Beeland Group, LLC

UIC PERMIT APPLICATION

Class | Non-Hazardous Injection Well

Beeland Group, LLC

Alba, Michigan Facility

Antrim County

T30N, R5W, Section 14, SE 1/4 Section

EPA Permit # TBD

October 6, 2006

Prepared By:

Petrotek Engineering Corporation 9088 S. Ridgeline Boulevard, Suite 105 Littleton, Colorado 80129 Phone: (303) 290-9414 Fax: (303) 290-9580

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Table of Contents

1.0	PERMIT APPLICATION AND INTRODUCTION	1-1
2.0	USEPA FORM 7520-6 PERMIT APPLICATION ATTACHMENTS	2-1
2.A	AREA OF REVIEW METHODS	2-1
	Critical Pressure Rise	2-1
	Cone-of-Influence	2-3
2.B	MAPS OF WELLS IN AREA AND AREA OF REVIEW	2-4
	Topographic Map	2-4
	Artificial Penetrations	2-4
2.C	CORRECTIVE ACTION PLAN AND WELL DATA	2-9
	Corrective Action	2-9
	Area of Review Oil and Gas Well Data	2-9
	Water Wells Within 1/4 Mile AOR	2-14
	Property Ownership Data and Public Notice	2-14
2.D	MAPS AND CROSS SECTIONS OF USDWs	2-22
2.E	NAME AND DEPTH OF USDWs	2-26
2.F	MAPS AND CROSS SECTIONS OF GEOLOGIC STRUCTURE	2-27
	Stratigraphy and Lithology	2 -2 7
	Detroit River Group (lower injection and arrestment)	2 -28
	Traverse Group	2 -28
	Faulting	2-29
	Seismic Activity	2-30
2.G	GEOLOGICAL DATA ON INJECTION AND CONFINING ZONES	2-38
2.H	OPERATING DATA	2-39
	Maximum Injection Pressure	2-39
	Average Rates, Volumes and Pressures	2-39



Table of Contents

-

,

	Annulus Pressure	2-39
	Nature of Annulus Fluid	2-39
	Injectate Characteristics	2-40
	Impact of Injection	2-42
2.1	FORMATION TESTING PROGRAM	2-43
2.J	STIMULATION PROGRAM	2-45
2.K	INJECTION PROCEDURES	2-46
	Surface Facility Description	2-46
	Injection Procedures	2-46
	Well Operating Procedures, Alarms and Annulus Pressure Maintenance	2-46
2.L	CONSTRUCTION PROCEDURES	2-50
	Nature of Annulus Fluid	2-51
2.M	CONSTRUCTION DETAILS	2-52
	Proposed Subsurface Well Construction Details	2-52
	Surface Well Construction Details	2-52
	Annulus Monitoring System	2-52
	Mechanical Integrity	2-53
2.N	CHANGES IN INJECTED FLUID	2-56
2.0	PLANS FOR WELL FAILURES	2-57
2.P	MONITORING PROGRAM	2-58
	Mechanical Integrity and Periodic Testing	2-58
	Continuous and Operational Monitoring	2-59
	Annulus and Injection Pressure	2 - 60
	Injection Rate and Volume	2-60
	Annulus Tank Levels	2-60
	Waste Characterization and Analysis	2-60



Table of Contents

2.Q	PLUGGING AND ABANDONMENT PLAN	2-61
	Post-Closure Care Requirements	2-62
2.R	NECESSARY RESOURCES	2-65
2.S	AQUIFER EXEMPTIONS	2-66
2.T	EXISTING EPA PERMITS	2-67
2.U	DESCRIPTION OF BUSINESS	2-68

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TABLES

TABLE C-1	ARTIFICIAL PENETRATIONS: MDEQ OIL & GAS PERMITS WELLS PENETRATING TO INJECTION ZONE IN AOR
TABLE C-2	ARTIFICIAL PENETRATIONS: MDEQ OIL & GAS PERMITS SHALLOW AND ANTRIM WELLS IN AOR
TABLE C-3	PROPERTY OWNERS WITHIN ½ MILE RADIUS OF PROPOSED BEELAND GROUP, LLC WELL NO. 1 PROPERTY
TABLE F-1	PROPOSED BEELAND NO. 1 WELL PROJECTED FORMATION DEPTH SUMMARY 2-27
TABLE H-1	OPERATING, MONITORING AND REPORTING REQUIREMENTS BEELAND GROUP, LLC DISPOSAL WELL NO. 1
TABLE H-2	EXAMPLE ANALYSIS OF INJECTATE FROM BAY HARBOR, MICHIGAN REMEDIATION
TABLE L-1	LIST OF PROPOSED LOGS BEELAND GROUP, LLC WELL NO. 1

FIGURES

FIGURE 1	SITE LOCATION MAP	. 1-3
FIGURE A-1	CRITICAL PRESSURE RISE	. 2-2
FIGURE B-1	TOPOGRAPHIC MAP SHOWING WELL LOCATION AND AOR	. 2-6
FIGURE B-2	OIL AND GAS WELL LOCATION MAP	. 2-7
FIGURE B-3	FRESHWATER PENETRATION LOCATION MAP	2-8
FIGURE C-1	AOR SCHEMATIC WELL #27750	2-17

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Table of Contents

.

FIGURE C-2	AOR SCHEMATIC WELL #41955	2-18
FIGURE C-3	AOR SCHEMATIC WELL #46244	2-19
FIGURE C-4	AOR SCHEMATIC WELL #42680	2-20
FIGURE C-5	SURFACE PROPERTY OWNERS WITHIN ½ MILE OF SITE PROPERTY	2-21
FIGURE D-1	MARSHALL AQUIFER EXTENT	2-24
FIGURE D-2	SAGINAW AQUIFER EXTENT	2-25
FIGURE F-1	STRATIGRAPHIC NOMENCLATURE FOR MICHIGAN	2-31
FIGURE F-2	REGIONAL MICHIGAN DUNDEE STRUCTURE	2-32
FIGURE F-3	REGIONAL MICHIGAN DUNDEE THICKNESS	2-33
FIGURE F-4	REGIONAL MICHIGAN TRAVERSE THICKNESS	2-34
FIGURE F-5	REGIONAL MICHIGAN TRAVERSE SHALE PERCENTAGE THICKNESS	2-35
FIGURE F-6	LOCAL GEOLOGIC CROSS SECTION (NORTH – SOUTH)	2-36
FIGURE F-7	LOCAL GEOLOGIC CROSS SECTION (WEST - EAST)	2-37
FIGURE K-1	SURFACE INJECTION PROCESS AND INSTRUMENTATION	2-49
FIGURE M-1	PROPOSED WELL SCHEMATIC	2-54
FIGURE M-2	PROPOSED WELLHEAD (TREE) SCHEMATIC	2-55
FIGURE Q-1	PLUGGING AND ABANDONMENT WELL SCHEMATIC	2-64

USEPA Permit Forms

Form 7520-6	Proposed Well No. 1 UIC Permit Application	1-2
Form 7520-14	Proposed Well No. 1 Plugging And Abandonment	2-63

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1.0 PERMIT APPLICATION AND INTRODUCTION

Through the submittal of this application, Beeland Group, LLC, requests authorization from the US Environmental Protection Agency (USEPA) to install and operate a non-hazardous Class I disposal well located at their Alba, Michigan facility pursuant to the applicable Underground Injection Control (UIC) regulations. The well is to be located in Antrim County, Michigan within the limits of Star Township, approximately 495 feet from the south line and 1,320 feet from the east line of the southeast corner of Section 14, T30N, R5W. A map identifying the facility location is included as Figure 1. A completed copy of USEPA UIC 7520-6, "Underground Injection Control Permit Application" for the well is included in this Response, and required attachments to this form are included in this document.

The Beeland Group facility in Alba, Michigan intends to operate one Class I Non-Hazardous Disposal Well for underground injection of fluids from a groundwater remediation project. Fresh water aquifers in the vicinity of this well are to be protected by multiple strings of casing and cement. Injected fluids will be delivered to the Dundee Formation injection interval under gravity feed or positive pressure flow through tubing and a packer. The well is to have one cemented long string protective casing extending into the injection interval. The wellbore is to be an openhole completion within the injection interval. The annulus area between the protective casing and injection tubing string is to be filled with inhibited fresh water. Annulus pressure will be continuously monitored to detect any leaks in the tubing or casing and annulus pressure is maintained at levels of more than 100 psi above the tubing pressure.

Relevant administrative data regarding the permit are summarized as follows.

Applicant: Beeland Group, LLC State: Michigan County: Antrim Township: Star **Facility Address:** 10577 Alba Highway, Alba, Michigan 49611 Mailing Address: One Energy Plaza, Jackson, Michigan 49201 Location of Well: SE/4 of Section 14, T30N, R5W USEPA ID Nos.: Beeland Disposal Well No. 1, TBD Michigan ID No.: Beeland Disposal Well No. 1, TBD Contact: Mr. Joseph Tomasik, Vice-President

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2.0 USEPA FORM 7520-6 PERMIT APPLICATION ATTACHMENTS

2.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 ¼-mile from the well bore unless the use of an equation is approved in advance by the Director.

RESPONSE

The radius of investigation used in this permit request has been based on standard practices applied historically in Region 5. Under Section 146.6 of the UIC regulations (40CFR), the area of review (AOR) for a non-hazardous Class I injection well is defined as either the calculated zone of endangering influence or a fixed radius of not less than one-fourth mile. USEPA, Region 5 has required a fixed two-mile radius AOR for the evaluation of all non-fresh water penetrations in the vicinity of a Class I non-hazardous well in Michigan.

Therefore, a fixed radius of two (2) miles for evaluation of non-fresh water artificial penetrations as specified by the USEPA, Region 5 has been investigated for Class I injection into the Beeland disposal well. This distance is substantially greater than the calculated cone-of-influence (COI) for operation of the proposed well as a Class I injector. A fixed radius of one-quarter mile for the circumscribing area around the disposal well is specified for the evaluation of fresh-water artificial penetrations. Area of review radii have been applied from the property boundaries for the well facility. Although water well investigation requirements have been waived by the USEPA, Region 5 in past submittals, fresh water well data for penetrations located within the area around a ¼-mile radius have been identified from state files and submitted. In addition, an updated map generated from Michigan Department of Environmental Quality (MDEQ) data has been submitted to summarize these data.

The cone-of-influence for injection is defined as that area around a well within which increased injection zone pressures caused by injection could be sufficient to drive fluids into an underground source of drinking water (USDW). The pathway for this theoretical fluid movement is assumed to be a hypothetical, open abandoned well which penetrates the confining zone for injection. Information used in the following calculations has been estimated from addition to logs and available neighboring well information summarized in this document.

Critical Pressure Rise

To calculate the COI, a value must first be assigned for the pressure increase in the injection interval that would be sufficient to cause injection zone brine to rise in an open pathway to the base of the lowermost USDW. This critical pressure rise, Pc, is assigned as indicated in Figure A-1.

The pressure required at the top of the injection interval to support injection zone brine in the configuration indicated is, in psi units:

$$P = 0.433 [y_B D_B + y_w (D_w - L)]$$

where: $D_B = D_x - D_w$

and the pressure rise is then:

$$Pc = 0.433 [y_BD_B + y_w(D_w-L)] - Po$$

where Po is the original, pre-injection value for pressure at the top of the injection interval expressed in psi units.

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Original pressure in the Dundee has been estimated from typical fluid gradients found in northern Michigan for this formation. For the estimated top of the injection interval of 2,150 feet (See Response F), a gradient of 0.35 psi/ft yields a pressure of 752 psi at the top of the Dundee.

In assigning the critical pressure rise and calculating the cone-of-influence at this site, the base of the lowermost USDW is assigned as 900 feet, as discussed in Response 2.D of this document. The lowest potentiometric surface of the water table within 2 miles of the Beeland well is projected to be closer than 100 feet from ground level. In these calculations, it is assumed that the water table is at approximately 200 feet below ground level, which is larger than anticipated drawdown, and is deeper that the total depth of most water wells in the area.

TABLE A-1 CRITICAL PRESSURE CALCULATION PARAMETERS

Parameter	Value
Original pressure, Po	752 psi @ 2150 feet
Depth to base of USDW, D _w	900 feet
Depth to top of injection zone, Dx	2150 feet
Depth to USDW fluid level, L	200 feet
Density of USDW fluids, yw	1.0
Density of injectate or injection zone brine, y _B	1.05

These values were used in the above equation to compute the critical pressure rise as follows:

or:

ġ,

Pc = 119 psi

Cone-of-Influence

Based on the calculated value for the critical pressure rise, the cone-of-influence can be calculated for the Beeland well over a twenty-year period of injection. At the proposed Beeland well, there is projected to be no cone-of-influence for continuous injection at a rate of 200 gpm (6,857 bwpd). This value can be confirmed by examination of the following calculation (oilfield units) of pressure rise in the reservoir at a distance of five feet from the injection well:

 $dP = -70.6 \text{ Bq}\mu / \text{kh} * \ln ([1,688 \phi \mu c_t r^2 / \text{kt}] - 2s)$

where the values listed in Table A-2 have been assigned based on site-specific information.

The above calculation for pressure rise due to twenty years of injection at a rate of 200 gpm yields an increase of approximately 115 psi. This value is smaller than the conservatively calculated critical pressure, Pc, of 119 psi which would be necessary before there is potential for upward fluid movement to the base of a USDW if an open pathway were present. Therefore the cone-of-influence at this site is less than 5 feet, even under a conservative scenario. Due to the relatively high permeability and relatively low original pressure of the Dundee Limestone injection formation at this site, there exists no potential for contamination of USDW resources due to improperly completed or abandoned wells within the statutory minimum 2-mile radius area of review.

TABLE A-2 CONE-OF-INFLUENCE PARAMETERS

Parameter	Calculation	Value
Flow rate, q	200 gpm *1440 min/day* bbl/42 gal	6,857 bbl/d
Thickness, h		100 feet
Formation Volume Factor, B		1.015
Porosity, ø		0.10
Permeability, k		1,000 millidarcies
Viscosity, µ	•	1.05 centipoise @ 72 degrees F
Total Compressibility, Ct	3.2x10 ⁻⁶ psi ⁻¹ + 4.8x10 ⁻⁶ psi ⁻¹	8x10 ⁻⁶ psi ⁻¹
Radius, r		5 feet
Time, t	20 years x 365.25 days/yr * 24hr/day	175,320 hours

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2.B MAPS OF WELLS IN 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 well, injection well, abandoned well, 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 well, 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 on this map.

RESPONSE

Maps based on available public records have been prepared and submitted in this Response as summaries of the required data.

Topographic Map

A copy of the USGS Topographic map available from the area of review with the outline of the Region 5 minimum two-mile radius area of review and an injection well symbol representing the facility superimposed on the map is included as Figure B-1.

This topographic map extends in excess of 1 mile beyond the Beeland site in all directions. The Beeland property encompasses an irregular rectangular area of approximately 60 acres in the southeast quarter of Section 14. In addition, the map shows the location of all known surface bodies of water, springs, mines, quarries, residencies and roads. Separate additional maps submitted in this Response present water wells and deeper artificial penetrations. A listing of neighboring property owners within a ½ mile radius has been also been developed and submitted with this application for the well permit. No known hazardous waste treatment storage or disposal facilities are present within the AOR based on available state of Michigan permit information.

Artificial Penetrations

There are a number of artificial penetrations identified in the area of review conducted for a two-mile radius surrounding the proposed Beeland disposal well. However, a majority of the wells permitted and/or drilled in the vicinity of the Beeland well only penetrate the Antrim shale for the purpose of gas production. These wells are typically drilled to a depth of between 1,250 and 1,750 feet below ground level (BGL) and are not potential pathways for fluid migration out of the permitted injection zone, since they do not penetrate through the confining, arrestment or injection intervals. An examination of all available records at the Michigan Department of Environmental Quality (MDEQ) has been accomplished as of September 2006 to evaluate these wells. Data for all deep wells which have been drilled within a two-mile radius of the Beeland well are summarized in the following Response (Tables 2-1 and 2-2, Response 2.C) and copies of pertinent MDEQ Beeland well are also presented in Response 2.C.

Figure B-2, a map generated with the PETRA software program from data provided by the state of Michigan



in September of 2006, shows the location of all non-fresh water artificial penetrations in the state oil and gas well database within the required two-mile AOR. Permit numbers are shown at each well symbol. The Proposed Beeland Well No. 1 is designated as an injection well (also labeled with the well name), and is located in the southeast quarter of Section 14. General geographic features and the outline of the required two-mile AOR are also shown on the map. Index lines showing cross sections presented in Response 2.F. are also shown, with summaries of relevant formation tops from the MDEQ database. The "legend" on this map contains pertinent information designating all other wells with the area of review.

Figure B-3, a map modified from data generated by the state of Michigan in September of 2006, presents the location of all local freshwater well penetrations in the state water well database. Note that fresh water penetrations in the area of review typically range from approximately 50 to 200 feet, and are not critical with regard to the fluid injection at the Proposed Well No. 1. Copies of selected water well records for freshwater penetrations are submitted in Response 2.C of this document.

According to the MDEQ records, there are 109 wells located within the two-mile AOR. Only four of these wells penetrated into the Bell Shale or the Dundee Limestone. Three of these penetrations are active Class II brine disposal wells (#41955, #42680, and #46244), and one well was plugged in 1969 as a dry hole (#27750). The remaining 105 wells only penetrate to the Antrim or Traverse Group, and do not penetrate the arrestment or injection interval for the proposed Beeland well. There have been no Class I wells drilled within the area of review.

Well #27750 in Section 26 of T30N-R5W, which had been listed as a dry Niagaran exploratory well with a TD of 6,550 feet, was plugged according to applicable state standards and a plugging record is available for this well (see Response 2.C). The Dundee is isolated from deeper formations by cement plugs, and is isolated from shallower formations by multiple cement plugs and cemented casing that was left in the well. Class II brine disposal wells (#41955, #42680, and #46244), are each completed according to current state and federal regulatory requirements and have long-string casing cemented to isolate the Dundee injection interval from overlying formations and fresh water resources. Records for Permit #56773 in Section 10 of T30N R5W are presented showing that the formation at TD is the Traverse Limestone despite a total depth of 2,200' reported in the MDEQ database.

