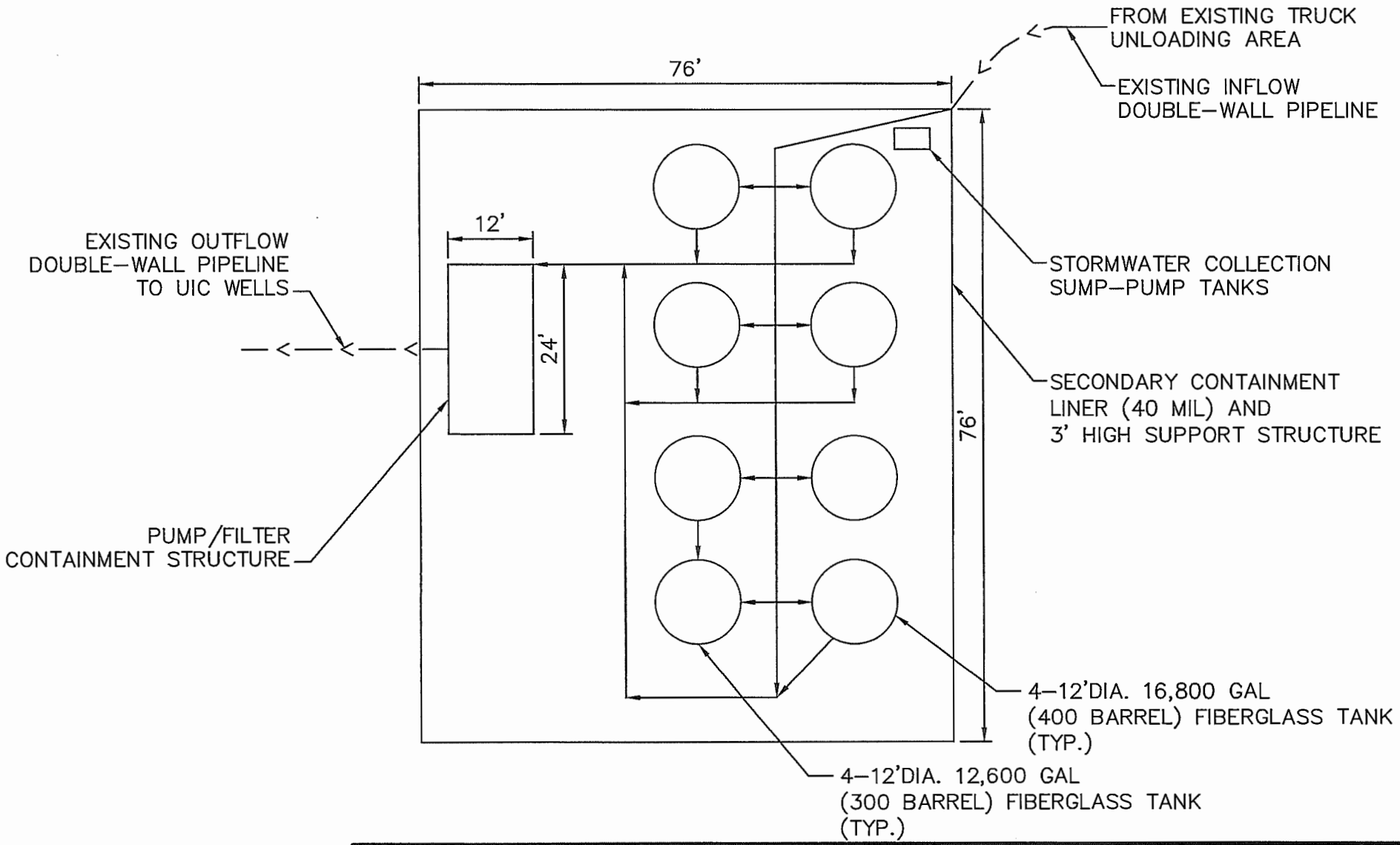
General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	130000		1000	200	mg/L			01/12/13 11:36	1000
Alkalinity	6.5	B	5.0	0.41	mg/L			01/14/13 08:06	1
Bicarbonate Alkalinity as CaCO3	6.5	B	5.0	0.41	mg/L			01/14/13 08:06	1
Carbonate Alkalinity as CaCO3	ND		5.0	0.41	mg/L			01/14/13 08:06	1
Hardness	74000		2500	770	mg/L			01/14/13 09:05	500
Total Dissolved Solids	200000		1000	1000	mg/L			01/11/13 14:39	1
Total Organic Carbon - Duplicates	63		40	7.5	mg/L			01/21/13 11:02	40

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH	6.23	HF	0.100	0.100	SU			01/15/13 09:50	1
Specific Conductance	440000		1600	1600	umhos/cm			01/11/13 18:45	1600
Total Solids	220000		10	10	mg/L			01/15/13 15:50	1

OPERATING DATA

FACILITY LAYOUT SCHEMATIC



TETRA TECH
WWW.TETRATECH.COM
661 ANDERSEN DRIVE – FOSTER PLAZA 7
PITTSBURGH, PA 15220
T: (412) 921-7090 | F: (412) 921-4040

BEAR LAKE PROPERTIES, LLC
COLUMBUS TOWNSHIP, WARREN COUNTY, PA

GENERAL ARRANGEMENT
BEAR LAKE PROPERTIES
BRINE TRANSFER FACILITY

DATE:	10/28/13
PROJECT NO.:	112C05908
DESIGNED BY:	
DRAWN BY:	CK
CHECKED BY:	
SHEET: 1 OF 1	

FORM O-1

OPERATING DATA

ANNUAL OPERATING DATA REPORTS

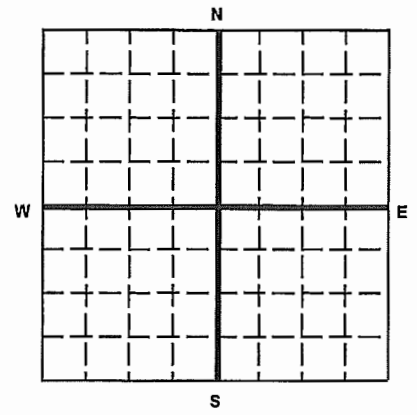
OMB No. 2040-0042 Approval Expires 11/30/2014

United States Environmental Protection Agency
Washington, DC 20460

ANNUAL DISPOSAL/INJECTION WELL MONITORING REPORT

Name and Address of Existing Permittee	Name and Address of Surface Owner
Bear Lake Properties, LLC 3000 Village Run Road, Unit 103, #223, Wexford, PA 15090	Miles Sampsel 82530 Pangan Rd., Erie, PA 16509