Due to the small pressure rise associated with projected injection activities and the corresponding nonexistent cone-of-influence (see Response 2.A), it is noted that none of the wells within the regulatory minimum two-mile AOR could have the potential for causing any endangerment to USDW resources in the vicinity.



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2.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 well within the area of review, including those on the map required in Attachment B, which penetrate the proposed injection zone. Such data shall include the following:

Class I

A description of each well's type, 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 well, include the corrective action proposed to be taken by the applicant under 40 CFR 144.55.

RESPONSE

Corrective Action

A corrective action plan is not required for any of the artificial penetrations within the proposed Beeland well AOR because, based on calculations, there is no cone-of-influence and there are no artificial penetrations to the injection zone within the area of review that have the potential for allowing injection activities to have an impact on the USDW. If a corrective action plan for any neighboring well becomes necessary in the future, it will be developed according to appropriate regulatory standards and guidelines.

The corrective action plan which would be proposed by Beeland, should the potential for fluid migration to occur through the confining layer develop via any future well, will include the following:

- 1. Beeland Group, LLC injection well will be shut-in.
- 2. The USEPA, Region 5 UIC Section and the MDEQ will be notified.
- 3. Following well shut-in, waste will be shipped to alternative permitted facilities for off-site treatment and/or disposal as necessary.
- 4. A contingency plan will be prepared as follows:
 - a. Locate well and identify present operator or owner, if any.
 - b. Identify mode of failure.
 - c. Prepare remedial plan outlining course of action.
 - d. The remedial plan will be submitted to the USEPA, Region 5 and MDEQ for approval.
 - e. Upon authorization, the remediation plan will be implemented.

Area of Review Oil and Gas Well Data

Data regarding artificial penetrations collected for wells within the area of review have been categorized and are listed by well type. Oil and gas industry (non-fresh water) well locations are shown on Figure B-2, provided as a portion of Response B in this document. Oil and gas permitted wells drilled into or deeper than the injection zone and subsequently abandoned, wells drilled through the injection zone that are still active producers, and temporarily abandoned wells that penetrate to the injection zone are listed in Table C-1. Wells are labeled with MDEQ permit numbers. Following this table is a listing of oil and gas wells permitted

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by the MDEQ that have been drilled to depths, which do not penetrate the injection zone (Table C-2). Typically, these wells are Antrim gas wells that reached a total depth within the Antrim Shale or the top of the Traverse Limestone. Data presented in this table regarding wells within the area of review include MDEQ permit number, location, total depth, status, construction, and completion or plugging date. Figures C-1 through C-4 present summaries of the wellbore configurations for each of the wells that penetrate to the proposed injection interval.

Copies of well records are presented at the end of this Response for all non-freshwater penetrations that reached the top of the arrestment interval (Bell Shale) within the area of review.

TABLE C-1ARTIFICIAL PENETRATIONS: MDEQ OIL & GAS PERMITSWELLS PENETRATING TO INJECTION ZONE IN AOR

MDEQ Permit #	Location (T-R)	Section	Well Status	Formation at TD	Total Depth (ft. BGL)	Date of Completion or Plugging
27750	30N-5W	26	Dry	CABOT HEAD	6550	08-Oct-69
41955	30N-5W	23	SWD	DUNDEE	2114	16-May-89
42680	30N-4W	19	SWD & Gas	DETROIT RIVER	2472	14-Dec-00
46244	30N-5W	1	SWD	DETROIT RIVER ANHY	2315	10-Nov-92

Notes:

Date Completion or plugging

dry Dry hole, plugged

swd Class II brine disposal well

& Gas Dual completion to also produce Antrim gas

18385 30N-5W 25 Dry Hole TRAVERSE LIMESTONE 41904 30N-4W 18 Natural Gas Well ANTRIM 41906 30N-4W 18 Natural Gas Well ANTRIM 41907 30N-4W 18 Natural Gas Well ANTRIM 41908 30N-4W 18 Natural Gas Well ANTRIM 41909 30N-4W 18 Natural Gas Well ANTRIM 41909 30N-4W 18 Natural Gas Well ANTRIM 41910 30N-5W 23 Natural Gas Well ANTRIM DARK 41911 30N-5W 23 Natural Gas Well ANTRIM DARK 41912 30N-5W 23 Natural Gas Well ANTRIM DARK 41913 30N-5W 23 Natural Gas Well ANTRIM DARK 41914 30N-5W 23 Natural Gas Well ANTRIM DARK 41916 30N-5W 23 Natural Gas Well ANTRIM DARK 41917 30N-5W 14 Natural Gas Well ANTRIM DARK	MDEQ Permit #	Location (T-R)	Section	Well Status	Formation at TD	Total Depth (ft. BGL)
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4190930N-4W18Natural Gas WellANTRIM4191030N-5W23Natural Gas WellANTRIM DARK4191130N-5W23Natural Gas WellANTRIM DARK4191230N-5W23Natural Gas WellANTRIM DARK4191330N-5W23Natural Gas WellANTRIM DARK4191430N-5W23Natural Gas WellANTRIM DARK4191530N-5W23Natural Gas WellANTRIM DARK4191630N-5W23Natural Gas WellANTRIM DARK4191730N-5W23Natural Gas WellANTRIM DARK4191830N-5W23Natural Gas WellANTRIM DARK4191930N-5W14Natural Gas WellANTRIM DARK4191830N-5W14Natural Gas WellANTRIM DARK4192030N-5W14Natural Gas WellANTRIM DARK4192130N-5W14Natural Gas WellANTRIM DARK4192330N-5W13Natural Gas WellTRAVERSE LIMESTONE4192330N-5W13Natural Gas WellANTRIM DARK4192430N-5W13Natural Gas WellANTRIM DARK4192530N-5W14Natural Gas WellANTRIM DARK4192630N-5W24Natural Gas WellANTRIM DARK4192630N-5W24Natural Gas WellANTRIM DARK4192730N-5W23Natural Gas WellANTRIM DARK4192630N-5W24Natural Gas We	41908	30N-4W	18	Natural Gas Well	ANTRIM	1183
4191030N-5W23Natural Gas WellANTRIM DARK4191130N-5W23Natural Gas WellANTRIM DARK4191230N-5W23Natural Gas WellANTRIM DARK4191330N-5W23Natural Gas WellANTRIM DARK4191430N-5W23Natural Gas WellANTRIM DARK4191530N-5W23Natural Gas WellANTRIM DARK4191630N-5W23Natural Gas WellANTRIM DARK4191730N-5W23Natural Gas WellANTRIM DARK4191830N-5W23Natural Gas WellANTRIM DARK4191930N-5W14Natural Gas WellTRAVERSE LIMESTONE4191830N-5W14Natural Gas WellANTRIM DARK4192030N-5W14Natural Gas WellANTRIM DARK4192130N-5W14Natural Gas WellANTRIM DARK4192230N-5W13Natural Gas WellTRAVERSE LIMESTONE4192330N-5W13Natural Gas WellANTRIM DARK4192430N-5W13Natural Gas WellANTRIM DARK4192530N-5W14Natural Gas WellANTRIM DARK4192630N-5W24Natural Gas WellANTRIM DARK4192730N-5W23Natural Gas WellANTRIM DARK4192630N-5W24Natural Gas WellANTRIM DARK4192730N-5W23Natural Gas WellANTRIM DARK4192630N-5W24Na	41909	30N-4W	18	Natural Gas Well	ANTRIM	1185
4191130N-5W23Natural Gas WellANTRIM DARK4191230N-5W23Natural Gas WellANTRIM4191330N-5W23Natural Gas WellANTRIM DARK4191430N-5W23Natural Gas WellANTRIM DARK4191530N-5W23Natural Gas WellANTRIM DARK4191630N-5W23Natural Gas WellANTRIM DARK4191730N-5W23Natural Gas WellANTRIM DARK4191830N-5W23Natural Gas WellANTRIM DARK4191730N-5W14Natural Gas WellTRAVERSE LIMESTONE4191830N-5W14Natural Gas WellANTRIM DARK4191930N-5W14Natural Gas WellANTRIM DARK4192030N-5W14Natural Gas WellANTRIM DARK4192130N-5W13Natural Gas WellANTRIM DARK4192330N-5W13Natural Gas WellANTRIM DARK4192430N-5W13Natural Gas WellANTRIM DARK4192530N-5W14Natural Gas WellANTRIM DARK4192630N-5W24Natural Gas WellANTRIM DARK4192730N-5W23Natural Gas WellANTRIM DARK4192630N-5W24Natural Gas WellANTRIM DARK4192730N-5W24Natural Gas WellANTRIM DARK4192830N-5W14Natural Gas WellANTRIM DARK4206930N-5W23Natural Gas We	41910	30N-5W	23	Natural Gas Well	ANTRIM DARK	1241
4191230N-5W23Natural Gas WellANTRIM4191330N-5W23Natural Gas WellANTRIM DARK4191430N-5W23Natural Gas WellTRAVERSE LIMESTONE4191530N-5W23Natural Gas WellANTRIM DARK4191630N-5W23Natural Gas WellANTRIM DARK4191730N-5W23Natural Gas WellANTRIM DARK4191830N-5W14Natural Gas WellTRAVERSE LIMESTONE4191830N-5W14Natural Gas WellTRAVERSE LIMESTONE4191930N-5W14Natural Gas WellANTRIM DARK4192030N-5W14Natural Gas WellANTRIM DARK4192130N-5W14Natural Gas WellANTRIM DARK4192330N-5W13Natural Gas WellTRAVERSE LIMESTONE4192330N-5W13Natural Gas WellANTRIM DARK4192430N-5W13Natural Gas WellANTRIM DARK4192530N-5W14Natural Gas WellANTRIM DARK4192630N-5W14Natural Gas WellANTRIM DARK4192730N-5W24Natural Gas WellANTRIM DARK4192730N-5W23Natural Gas WellANTRIM DARK4206930N-5W24Natural Gas WellANTRIM DARK4206930N-5W14Natural Gas WellANTRIM DARK4268130N-4W19Natural Gas WellANTRIM DARK4268130N-4W19 </td <td>41911</td> <td>30N-5W</td> <td>23</td> <td>Natural Gas Well</td> <td>ANTRIM DARK</td> <td>1207</td>	41911	30N-5W	23	Natural Gas Well	ANTRIM DARK	1207
4191330N-5W23Natural Gas WellANTRIM DARK4191430N-5W23Natural Gas WellTRAVERSE LIMESTONE4191530N-5W23Natural Gas WellANTRIM DARK4191630N-5W23Natural Gas WellANTRIM DARK4191730N-5W14Natural Gas WellANTRIM DARK4191830N-5W14Natural Gas WellTRAVERSE LIMESTONE4191930N-5W14Natural Gas WellTRAVERSE LIMESTONE4191930N-5W14Natural Gas WellANTRIM DARK4192030N-5W14Natural Gas WellANTRIM DARK4192130N-5W14Natural Gas WellANTRIM DARK4192230N-5W13Natural Gas WellTRAVERSE LIMESTONE4192330N-5W13Natural Gas WellANTRIM DARK4192430N-5W13Natural Gas WellANTRIM DARK4192530N-5W14Natural Gas WellANTRIM DARK4192630N-5W14Natural Gas WellANTRIM DARK4192730N-5W24Natural Gas WellANTRIM DARK4192730N-5W23Natural Gas WellANTRIM DARK4206930N-5W14Natural Gas WellANTRIM DARK4206930N-5W14Natural Gas WellANTRIM DARK4268130N-4W19Natural Gas WellANTRIM DARK4268130N-4W19Natural Gas WellANTRIM DARK4268130N-4W <td< td=""><td>41912</td><td>30N-5W</td><td>23</td><td>Natural Gas Well</td><td>ANTRIM</td><td>1185</td></td<>	41912	30N-5W	23	Natural Gas Well	ANTRIM	1185
4191430N-5W23Natural Gas WellTRAVERSE LIMESTONE4191530N-5W23Natural Gas WellANTRIM DARK4191630N-5W23Natural Gas WellANTRIM DARK4191730N-5W14Natural Gas WellTRAVERSE LIMESTONE4191830N-5W14Natural Gas WellTRAVERSE LIMESTONE4191930N-5W14Natural Gas WellANTRIM DARK4192030N-5W14Natural Gas WellANTRIM DARK4192130N-5W14Natural Gas WellANTRIM DARK4192130N-5W14Natural Gas WellANTRIM DARK4192230N-5W13Natural Gas WellTRAVERSE LIMESTONE4192330N-5W13Natural Gas WellANTRIM DARK4192430N-5W13Natural Gas WellANTRIM DARK4192530N-5W14Natural Gas WellANTRIM DARK4192630N-5W14Natural Gas WellANTRIM DARK4192730N-5W14Natural Gas WellANTRIM DARK4192630N-5W24Natural Gas WellANTRIM DARK4192730N-5W23Natural Gas WellANTRIM DARK4192730N-5W14Natural Gas WellANTRIM DARK4206930N-5W23Natural Gas WellANTRIM DARK4206930N-5W14Natural Gas WellANTRIM DARK4268130N-4W19Natural Gas WellANTRIM DARK4268130N-4W <td< td=""><td>41913</td><td>30N-5W</td><td>23</td><td>Natural Gas Well</td><td>ANTRIM DARK</td><td>1195</td></td<>	41913	30N-5W	23	Natural Gas Well	ANTRIM DARK	1195
4191530N-5W23Natural Gas WellANTRIM DARK4191630N-5W23Natural Gas WellANTRIM DARK4191730N-5W14Natural Gas WellTRAVERSE LIMESTONE4191830N-5W14Natural Gas WellTRAVERSE LIMESTONE4191930N-5W14Natural Gas WellANTRIM DARK4192030N-5W14Natural Gas WellANTRIM DARK4192130N-5W14Natural Gas WellANTRIM DARK4192130N-5W14Natural Gas WellTRAVERSE LIMESTONE4192230N-5W13Natural Gas WellTRAVERSE LIMESTONE4192330N-5W13Natural Gas WellANTRIM DARK4192430N-5W13Natural Gas WellANTRIM DARK4192530N-5W14Natural Gas WellANTRIM DARK4192630N-5W14Natural Gas WellANTRIM DARK4192730N-5W24Natural Gas WellANTRIM DARK4192730N-5W24Natural Gas WellANTRIM DARK4206930N-5W23Natural Gas WellANTRIM DARK4206930N-5W14Natural Gas WellANTRIM DARK4216230N-5W14Natural Gas WellANTRIM DARK4268130N-4W19Natural Gas WellANTRIM DARK4353830N-4W30Natural Gas WellTRAVERSE FORMATION4353930N-4W30Natural Gas WellTRAVERSE LIMESTONE	41914	30N-5W	23	Natural Gas Well	TRAVERSE LIMESTONE	1376
4191630N-5W23Natural Gas WellANTRIM DARK4191730N-5W14Natural Gas WellTRAVERSE LIMESTONE4191830N-5W14Natural Gas WellTRAVERSE LIMESTONE4191930N-5W14Natural Gas WellANTRIM DARK4192030N-5W14Natural Gas WellANTRIM DARK4192130N-5W14Natural Gas WellANTRIM DARK4192130N-5W23Natural Gas WellANTRIM DARK4192230N-5W13Natural Gas WellTRAVERSE LIMESTONE4192330N-5W13Natural Gas WellANTRIM DARK4192430N-5W13Natural Gas WellANTRIM DARK4192530N-5W14Natural Gas WellANTRIM DARK4192630N-5W14Natural Gas WellANTRIM DARK4192730N-5W14Natural Gas WellANTRIM DARK4192730N-5W24Natural Gas WellANTRIM DARK4192730N-5W23Natural Gas WellANTRIM DARK4206930N-5W23Natural Gas WellANTRIM DARK4206930N-5W14Natural Gas WellANTRIM DARK4268130N-4W19Natural Gas WellANTRIM DARK4268130N-4W30Natural Gas WellTRAVERSE FORMATION4353830N-4W30Natural Gas WellTRAVERSE LIMESTONE4353930N-4W30Natural Gas WellANTRIM DARK	41915	30N-5W	23	Natural Gas Well	ANTRIM DARK	1193
4191730N-5W14Natural Gas WellTRAVERSE LIMESTONE4191830N-5W14Natural Gas WellTRAVERSE LIMESTONE4191930N-5W14Natural Gas WellANTRIM DARK4192030N-5W14Natural Gas WellANTRIM DARK4192130N-5W14Natural Gas WellANTRIM DARK4192130N-5W23Natural Gas WellTRAVERSE LIMESTONE4192230N-5W13Natural Gas WellTRAVERSE LIMESTONE4192330N-5W13Natural Gas WellANTRIM DARK4192430N-5W13Natural Gas WellANTRIM DARK4192530N-5W14Natural Gas WellANTRIM DARK4192630N-5W14Natural Gas WellANTRIM DARK4192630N-5W24Natural Gas WellANTRIM DARK4192730N-5W23Natural Gas WellANTRIM DARK4206930N-5W23Natural Gas WellANTRIM DARK4206930N-5W24Natural Gas WellANTRIM DARK4216230N-5W14Natural Gas WellANTRIM DARK4268130N-4W19Natural Gas WellANTRIM DARK4268130N-4W30Natural Gas WellTRAVERSE LIMESTONE4353830N-4W30Natural Gas WellTRAVERSE LIMESTONE4353930N-4W30Natural Gas WellANTRIM	41916	30N-5W	23	Natural Gas Well	ANTRIM DARK	1205
4191830N-5W14Natural Gas WellTRAVERSE LIMESTONE4191930N-5W14Natural Gas WellANTRIM DARK4192030N-5W14Natural Gas WellANTRIM DARK4192130N-5W23Natural Gas WellTRAVERSE LIMESTONE4192230N-5W13Natural Gas WellTRAVERSE LIMESTONE4192330N-5W13Natural Gas WellANTRIM DARK4192430N-5W13Natural Gas WellANTRIM DARK4192530N-5W13Natural Gas WellANTRIM DARK4192630N-5W14Natural Gas WellANTRIM DARK4192630N-5W24Natural Gas WellANTRIM DARK4192730N-5W24Natural Gas WellANTRIM DARK4192730N-5W23Natural Gas WellANTRIM DARK4206930N-5W23Natural Gas WellANTRIM DARK4216230N-5W14Natural Gas WellANTRIM DARK4268130N-4W19Natural Gas WellANTRIM DARK4353830N-4W30Natural Gas WellTRAVERSE FORMATION4353930N-4W30Natural Gas WellTRAVERSE LIMESTONE	41917	30N-5W	14	Natural Gas Well	TRAVERSE LIMESTONE	1432
4191930N-5W14Natural Gas WellANTRIM DARK4192030N-5W14Natural Gas WellANTRIM DARK4192130N-5W23Natural Gas WellTRAVERSE LIMESTONE4192230N-5W13Natural Gas WellTRAVERSE LIMESTONE4192330N-5W13Natural Gas WellANTRIM DARK4192430N-5W13Natural Gas WellANTRIM DARK4192530N-5W13Natural Gas WellANTRIM DARK4192630N-5W14Natural Gas WellTRAVERSE LIMESTONE4192630N-5W24Natural Gas WellANTRIM DARK4192730N-5W24Natural Gas WellANTRIM DARK4206930N-5W23Natural Gas WellANTRIM DARK4216230N-5W14Natural Gas WellANTRIM DARK4268130N-4W19Natural Gas WellANTRIM DARK4353830N-4W30Natural Gas WellTRAVERSE FORMATION4353930N-4W30Natural Gas WellANTRIM DARK	41918	30N-5W	14	Natural Gas Well	TRAVERSE LIMESTONE	1389
4192030N-5W14Natural Gas WellANTRIM DARK4192130N-5W23Natural Gas WellTRAVERSE LIMESTONE4192230N-5W13Natural Gas WellTRAVERSE LIMESTONE4192330N-5W13Natural Gas WellANTRIM DARK4192430N-5W13Natural Gas WellANTRIM DARK4192530N-5W13Natural Gas WellANTRIM DARK4192630N-5W14Natural Gas WellTRAVERSE LIMESTONE4192630N-5W24Natural Gas WellANTRIM DARK4192730N-5W24Natural Gas WellANTRIM DARK4192830N-5W24Natural Gas WellANTRIM DARK4192730N-5W24Natural Gas WellANTRIM DARK4206930N-5W23Natural Gas WellANTRIM DARK4206930N-5W14Natural Gas WellANTRIM DARK4268130N-4W19Natural Gas WellANTRIM DARK4268130N-4W30Natural Gas WellTRAVERSE FORMATION4353830N-4W30Natural Gas WellTRAVERSE LIMESTONE4353930N-4W30Natural Gas WellANTRIM	41919	30N-5W	14	Natural Gas Well	ANTRIM DARK	1193
4192130N-5W23Natural Gas WellTRAVERSE LIMESTONE4192230N-5W13Natural Gas WellTRAVERSE LIMESTONE4192330N-5W13Natural Gas WellANTRIM DARK4192430N-5W13Natural Gas WellANTRIM DARK4192530N-5W14Natural Gas WellTRAVERSE LIMESTONE4192630N-5W14Natural Gas WellTRAVERSE LIMESTONE4192730N-5W24Natural Gas WellANTRIM DARK4192730N-5W24Natural Gas WellANTRIM DARK4206930N-5W23Natural Gas WellANTRIM DARK4216230N-5W14Natural Gas WellANTRIM DARK4268130N-4W19Natural Gas WellTRAVERSE FORMATION4353830N-4W30Natural Gas WellTRAVERSE LIMESTONE4353930N-4W30Natural Gas WellANTRIM	41920	30N-5W	14	Natural Gas Well	ANTRIM DARK	1218
4192230N-5W13Natural Gas WellTRAVERSE LIMESTONE4192330N-5W13Natural Gas WellANTRIM DARK4192430N-5W13Natural Gas WellANTRIM DARK4192530N-5W14Natural Gas WellANTRIM DARK4192630N-5W24Natural Gas WellANTRIM DARK4192730N-5W24Natural Gas WellANTRIM DARK4192730N-5W24Natural Gas WellANTRIM DARK4206930N-5W23Natural Gas WellANTRIM DARK4216230N-5W14Natural Gas WellANTRIM DARK4268130N-4W19Natural Gas WellTRAVERSE FORMATION4353830N-4W30Natural Gas WellTRAVERSE LIMESTONE4353930N-4W30Natural Gas WellANTRIM	41921	30N-5W	23	Natural Gas Well	TRAVERSE LIMESTONE	1394
4192330N-5W13Natural Gas WellANTRIM DARK4192430N-5W13Natural Gas WellANTRIM DARK4192530N-5W14Natural Gas WellTRAVERSE LIMESTONE4192630N-5W24Natural Gas WellANTRIM DARK4192730N-5W24Natural Gas WellANTRIM DARK4192730N-5W24Natural Gas WellANTRIM DARK4206930N-5W23Natural Gas WellANTRIM DARK4216230N-5W14Natural Gas WellANTRIM DARK4268130N-4W19Natural Gas WellTRAVERSE FORMATION4353830N-4W30Natural Gas WellTRAVERSE LIMESTONE4353930N-4W30Natural Gas WellANTRIM	41922	30N-5W	13	Natural Gas Well	TRAVERSE LIMESTONE	1368
4192430N-5W13Natural Gas WellANTRIM DARK4192530N-5W14Natural Gas WellTRAVERSE LIMESTONE4192630N-5W24Natural Gas WellANTRIM DARK4192730N-5W24Natural Gas WellANTRIM DARK4206930N-5W23Natural Gas WellANTRIM DARK4216230N-5W14Natural Gas WellANTRIM DARK4268130N-4W19Natural Gas WellTRAVERSE FORMATION4353830N-4W30Natural Gas WellTRAVERSE LIMESTONE4353930N-4W30Natural Gas WellANTRIM	41923	30N-5W	13	Natural Gas Well	ANTRIM DARK	1190
4192530N-5W14Natural Gas WellTRAVERSE LIMESTONE4192630N-5W24Natural Gas WellANTRIM DARK4192730N-5W24Natural Gas WellANTRIM DARK4206930N-5W23Natural Gas WellANTRIM DARK4216230N-5W14Natural Gas WellANTRIM DARK4268130N-4W19Natural Gas WellTRAVERSE FORMATION4353830N-4W30Natural Gas WellTRAVERSE LIMESTONE4353930N-4W30Natural Gas WellANTRIM	41924	30N-5W	13	Natural Gas Well	ANTRIM DARK	2101
4192630N-5W24Natural Gas WellANTRIM DARK4192730N-5W24Natural Gas WellANTRIM DARK4206930N-5W23Natural Gas WellANTRIM DARK4216230N-5W14Natural Gas WellANTRIM DARK4268130N-4W19Natural Gas WellTRAVERSE FORMATION4353830N-4W30Natural Gas WellTRAVERSE LIMESTONE4353930N-4W30Natural Gas WellANTRIM	41925	30N-5W	14	Natural Gas Well	TRAVERSE LIMESTONE	1390
4192730N-5W24Natural Gas WellANTRIM DARK4206930N-5W23Natural Gas WellANTRIM4216230N-5W14Natural Gas WellANTRIM DARK4268130N-4W19Natural Gas WellTRAVERSE FORMATION4353830N-4W30Natural Gas WellTRAVERSE LIMESTONE4353930N-4W30Natural Gas WellANTRIM	41926	30N-5W	24	Natural Gas Well	ANTRIM DARK	1188
4206930N-5W23Natural Gas WellANTRIM4216230N-5W14Natural Gas WellANTRIM DARK4268130N-4W19Natural Gas WellTRAVERSE FORMATION4353830N-4W30Natural Gas WellTRAVERSE LIMESTONE4353930N-4W30Natural Gas WellANTRIM	41927	30N-5W	24	Natural Gas Well	ANTRIM DARK	1172
4216230N-5W14Natural Gas WellANTRIM DARK4268130N-4W19Natural Gas WellTRAVERSE FORMATION4353830N-4W30Natural Gas WellTRAVERSE LIMESTONE4353930N-4W30Natural Gas WellANTRIM	42069	30N-5W	23	Natural Gas Well	ANTRIM	1187
42681 30N-4W 19 Natural Gas Well TRAVERSE FORMATION 43538 30N-4W 30 Natural Gas Well TRAVERSE LIMESTONE 43539 30N-4W 30 Natural Gas Well ANTRIM	42162	30N-5W	14	Natural Gas Well	ANTRIM DARK	1214
43538 30N-4W 30 Natural Gas Well TRAVERSE LIMESTONE 43539 30N-4W 30 Natural Gas Well ANTRIM	42681	30N-4W	19	Natural Gas Well	TRAVERSE FORMATION	1341
43539 30NL4W/ 30 Natural Gas Well ANTRIM	43538	30N-4W	30	Natural Gas Well	TRAVERSE LIMESTONE	1384
	43539	30N-4W	30	Natural Gas Well	ANTRIM	1222
43597 30N-4W 19 Natural Gas Well TRAVERSE LIMESTONE	43597	30N-4W	19	Natural Gas Well	TRAVERSE LIMESTONE	1397