Locate Well and Outline Unit on Section Plat - 640 Acres



State	County	Permit Number
Pennsylvania	Warren	PAS2D215 BWAR

Surface Location Description

___ 1/4 of ___ 1/4 of ___ 1/4 of ___ 1/4 of Section ___ Township ___ Range ___

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

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

WELL ACTIVITY
- [x] Brine Disposal
- [ ] Enhanced Recovery
- [ ] Hydrocarbon Storage

TYPE OF PERMIT
- [x] Individual
- [ ] Area

Number of Wells ___

Lease Name Bittinger Well Number 4

MONTH YEAR	INJECTION PRESSURE AVERAGE PSIG	INJECTION PRESSURE MAXIMUM PSIG	TOTAL VOLUME INJECTED BBL	TOTAL VOLUME INJECTED MCF	TUBING -- CASING ANNULUS PRESSURE (OPTIONAL MONITORING) MINIMUM PSIG	TUBING -- CASING ANNULUS PRESSURE (OPTIONAL MONITORING) MAXIMUM PSIG
January-2014	1100	1440	8995		0	540
February-2014	960	1130	2716		0	0
March-2014	0	0	1474		0	0
April-2014	1200	1460	15395		0	120
May-2014	1500	1600	14586		80	120
June-2014	1550	1620	12803		80	100
July-2014	1300	1400	17838		80	100
August-2014	1380	1400	9316		80	100
September-2014	1540	1620	2434		50	150
October-2014	1580	1620	12338		60	180
November-2014	1580	1620	9840		80	200
December-2014	1590	1620	8559		80	200

Certification

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

Name and Official Title *(Please type or print)*	Signature	Date Signed
John C. Holko, Vice President		01/29/15

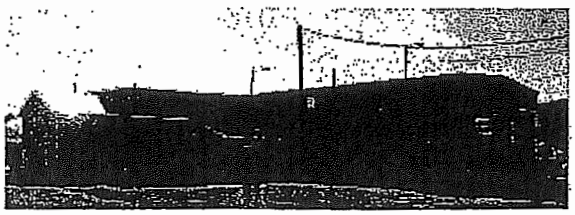
EPA Form 7520-11 (Rev. 12-11)

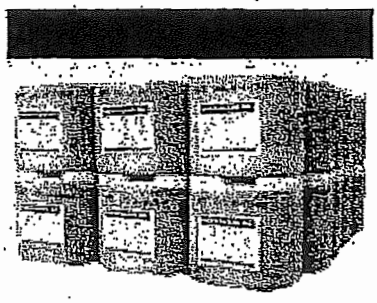
OPERATING DATA

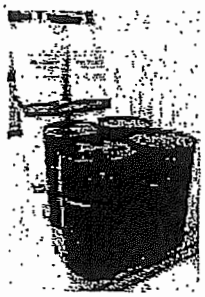
TYPICAL CORROSION INHIBITOR

AQUACLEAR
PRODUCT INFORMATION

609 Virginia Street East Charleston, WV 25301-3109
(304) 343-4782 Fax (304) 345-2119







Corrosion Inhibitor SticksT

WHAT ARE CORROSION INHIBITOR STICKST?
Corrosion Inhibitor SticksT are water soluble or oil soluble sticks that contain a blend of Imidazolines which have excellent filming characteristics and low emulsion tendencies. This unique blend gives effective corrosion control for most oil field corrosion problems.

CORROSION INHIBITOR STICK™ USES
Corrosion Inhibitor Sticks ™ are primarily used to control common corrosion problems found in producing oil and gas well systems. They can be used to treat hard to reach 'dead' areas such as the annulus space above the packer, rat-hole, or the bottom of water supply tanks.

ADVANTAGES OF CORROSION INHIBITOR STICKST
Corrosion Inhibitor SticksT can provide corrosion control throughout the entire production system. Regular usage will help control corrosion at the point they begin - down-hole.

They are available in two different formulations (oil soluble and water dispersable) or (water soluble and oil dispersable). The oil soluble type is soluble in oil, condensate and wet gas and can slowly disperse inhibitor into the water phase. The water soluble type is soluble in water and can slowly disperse inhibitor into the oil phase.

Corrosion Inhibitor SticksT can effectively inhibit corrosion in wells that produce both water and distillate or oil phases. In this case, it may be desirable to treat the well with both types of sticks by first dropping water soluble sticks and allowing them to fall through the oil into the water, thus dissolving and releasing inhibitor in

TREATMENT DETERMINATION
The number of Corrosion Inhibitor SticksT used is based on the volume of total fluid produced (oil or condensate plus water). Field experience indicates that for most corrosive environments the best results are achieved by using a larger initial slug treatment (80 PPM daily) until the problem is under control then reduce to smaller periodic treatments (40 PPM daily) thereafter. EXAMPLE: An initial slug treatment of 80 PPM would require 0.64 lbs of Corrosion Inhibitor Stick™ per 24 BBL (1000 gallons) of total fluid produced.

COR. INH. STICK™ SIZES	STICKS PER BBL
SENIOR (1 5/8 " x 18")	1 per 58 bbls
JUNIOR (1 3/8 " x 16 ")	1 per 40 bbls
JUNIOR (1 1/4" x 15")	1 per 29 bbls
THRIFTY (1" x 15")	1 per 18 bbls
MIDGET (5/8" x 15")	1 per 7 bbls

NOTE: To successfully control any corrosion problem, the inhibitor insertion into the fluid stream must be constant. For intermittent treatment or extreme corrosive environments increase the number of sticks accordingly.

THE MOST COMMON PROCEDURE for producing wells is to shut-in well and drop sticks through lubricator. Leave well shut until sticks fall to the bottom. The time in minutes for the sticks to fall to the bottom (assuming well is shut-in with fluid at surface) is equal to the depth divided by 100. (Time, min. = Depth, ft / 100).

FOR WATER INJECTION SYSTEMS drop the sticks into the water supply tank to inhibit more of the system.

the water column). Then drop the oil soluble sticks which will "FLOAT" at where the oil and water contact thus slowly dissolving and releasing inhibitor in the oil column.

The sticks are economical when compared to conventional corrosion control operations and therefore save investment in pumps, drums of chemical, and equipment maintenance.

Corrosion Inhibitor SticksT may be used in wells with bottom hole temperatures (BHT) of up to 375 degrees Fahrenheit.

PRODUCTION SPECIFICATIONS

OIL SOLUBLE: The stick will dissolve in 20 to 120 minutes (in moving diesel) depending on temperature, salt content, and relative fluid motion. The stick will melt at 135 degrees Fahrenheit and the specific gravity is 0.95.

WATER SOLUBLE: The stick will dissolve in 12 to 24 hours (in 60,00 PPMmoving brine water) depending on temperature, salt content, and relative fluid motion. The stick will melt at 125 degrees Fahrenheit and the specific gravity is 1.10.

PRODUCT PACKAGING

SENIOR	1.55 lb/stick	24/case	31/pail	48/chest
JUNIOR(1)	1.20 lb/stick	36/case	n/a	72/chest
JUNIOR(2)	0.76 lb/stick	36/case	52/pail	72/chest
THRIFTY	0.49 lb/stick	49/case	72/pail	98/chest
MIDGET	0.19 lb/stick	108/case	204/pail	216/chest

WHERE TO BUY

All good oil field supply stores carry Aqua-Clear, Inc. Corrosion Inhibitor Sticks™, but you can also buy direct from us.

Ordering Information

Should you wish to speak to a sales representative about any of our products, you can call or email Tommy Halloran Jr., Ronald "Buster" Wilson, or Russell Cook directly:

Tommy Halloran Jr.
W 304-343-4792
H 304-345-5152
C 304-546-8526
tom@aquaclear-inc.com

Ronald "Buster" Wilson
W 304-546-8518
H 304-965-7996
Fax 304-965-2713
buster@aquaclear-inc.com

Russell Cook
W 304-546-2940
H 304-842-7050
Fax 304-842-7050
russell@aquaclear-inc.com

Section 7 – Well Construction Details

WELL CONSTRUCTION

INJECTION WELL CONFIGURATION

Figure 1
Well Construction Diagram

Bear Lake Properties, LLC
Smith-Ras Unit #1
Columbus Township
Warren County, PA
37-123-34843

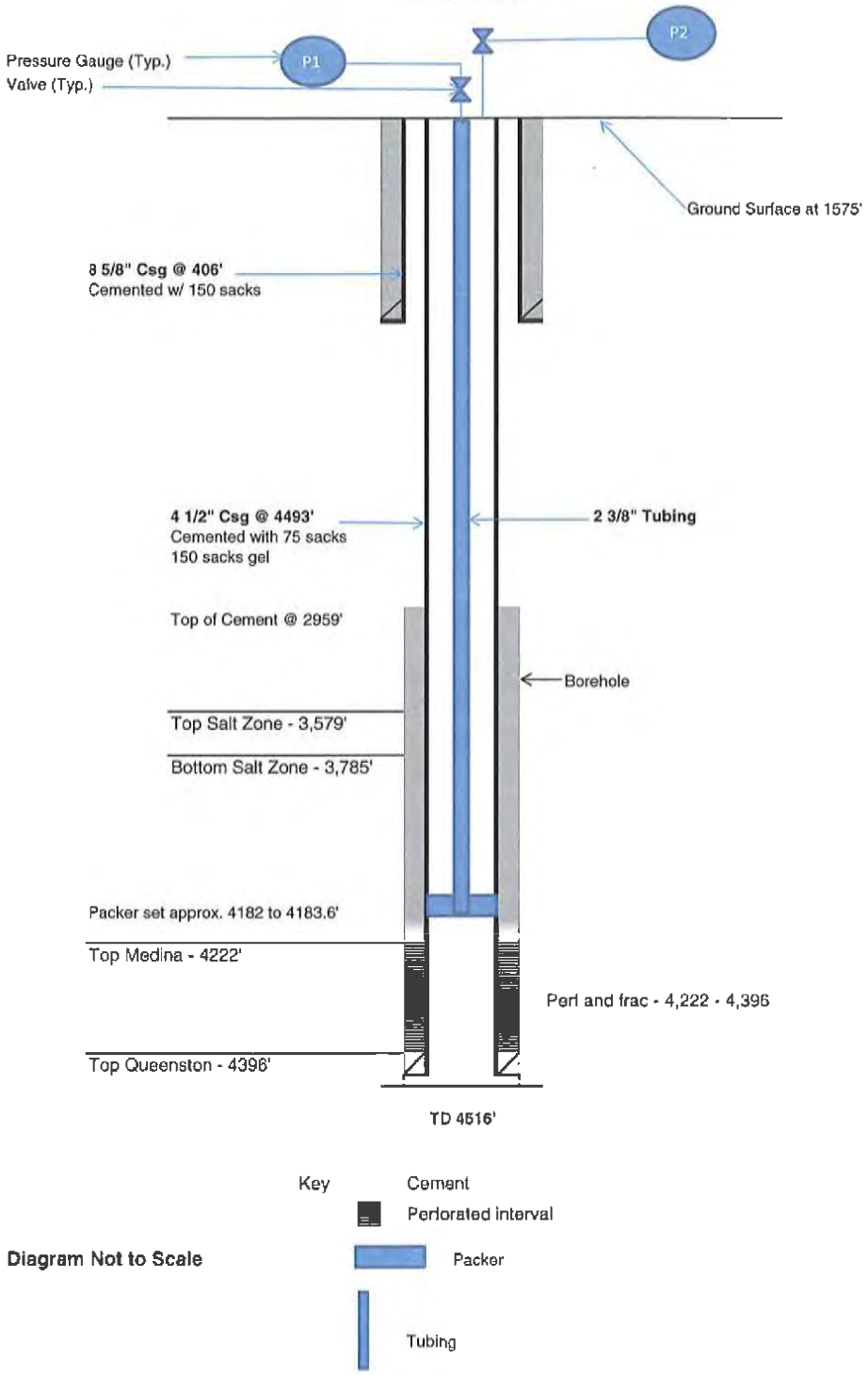


Diagram Not to Scale

Smith-Ras #1 surface cement calculation:

Surface hole size: 12-1/4"
Suface cement volume: 150 sx Class A
Surface casing: 406ft. of 8-5/8"

Class A cement yield: 1.18 cu. ft. per sack
Annular volume between 12-1/4" O.H. and 8-5/8" casing: 0.4127 cu. ft. per ft.