TABLE C-2ARTIFICIAL PENETRATIONS: MDEQ OIL & GAS PERMITS
SHALLOW AND ANTRIM WELLS IN AOR

Petrotek

MDEQ Permit #	Location (T-R)	Section	Well Status	Formation at TD	Total Depth (ft. BGL)
43598	30N-4W	19	Natural Gas Well	TRAVERSE LIMESTONE	1368
43600	30N-4W	30	Natural Gas Well	TRAVERSE LIMESTONE	1367
43601	30N-4W	30	Natural Gas Well	TRAVERSE LIMESTONE	1395
43602	30N-4W	30	Natural Gas Well	TRAVERSE LIMESTONE	1415
43603	30N-4W	19	Natural Gas Well	TRAVERSE FORMATION	1344
43606	30N-4W	19	Natural Gas Well	TRAVERSE FORMATION	1332
43608	30N-4W	19	Natural Gas Well	TRAVERSE LIMESTONE	1402
43609	30N-4W	19	Natural Gas Well	TRAVERSE FORMATION	1353
46241	30N-5W	1	Natural Gas Well	TRAVERSE LIMESTONE	1385
46496	30N-5W	2	Natural Gas Well	TRAVERSE LIMESTONE	1360
46498	30N-5W	11	Natural Gas Well	TRAVERSE LIMESTONE	1368
46499	30N-5W	11	Natural Gas Well	TRAVERSE LIMESTONE	1405
46505	30N-5W	2	Natural Gas Well	TRAVERSE LIMESTONE	1429
47373	30N-5W	25	Natural Gas Well	TRAVERSE LIMESTONE	1469
47606	30N-5W	13	Natural Gas Well	TRAVERSE LIMESTONE	1408
47607	30N-5W	13	Natural Gas Well	TRAVERSE LIMESTONE	1398
47608	30N-5W	14	Natural Gas Well	TRAVERSE LIMESTONE	1399
47609	30N-5W	14	Natural Gas Well	TRAVERSE LIMESTONE	1411
47655	30N-5W	3	Natural Gas Well	TRAVERSE LIMESTONE	14 11
47717	30N-5W	12	Natural Gas Well	TRAVERSE LIMESTONE	1329
47718	30N-5W	12	Natural Gas Well	TRAVERSE LIMESTONE	1358
50459	30N-5W	15	Natural Gas Well	TRAVERSE LIMESTONE	1324
52031	30N-5W	14	Natural Gas Well	TRAVERSE LIMESTONE	1407
52467	30N-5W	13	Natural Gas Well	TRAVERSE LIMESTONE	1385
52468	30N-5W	13	Natural Gas Well	TRAVERSE LIMESTONE	1387
52469	30N-5W	14	Natural Gas Well	TRAVERSE LIMESTONE	1422
52470	30N-5W	15	Natural Gas Well	TRAVERSE LIMESTONE	1403
52471	30N-5W	15	Natural Gas Well	TRAVERSE LIMESTONE	1398
52472	30N-5W	22	Natural Gas Well	TRAVERSE LIMESTONE	1366
52480	30N-5W	13	Natural Gas Well	TRAVERSE LIMESTONE	1354
52540	30N-5W	15	Natural Gas Well	TRAVERSE LIMESTONE	1400
52953	30N-5W	11	Natural Gas Well	TRAVERSE LIMESTONE	1410
52954	30N-5W	12	Natural Gas Well	TRAVERSE LIMESTONE	1357
52955	30N-5W	10	Natural Gas Well	TRAVERSE LIMESTONE	1419
52956	30N-5W	12	Natural Gas Well	TRAVERSE LIMESTONE	1370

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MDEQ Permit #	Location (T-R)	Section	Well Status	Formation at TD	Total Depth (ft. BGL)
53654	30N-5W	22	Natural Gas Well	TRAVERSE LIMESTONE	1403
53664	30N-5W	24	Natural Gas Well	TRAVERSE LIMESTONE	1376
53665	30N-5W	24	Natural Gas Well	TRAVERSE LIMESTONE	1378
53666	30N-5W	24	Natural Gas Well	TRAVERSE LIMESTONE	1379
53667	30N-5W	23	Natural Gas Well	TRAVERSE LIMESTONE	1418
53726	30N-5W	27	Natural Gas Well	TRAVERSE LIMESTONE	1397
53727	30N-5W	27	Natural Gas Well	TRAVERSE LIMESTONE	1411
53728	30N-5W	22	Natural Gas Well	TRAVERSE LIMESTONE	1389
53729	30N-5W	28	Natural Gas Well	TRAVERSE LIMESTONE	1382
53730	30N-5W	27	Natural Gas Well	TRAVERSE LIMESTONE	1395
53731	30N-5W	23	Natural Gas Well	TRAVERSE LIMESTONE	1388
53732	30N-5W	27	Natural Gas Well	TRAVERSE LIMESTONE	1395
53733	30N-5W	22	Natural Gas Well	TRAVERSE LIMESTONE	1417
53734	30N-5W	22	Natural Gas Well	TRAVERSE LIMESTONE	1403
54380	30N-5W	24	Natural Gas Well	TRAVERSE LIMESTONE	1397
54428	30N-5W	10	Natural Gas Well	TRAVERSE LIMESTONE	1404
54429	30N-5W	12	Natural Gas Well	TRAVERSE LIMESTONE	1371
54430	30N-5W	12	Natural Gas Well	TRAVERSE LIMESTONE	1354
54487	30N-5W	11	Natural Gas Well	TRAVERSE LIMESTONE	1407
54488	30N-5W	12	Natural Gas Well	TRAVERSE LIMESTONE	1351
54489	30N-5W	12	Natural Gas Well	TRAVERSE LIMESTONE	1378
54601	30N-4W	7	Natural Gas Well	TRAVERSE LIMESTONE	1379
54602	30N-4W	7	Natural Gas Well	TRAVERSE LIMESTONE	1371
54603	30N-4W	7	Natural Gas Well	TRAVERSE LIMESTONE	1359
54896	30N-5W	21	Natural Gas Well	TRAVERSE LIMESTONE	1376
54926	30N-5W	26	Natural Gas Well	TRAVERSE LIMESTONE	1423
55014	30N-5W	9	Natural Gas Well	TRAVERSE LIMESTONE	1367
55138	30N-5W	10	Natural Gas Well	TRAVERSE LIMESTONE	1428
55139	30N-5W	10	Natural Gas Well	TRAVERSE LIMESTONE	1449
55141	30N-5W	16	Natural Gas Well	TRAVERSE LIMESTONE	1286
55142	30N-5W	16	Natural Gas Well	TRAVERSE LIMESTONE	1295
55144	30N-5W	16	Natural Gas Well	TRAVERSE LIMESTONE	1406
55171	30N-5W	21	Natural Gas Well	TRAVERSE LIMESTONE	1437
55172	30N-5W	21	Natural Gas Well	TRAVERSE LIMESTONE	1407
55179	30N-5W	10	Natural Gas Well	TRAVERSE LIMESTONE	1429

.

.



MDEQ Permit #	Location (T-R)	Section	Well Status	Formation at TD	Total Depth (ft. BGL)
55180	30N-5W	15	Natural Gas Well	TRAVERSE LIMESTONE	1367
55581	30N-5W	16	Natural Gas Well	TRAVERSE LIMESTONE	1274
56364	30N-5W	26	Natural Gas Well	TRAVERSE LIMESTONE	1430
56773	30N-5W	10	Natural Gas Well	TRAVERSE LIMESTONE	2200

Water Wells Within ¼ Mile AOR

As shown on Figure B-3, there are four water wells located inside the ¼ mile AOR radius in the available MDEQ databases. Another well may exist within ¼ mile of the property boundary based on unconfirmed data presented in a previous Class II permit application. No public data is available regarding this well. As an attachment to Response 2.D, a copy of data from fresh-water wells in the vicinity of the proposed well are presented as part of the characterization of the USDW in the vicinity of the proposed well.

Property Ownership Data and Public Notice

Data regarding the ownership of property within a ½ mile radius of the proposed Beeland Disposal Well No. 1 property boundary is also provided as an attachment to Response 2.C. Figure C-5 presents a copy of the plat map showing parcel locations. In addition to a printed listing of names, addresses and parcel numbers obtained from the <u>Antrim County records</u>, an electronic copy of the data and copies of the assessor's maps are also presented to document the ownership of neighboring properties.

For the purpose of public notice, newspaper service is available from several publishers in the area including the closest paper to the proposed facility: the Antrim County News 206 North Bridge Street, Bellaire, MI 49615 (231) 533-8523 in addition to the closest daily paper: the Gaylord Herald Times, P.O. Box 598 Gaylord, MI 49734 989-732-1111.

TABLE C-3 PROPERTY OWNERS WITHIN ½ MILE RADIUS OF PROPOSED BEELAND GROUP, LLC WELL NO. 1 PROPERTY

	Section	Address	City	Zip	Parcel No.
Biehl, Larry L	13	1070 South Ridge	Traverse City, MI	49686	013-001-20
Westphal, Charles E & Agnes V	13	11357 Woodside St	Elmira, Mi	49730	013-001-55
Westphal, Charles E & Agnes V	13	11357 Woodside St	Elmira, MI	49730	013-001-58
Middleton, Green B & Jaqueline	13	11311 Woodside St	Elmira, MI	49730	013-001-60
Barrett, Julie K & Rodney A	13	22503 Downing	St Clair Shores, MI	48080	013-001-63
Workman, Jim F Jr	13	1328 S Holly Rd	Fenton, MI	48430	013-001-65
Patten, David & Kimberly A	13	11535 William	Taylor, Mi	48180	013-001-68



.

	Section	Address	City	Zip	Parcel No.
Biehl, Larry L	13	1070 South Ridge	Traverse City, Mi	49686	013-001-85
Groleau, Louis	13	1822 Hammond Rd	Traverse City, MI	49680	013-002-00
Martell, Keith R & Catherine L	13	205 Arrowhead Trail	Gaylord, MI	49735	013-003-00
Avery, James W - Wilhelm, Joanne	13	P O Box 1232	Gaylord, Mi	49735	013-005-00
Hintz, Louis E & Sharlene J	13	11405 Alba Hwy	Elmira, MI	49730	013-006-00
Stapleton, John C & Elaine L	13	70827 Romeo Plank Rd	Armada, MI	48005	013-006-50
				+	
Marshall, Robin & Jacalyn J	14	2342 Patterson Rd	Elmira, Ml	49730	014-002-00
Acer Paradise, Inc	14	PO Box 758	Mancelona, MI	49659	014-002-10
Chippa, Michael A & Janice K	14	10303 Alba Hwy	Elmira, Mł	49730	014-003-00
Croft, LLC	14	121 E Front St Ste 200	Traverse City, MI	49684	014-006-00
Chippa, Michael A & Janice K	14	10304 Alba Hwy	Elmira, MI	49730	014-007-00
Pomeroy, Penny	14	10085 Alba Hwy	Elmira, MI	49730	014-008-00
Sloan, Donna J	14	2977 Primrose Rd	Elmira, Ml	49730	014-008-05
Croft, LLC	14	121 E Front St Ste 200	Traverse City, MI	49684	014-008-10
Gates, Dale E	14	2525 Primrose Rd	Elmira, MI	49730	014-008-20
O'Connell, Rhonda L Dararah Cheryl -	14	P O Box 1	Alba, Mi	49611	014-009-00
Voelker, Oreitha M. Living Trust	23	105 Boughey Street	Traverse City, MI	49684	023-001-00
Martin, Timothy G	23	3384 Patterson Rd	Elmira, MI	49730	023-002-00
Hostman, David J & Elizabeth A	23	P O Box 158	Elmira, MI	49730	023-002-10
Hostman, David J & Elizabeth A	23	P O Box 158	Etmira, MI	49730	023-002-20
Warren, Michael J & Robin R	23	3376 Patterson Rd	Elmira, MI	49730	023-002-25
Bradley, Anthony W	23	3322 Patterson Rd	Elmira, MI	49730	023-002-30
Hostman, David J & Elizabeth A	23	P O Box 158	Elmira, Ml	49730	023-002-40
Kassuba, Evelyn M	23	520 N Townline Rd	Gaylord, Mi	49735	023-002-50
Lamoreaux, Dawn	23	1906 Spruce St	West Point, GA	31833	023-002-60
Kassuba, Evelyn M	23	520 N Townline Rd	Gaylord, MI	49735	023-002-70
Croft, LLC	23	121 E Front St Ste 200	Traverse City, MI	49684	023-003-00
Chippa, Michael A & Rebecca M	23	10266 Alba Hwy	Elmira, Ml	49730	023-003-10
Thurston, Todd M. & Deanna L	23	615 W. Sheldon St	Gaylord, MI	49735	023-003-20
Croft, LLC	23	121 E Front St Ste 200	Traverse City, MI	49684	023-004-00
Ray, James L	23	9972 Alba Hwy	Elmira, MI	49730	023-004-10
Croft, LLC	23	121 E Front St Ste 200	Traverse City, MI	49684	023-004-15
				+	

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Petrotek

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	Section	Address	City	Zip	Parcel No.
Taylor, Robert W Family Trust	24	P O Box 120401	Arlington, TX	76012	024-002-00
Voelker, Oreitha M. Living Trust	24	105 Boughey Street	Traverse City, MI	49684	024-006-00
Hunley, Robert & Annette	24	3121 Patterson Rd	Elmira, MI	49730	024-006-10
Milbocker, Terrance AA & Mathey, Carrie	24	11030 Alba Hwy	Elmira, MI	49730	024-006-15
Avery, James W - Wilhelm, Joanne	24	P O Box 1232	Gaylord, MI	49735	024-007-00
Britton, Harvet & Kimberly	24	3455 Patterson Rd	Elmira, MI	49730	024-008-00
Britton, Harvet & Kimberly	24	3455 Patterson Rd	Elmira, MI	49730	024-008-05
Huffman, Terry L - Wooley, Lisa	24	4001 W Silverspring Blvd	Ocala, FL	34482	024-008-10
Britton, Harvet & Kimberly	24	3455 Patterson Rd	Elmira, MI	49730	024-008-20





Assume cement yield of only 1.18 ft³/sx

5.7719 ft/ft³ * 265 sx * 1.18 ft³/sx = 1,805 ft

4.7622 ft/ft³ * 350 * 1.18ft³/sx = 1,967 ft

Petrotek Engine	ering Corporation
Figure (-2
Beeland Gro Alba, Michiga	up, LLC. n Facility
AOR WELL SO WELL # 4 TERRA; GATES	HEMATIC 1955 # 1-23 SWD
SCALE: NONE	DATE: 10/06







			STATE	OF MICHIGAN		NO
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			AND ACT	328 P A. 1937)		
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Sample Descriptions

Shell, Gates 1-26 SE NW SW Section 26, T 30 N, R 5 W Antrim County, Michigan Elev. 1305.8' KB

Set 8-5/8" surface casing 1116' KB. Samples start at surface. Permit No. 27750.

0-795 Drift

Base Drift - Top Bedford

- 795-1190 Shale, green-gray, blocky, dolomitic.
- 1120-1235 Shale, green-gray, blocky, dolomitic, with small amount light brown-gray.

Antrim

1235-1340	Shale, gray-brown, blocky, minutely micaceous, dolomitic, with scattered Tasmanites, pyritic.
1340-50	Limestone, gray-tan, dense to extremely finely crystalline, slightly fossiliferous, with interbedded light gray-green, calcareous shale.
1350-60	Shale, light gray-green, blocky, calcareous.
1360-70	Shale, dark gray-brown, blocky, scattered Tasmanites.
1370-90	Limestone, gray-tan, extremely finely crystalline, argillaceous, with interbedded light gray-green shale.
1390-95	Limestone, brown, extremely finely crystalline, argillaceous, with interbedded brown, calcareous, shale.
Traverse	
1395-1420	Limestone, gray-tan, extremely finely crystalline, fossiliferous, argillaceous, with interbedded gray-tan, calcareous, shale.

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1420-37 Limestone, tan to light brown, dense to extremely finely crystalline, fossiliferous, glauconitic.

Traverse Limestone

1437-50 Limestone, buff to brown, extremely finely to medium crystalline, dolomitic, fossiliferous.

1450-80	Limestone, gray-white to gray-brown, dense to finely crystalline, fossiliferous, argillaceous.
1480-90	Limestone, tan, dense, finely colitic, with fair inter-colitic porosity.
1490-1505	Limestone, buff to brown, dense to very finely crystalline, fos- siliferous.
1505-20	Limestone, tan, dense, finely colitic, with poor inter-colitic porosity.
152025	Limestone, tan to brown, dense.
1525-30	Gypsum, white.
1530-60	Limestone, tan to light brown, dense.
1560-90	Shale, green-gray, blocky, very calcareous, minutely micaceous.
1590-1620	Limestone, buff to gray-brown, dense to extremely finely crystalline, argillaceous, fossiliferous, with interbedded brown-gray shale.
1620-40	Limestone, tan to brown, dense to extremely finely crystalline, fossiliferous.
1640-60	Limestone, buff to brown, dense to medium crystalline, fossiliferous.
1660-70	Limestone, tan to brown, dense to extremely finely crystalline, with tan to brown, semi-opaque to opaque chert.
1670-80	Limestone, buff to brown, dense to medium crystalline, fossiliferous, with fair, finely vugular porosity, corals, crinoids.
1680-1710	Limestone, buff to brown, dense to extremely finely crystalline, fossiliferous.
1710-20	Limestone, cream to gray-brown, dense to medium crystalline, fos- siliferous, argillaceous, coral, crinoid.
1720-30	Limestone, tan, finely crystalline, coralline, scattered finely vugular porosity.
1730-40	Limestone, gray-brown, dense to very finely crystalline, scattered fossils, argillaceous with thin beds dark gray shale.
1740-50	Limestone, cream to brown, dense to medium crystalline, fossiliferous.
1750-80	Limestone, tan to light brown, dense to extremely finely crystalline, fossiliferous.

1780-1800 Limestone, cream to light brown, dense to finely crystalline, fossiliferons.

- 1800-20 Limestone, tan to brown, dense to extremely finely crystalline, fossiliferous.
- 1820-30 Linestone, tan to brown, dense, trace finely colitic and finely vugular porosity.
- 1830-50 Limestone, tan to brown, dense to extremely finely crystalline, slightly fossiliferous.
- 1850-1975 Limestone, tan to gray-brown, dense to extremely finely crystalline, slightly fossiliferous, argillaceous, with dark gray shale partings.
- 1975-90 Shale, medium gray, blocky, very calcareous, minutely micaceous, trace glauconite.
- 1990-2070 Limestone, buff to brown, dense to finely crystalline, fossiliferous, crinoid, coral, with scattered argillaceous partings.
- 2070-80 Limestone, as above, with scattered quartz crystals from 2070 to 2090.
- 2080-98 Dolomite, brown, very finely sucrosic to finely rhombic, with scattered white medium to coarse crystals.
- Bell

2098-2172 Shale, medium gray to green-gray, blocky, calcareous, fossiliferous.

Dundee

- 2172-2240 Limestone, buff to brown, dense, fossiliferous, crinolds, scattered "spore cases".
- 2240-50 Dolomite, brown, very finely to finely sucrosic, with trace intercrystalline and finely vugular porosity.
- 2250-60 Dolomite, buff to brown, very finely sucrosic, trace finely vugular porosity.
- 2260-70 Dolomite, brown, finely rhombic, with fair intercrystalline and vugular porosity.
- 2270-80 Dolomite, buff to tan, very finely sucrosic.
- 2280-90 Dolomite, buff to tan, finely sucrosic to finely rhombic, with zones of fair intercrystalline porosity.

2290-2300 Limestone, buff to brown, dense, slightly fossiliferous.

278098	Dolomite, tan to brown, very finely sucrosic, with scattered fine vugs, probably salt filled.
2798-2840	Salt.
2840-70	Anhydrite with interbedded dolomite, tan, very finely sucrosic.
2870-90	Anhydrite.
2890-2900 °	Dolomite, buff to tan, very finely sucrosic.
2900 90	Anhydrite.
2990~3020	Limestone, buff to light brown, dense, slightly dolomitic.
3020-3340	Dolomite, buff to brown, very finely sucrosic, anhydritic.
3340-80	Limestone, buff to gray-brown, dense to very finely crystalline, slightly dolomitic, fossiliferous, with scattered dark gray shale partings.
3380-3490	Limestone, buff to gray-brown, dense to very finely crystalline, fossiliferous, with white devitrified and buff to brown, opaque chert.
3490-3530	Limestone, buff to brown, dense to very finely crystalline, fossil- iferous.
3530-60	Dolomite, buff to tan, very finely sucrosic.
3560-3620	Limestone, buff to brown, dense to very finely crystalline.
3620-40	Dolomite, tan to brown, very finely sucrosic.
3640-60	Limestone, buff to brown, dense to very finely crystalline, slightly fossiliferous with gray to buff to brown, opaque, spicular in part, chert and white tripolitic chert.
3660-90	Limestone, as above, trace glauconite from 3660-80.
3690-3710	Dolomite, tan, extremely finely sucrosic.
3710-40	Dolomite, tan to brown, very finely to finely sucrosic, with fair intercrystalline and finely vugular porosity.
3740-69	Dolomite, buff to light brown, very finely sucrosic.
Bass Island	
3769- 80	Dolomite, gray-tan, dense.
3780-4072	Dolomite, tan to brown, dense to extremely finely crystalline.

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4072-4100 Dolomite, green-gray, dense, earthy, very argillaceous. Salina 4100-4166 Dolomite, green-gray, dense, earthy, very argillaceous.

4166-4340 Salt. 4340-50 Anhydrite. 4350~66 Salt. 4366--85 Anhydrite. 4385-92 Salt. 4392-4410 Anhydrite. 4410-77 Salt. 4477-4503 Anhydrite. 4503-4634 Salt. 4634-52 Anhydrite. 4652-87 Salt. 4687-4718 Anhydrite. 4718-88 Salt. 4788-4822 Anhydrite. 4822-4912 Salt. Salina E 4912-58 Anhydrite, white to brown, with streaks of dolomite, tan to brown, dense to extremely finely sucrosic. 4958-66 Salt. 4966-5066 Anhydrite and dolomite, as at 4912. Salina D 5066-84 Salt.

5000-04

<u>Salina C</u>

5084-5204 Shale, light gray-green, blocky, dolomitic, anhydritic.
	2 19 <u>-</u>			· 注册
•	Carnesson - Arten College 1997 - Status Status - Status			7
Salina B				
5204-5512	Salt.			
Salina A-2 Ca	rbonate - Niagaran			
5512-26	Dolomite, tan to	brown, dense to extremely	finely sucrosic, fi	ne
	salt-filled vugs.		•	
5526-5617	Dolomite, brown, o	dense to extremely finely	sucrosic.	
lore #1 - 561	<u>7–5706</u>			
5617-30		mery finely laminated anh	vdritic lenses. occ	asional
2011-3U	carbonate partines			
5630-40	Dolomite, as above	e, anhydritic shale partin	gs in top foot.	
5640-73	Dolomite wery thi	inly leminsted, dips of 30	⁰ . filled fractures	at
5040-75	5662 and 5667, ble	eding oil.	•	
5673-81	Dolomite, light gr	ay, mottled, finely to co	arsely sucrosic.	
5681-5706	Dolomite. as above	, pen point to 's" vugs. o	ccasional hairline	fractures
	grades from tight	at top to porous at base.	e.	
Core #2 - 570	<u>6-5796</u>		:	
5706-27	Dolomite, finely t	o medium sucrosic, slight	ly anhydritic, foss	iliferous,
	pin point porosity			
5707 (5		food 11 foroug inc	reading nervetity a	1001 - Sta
5/2/~45	stulolitic corals	, more lossilierous, inc	reasing borosica, a	тЯнт
	Jeyavastaty Coldid			
5745-50	Dolomite, as above	, with pin point porosity	, no fossils.	
5750 41	Bolomita	warm faceiliferaus	alatic same	ri to-
7/20-0T	filled vues.	, very russificious, sty	torocac, some anityu	
				57 F 47
5761-72	Dolomite, as above	, pin point porosity, no	fossils.	4 4
5779-04	Dolomite on shows	Foodliferous week so	cosity.	
J//2-90	boromite, as above	, rosstitterous, vagey po		
<u>Core #3 - 579</u>	6-5884			
		ی میں ایک		
5796-5801	Dolomite, light gr	ay-brown, finely crystall:	ne, tossiliferous,	
	SLATOTTCLC, AURA L			
5801-06	Dolomite, as above	, no fossils, pin point to	vugular porosity.	
				1.5.6.6

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Line Statis

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LUCCING REQU Run dri A-2 200 pipe to Puil dri to 1130 01 and 2 dep with	ITREMENTS: 11 pipe 1 24004 em 11 pipe 4 end spo 2044 esta b steel p	to Stoo ⁴ an drill pipe of spot 60 to 1075 ⁴ a st 35 socks of 35 socks of to be a olate and c	d spot 60 s to bl25° a socks of or ad spot 35 of canont bendened with	und spot most the socks til to the i its the v	coment ti 35 sects rough and trough th 1000 of ti 1011. Cu	iz of a above to 21 to 21 to 21	h and sb mant th of the Du of the surface ings off	ove the rough ti ndoo-De Traverou pipe. 3ª bei	Hiagar ha Sali troit A p. Pal p. grou	on and t no. Pu Ivor so I drill nd iovo	te ti pi i a
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Permit No. 27750 Shell Oll Company 1-26 Cler. Gerald G. Gales No. Farm Antrim Star (In-T#p. н. 5W 26 - 30N SE NW SW Ям 411 Humor 14 Ann. ' trom · Irnen nud property libe • fram · Irnta nn/i Halliburton or Dowell Cimbrantor 10/8/69 C bezerega kmitt GARING REPHILD Pathot Long H 91*71* 1 121(100+0 XX 2011 26 10" 1116 (559+) A4" A 16* 5**%**,* ł EMENTING RECORD миррима амр f loon party No. Seeks Data 91xe 107 я 14* n 96° 68.1 ORODOGICAL FORMATION REPORT Plug Intls: 10/8/69 Blovation 1292,8 Gr. 908 Tariff to Pay plugged: 6613 41 12. e n EP (N) D & A 1 P (A) Plug Comp.