Cement volume required: 406 ft. x 0.4127 cu. ft. per ft. = **167.6 cu. ft.**

Cement volume pumped: 150 sx class A x 1.18 cu. ft./sk = **177 cu. ft.**

WELL CONSTRUCTION

SMITH-RAS UNIT #1 COMPLETION RECORD

ER-OG-4: Rev. 2/80

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

Office Use Only

WELL RECORD

PERMIT NO. WAR-34843 | PROJECT NO. | TYPE OF WELL Gas

WELL OPERATOR				TELEPHONE NO.
U.S. Energy Development Corporation				(716)856-9764
ADDRESS				ZIP
670 Statler Building, Buffalo, NY				14202
FARM NAME		FARM NO.	SERIAL NO.	ACRES
Smith/Ras Unit		#1		72
TOWNSHIP	COUNTY			
Columbus	Warren			
DRILLING COMMENCED	DRILLING COMPLETED			
3/21/84	3/26/84			
ELEVATION	QUADRANGLE			
1575'	Columbus	☒ 7½'		☐ 15'

CASING AND TUBING RECORD

PIPE SIZE	AMOUNT IN WELL	MATERIAL BEHIND PIPE: CEMENT (SKS.)	GEL (SKS.)	PACKER: TYPE	SIZE	DEPTH	DATE RUN
8 5/8"	406'	150					3/22/84
4 1/2"	4493'	75	150				3/26/84

PERFORATION RECORD / STIMULATION RECORD

DATE	INTERVAL PERFORATED FROM	TO	DATE	INTERVAL TREATED	AMOUNT FLUID	AMOUNT SAND	INJECTION RATE
6/27/84	4269	4383	6/27/84	4269-4383	674 bbls	58,000#	21 BPM

NATURAL OPEN FLOW	NATURAL ROCK PRESSURE	HRS. / DAYS
N/A	Not Taken	
AFTER TREATMENT OPEN FLOW	AFTER TREATMENT ROCK PRESSURE	HRS. / DAYS
5.208 MMCF	1240 PSI	XXXX

REMARKS:

Driller's TD 4525'

Logger's TD 4518'

(FORMATION ON REVERSE SIDE)

8424

FORMATIONS

NAME	TOP	BOTTOM	GAS AT	OIL AT	WATER AT (FRESH OR SALT WATER)	SOURCE OF
Unconsolidated Gravel	0'	120'			Fresh @ 105'	Drillers' records a geophysic logs
Devonian Shale	120'	2768'				
"Tully" Limestone	2768'	2877'				
Hamilton Shales	2877'	3049'				
Onondaga	3049'	3218'				
Unconformity Interval	3218'	3233'				
Akron-Bertie	3233'	3317'				
Camillus	3317'	3389'				
Syracuse	3389'	3597'				
Vernon	3597'	3861'				
Salt Zone	3579'	3785'				
Lockport	3861'	4065'			Salt @ 3910'	
Rochester	4065'	4184'				
Irondequoit-Reynales	4184'	4222'				
Grimsby	4222'	4351'				
Power Glen	4351'	4383'				
Whirlpool	4383'	4396'				
Queenston	4396'	TD				
TD	4516'					

July 17, 1984
DATE

Douglas K. Welch
APPROVED BY

Douglas K. Welch, Geophysicist
TITLE

DIVISION OF THE DOW CHEMICAL U.S.A.
AN OPERATING UNIT OF THE DOW CHEMICAL COMPANY

OILFIELD SERVICES
MINING SERVICES
INDUSTRIAL SERVICES

DOWELL SERVICE ORDER, RECEIPT, AND INVOICE NO.	CORRESPONDENCE	REMITTANCE	DOWELL SERVICE LOCATION NAME AND NUMBER
01-16-6292	P.O. BOX 4378 HOUSTON, TEXAS 77210	P.O. BOX 100344 HOUSTON, TEXAS 77212	CORRY 01-16

CUSTOMER NUMBER	CUSTOMER P.O. NUMBER	TYPE SERVICE CODE	BUSINESS CODES
792186	VERBAL	275	

WORKOVER ☐ W
NEW WELL ☑ N
OTHER ☐

API OR IC NUMBER: N/A

CUSTOMER'S NAME: U.S. ENERGY

ADDRESS: 680 STATLER BLD.

CITY, STATE AND ZIP CODE: BUFFALO, N.Y. 14202

IMPORTANT
SEE OTHER SIDE FOR TERMS & CONDITIONS

	MO.	DAY	YR	TIME
ARRIVE LOCATION	3	22	84	1500
JOB COMPLETION	3	22	84	2130

DOWELL shall furnish and Customer shall purchase materials and services required in the performance of the following SERVICE INSTRUCTIONS or DOWELL INDUSTRIAL SERVICE CONTRACT NO. 01-16-6292

CEMENT 394' OF 8 5/8 CASING INTO 419' OF OPEN HOLE USING 150 SKS OF CLASS "A" WITH 3% CACL AND 30 LB OF D46. ADD 50 LB OF D29 WHILE MIXING SLURRY.

SERVICE ORDER I authorize work to begin per vice instructions in accordance with terms and conditions printed on the reverse side of this form represent that I have authority to accept and sign order.

CUSTOMER AUTHORIZED AGENT: Michael Hile

SERVICE RECEIPT I certify that the materials services listed were received and all services performed in a workmanlike manner.

CUSTOMER AUTHORIZED AGENT: Michael Hile

STATE CODE	COUNTY / PARISH CODE	CITY
PA. 37	WARREN 123	BEAR LAKE TWP.

WELL NAME AND NUMBER / JOB SITE	LOCATION AND POOL / PLANT ADDRESS	SHIPPED VIA
SMITH-RAZZ #1	BEAR LAKE	DOWELL

ITEM/PRICE REF. NO.	MATERIAL, EQUIPMENT AND SERVICES USED	UNIT	QUANTITY	UNIT PRICE	$ AMOUNT
00 823-121	CLASS "A" CEMENT	SKS.	150	4.76	714.00
07005-100	S-1 DOWFLAKE	LB	400	.27	108.00
102-050	D46 ANTIFOAM AGENT	LB	30	2.50	75.00
44003-025	D29 CELLOFLAKE	LB	50	1.22	61.00
6702-085	8 5/8 WOOD PLUG	EA	1	60.00	60.00
0101-085	8 5/8 GUIDE SHOE	EA	1	190.00	190.00
6008-085	8 5/8 BASKET	EA	1	180.00	180.00
6011-085	8 5/8 CENTRALIZER	EA	2	53.00	106.00
0003-044	4 1/2 FLAPPER FLOAT SHOE	EA	1	190.00	190.00
3004-045	4 1/2 LATCH IN RECEP	EA	1	265.00	265.00
6008-044	4 1/2 BASKET	EA	1	105.00	105.00
6031-044	4 1/2 CENTRALIZER	EA	5	41.00	205.00
99800-001	MILEAGE ON PUMPER	MI	10	2.15	21.50
01104-005	EQUIPMENT CHARGE	EA	1	440.00	440.00
01104-100	ADDITIONAL DEPTH	FT	143	.44	62.92
49100-000	SERVICE CHARGE	CU/FT	162.	.96	155.52
49102-000	HAULING CHARGE 7.2 x MI	T.M.	81	51.75	57.75
49102					

	SUB TOTAL				2946.65
	LICENSE/REIMBURSEMENT FEE				
	LICENSE/REIMBURSEMENT FEE				

MARKS.

THANKS FOR USING DOWELL

STATE ME-5	% TAX ON $	
COUNTY SE-5	% TAX ON $	
CITY	% TAX ON $	
DOWELL REPRESENTATIVE McDonald	TOTAL	$ 3001.29

CEMENTING SERVICE REPORT

DOWELL DIVISION OF DOW CHEMICALS
AN OPERATING UNIT OF THE DOW CHEMICAL COMPANY

TICKET NUMBER 01-14-4293 | DATE 3/22/8
STAGE | DOWELL DIST. CORRY 01-16

PRINTED IN U.S.A.

NAME AND NO. SMITH-RAZZ #1 | LOCATION (LEGAL) BEAR LAKE TWP
POOL BEAR LAKE TWP | FORMATION SURFACE
COUNTY WARREN | STATE PA. | API NO

RIG NAME RAMCO #1

WELL DATA		BOTTOM	TOP
BIT SIZE 12 1/4	CSG/LINER SIZE	8 5/8	
TOTAL DEPTH 419	WEIGHT	24	
☑ ROT ☐ CABLE	FOOTAGE	394	
MUD TYPE FRESH	GRADE	NEW	
☐ BHST ☐ BHCT	THREAD	8R	
MUD DENSITY	LESS FOOTAGE SHOE JOINT(S)	+15	TOTAL
MUD VISC 60	DISP CAPACITY	26,5	

NOTE: INCLUDE FOOTAGE FROM GROUND LEVEL TO HEAD IN DISP. CAPACITY

COMPANY U.S. ENERGY
680 STATLER BLD.
ADDRESS BUFFALO N.Y.
ZIP CODE 14202

FLOAT	TYPE	NONE	STAGE TOOL	TYPE
	DEPTH			DEPTH
SHOE	TYPE	NONE		TYPE
	DEPTH			DEPTH

SPECIAL INSTRUCTIONS
CEMENT 394' OF 8 5/8 CASING INTO 419' OF 12 1/4 OPEN HOLE USING 150 SKS OF CLASS "A" CEMENT PLUS 3% CACL AND 50 LB CELLOFLAKE.

HEAD & PLUGS	☐ TBG ☐ D.P.	SQUEEZE JOB	
☐ DOUBLE	SIZE	TOOL	TYPE
☐ SINGLE	☐ WEIGHT		DEPTH
☑ SWAGE	☐ GRADE	TAIL PIPE SIZE	DEPTH
☐ KNOCKOFF	☐ THREAD	TUBING VOLUME	Bbl
TOP ☐ R ☐ W	☐ NEW ☐ USED	CASING VOL. BELOW TOOL	Bbl
BOT ☐ R ☐ W	DEPTH	TOTAL	Bbl
		ANNUAL VOLUME	

PRESSURE LIMIT 500 PSI | BUMP PLUG TO 0 PSI
RATE — RPM | RECIPROCATE — FT | NO OF CENTRALIZERS

JOB SCHEDULED FOR TIME 3/22/84 DATE 1500 | ARRIVE ON LOCATION TIME 1500 DATE 3/22/84 | LEFT LOCATION TIME 2130 DATE 3/22/8

TIME (2401 to 2400)	PRESSURE TBG OR D.P.	PRESSURE CASING	VOLUME PUMPED BBL INCREMENT	VOLUME PUMPED BBL CUM.	INJECT RATE	FLUID TYPE	FLUID DENSITY	SERVICE LOG DETAIL
510					BPM			PRE-JOB SAFETY MEETING
700								SPOT TRUCKS - HOOK UP
								CALIBRATE DENSITOMETER
		0	20		2-3	H2O	8.34	PUMP AND CIRCULATE
~~1734~~ 1734		0	20	20	2	CEM	15.6	START CLASS "A"
1812		0	70	40	4	H2O	8.34	SHUT DOWN - START TO CIRCULATE OUT
1830		0		110				CIRCULATED OUT - WAIT ON AIR CAN
1945								RIG UP AIR CAN
1952		0	5		2	H2O	8.34	PUMP TO CIRCULATE
1955		0	32	115	3	CEM	15.6	START CLASS A
005		0		147				SHUT DOWN - DROP PLUG
006		0	25.5	~~173~~				START DISPLACEMENT
015				173				DISPLACEMENT IN
017								CLOSE HEAD - BLEED PRESSURE
130								RACK UP - OFF LOCATION.

REMARKS ANNULAR VOL = 29

SYSTEM CODE	NO. OF SACKS	YIELD CU FT/SK	COMPOSITION OF CEMENTING SYSTEMS	SLURRY MIXED BBLS	SLURRY MIXED DENSITY
1	150	1.18	CLASS "A" + 3% CACL + 30LB D-46	31,5	15,6
2					
3					
4					
5					

PRODUCTION FLUID TYPE — VOLUME — DENSITY
LOCATION SO ☐ RUNNING SO
SHOWDOWN PSI FINAL PS
HOLD THRU PERFS ☐ YES ☐ NO TO F
PERFORATIONS TO TO TO TO

CIRCULATION LOST ☐ YES ☐ NO
DISPLACEMENT VOL 25,5 Bbls
MEASURED DISPLACEMENT ✓ ☐ WIRELINE

PRESSURE MAX 500 MIN 0
CEMENT CIRCULATED TO SURF ☐ YES ☐ NO Bbls
TYPE OF WELL ☐ OIL ☐ GAS ☐ STORAGE ☐ INJECTION ☐ BRINE WATER ☐ WILDCAT