Due ND to 59001 & coot 60 say of cement t
KUN UF to SOUL & SPOL OU SAN OF COMMENCE
thru & above the Niag, & to the A-2 zone.
Pull DP to 4125 & spot 35 sax of cement
thru the Salina. Pull DP to 2400 & S
60 sail cement thru & above DdDet. Rvr.
section. Pull DP to 1475 & spot 35 sax 1
thru the top of the Try, Pull DP to 1130
s anot 35 say of cement to the base of
$\frac{6}{10}$ spot 11 say of concile to the rest.
the of surrace pipe, o s zo cays.
to be abandonew w/weil. Lot csus. off.
<u>3' below ground level & cap w/steel plate</u>
GS-14

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• <i>J</i>	DEPA	STATE OF	MICHIGAN	ICES APR	i 4 1993	PERMIT NO./DEEPENING PERMIT NO. TYPE OF WELL (after completing and the second s						tion)			
	P.O. BC	SEOLOGICAL SL X 30028, LANS	URVEY DIVISION	48909				46244		В	rine	Dis	posa.	L.	
RECO		NELL DR	ILLING OF			B	ART S	TAR							
IRED BY	AUTHORITY O	F:			е ци I V,	WEL	L NAME &	NUMBER							
ACT 61, F (Submit 2	P.A. 1939, AS A copies within 3	MENDED. 0 days	L ACT 315, (Submit 2	P.A. 1969, J copies weth	n 60 days		<u></u>	Estell	le D1-1	SWD					
NON-SUBMISSI FINES AND/OR	ion.j Ion and/or fa L imprisonmen	LSIFICATION 0	F THIS INFORM	ATION MAY	RESULT IN	SUR	FACE LOC	of SW 1/4	of SW	V4 Sect	ion	1 -	r 30N	8 5	5W
NAME AND AD	DORESS OF OW	INER				TOW	NSHIP			COUN	rγ				
Terra E	nergy Lt	d.						Star			Ant	<u>rim</u> :			
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Travers	<u>se City,</u>	MI 4968	34		·	3	339 Ft.	Trom S	Line and	769 F	i, irom	W	Lin	e or %	Sec.
Digord /	Drillor	Tha	CION			N		of ¹ / ₄	of	% Sect	ion	Г	г	R	
1315 N.	Mission	Rd.				TOW	NSHIP		· · · · · ·	COUNT	Γ Υ			·	···· ·
Mt. Ple	asant, M	I 48858	3			N	A			NA					
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Driller	OF WELL	FORMATION A	TT.D.	PROD. FOR	MATION(S)	FEET	DAILLED	CABLE TOO	DLS	FEET		— AC	TARY TO	00LS 2220	、
	T INJECTION	Det. RI	Iver Anny	SOLUTION	FORMATION				E1 E1		<u> </u>		10	2000	,
12/23/9	2	Dund	lee	NA	- Orthorn Dir	KB	1404	# B.F.	ELEY ft.	B.T	3	ft.	Grd.	1 39	4 ft
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14	<u> </u>	7		30			DATE	HULES	Open	HOLE	Tn		 al	YES	
5 1/2	212	9	3	10					open	2129	- 23	30	**		
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. Kenner	GROSS	PAY INTER	VALS		A	LL O	THER O	IL AND GA	s shows	OBSER	VED (DR LO	OGGED		
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	STIM	ULATION BY	ACID OR	FRACTUR	ING		w	ATER FILL	UP (F.U.)	or lo	ST CI	RCULA	TION	(L.C.)	(X)
DATE	INTERVAL T	REATED	MATER	ALS AND	AMOUNT USED			FORMATIO	N F.	U. L.C.	DEPT	н	A٨	IOUNT	
10/29/92	2129-23	30 2	.000 gal	10% HC	1			_							
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BRAND	(X)	LOG TYPES	LOGGED INTERVALS	DEPTH	CORRECTION	RUN AT	DEGREES	YES	NO	DEPTH
Schlumberger		no logs run		none						
Birdwell										
9										
0L4										

PRODUCTION TEST DATA Bbls/day GRAVITY --- "API COND. Bbls/day GAS — MCF/day WATER --- Bbls/day H₂S — Grains/100 cu. ft. B.H.P. AND DEPTH NA NA NA NA NA NA NA

I AM RESPONSIBLE FOR THIS REPORT. THE INFORMATION IS COMPLETE AND CORRECT.

DATE /	1
4/12.	193
112	

NAME AND	TITLE	(PRINT)	
Stephe	nJ.	Savoie,	Geologist

SIGNATOR

NOTICE: REPORT COMPLETE SAMPLE AND FORMATION RECORD, CORING RECORD AND DRILL STEM TEST INFORMATION ON REVERSE SIDE.

PR 7200-5

#46244

FORMATION RECORD (ATTACH ADDITIONAL SHEETS IF NECESSARY)

GEOLOGIST MAME lor TOPS TAKEN FROM: DRILLERS LOG \Box SAMPLE LOG ELECTRIC LOG FORMATION (TYPE, COLOR, HARDNESS) FORMATION (TYPE.COLOR, HARDNESS) юм то FROM то IF WELL DIRECTIONALLY DRILLED, ADD TRUE VERTICAL DEPTH FORMATION TOPS WHERE APPROPRIATE. 2222 2315Dolomite and Limestone, brown tan, 1506 1522 Shale and limy Shale, fairly clean, gray, interbedded fossiliferous, with Limestone, as finely sucrosic above, dense texture in part, 1522 1850 Limestone, brown tan microcrystalline gray, argillaceous to extremely fine, in part, mostly good to poor porosity fossiliferous, cherty in part, RIVER ANHYDRITE DETROIT microcrystalline 2315 2330 Anhydrite, white to extremely fine, dense 1850 2027 Shale and limy Shale, gray, interbedded with Limestone and shaly Limestone, IF WELL WAS CORED, ATTACH CORE DESCRIPTION dense DRILL STEM TEST DATA BELL SHALE 2027 2110 Shale, gray, mostly non calcareous, soft texture DUNDEE LIMESTONE 2110 2174 Limestone, brown brown-gray, argillaceous, mostly fossiliferous, trace residual hydrocarbon stain, microcrystalline to extremely fine, dense to poor porosity 2174 2222 Dolomite, tan buff , mostly clean, somewhat fossil-LIST ATTACHMENTS: iferous, sucrosic texture in part, vuggy in partlarge white dolomite rhombs, extremely fine to microcrystalline, good to fair porosity GEOLOGICAL SURVEY USE ONLY REVIEWED BY: DATE OF REVIEW:

FORMATION RECORD (ATTACH ADDITIONAL SHEETS IF NECESSARY)

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#46	244		TION RECORD	FORSARY		
			TOPS TAKEN FROM			<u> </u>
ANG4 KB	GEQL	E. Taylor	DRILLERS I	LOG 🔏	SAMPLE LOG	ELECTRIC LOG
	TO	FORMATION (TYPE COLOR HARDNESS)	EBOM	7 TO	(TYPE.)	FORMATION COLOR HARDNESS)
NOTE: IF WELL	DIRECTIONALL	Y DRILLED, ADD TRUE VERTICAL	TDAVERSE	TIMEST	ONE	
	RIFT 800	Sand, gravel and	1375	1404	Limestone argilla ferous, alline,	e, brown-gray, aceous, fossil- , microcryst- , pyrite
		Clay beds	1404	1 4 4 4	inclusi	ions, dense 3 limy Shale.
SUNBUR 800	<u>(SHALE</u> 950	Shale, black-very dark brown, carb- onaceous, fissle	1404	1444	gray gr interbe Limesto stone,	ay-brown, edded with shaly one and Lime- brown-gray, dens
<u>ELLSWO</u> 950	RTH SHAL	Shale, gray-brown gray-green gray, very banded, silty in part	1444	1506	Limestone argilla iferous part, a microcu extreme	e, brown-gray, aceous, fossil- s, cherty in algal mats, rystalline to aly fine, dense
ANTRIM	SHALE		IF WE	LL WAS COP	RED, ATTACH CO	DRE DESCRIPTION
1180	1256	Shale, black-very		DRILI	STEM TEST D	ATA
1256	1296	carbonaceous, non- calcareous, grainy texture, fissle, trace disseminated pyrite, 1% to 10% gold spore fluor- escence Shale, gray brown-			,	
1296	1319	gray gray-green, limy in part, clay rich, carbonaceous in part, 1% gold spore fluor. Shale, black, very carbonaceous, non- calcareous, grainy texture, fissle, minor disseminated pyrite, 10% to 20% gold spore fluor.		LIS	TATTACHMENT	<u>.</u> 5:
TRAVERS	SE FORMA	TION				
1319	1375	Shale, brown-gray, mostly calcareous, limy in part				· · · ·
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			REVIEWED BY:			
,			DATE OF REVIEW			
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PEPA PLUG GING AND ABANDONMENT PLAN MI-009-2D-0064 Page B-1 052 PLUG GING AND ABANDONMENT PLAN MILLONALISIA AND ABANDONMENT PLAN MILLONALISIA AND ABANDONMENT PLAN MILLONALISIA AND ABANDONMENT SETERLE 401-1 SMD Bart Start Antring Gas Project MILLONALISIA AND ABANDONMENT PLAN MILLONALISIA AND ABANDONMENT MILLONALISIA AND ADIA MILLONALISIA AND ABANDONMENT MILLONALISI	7	44 														
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CEMENT TO PLUG AND ABANDON BATA: Plug * 1 Plug * 2 Plug * 3 Plug * 4 Plug * 5 Pag * Plug * Sider Made & Mund Rum Plug Will & Pages (marks): Calculate of Plug in 1 NA DESCRIPTION OF PLUGGINO PROCEDURE <td <="" colspan="2" td=""><td><u>1/2</u></td><td>13.54</td><td>2125</td><td>21</td><td>25</td><td>NICO /</td><td></td><td>211-</td><td>FOZ A</td><td colspan="5">n D Other, Explain:</td></td>	<td><u>1/2</u></td> <td>13.54</td> <td>2125</td> <td>21</td> <td>25</td> <td>NICO /</td> <td></td> <td>211-</td> <td>FOZ A</td> <td colspan="5">n D Other, Explain:</td>		<u>1/2</u>	13.54	2125	21	25	NICO /		211-	FOZ A	n D Other, Explain:				
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Leggen; Ar; er Fulling Unit Ar; er Fulling Unit 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 OFFICAL TITLE (Presse type or print) Stepher: J. Savoie, Geologist EPA Form 7520-14 (3-84)	Cement		ESTIMATED	COST	of Plog			Bridge Plus	10261	•						
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TOTAL DEPTH OF WE	u.	FORMATION A	T T.D		ION(S)	FEET ORILLED	- CABLE TO	QLS	FEET DRELL	ED - RC	TARY TO	2015	
Driller 2490 Log		Det Ri	iv Salt	Antria	Ċ,	From	То		From O		<u> </u>	D	
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SIZE	WHERE SET	CEMENT FT. PULLED			NUMBER	1	OP 0P	EN
14	51	Driven		DATE	HOLES	INTERVAL PERFORATED	YES	NO
8 5/8	940	200 sx 35/65 poz		12/8	66	1244-1247	X	L
		150 sx class A			22	1337-1347		
5 1/2	2151	100 sx 35/65 poz						
		280 sx class A						

GROSS PAY INTERVALS

ALL OTHER OIL AND GAS SHOWS OBSERVED OR LOGGED

											_		
FORMATION	DIL OR GAS	FROM	TO		OIL		WHERE OBSERVED (X)						
ANIRIM	GAS	1205	1284	FORMATION	OF GAS	DEPTH	Sam. pies	000-	Pes.	Line	Gn Log	Fa Ut	
		1320	1354										
<u> </u>	<u>+</u>			·									
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STIMULATION BY ACID OR FRACTURING

WATER FILL UP (F.U.) OR LOST CIRCULATION (L.C.) (X)

DATE	INTERVAL TREATED	MATERIALS AND AMOUNT USED	FORMATION	F.U	LC	DEPTH	ANOUNT
12/11	1244-1274	279,000 Scf N2					
	1337-1347	300 sx 20/40 sand					
		100 sx 12/20 sand					
		243 bbls fluid					

MECHANICAL LOGS, LIST EACH TYPE RUN

DEPTH CORRECTION DEVIATION SURVEY PLUGGED BACK

BRAND	(X)	LOG TYPES	LOGGED INTERVALS	DEPTH	CORRECTION	RUN AT	DEGREES	YES	NO	DEPTH
5 niumberger		No logs run								
Birdweit										
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Dit — Bois day	GRAVITY - "API	COND Bots/day	GAS - MCF/day	WATER - Bois/day	his - Grains/100 EV R	SHP AND DEPTH
	BLE FOR THIS REP	DRT. THE INFORMA	TION IS COMPLET	AND CORRECT.		
L/11/90	NAME AND TH	LE (PRINT) J. Savoie, Ge	ologist	SIGNATURE	1 de	

an a			and a second
	FORMATION RECORD	PN.	42680
(ATTACH	ADDITIONAL SHEETS IF NECESSAR	Y)	

KB 1360	l	Stepnen J. Savoie					LOG		ECTRIC LO	ن)ر. مصب
FROM	70	TORMATION (TYPE, COLDR. HARDNESS)	FROM	10		 	TTPE.CO	OR. HAR	DHE551	
EPTH FORM	ATION TOPS W	ILLY DRILLED, ADD TRUE VERTICAL HERE APPROPRIATE.	1							
	833 1205 1354 1404 2061 2141 2472 2490	Base of Drift Dark Antrim Traverse Fm Traverse LS Bell Shale Dundee Det Riv Salt TD								
833	1165	Shale, light to med gray, soft, firm, calc		•	i		\$ -#			
1165	1205	Shale, med. to dark gray, firm, fissile, sl carb.				-				
1205	1284	Shale, black, firm, fissile, carb.	IF WE	LL WAS	CORE	D, ATTA		e desc	RIPTION	
1284	1320	Shale, light to med. gray firm, calc.						-		
1320	1354	Shale, black, firm fissle, carb.								
1354	1404	Shale, light gray, firm, calc.		_						
1404	, 2061	Limestone, tan to light gray to white, with scattere beds of shale, light gray soft, calc.	a	•						
2061	21 41	Shale, light gray, soft, calc.								
2141	2472	Limestone, gray to tan to brown with scattered dolomi & anhydrite beds.	e							
2472	2490	Salt				ATIACHM	ln1\$:		. <u>.</u> ,	
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	NEQUIRED BY AUTHORITY OF		O L. APPRESSE	
	📜 ACT 61. P.A. 1939, AS AMENDED 🛛 🛄 ACT 315. P.A. 1969, AS AMEN	OED TEKKA ENERGY LT	u ield Rose	1
ļ	APPLICATION TO (Submit 4 copies):	Traverse City,	Michigan	49684
ľ	CHANGE WELL STATUS	uee .		
ł.	AND CA IN PAISONMENT	FIELD/FACILITY NAME		<u> </u>
	CHAILGE OF WELL STATUS REQUESTED FOR	WILDCAT		
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+				<u>l</u>
	Belt Shale 2061 AUG Dundee 2141 TD 2490 Permits & E	5 1994 Bonding Unit		
DE	Rig up completion rig and set retr casing gun and perforate interval with 4jspf. TOH with casing gun an fracturing equipment and fracture Flow well back and test Antrim Fm	rievable bridge plug from 1240' to 1270' nd TIH with tubing to perfed formation wit for possible gas.	at 2100' and 1335 1140'. h nitrog	. TIH with ' and 1345' Rig up en and sand.
	ETAL PROPOSED PROCEDURES Rig up completion rig and set retr casing gun and perforate interval with 4jspf. TOH with casing gun an fracturing equipment and fracture Flow well back and test Antrim Fm ** ADDIFICHAL REQUIREMENTS ** ADDIFICHAL REQUIREMENTS ** ADDIFICHAL REQUIREMENTS ** ADDIFICHAL REQUIREMENTS ** ADDIFICHAL REQUIREMENTS	ineer Wille Cuit	at 2100' and 1335 1140'. h nitrog	. TIH with ' and 1345' Rig up en and sand. /30/VY