CUSTOMER REPRESENTATIVE MIKE HITE
DOWELL SUPERVISOR McDOWELL/KELSEY

Section 8 – Monitoring Program

Section 8 - Monitoring Program

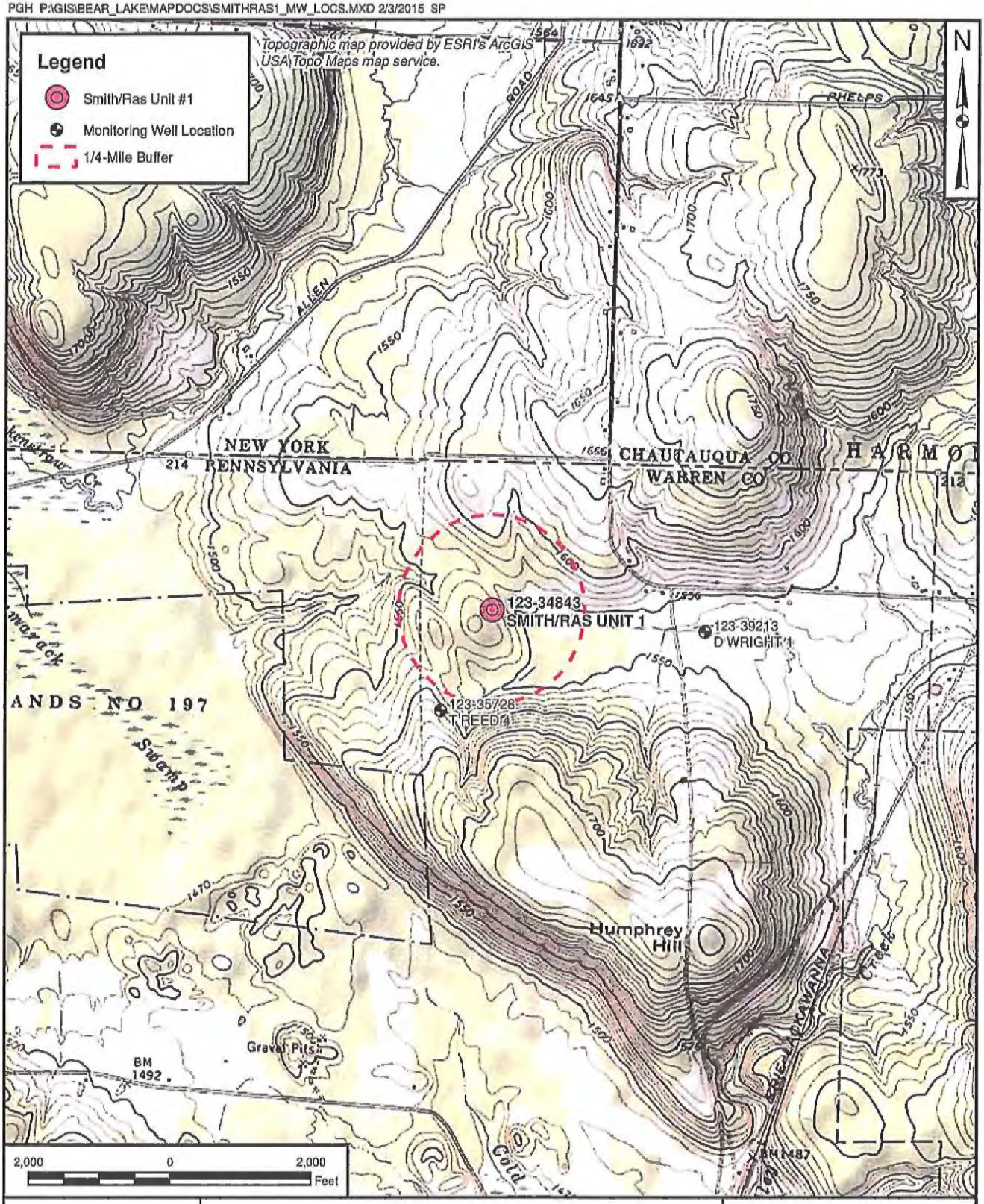
The fluid levels in the following nearby depleted Medina natural gas wells will be measured and recorded semi-annually, at a minimum. The monitoring well locations are shown on the attached figure.

Injection Well	Monitoring Well	Approximate Distance and Direction From Injection Well
Smith-Ras Unit #1	T. Reed #4	1,500 ft to the southwest
	D. Wright #1	2,000 ft to the east

MONITORING PROGRAM

MONITORING WELL LOCATIONS

PGH P:\GIS\BEAR_LAKE\MAPDOCS\SMITHRAS1_MW_LOCS.MXD 2/3/2015 SP



TETRA TECH

MONITORING WELL LOCATIONS
SMITH/RAS UNIT 1 WELL
BEAR LAKE PROPERTIES, LLC
WARREN COUNTY, PENNSYLVANIA

DRAWN BY: S. PAXTON 01/27/15
CHECKED BY: D. SKOFF 02/03/15
APPROVED BY:

CONTRACT NUMBER: 212C-PB-00103

FIGURE NUMBER	REV
2	0

Section 9 – Plugging and Abandonment Plan

Section 9 - Plugging and Abandonment Plan

At the point when the well is no longer used, the well will be abandoned in accordance with EPA and PADEP regulations. With regard to PADEP regulations, this currently includes providing a "Notice of Intent to Plug a Well" no less than 3 days and no more than 30 days prior to abandoning the well, to allow a PADEP inspector to be present during the plugging procedure. The PADEP may waive the notification period. The notification will include well location plat, well logs, production logs, injection logs, construction details, and proposed abandonment method. After receiving approval from PADEP to proceed, the well will be abandoned and the abandonment procedures will be documented on a "Certificate of Plugging".

The USEPA will be notified of the plugging activity at least 45 days prior to commencing activities. This notification will include USEPA Form No. 7514-20. A proposed plugging plan (Form 7514-20) is attached based on the current PADEP and USEPA regulations. However, this may be modified prior to plugging in order to meet the requirements at the time of the plugging activity. A contractor cost estimate to perform plugging and abandonment according to the proposed plugging plan is attached. The contractor estimate is approximately $24,000 for these services.

PLUGGING AND ABANDONMENT PLAN

PLUGGING AND ABANDONMENT ESTIMATED COSTS

DLH Energy Service, LLC
PO Box 40
5296 Bly Hill Road
Ashville, NY 14710
Phone: 716-410-0204 or 716-410-0028
Fax: 716-526-4080
www.dlhenergyservice.com

03/18/2014

Re: Plugging Estimate for the Smith-Ras Unit #1 Well Columbus Twp PA

Dear Sirs,

The following is an estimate for the plugging to abandon the above mentioned well.

Rig Time: Two twelve hour days rig at $215/hour, crew truck $100/day, 4th man 8 hours $40/hr for laying down casing,	**$5,680.00**
Wire line service: Jet Cut 4 ½ casing:	**$2,500.00**
Cement and pumping service: Up to 500 sacks cement and up to 140 bbls. Gel.	**$9,948.00**
Water Hauling and Disposal: Delivery of fresh water and removal of returned fluid	**$855.00**
Rentals: 500 bbl. Water tank and open top returns tank 5 day minimum	**$500.00**
Support equipment: Dozer at 2 days	**$500.00**
Trucking: mob and de mob dozer, excavator, water tank, open top, casing and tangibles (20 hrs)	**$1,900.00**
Remedial Work Pea stone plug back with delivery, tank cleaning, excavating and cutting off surface casing, welding cap and monument, reclamation and seeding.	**$1,500.00**
Total	**$23,383.00**

If you have any questions, please feel free to contact me at (716) 410-1543.