STATE OF MICHIGAN DEPARTMENT OF NATURAL RESOURCES DECOLOGICAL SURVEY DIVISION BOX 30028 LANSING, MICHIGAN 48909 LANSING, MICHIGAN 48909 USE APORDRIATE BLOCKS. FOR ITEMS NOT LISTED SUBMIT ATTACHMENTS. Image: State of State	IERMIT NO. 42680 IELO/FACELITY NAME Wildcat IEL MARG & MUMBER Caple #1-19 IEL LOCATION NE 14 of SE 14 of SE MAREWORK STARTING DATE 2490 NGREWORK STARTING DATE 2490 NGREWORK STARTING DATE 2490 NGREWORK STARTING DATE 2490 NGREWORK STARTING DATE 2490 NGREWORK STARTING DATE 2490 NGREWORK STARTING DATE 25 100ES OR PLUGS DE 100ES OR PLUGS DE	TYPE O Gas Gas Sectio COUNTY Otse FORMATH De PLUGGUM 12-1 MECHAMM GR/ FORMATH Ant PUN PLACED 1425	MELL 9 19 T 30N R 4W 20 00 20 20 20 20 20 20 20 20
BEOLUGIAL SUMPET DIVISION BOX 30028 LANSING. MICHIGAN 48909 USE APORDRIATE BLOCKS. FOR ITEMS NOT LISTED SUBMIT ATTACHMENTS. REQUIRED BY AUTHORITY OF: ACT 61, P.A. 1939, AS AMENDED ACT 315, P.A. 1969, AS AMENDED NON-SUBMISSION AND/OR FALSIFICATION OF THIS INFORMATION MAY RESULT IN FINES AND/OR IMPRISONMENT. RECORD OF WELL: PLUGGING X REWORK (MAIL THREE COPIES TO THE DISTRICT OFFICE WITHIN 30 DAYS AFTER COMPLETION OF PLUGGING OR REWORK) NAME AND ADDRESS OF WELL OWNER Terra Emergy Ltd. 1503 N. Garfield Road Traverse City, MI 49684 CASING SIZE WHERE SET AMOUNT RECOV 5-1/2 2151 NA	42680 RELOFFACELITY NAME Wildcat PEL MANE & MUMBER Caple #1-19 PEL LOCATION NE 14 of SE 14 of SE DWMSHIP Hayes DTAL DEPTH 2490 NG/REWORK STARTING DATE 27-89 NO NETH AFTER REWORK 1 MPLETED FOR 5 ROBES OF PLUGS DE 	H Sectio COUNTY Otse FORMATE PLUGGIM 12-1 MECHAMI GR/ FORMATE Ant PTN PLACED 1425	s n 19 T 30N R 4W 2g0 ON 2troit River Salt 2-89 2AL LOSS RUN CCL 3N AND 2DNE TIM Shale SACKS OF CEMENT & ADDITIVES NA
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AEQUIRED BY AUTHORITY OF: ACT 61, P.A. 1939, AS AMENDED ACT 315, P.A. 1989, AS AMENDED NON-SUDMISSION AND/OR FALSIFICATION OF THIS INFORMATION MAY RESULT IN FINES AND/OR IMPRISONMENT. RECORD OF WELL: PLUGGING COMPLETION OF PLUGGING OR REWORK; MAIL THREE COPIES TO THE DISTRICT OFFICE WITHIN 30 DAYS AFTER COMPLETION OF PLUGGING OR REWORK; NAME AND ADDRESS OF WELL OWNER Terra Energy Ltd. 1503 N. Garfield Road Traverse City, MI 49684 CASING SIZE WHERE SET AMOUNT RECOV -	The name a number Caple #1-19 Fell LOCATION NE 14 of SE 14 of SE WHISHIP Hayes TAL DEPTH 2490 VGREWORK STARTING DATE 77-89 VFTH AFTER REWORK V MPLETED FOR S DGES OR PLUGS DE 	14 Section COUNTY Otse FORMATH DEE PLUGGMAT 12-1 MECHANN GR FORMATK ANT	a 19 T 30N R 4W 20 21 20 20 20 20 20 20 20 20 20 20
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and 1000 gal 28% HCl acid TTU with other and acid	+2.) . Ith with perf	gun and	perf 5-1/2"

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250 gal 15% Fe at 1350'. TIH with perf gun and perf 1244' to 1274' and 1337' to 1347' with 4 jspf. Acidize perfs with 3400 gal 15% Fe. Flow back frac. Drill up CIBP at 1425'. TIH with Arrow XLW packer and set at 2096'. TIH with 29 jts 2-3/8" tubing, dual packer and 36 jts 1.9" tubing and sting into at 2096'. Set dual packer at 1202'. TIH with 36 jts 1.9" tubing and circulate corrosion inhibitor with tubing/casing annulus. Sting into dual packer.

PR 7200-8

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	FOR	GR(DSS	DIL OR	RVALS GAS FR	SX F		AL		HER O	IL A	OIL P GAS	SHOW DEP1	/s o	BSEF	WHE Od:	DR LC	DGGED	D (X)	
	FOR	GR	DSS	DIL OR	AVALS			AL		HER O	IL A 07	IND GAS	SHOW DEP1	/S 0	BSEF	WHE Od:	DR LC	GGED	D (X)	
	FOR	GR(DSS	DIL OR	RVALS GAS FR			AL		HER O	IL A OF	OIL P GAS	SHOW DEP1	/S 0	BSEF	RVED (WHE	DR LC RE OE	DGGED	2D (X)	
	FOR	GRI MATIUN S	TIMU	DIL OR	AVALS GAS FR			AL FORMA		HER O		NND GAS	DEFT		BSEF Peol		DR LC	DGGED	.D (X)	
		GRI		ATION E	AVALS GAS FR					HER O	IL A 07	AND GAS	SHOW DEPT	/S 0 H		RVED (WHE Od: ST CIF		DGGED	(L.C.)- ((X)
		GR(IMATION S INTERV		ATION E	GAS FR		TO TO RACTURING	AL FORMA		HER O		AND GAS	DEFT	/S 0 rl	BSEF Pes	RVED WHE Oa: ST CIF DEPT 1470		DGGED	(L.C.) (ACU: 1 Cont	
		GR(IMATIUN S INTERVI			AVALS GAS FR					HER O		AND GAS	SHOW DEFT	/S 0	BSEF Peta L C X	RVED (WHE Od: ST CIF DL PT 1470 2260		TION	(L.C.) ((L.C.) (10 (X) 10	(X)
		GR(IMATION S INTERVA		ATION E	AVALS GAS FR		TO TO RACTURING			HER O		AND GAS	SHOW DEFT		BSEF Peti L C X X	RVED (WHE Od: ST CIF DEP: 1470 2260		DGGED	(L.C.) ((L.C.) (1.0.1) (L.C.) (1.0.1)	(X)
	FOR	GR(IMATION S INTERVA		ATION E	AVALS GAS FR					HER O		AND GAS	SHOW DEPT		BSEF Pest	RVED (WHE Oa: ST CIF DEP: 1470 2260		TION	(L.C.) ((L.C.) ((C.C.) (C.C.) ((X)
		GR(IMATIUN S INTERVI			AVALS GAS FR			AL FORMA		HER O		AND GAS	SHOW DEFT		BSEF pets L C X X	RVED (WHE Od: ST CIF DLP: 1470 2260		DIGGEO	(L.C.) ((L.C.) (1000000000000000000000000000000000000	
		GR(IMATEON S INTERVA		ATION E	AVALS GAS FR		TO RACTURING	AL FORMA		HER O	IL A OF	AND GAS	SHOW DEFT PP (F.U.		BSEF Production	RVED (WHE Od: ST CIF DEPT 1470 2260		DGGED	(L.C.) ((L.C.) ((L.C.) ((()))))))))))))	
		GR(IMATION S INTERVI MECH 0		ATION E	ACID MACID M LIST E TYPES		TO TO RACTURING	AL FORMA OUNT USED		HER O W/ Tra Dun EPTH C		AND GAS			BSEF Peta L CO X X X DN S DE	RVED (WHE Od: ST CIF DEP: 1470 2260 URVEY GREES		DIGGED	.D (X) .D (X) 	
	FOR BRAN	GR(IMATIUN S INTERVI MECH		ATION E	AVALS GAS FR		TO TO RACTURING	AL FORMA OUNT USED		HER O		AND GAS			BSEF Deta L C L C X X DN S DF	RVED (WHE Oa: ST CIF DEPT 1470 2260			(L.C.) (X) (L.C.) ((L.C.) ((L.C.) ((U.C.) ((U.C	
DATE DATE Schurnt Broke: Q. ht	FOR BRAN	GR(IMATION S INTERVI MECH			AVALS GAS FR GAS FR HY ACID M LIST E TYPES		TO TO RACTURING			HER O		AND GAS	SHOW DEFT PP (F.U. DEV		BSEF Desi LC X X DN S DF	RVED (WHE Od: ST CIF DEPT 1470 2260		Digged SERVE	.D (X) .C (X) 	
DATE Schurnt Birdwe P Hal	FOR BRAN Uterger	GR(IMATION S INTERVI MECH 0			AVALS GAS FR GAS FR DY ACID M G, LIST E TYPES		TYPE RUN	AL FORMA OUNT_USED		HER O	IL A Of Ver	AND GAS	SHOW DEFT DF (F.U.		BSEF Peti L C L C X X X D F E I L C	RVED (WHE Od: ST CIF DEPT 1470 2260		DIGGED	(L.C.) ((L.C.) ((L.C.) ((Corr NOWE) NOWE Corr NOWE Corr Co	
DATE DATE Schurn Bridwe: P Hal	FOR BRAN Uterger	GR(IMATION S INTERVI MECHO			AVALS GAS FR GAS FR ACID M STACID STACID		TO TO RACTURING ALS AND AM TYPE RUN LOGGED 0-215			HER O	IL A OF	AND GAS			BSEF Pris L C X X DE DE	RVED (WHE Oat ST CIF DLPT 1470 2260 URVEY GREES			D (X) G(1) G(1) G(2)	
DATE Schlurn Birdwe P Hal	FOR BRANN BRANN	GR(IMATION S INTERVI MECHO		ATION E	AVALS GAS FR GAS FR HY ACID M HY ACID M HY ACID M HY ACID M HY ACID		TO TO RACTURING RACTURING NLS AND AM TYPE RUN LOGGED 0-215	AL FORMA OUNT USED INTERVALS		HER O	IL A OF	AND GAS			BSEF Details LO LO LO LO DE DF DF	RVED (WHE Oat ST CIF DEPT 1470 2260			D (X)	
DATE Schlurnt Birdwe F Hall	FOR BRAN Utwiger	GR(IMATION S INTERVI MECHO UZTOR			AVALS GAS FR GAS FR AVALS GAS FR AVALS GAS FR AVALS FR AVALS GAS FR AVALS GAS FR AVALS CON		TYPE RUN LOGGED	AL FORMA OUNT USED INTERVALS		HER O		AND GAS			BSEF Des LC X X DN S DF DF	RVED (WHE Od: ST CIF 1470 2260 URVEY GREES	ОЯ LC RE OE P ₁₃	AND	D (X) Cet 107	
DATE Schlurnt Birdwr P Hal	FOR FOR BRAN BRAN	GR(IMATION S INTERVI MECH 0			ACID M ACID M LIST E TYPES		TO TO RACTURING RACTURING NLS AND ALL TYPE RUN LOGGED 0-215 PI SAGBY C	AL FORMA OUNT USED INTERVALS 55 RODUCTION IAS - MCF/da				AND GAS			BSEF Sari Pess L C L C X X DF DF DF	RVED (WHE Oa: DEPT 1470 2260 URVEY GREES			D (X)	
DATE Schlurnt Birdwe P Hal HL — BC	FOR BRAN BRAN Utwiger				AVALS GAS FR GAS FR HY ACID M HY HY H		TYPE RUN LOGGED			HER O		AND GAS			BSEF Des LC X X DN S DF DF	RVED (WHE Od: ST CIF DEPT 1470 2260 URVEY GREES	ОЯ LC RE OE P ₁₃	AND	D (X) Cet 107	
DATE Schlum Birdwe PHal Hal AM R ATE	FOR BRAN BRAN Uterger			ATION E EATED ALLOGS LOG GR-Neut TY - "API THIS RI	AVALS GAS FR GAS FR DY ACID M DY ACID M CON CON EPORT. T TITLE (PR		TYPE RUN LOGGED 0-215	AL FORMA OUNT USED OUNT USED INTERVALS 55 RODUCTION IAS - MCF/da N IS COMPL				AND GAS			BSEF Des LC X X DN S DE DE DE	RVED (WHE Od: ST CIF DEPT 1470 2260 URVEY GREES	OR LC RE OE P13	AND	D (X) Cet 10 Cet	

FORMATION RECORD (ATTACH ADDITIONAL SHEETS IF NECESSARY)

7419**55**

ELIEVA L'I CU	.c. 61	LOLOGIST NAME	TOPS TAKEN FROM
KB 1321	·	Stephen J. Savoie	[] DRILLERS LOG SAMPLE LOG DE ELECTRIC LOG
ГВОМ	10	FORMATION (TYPE, COLOR HARDNESS)	
DEPTH FORM	LL DIRECTIONA	HERE APPROPRIATE	
	007		
	907	Base of drift	
	1180	Dark Antrin	
	1320	Traverse En	
	1376	Traverse IS	
	2035	Bell Shale	
	2114	Dundee	
	2411	Total Depth	
Q∩7	1125		
		firm, calc.	
1125	1180	Shale, light to med	
1180	1257	Shale, black, firm	
1257	1194	fissile, carb.	
		firm, fissile, calc	IF WELL WAS CORED, ATTACH CORE DESCRIPTION
1194	1320	Shale, black, firm,	DRILL STEM TEST DATA
1320	1376	Shale, light gray,	
		stone, white.	
13/6	2035	Limestone, white to	
		scattered shale light	
		grav, firm, calc	
2035	2114	Shale light to med	
2114	2250	blue gray, soft, calc.	
2114 	2250	Limestone, gray to	
		scattered dolomite beds	n
2250	2385	Dolomite, med to dk	
2385	2300	brown, porous	
2390	2611	Annyarite , while	
2370	2411	tight with scattered	
		beds of anhydrite and	LIST ATTACHMENTS
		doromrie.	
Annehide Contraction Augusta			
			ACHINED SHE

1989 SEC SON I PERMIT 41958 SE NE NW U U 23 5¥ MICH AN TERRA ENERGY 1-23 1321KB 130 * 1250FNL 100FEL NW PETROLEUM INFORMATION COPYNICATED UUU 1321KB 1307GR ANCELONA E SPUD 05/10/1983 COMP 05/18/1989:ROTARY SERVCE PROJ DEPTH 2800 DUNDEE CONTR&MCLACHLAN L M /2 DTD 2411 LTD 2188 FM/TD DUNDEE 5 7/8 MI N HANCELONA EAST FLD 10 1/2 MI NE RANCELONA EAST FLD 10 1/2 MI NE RANCELONA, MI DRLG UNIT: SEC 23 (NE, NW) CSG 5 1/2 0 2118 W/ 285 SACKS CSG 5 1/2 0 2118 W/ 285 SACKS LOG DRIFT 907 414 LOG TRAVERSE 1320 1 LOG TRAVELM 1376 -85 LOG BELL 2035 -714 LOG BELL 2035 -714 LOG DUNDEE 2114 -793 TD 2411 - 4000 907 1180 1320 1376 2035 2114 2411 -714 -793 -1090 TD DUNDEE ORENHOLE DISPOSAL RATE NA NATURAL LOGS 0- 2:155 GRNL NAMED TWP STAR 2116- 2411 21 5 in the part

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and a strength part of the strength and the strength of the strength of the strength of the strength of the str

County		Fraction	Section No. Town No. Ranne No.
HNIRIM STAR		1/4	1/4 1/4 13 BON. 5W
Distance and Direction from Road Intersection Front	🗯 ALS/,	* R.D	3. OWNEROFWELL CHANLES WEST PHAL
& mool since do nown m	00005-0	او.	Address 600 Sphiry, KU
The AM.			AIBA MI
Street Address & City of Well Location			Address Samé as Well Location 🛛 🖉 Yes 🗔 No
	Sketch Map		4. WELL DEPTH: Date Completed LY New Well 14.0 th FIL 94. Replacement Well
	4		5 Cable Tool Repart Driven Drug
W E	ΞĮν	Vennein	Hollow Rod Auger/Bored Jetted
		<u>swindin</u> A	👟 USE: 🛛 Household 🔲 Type I Public 🔲 Type III Public
	হা	1.	Litrigation Litype IIa Public Li Heat Pump
	-1		7 CASINC: Stool Threaded Height' Above Release
			Plastic Welded Surface:ft
2. FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTHTO BOTTOM OF STRATUM	
P. C.		<u> </u>	Diameter:in. toft. depth Weight:bs/
Pr SAND		3	BORE HOLE:
CONSE TAN SAND	55	60	Diameter: <u>7</u> in. to <u>16(2</u> it. depth L Shale Packer in. to ft. depth
CONSETAN SAND : .			8 SCBEEN: Not installed SGravel-Packed
SMALL GRAVEL	100.	160	Type PVC Diameter <u>JIN</u>
3			Storgenze 15 Length: 6 Feel
	***		FITTINGS: K-Packer Bremer Check
	-		Blank Above Screen [I. Other_PVC. BCF/]
	_		9. STATIC WATER LEVEL:
			10 DIMPING I EVEL: Below Land Surface
			fl. Afterhrs. Pumping at _5G.P.M
i i			Plunger Bailer XAAr LTest Pump
			11. WELL HEAD COMPLETION:
			Basement Offset
			12. WELL GROUTED? No Dryes From O to 144
			Neat Coment Wentonite Mother <u>Grout 11</u>
1977 - 19			
			Type SEPTIC Distance 60+ It. Direction NE
			Type Distancet. Direction
		4	14. PUMP: Not Installed Pump Installation Only
Casing Diameterin. Depthft.			Model NumberHP_34Volts 22(
PLUGGING MATERIAL: L Neat Cement	Bentonite	Slurry	Length of Drop Pipe 155 It. Capacity 12 G.P.I
No.of Bags Casing Removed?	Yes	No	TYPE: La Submersible La Jet La Other
16. REMARKS: (Elevation, Source of Data, etc.)			Manufacturer's Name_XTRO
			Model Number 203 Capacity 9, 9 Gallons 3-
	15. WATER	WELL CONT	RACTOR'S CERTIFICATION:
17. DRILLING MACHINE OPERATOR	knowled	ge and belief	QL + MI MO'M' 100
	REGISTER	EL BUSINESS NAM	Jourdan Waler Miell In Mig 67-1
Name	Address	1990	VAN INE KU GAYLOND M.4
GW-2-228 9/93		Str	In FUNDA m 512 96