Best Regards,
Bill Weaver

Bill Weaver
Operations Supervisor
DLH Energy Service

PLUGGING AND ABANDONMENT PLAN

EPA FORM 7520-14

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

United States Environmental Protection Agency
Washington, DC 20460

PLUGGING AND ABANDONMENT PLAN

Name and Address of Facility
Bear Lake Properties Smith-Ras Unit #1
1889 Cornish Hill Rd., Bear Lake, PA 16402

Name and Address of Owner/Operator
Bear Lake Properties, LLC
3000 Village Run Road, Unit 103 # 223, Wexford, PA 15090

Locate Well and Outline Unit on Section Plat - 640 Acres

N / W / E / S

State	County	Permit Number
Pennsylvania	Warren	

Surface Location Description
[ ] 1/4 of [ ] 1/4 of [ ] 1/4 of [ ] 1/4 of Section [ ] Township [ ] Range [ ]

Locate well in two directions from nearest lines of quarter section and drilling unit
Surface Location [ ] ft. frm (N/S) [ ] Line of quarter section
and [ ] ft. from (E/W) [ ] Line of quarter section.

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

Number of Wells [ ]

Lease Name: Smith-Ras

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

Well Number: Unit #1

CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT (LB/FT)	TO BE PUT IN WELL (FT)	TO BE LEFT IN WELL (FT)	HOLE SIZE
8-5/8"	24	406	406	12-1/4"
4-1/2"	10.5	4493	1534	7-7/8"

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

CEMENTING TO PLUG AND ABANDON DATA:	PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6	PLUG #7
Size of Hole or Pipe in which Plug Will Be Placed (inche	4-1/2"	7-7/8"	7-7/8"	8-5/8			
Depth to Bottom of Tubing or Drill Pipe (ft	4450	2959	460	18			
Sacks of Cement To Be Used (each plug)	20	397	16	5			
Slurry Volume To Be Pumped (cu. ft.)	23.6	468.5	18.9	5.9			
Calculated Top of Plug (ft.)	4180	1700	410	0			
Measured Top of Plug (if tagged ft.)							
Slurry Wt. (Lb./Gal.)	15.6	15.6	15.6	15.6			
Type Cement or Other Material (Class III)	Class A	Class A	Class A	Class A			

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

From	To	From	To

Estimated Cost to Plug Wells
$23,383.00

Certification

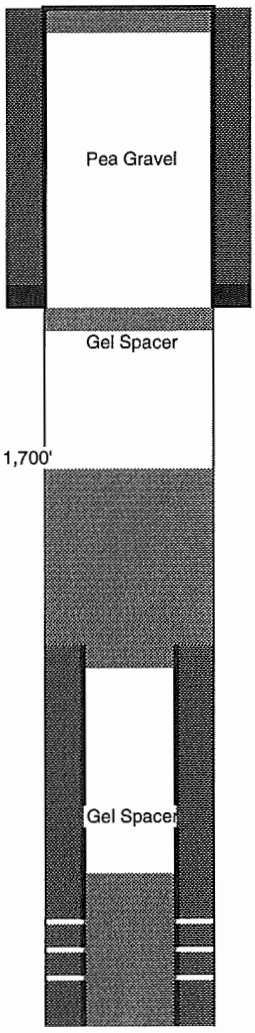
I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate,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

Name and Official Title *(Please type or print)*	Signature	Date Signed
John C. Holko, Vice President		03/06/2015

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

FINAL PLUGGED WELL DRAWING

API/Permit: 37-123-34843
Smith-Ras Unit #1



Pipe cut below plow depth with plate on top

Btm of surface csg 406'

16 sk cement plug 410'-460'

Dunkirk Shale Top approx 1,700'

397 sk cement plug 1700'-2959'

TOC 2,959'

Medina/Whirlpool Perfs
4,222' to 4,396'

20 sk cement plug 4,180'-4,450'

Total casing 4,493 ft

Capacity 4-1/2" casing	0.0895 ft3/ ln- ft	
Capacity 7-7/8" hole	0.3382 ft3/ ln- ft	
Capacity 8-5/8" casing	0.3575 ft3/ ln- ft	
	10.00% Excess	open hole plugs
Plugging Plan	1.18 ft3/sk	cement yield

Top Plug	Plug Size Ft	Cement Amnt in Sacks
0 ft		
18 ft	6	5
Bottom of Surface Casing		
410 ft		
460 ft	19	16
One Plug for Hydrocarbon Intervals to Cutoff Point		
1700 ft		
2959 ft	468	397
Plug across producing interval		
4180 ft		
4450 ft	24	20

Section 10 – Necessary Resources

Section 10 - Necessary Resources

Bear Lake Properties, LLC will establish the financial resources for the plugging and abandonment of the well prior to EPA's issuance of the public notice, draft permit and statement of basis for the well. A Certificate of Deposit will be filed under separate cover in the amount of $24,000.

Section 11 – Plan for Well Failures

Section 11: Plans for Well Failure

General system design and monitoring: The system being utilized for monitoring and control will function with the use of pressure switch gauges with adjustable limit switches and motor valves. The gauges provide a sensing device for changes in pressure conditions and if the limit switches are reached, they will send responses to activate motor valves controlling injection flow and pressure relief. In addition to the automated portion of the system, the manual operation of all pumping equipment as well as the continual inspections of the pumping and monitoring equipment provide additional safeguards for appropriate actions necessary in case of well failures.

Injection Pressure Limit Monitoring: The primary safeguard to prevent over pressuring is the automated shutdown on the pumping equipment at which the maximum operating pressure can be set as a limit at which all pumping will cease.

Additional switch gauges and motor valves will be utilized at the wellhead to monitor pressure changes that would be caused by tubing or casing failures and the appropriate valve will be activated to cease injection.

Tubing and Packer Monitoring: With the monitoring switch gauge connected to the tubing, we will have a secondary system to prevent over pressuring of the tubing. When the maximum pressure is sensed, a response is sent to a motor valve which will stop additional injection into the tubing.

Tubing to Casing Annulus Monitoring: This annular space will be monitored for both increase and decreases in pressure. The switch gauge will have both a low and high shutdown tab limit. When either of the limits is reached, the sensor will send a response to a motor valve shutting down flow. The lower limit will be used to monitor damage to the casing which allows fluid to leave the casing, and the high limit will sense a pressure increase in the casing that may be caused by communication with the tubing or flow into the annular space. Both of these limits when reached will send responses shutting down the injection cycle.

8-5/8" Annular Monitoring: The PADEP requires the annular valve on the 8-5/8" casing head to remain open to the atmosphere at all times. We will connect this point to a storage tank capable of collecting any fluid and allowing visual monitoring of any fluid flow. The valve and associated gauge will be monitored and inspected visually for changes or fluid flow. If such is detected, the system will be shut down and the remaining equipment associated with the system will be inspected to evaluate the cause of the changes.

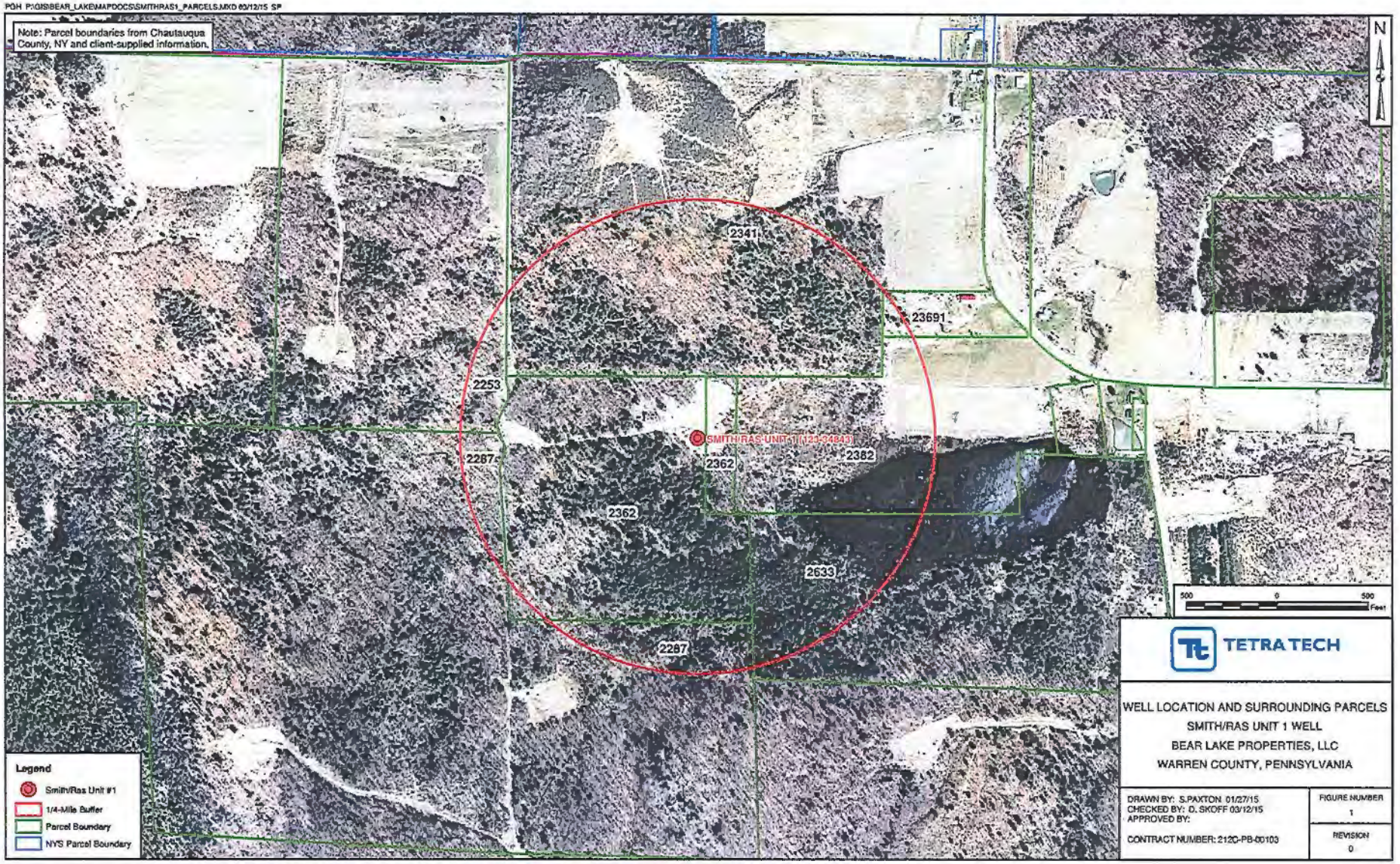
Under the monitoring provided above, well failures will either be identified by the automated equipment and switch gauges or by visual inspection during injection operations or at other times. Should any failure occur, all injections will cease and proper notifications to EPA will be made. Analysis of the failure will take place and the

necessary repairs to be implemented along with any equipment replacement will be coordinated with the EPA.

Appendix A – Surrounding Landowner Information

Landowners Within 1/4 Mile of the Smith-Ras Unit #1 Well

Pennsylvania Landowners		
PARCEL #	**OWNER**	**ADDRESS**
2341	Bear Lake Properties, LLC	3010 Village Run, Suite 103, Wexford, PA 15090
2382	Theodore G & Eloise R Smith	1655 Cornish Hill Rd, Bear Lake, PA 16402
2633	John C. & Annaliese Wright	50 Long Branch Lane, Stafford, VA 22336
2362	Jack R & Marilyn McCoy	PO Box 112 Columbus, PA 16405
2287	Cornish Lumber Company	PO BOX 140 Bear Lake, PA 16402
2253	Miles D and Joyce E Sampsell	8253 Pagan Rd, Erie, PA 16509
23691	Theodore G and Eloise Smith	1655 Cornish Hill Rd, Bear Lake, PA 16402


P:\GIS\BEAR_LAKE\MAPDOCS\SMITHRAS1_PARCELS.MXD 03/12/15 SP
Note: Parcel boundaries from Chautauqua County, NY and client-supplied information.
N
2341
23691
2253
2287
SMITH/RAS UNIT 1 (120-04843)
2362
2382
2362
2633
2287
500 0 500 Feet
Legend
Smith/Ras Unit #1
1/4-Mile Buffer
Parcel Boundary
NYS Parcel Boundary
TETRA TECH
WELL LOCATION AND SURROUNDING PARCELS
SMITH/RAS UNIT 1 WELL
BEAR LAKE PROPERTIES, LLC
WARREN COUNTY, PENNSYLVANIA
DRAWN BY: S.PAXTON 01/27/15
CHECKED BY: D. SKOFF 03/12/15
APPROVED BY:
CONTRACT NUMBER: 212C-PB-00103
FIGURE NUMBER
1
REVISION
0