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WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978. Failure to comply is a misdemeanor. Well ID: 0500000748 Tax No: 05-13-013-001-60 Permit No: A01-004 County: Antrim Township: Star Town/Range: French Claim WSSN Fraction: Section: 30N 05W NE¼ SW¼ U¼ 13 Well ID: 0500000748 Distance and Direction from Road Intersection: Elevation Well Name: Latitude: 44.99581562 Well Owner: Middleton, Green B. Well Address: Owner Address: Longitude: -84.86237975 11311 WOODSIDE DR. 90 MCCOY RD. GAYLORD MI 49735 Drilling Method: Auger/Bored Pump Installed: Yes Pump Installation only: No Well Depth: 161.00 ft. Well Use: Household HP: 0.75 Pump Installation date: Well Type: New Date Completed: 3/20/2001 Manufacturer: Goulds Pump Type: Submersible Casing Type: Steel - black Pump Capacity: 12.00 GPM Model Number: Casing Joint: Threaded & coupled Length of Drop Pipe: 154.00 ft. Id of Well: Diameter: 4.00 in to 157.00 ft depth Diameter of Drop Pipe: Draw Down Seal Used: No Bore Diameter 1: 5.00 in. to 165.00 ft. depth Pressure Tank Installed: Yes **Bore Diameter 2:** Pressure Tank Type: Unknown Bore Diameter 3: Manufacturer: Challenger Height: 1.00 ft. above grade Tank Capacity : 20 Gallons Model Number Casing Fitting: None Pressure Relief Valve Installed : No Static Water Level: 140.00 ft. Below Grade(Not Flowing) **Formation Description** Thickness Yield Test Method: Test pump Sand Measurement Taken During Pump Test: 0.50 hrs. pumping at 22.00 GPM Sand Water Bearing Abandoned Well Plugged: No Reason for not plugging Well: Abandoned well ID: Screen Installed: Yes Well Intake: Filter Packed: No Screen Diameter: 3.00 in. Length: 4.00 ft. Screen Material Type: Stainless steel-wire wrapped Slot: 10.00 in. Set Between 157.00 ft. and 161.00 ft. Blank: Fittings: Neoprene packer

Well Grouted: Yes Grouting Method: Unknown No. of Bags: 4 Additives: None Geology Remarks: Grouting Materials: From 0.00 ft. to 150.00 ft. Bentonite slurry Well Head Completion: Pitless adapter Contractor Type: Water well drilling contractor Registration Number: 1617 Nearest source of possible contamination: Business Name: JACK'S WELL DRILLING Business Address: **Distance Direction** Septic tank 60.00 ft. North WATER WELL CONTRACTOR'S CERTIFICATION: This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief. Drilling Machine Operator Name: JACK Signature of Registered Representative Date Employment: Subcontractor

General Remarks: OTHER REMARKS EQP 2017C (2/2000)

Туре

ATTENTION WELL OWNER: FILE WITH DEED

7/10/2002 12:38

Depth to

Bottom

140.00

165.00

140.00

25.00



	DRINKING WATER		ENT OF E	NVIRONMENTAL QUALITY
	WATER) Completion is requin	WELL A ed under au	ND PUN	AP RECORD PERMIT NO: art 127 Act 368 PA 1978
County train	ownship Name	tie to comp	Fraction	emeanor Section No. Town No. Range No.
Distance and Direction from Road Inters	ection		5 101/4	194 1/4 1/4 JO 5-
Orphim tose	ROAD			Address Dale Gates 9991 Primrose Rd. Eimira.MI 49730
Street Address & City of Well Location				Address Same as Well Location 🙀 Yes 🖬 No
Locate with 'x' in Section Below	S	šketch Map		4. WELL DEPTH: Date Completed Wew Weil 160 it. 7 197 Papiacement Weil
				5. Cable Tool Cable Tool Dug
				6. USE: XI Household U Type I Public U Type III Public Irrigation Type IIa Public Heat Pump Test Well Type IIb Public
				7. CASING: Steel Threaded Height: Above/Below
2. FORMATION DESCRIPTION		THICKNEBS OF STRATUM	DEPTN TO BOTTOM OF STRATUM	Diameter: <u>Vh</u> in. to <u>ft</u> , depth Weight: <u>bs</u> /ft
SAND		140	140	BORE HOLE:in, toit, depthDrive Shoe
WATER SAN	4	20	160	in. toft. depth
· · · · · · · · · · · · · · · · · · ·				Type
	· · · · · · · · · · · · · · · · · · ·			Set Between 176 It. and 160 ft. FITTINGS: XK-Packer Bremer Check
				9. STATIC WATER LEVEL:
				10. PUMPING LEVEL: Below Land Surface
A A A A				Plunger Bailer Air X Test Pump
				Pittess Adapter
				12. WELLGROUTED? No Ves From to 12. Neat Cement Bentonite Conternation of Bags Additives
				13. NEAREST SOURCE OF POSSIBLE CONTAMINATION: Type 5 of 1 c Distance 60 ft. Direction E Type Distance ft. Direction
15. ABANDONED WELL PLUGGED? Casing Diameter in	Ves No	. <u>. </u>	P	14. PUMP: Not Installed Pump Installation Only Manufacturer's Name 604105
PLUGGING MATERIAL:	Neat Cement Concrete Grout	Bentonite (Bentonite (Slurry Chips	Model NumberHP_ <u>J</u> Volts <u>∂</u> <u>∂</u> <u>∂</u> Length of Drop Pipe_ <u></u> It. Capacity_ <u></u> G.P. M. TYPE: XI SubmersibleLetOther
16. REMARKS: (Elevation, Source of Da	Casing Removed?	Yes 🗌 I	No	PRESSURE TANK: Manufacturer's Name CHallonge Ch
	1	9 . WATER V		Model NumberC & Gallons
17. DRILLING MACHINE OPERATOR:	(knowledge	and belief.	11 OHILING 1617
Name Aogor Se	kon ski	REGISTERIO		ELMIKA REGISTRATION NO.
-		Signed (AUTHORIZE	EO HEPACESENTATIVE Date 8-87
	ĠŔŎĿŎĊ	ALC AL SI	UAVEV (EQP 2017 (12/96)



WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Well ID: 05000001341			Failure to co	mply is a mis	sdemeanor	<u>. </u>			
Tax No: 05-13-014-008-15	Permit No: 0	03-111		County:	Antrim		Towns	ship: Star	
		Fraction	n:	Section:	Town/Ra	inge:	French Cli	aim: WSSN:	
		SW1/4	SW¼ U¼	14	30N 0	VVC			
Well ID: 0500000	1341	Distanc	e and Directi	ion from Roa	ad interse	ction: (DSE ROAD	
Elevation:									
		Well Na	me:						
Latitude: 44.98925512		Well Ow	ner: Robert	Sloan	·				
Longitude: -84,88761098		Well Ad	dress:			Owne	r Address:		
		MI				5345 BOYI	NE CITY M	49712	
	· · · · · · · · · · · · · · · · · · ·		·.	*					
Drilling Method: Auger/Bored	cohold		Pump Insta	alled: Yes			Pump Insta	llation only	No
Weil Type: New Date Complete	senoia ad: 4/30/2003	·	Pump Insta	illation date:			HP: 0.75	. .	1.
Casing Type: Steel - unknown		-	Manufactur Model Num	ner: Goulds	ED		Pump Type Pump Capa	Submersit	CDM
Casing Joint: Threaded & coupled	-1 6 L		Length of r	iver. onulo)rop Pine: 1:	ER 20.00 ft		r ump capa Id of Well	GILY. 12.00	GEW
4.00 in. to 126.00 ft.	aepin		Diameter o	f Drop Pipe:					
			Draw Down	Seal Used.	No				
Bore Diameter 1: 7.00 in. to 130.00 ft. dep Bore Diameter 2:	oth		Pressure T	ank Installed	l: Yes				
Bore Diameter 3:			Pressure T	ank Type: U	nknown				
Height: 1.00 ft. above grade			Manufactur	rer: Challeng	jer		Taak	Canadibe	
Casing Fitting: None			Pressure R	elief Valve h	nstalled '	No	талк	Capacity : 2	o Galions
Static Water Level: 95,00 ft. Below Grade()	Not Flowing)	•		Formatio	Decoried	ion		Thiskness	Depth to
Yield Test Method: Test pump				rormatio	n neacubt	1011		THEXNESS	Bottom
Measurement Taken During Pump Test:			Sand			· •		95.00	95,00
100.00 ft. after 20.00 hrs. pumping at 12.0	IO GPM		Sand Water	Bearing				35.00	130,00
Abandoned Well Plugged: No				···					
Reason for not plugging Well:									
Abandoned well ID:									+
Screen Installed: Yes Well Intak	e								
Filter Packed: No				•	· · ·				i
Screen Diameter: 3.00 in. Length: 4	.00 ft.				<u> </u>				
Stot: 10.00 in. Set Between 126.00 ft. and	130.00 ft								
Blank:									ļ
Fittings:			ļ			•••			
weoprene packer									L
Well Grouted: Yes Crowing Mathed	known		ļ						
No of Bage: 5	KIROWIT		Geology P-	marke:				·····	
Grouting Materials:	he		Geology Re	marks.					
Bentonite slurry From 5.00 ft. to	110.00 ft.								:
·									
Well Head Completion: Pitless adapter			Contractor 1	Terman 182-1	- التحلم (أحميه	* ***	antar		
			Registration	rype. water 1 Number: 1	wen omitni 617	y contr	acioi		
Nearest source of possible contamination	:		Business N	ame: JACK (S WELL DI	RLG			
Ustance Directi	on		Business A	adress:					
Unknown			This well way	WATER WI s drilled unde	er my jurisd	RACI (OR'S CERTI and this repo	FICATION: It is true to th	ne fiest of
	····		my knowledg	e and belief.					
Drilling Machine Operator Name: JACK			Signature	f Renistered	Represen	Itative	п	ate	
Employment: Subcontractor			J.J.101010 0	giotoieu			U		
General Remarks:							· · ·		
OTHER REMARKS									
EQP 2017C (2/2000)	TTENTION	WELL	OWNER:	FILE WIT	H DEEC			5/14	4/2003 09:31
				· ·					

,	DRINKING WATE	DEPARTME	ENT OF EN OGICAL F	VIRONMENTAL QUALITY PROTECTION DIVISION	,
TAX NO: 05-13-014-007-00		R WELL A		IP RECORD	PERMIT NO:
1. LOCATION OF WELL	F	ailure to comp	ly is a misde	an 127 ACL 300 PA 1978 Emeanor	A99-59
County	Township Name		Fraction	Section No.	Town No. Range No.
Distance and Direction from Road Ir	ntersection		1.2W 042	3. OWNER OF WELL	
				Address CH.	IPPA, MIKE 303 ataa hwy
	10303 3165	73		EL	MIRA_MI 49730
Street Address & City of Well Locat Locate with 'x' in Section Below	ion 10303 MDa	Sketch Map	ute lube	Address Same as Well Loca	ation Ves No
	l.	XI		129 tt 5 /	18199 Z Replacement Well
	r	C-4	.	5. Cable Tool R	otary Driven Dug
	1			6. USE: Household T	rpe I Public Type III Public
│				Irrigation	/pe lla Public 🔲 Heat Pump
	C-42	0105	RD	7. CASING: Steel	readed Height: Above/Below
2. FORMATION DESCRIPTION		THICKNESS	DEPTH TO		elded Surface:ft
		ราหลั่าบด	STRATUM	Diameter: 4/ in. to 4	25tt. depth Weight: // == lbs/ft.
SAND AND C	RAVEL	129	129	BORE HOLE:	ft. depth
			ļ	Diameter: <u> </u>	t. depth
			 	8. SCREEN: Not installed	J Gravel-Packed
				Type Telascope- SlovGeuge	Diameter
				SetBetween 135	ft.and/39tt.
		·		Blank Above Screen _/	Bit, Other <u>3" PLuc</u>
· · · · · · · · · · · · · · · · · · ·				9. STATIC WATER LEVEL:	
	· E I V STAN			10. PUMPING LEVEL: Below Land	nd Surface
MICH DEPT OF A	WHOMMER'S CHALINY			135 ft. Alter	hrs. Pumping atG.P.M.
MAV	9 7 1000			11. WELL HEAD COMPLETION:	
11/1/1 6	<u>a (1999</u>			Pitless Adapter 50	12" Above Grade
Brinklay, Spring & Lin Capanol &	and the second			12. WELL GROUTED?	Ves From //S to o ft
WILL CON	Ungervieweinen Ungervieweinen			Neat Coment Be	Intonite Other
				13. NEAREST SOURCE OF POS	SIBLE CONTAMINATION:
				Type <u>septic</u> Dist	ance <u>65</u> ft. Direction <u>6</u>
USE A 2ND SHEET			· · ·	14. PUMP: Not Installed	Pump Installation Only
Casing Diameter in.	. Depthft.	_		Manufacturer's Name	UDS ZEW
PLUGGING MATERIAL:	Neat Cêment	Bentonite	Slurry	14 Length & Drop Pipe	<u>ft.</u> Capacity G.P. M.
No. of Bags	Casing Removed?	Ves	No		∟ Jet ∟ Uther
16. REMARKS: (Elevation, Source	of Data, etc.)			Manufacturer's Name	KXCOAL VA Canacin Q1 Gallons Jan
		18. WATER	WELL CONTR	RACTOR'S CERTIFICATION:	
		This well	was drilled i ge and belief	under my jurisdiction and this repo	ort is true to the best of my,
	איז: בו	Kon's		DRILLING, I	NC 1234 REGISTRATION NO.
Name Kon Flore	alski //	Address_	Box 1	8 ALBA, MICH	49611
··· opper		Signed	Koz 4	LADONABE	Date 5-18-99
	GE	OLOGICAI	. Suave	Y сору	EQP 2017 (12/96)

TAX NO:	WATER WEL Completion is required und Failure to c	L AN ler auth comply	D PUMI ority of Par is a misder	PRECORD tt 127 Act 368 PA 1978 meanor PERMIT NO: 99-524
County	wiship Name	T	Fraction 5	E Section No. Town No. Hange No.
Distance and Direction from Road Interse	ciion 4 D	.	2	3. OWNER OF WELL Warde Prim#05e Address 10577 AIBAHWY ElMira MI49730 Address Same as Well Location Ø Yes □ No
Locate with 'x' in Section Below	Sketch	Мар .		4. WELL DEPTH: Date Completed X New Well 109 IL 9-14 +99 Replacement Well
				5. Cable Tool Rotary Driven Dug Hollow Rod Auger/Bored Jetted
				6. USE: A Household Type I Public Type III Public Inrigation Type IIa Public Heat Pump Test Well Type IIb Public
			05051170	7. CASING: Steel Threaded Height: Above/Below
2. FORMATION DESCRIPTION	THX		BOTTOM OF STRATUM	Diameter:in. toft. depth Weight:lbs/
SANd SAND	ð	5	85	BORE HOLE: Diameter:in. toit. depth
WALL SAND	¥	*		in. to fi. depth 8. SCREEN: Not installed Gravel-Packed Figure for
				Set Between Bremer Check
				9. STATIC WATER LEVEL: 1. Below Land Surface Flowing
	· · · · · · · · · · · · · · · · · · ·			10. PUMPING LEVEL: Below Land Surface 10. PUMPING LEVEL: Below Land Surface 11. After / _ hrs. Pumping at _ 2 O _ G.P.M Plunger Bailer Alr & Test Pump
MICH I.	RECENTED			11, WELL HEAD COMPLETION: Pilless Adapter 12" Above Grade Basement Offset Well House
	0CT 0 5 1999	7?		12. WELL GROUTED? No No Yes Fromto
	Vater & itadioiognal Protection Diversion Ground Weber Supply Suthen LL CONSTRUCTION			13. NEAREST SOURCE OF POSSIBLE CONTAMINATION: Type <u>5 cp / 1 c</u> Distance <u>6 0</u> th. Direction Type <u>1 c Distance</u> th. Direction
USE A 2ND SHEET IF 15. ABANDONED WELL PLUGGED? Casing Diameterin. PLUGGING MATERIAL: Cement/Bentonite Slurry No. of Bags	NEEDED 2019/17 (18)	entonite entonite es	Slurry Chips No	14. PUMP: Not installed Pump Installation Only Manufacturer's Name 6 4 1 0 5 Model Number HP 10 Length of Drop Pipe 10 6 TYPE: Submersible Jet PRESSURE TANK:
16. REMARKS: (Elevation, Source of	Data, etc.)	WATER	WELL CON	Manufacturer's Name Capacity Gattons
17. DRILLING MACHINE OPERATOR		This we knowled neolater Address	I was drilled ge and belie G K S EO BUSINESS W	under my jurisdiction and this report is true to the best of my, it. <i>We II D L III i g B B B B B B B B B B</i>
· •		Signed	AUTHO	RIZED REPRESENTATIVE



WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor. Well ID: 05000000682 Township: Star Permit No: A00-597 County: Antrim Tax No: 05-13-015-003-05 French Claim: WSSN: Fraction: Section: Town/Range: 30N 05W NE¼ SE¼ U¼ 15 Well ID: 0500000682 Distance and Direction from Road Intersection: Elevation: Well Name: Latitude: 44.99308632 Well Owner: Jeny & Wettlayfer Broods Owner Address: Well Address: Longitude: -84.88885784 11050 Sprucedale Primrose Elmira MI 49730 Pump installation only: No Drilling Method: Auger/Bored Pump Installed: Yes Well Depth: 150.00 ft. Well Use: Household Pump Installation date: HP: 0.75 Well Type: New Date Completed: 10/11/2000 Pump Type: Submersible Manufacturer: Goulds
 Weil Type:
 New

 Casing Type:
 Steel - black

 Casing Joint:
 Threaded & coupled

 Diameter:
 4.00 in. to 146.00 ft. depth
 Model Number: Pump Capacity: 10.00 GPM id of Well: Length of Drop Pipe: 140.00 ft. Diameter of Drop Pipe: Draw Down Seal Used: No Bore Diameter 1: 8.00 in to 150.00 ft depth Pressure Tank Installed: Yes Bore Diameter 2: Pressure Tank Type: Unknown Bore Diameter 3: Manufacturer: Challenger Height: 1.00 ft. above grade Tank Capacity : 20 Gallons Model Number : V-60 Casing Fitting: None Pressure Relief Valve Installed : No Depth to Static Water Level: 125.00 ft. Below Grade(Not Flowing) Thickness Formation Description Bottom Yield Test Method: Test pump 125.00 125.00 Sand Measurement Taken During Pump Test: 25.00 150.00 Sand Water Bearing 0.50 hrs. pumping at 22.00 GPM Abandoned Well Plugged: No Reason for not plugging Well: Abandoned well ID: Screen Installed: Yes Well Intake: Filter Packed: No Screen Diameter: 3,00 in. Length: 4.00 ft. Screen Material Type: Stainless steel-wire wrapped Slot: 10.00 in. Set Between 146.00 ft. and 150.00 ft. Blank: Fittings: Neoprene packer Well Grouted: Yes Grouting Method: Unknown Geology Remarks: No. of Bags: 4 Additives: None Grouting Materials: From 0.00 ft. to 150.00 ft. Bentonite dry granular Well Head Completion: Pitless adapter Contractor Type: Water well drilling contractor Registration Number: 1617 Nearest source of possible contamination: Business Name: Jack's Well Drilling Distance Direction Business Address: Type Septic tank 70.00 ft. West WATER WELL CONTRACTOR'S CERTIFICATION: This well was drilled under my jurisdiction and this report is true to the best of ny knowledge and belief. Drilling Machine Operator Name: Jack Date Signature of Registered Representative Employment: Subcontractor General Remarks: OTHER REMARKS 6/20/2002 08:47 EQP 2017C (2/2000) ATTENTION WELL OWNER: FILE WITH DEED



WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Well ID: 05000000751 Failure to comply is a misdemeanor. Tax No: 05-13-015-005-00 Permit No: A01-010 County: Antrim Township: Star Fraction: Section: Town/Range: French Claim: WSSN: 30N 05W U% U% U% 15 Well ID: 0500000751 Distance and Direction from Road Intersection: Elevation Well Name: Latitude: 44.99198635 Well Owner: Dennis Cross Well Address Owner Address Longitude: -84.8885592 2576 PRIMROSE RD. 2576 PRIMROSE RD. ELMIRE MI 49730 ELMIRE MI 49730 Drilling Method: Auger/Bored Pump installed: Yes Pump Installation only: No Well Use: Household Well Depth: 151.00 ft. Pump Installation date: HP: 0.75 Well Type: New Date Completed: 2/28/2001 Manufacturer: Goulds Pump Type: Submersible Casing Type: Steel - black Casing Joint: Threaded & coupled Model Number: Pump Capacity: 12.00 GPM Length of Drop Pipe: 135.00 ft. id of Well: Diameter: 4.00 in to 147.00 ft depth Diameter of Drop Pipe: Draw Down Seal Used: No Bore Diameter 1: 5.00 in. to 155.00 ft. depth Pressure Tank Installed: Yes Bore Diameter 2: Pressure Tank Type: Unknown Bore Diameter 3: Manufacturer: Challenger Height: Tank Capacity : 20 Gallons Model Number: Casing Fitting: None Pressure Relief Valve Installed : No Static Water Level: 120.00 ft. Below Grade(Not Flowing) Depth to Thickness **Formation Description** Bottom Yield Test Method: Test pump 120.00 120.00 Measurement Taken During Pump Test: Sand 155.00 0.50 hrs. pumping at 20.00 GPM Sand Water Bearing 35.00 Abandoned Well Plugged: No Reason for not plugging Well: Abandoned well ID: Screen Installed: Yes Well Intake: Filter Packed: No Screen Diameter: 3.00 in. Length: 4.00 ft. Screen Material Type: Stainless steel-wire wrapped Slot: 10.00 in. Set Between 147.00 ft. and 151.00 ft. Blank: Fittings: Neoprene packer Weil Grouted: Yes Grouting Method: Unknown Geology Remarks: No. of Bags: 5 Additives: None **Grouting Materials:** From 0.00 ft. to 135.00 ft. Bentonite slurry Well Head Completion: Pitless adapter Contractor Type: Water well drilling contractor Registration Number: 1617 Nearest source of possible contamination: Business Name: JACK'S WELL DRILLING Type **Distance** Direction Business Address: Unknown WATER WELL CONTRACTOR'S CERTIFICATION: Unknown This well was drilled under my jurisdiction and this report is true to the best of ny knowledge and belief. Drilling Machine Operator Name: JACK Date Signature of Registered Representative Employment: Subcontractor General Remarks: OTHER REMARKS EQP 2017C (2/2000) 7/10/2002 12:54 ATTENTION WELL OWNER: FILE WITH DEED

GEOLOGICAL SURVEY SAMPLE No. WATER WELL RECORD MICHIGAN DEPARTMENT ACT 294 PA 1965 OF 1 LOCATION OF WELL PUBLIC HEALTH Count Twp. Fraction Section No. Range lown SUD%MI <u>NW4</u> Ĵ ()∩**∦**, #/W. OWNER OF WELL: OWNER No. 0 14 mifilles THICKNESS OF STRATUM OEPTH TO BOTTOM OF STRATUM 4 WELL DEPTH: (completed) Date of 2 FORMATION ft. a Sand & Sunol 5 🗋 Cable tool 🔲 Rota 🖌 Driven 🗋 🗖 ուն 9 'ઠ 😥 Hollow rod bottol K Bored 6 USE: Domestic Public Supply Industry Trigation 🔲 Air Conditioning Commercial Test Well 7 CASING: Threaded & Welded Height: Above/Bal Qiem. 📥 in. to 3ft. Depth surface ft. Weight 🖱 Jbs/ft. - 9 Drive Shoe? Yes No ft. Depth _in, to 8 SCREEN: - ۲ Type: Set between Pittings; 9 STATIC WATER LEVEL ft. below land surface 10 PUMPING LEVEL below land surface ft. offer. <u>75</u> L.Ars, pumpin R. O. B. ___ft. after____hrs. pumping ý.p.m. 11 WATER QUALITY in Parts Per Million: ¢ Iron (Fe)_ "Chiorides (CI) ź Hordness 12 WELL HEAD COMPLETION: 1, In Approved Pit Pitless Adopter 2.12' Above 13 GROUTING: Well Grauled? 🖾 -Yes 🕅 No Material: Neat Cement ÷., Depth: From_ _ft. to__ _ft. 14 SANITARY: Nearest Source of possible contaminat 6 ALTYPE -60 icor -S_Direction Well disinfected upon completion 15 PUMP: Monufacturer's Name Model Number Length of Drop Pipe. ft. capacity G.P.M. Type: 🔲 Submersible Jet [Reciproceting 16 Remarks, elevation, source of data, etc. 17 WATER WELL CONTRACTOR'S CERTIFICATION: jurisdiction and this report is true This well was drilled under my ADDED INFO. BY DRILLER, ITEM NO. to the b 0/45 REGISTRATION NO. **CORRECTED BY:** **ADDITION BY: Add Signed AUTHORIZED REP JUL 20 1 0670 100M **5-6**6

GEOLOGICAL SURVEY COPY

GEOLOGICAI, SURVEY NO.	WATER	WELL /	AND PI	UMP RECORD	A 96 - 1.5 PERMIT NUMBER
1 LOCATION OF WELL	Township Name		Fraction	Section Number	Town Number Range Numb
Antrim	STAR		NE 14:	SE 1/4 NW1/4 23	30 N/S 5
Distance And Direction From Road	Intersection	and	Deule.	3 OWNER OF WELL: AALA	hony Readley
CHA WEST TURN	1 South ON 197	-en son	pine	1101	ind princing
31,0 miles TUSN U	Jest go Thru En	SEMENT ,	2110 mile	Address 1491 S.	Coppins Rd.
Street Address & City of Well Loca	nion well on M	Joith St	e RI	Address Same As Well Loca	tion? \Box Yes \Box No
Locate with "X" in Section Below	S- To ALBA S	ketch Map:	<u> </u>	4 WELL DEPTH: Date Compl.	ated New Well
	Same and the second		TY I'V	106 FT. 00 6 24	Pi 96 Replacement Well
	1-100	2		5 Cable tool Rote	iry 🔲 Driven 🗌 Dug
wh	A	-12		6 USE	er Jetted L_
		3	•	United to the second se	a l'Aublic La Public
	Ensiment to	20		Test Well	a lib Public
	prop	5		7 CASING: Steel Three	aded Height: Above/Bratery
1 MILE		-	·		Surface1
2 FORMATION DE	SCRIPTION	OF STRATUM	BOTTOM OF	in. to ft. depth	Weight Ibs./It.
6. m	l < l			Grouped Drill Hole Diameter	Drive Shac
FINE 4-1 les	SANd	O	40	in to it. depth	
Encland		HA	-70	B SCREEN.	Not Installed
<u> </u>		170	_/(r Diameter
Vriy Five S	And	70	108	Slot	Length
	÷	1		FITTINGS: K-Packer	It and It Lead Packer Second Second Check
COARSE SH	nd	102	100	Blank above screen	
				9 STATIC WATER LEVEL:	-
		+	·········	10 PUMPING LEVEL: below land	id surface
				72.00 - 2	20
				1 after hr	s. pumping at G.P.M.
	Mich Deni	VER		COMPLETION:	adapter 🗹 1125" above grade
	0f /	that to	•	12 WELL GROUTED7	Of all set Approved pit
			(FF)		Yes from to _/.cc
	River	1996		Noat cement Y Bon	Ionite Other
······	OCCUPATION	d7		No of bags of cement	Additives
	A TIONAL HEA	TH THE AN	,	Type SCOTIC Dist	ance 70 [L Direction ω]
		-owqs		Well disinfected upon completion	
	·····			Was old well plugged?	🗋 Yes 🔲 No
				34 PUMP: Not Installed	Pump Instellation Only
	· · · · · · · · · · · · · · · · · · ·	<u>├────</u> ┩		Manufacturer's name	
				Model number	HP Volts
		1		TYPE: Submersible	
			<u> </u>	PRESSURE TANK:	······································
1000 A 4400 CT	IE NEEDED			Manufacturer's name	^
USE A 2ND SHEET 15. Remarks, elevation, source	of data, etc.	L	16. WATER	Model number	Capacity Gal FICATION:
	-		This well	Il was drilled under my jurisdiction a est of my knowledge and belief	nd this report is true
			A in the	NEDS What Dill	10-18115
17. 0-0	·····		<u>71177</u>	REGISTERED BUSINESS NAME T	REGISTRATION NO.
17. Hig Uperator's Name:	EPProved.		Address	Idea HIPOII Ka	. HIKAMA, Mirth. 19
1/MV Kidder 4 1	her Rytill IV		Signed	No:1 Kt. Kome	Date 1-30-90
				- CALIFUNDIZED DEDDECCHITATIN	

DI.OGICAL	SURVEY	COPY

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!	GEOLOGICAL SURVEY SAMPLE No.			
i.	ny 1 3 1976			
Ň	IAI	WATER	WELL REG	CORD MICHIGAN DEPARTMENT
	1 LOCATION OF WELL	ACT	294 PA 196	65 OF PUBLIC HEALTH
	County Township Name		Fraction	Section Number Town Number Range Number
	Distance And Direction from Road Intersections	<u> </u>	WW W	3 OWNER OF WELL:
	I miles East and I mi	Vorth	of	deland tates
	Street address & City of Wall Location	620		Address KK
	Locate with X' in section below Ske	etch Map:		4 WELL DEPTH: (completed) Date of Completion
	× 31			113 1. 5-6-76
	J ⁵			5 Cable tool Rotary Driven Dug
			X well	6 USE Domestic Public Supply Industry
		o J		Trrigation Air Conditioning Commercial
		}		7 CASING: Threader Welded Height: Above/Retow
	Ht I MILE			Diam. Surfaceft.
	2 FORMATION	OF STRATUM	BOTTOM OF	4 in, to 107 ft. Depth Weight 100 lbs./ft.
	5.0.01 0			8 SCREEN: Howard - Smith 304
	Dand & thavel	115	115	Type: flacily Dia .: 4"
				Stot/Gause 10 Length 4
				Fittings4X3 K-Packer 3"plug
				9 STATIC WATER LEVER
				8.5 ft, below land surface
				10 PUMPING LEVEL below land surface
4		~~		g.p.m.
•				fz. after hrs. pumping 9.p.m.
				Iron (Fe) Chlorides (Ci)
				NardnessOther
				Pitless Adopter 12" Above Grade
				13 Weil Grouted7 Yes No
				Depth: Fromft, toft.
				14 Nearast Source of possible contamination
				Well disinfected upon completion Y Yes No
			1	15 PUMP: Not installed
	J		· 	Manufacturer's Name
				Length of Drop Pipe 99 ft. capacity 70 G.P.M.
				Type Submersible
			h	JetReciprocating
	USE A 2ND SHEET IF NEEDED 16 Remarks, elevation, source of data, etc.		17 14/4 700 14	
			This well	was drilled unter my jurisdiction and this report is true
	ADDED INFO BY DRILLER, IT	iem No.	Ron'a 4	Joll Drilling Inc. 1234
	CORRECTED BY		A duinna	Par 19 ALL MAR ALL MAR
	ELEVATION BY O			2 10 10 TIGH
s., 1	D67d 100M (Boy, 12-68)		Signed	AUTHORIZED REPRESENTATIVE Date 5-7-76

GEOLOGICAL SURVEY COPY

-05-13-023-003-10 1. LOCATION OF WELL	WATER W	ELL A	ND PU	MP	REC	ORD		A96-	0: -104	
County Antrim	Township Name		Fraction		_	Section	No.	Town	No,	Range
Distance and Direction from Road Inte	rsection Star		NW 1/4	VP-1/4	41/4	<u></u>			NO: 5-104 Vn No. Range Constraints of the second state of the s	
200 ft South of Alba a mile East of Prime	Rd Dse Rd			AI	idress	/ WELL (]]	hrie 0266 Imir	i and K i Alba a, MI	aren Hwy. 4973	Harvej 10
Street Address & City of Well Location)			Ac	dress S	iame as We	lí Locati	on 🖵 Y	'es 🗋	No
	ALD	Sketch Map		4. W	ELL DEF 129 Cable Hollow	PTH: <u>ft.</u> Fool Rod	Date Co	mpleted 9 96 ary er/Bored	New Rep Drive	v Well Hacement V en C ed C
				6. US		Household Irrigation Test Well		e i Public e ila Public e ilb Public eded	Height	III Public Pump
2. FORMATION DESCRIPTION		THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM	Dia	meter:	Plastic	Wel	ded	Surface:	
top soil	· · · · · ·	1	•	1		in.	to	ft. depth	weight.	╶── <u>┹</u> ╆╼┈┈┈
red sandy gravel	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	6		BO Dia	REHOL meter:	E: in.	10	ft death	Drive Shake	Shoe
white sand		22	/ 			In.	to	_ft. depth		
red sandy gravel		10	<u> </u>	8.SC Typ	REEN: e St	Not inst ainles	ailed s.St	Grav ee1_ Dir	el-Packer ameter	3
white sandy gravel		60	100	Slo	Batwan	10	······.	Le tt ord	ngth:	4 ft
medium brown water sa	nd & gravel	29	129	FIT	TINGS: Blank Al		Packer	Bren	ier Check	¥
				9. ST/		TERIEVE	14	1. Or		
					64	ft. Below L	and Su	riace	🗌 Fíowi	ng
				10. PUI	MPING :	LEVEL: Bel	ow Land	Surface		
1.22 · · · · · · · · · · · · · · · · · ·					Plunger	ft. After Ba	iler	hvs. Pump	oingat[G Test Pur
in the second se				11.WE	LL HEAI	COMPLET	ION:	_		
				×	Pitiess / Basema	Adapter		12 " ,	Above Gi	aqe
				12. WE	LGRO	JTED?			From	
iden i Va colad					Neat Ce	ment [Bent	nite	Other	
				1.2 NE	DEET		Add			
				талмел Тур	Se	otic-	Distant	о	ft. Direc	in: tion <u>pac</u> i
USE A 2ND SHEET IF	NEEDED			Тур	•		Distanc		_ft. Direc	tion
15. ABANDONED WELL PLUGGED? Casing Diameterin. PLUGGING MATERIAL: Cement/Bentonite Slurry No. of Bags2	Yes No Depth 1. Neat Cement Concrete Grout Casing Removed?] Bentonite S] Bentonite C] Yes II N	ilurry hips	14, PUN Man Mod Leni TYP	IP: { ufacture el Numb)th of Dr E: {	Not Insta "s Name er <u>2NIFT (</u> op Pipe y Submers	illed S2-1 2 120 ible	L_] Pum, 28 HP ft. Cap.] Jet [_]	p Installa	lion Only _ Volts_231 12G
16. REMARKS: (Elevation, Source of	Data, etc.)			PHE Man	SSUHE Llacture	i ANK: 's Name	An	<u>itro1</u>		
	1	5. WATER W This well y	ELL CONTE	Mod ACTOR's	e Numb CERTI jurisoict	er_WX20: FICATION: ion and this	report	Capaci	e best o	_ Gailons
17. DRILLING MACHINE OPERATOR:	HOWNER		and belief. Morey	Well	. Dri	.11ing			AEGIST	0193
Name the term	-antes	Address	72 Hay	es To	wer	Rd Gay	lord	<u>, MI (</u>	49735	
	`	Signed	AUTHORIZ) Intative	100	y_	Date	5/8/	96
		(]	/ · · · · · ·			/		Author	lly: Act 368 I

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MICHI	GAN DEPART	MENT O	ΕΡΙΝΙΟ ΗΕΔΙΤΗ
GEOLOGICAL SURVEY NO	ER WELL		
1 LOCATION OF WELL			PERMIT NUMBER
ANTRIM Jownship Name	r	Fraction	Section Number 14 14 30 N/S 5 E/W
Distance And Direction From Road Intersection			3 OWNER OF WELL:
0.0 0.00 , , ,			Z140 Willowbrook Cr.
Street Address & City of Well Location			Mancelona,MI 49659
Locate with "X" in Section Below	Sketch Map:		Address Same As Well Location? Yes Yes No 4 WELL DEPTH: Date Completed (18 Non-
			109 FT. 5 15 95 D Replacement Well
			b Cable tool Rotery Driven Dug Hollow rod Mager Letted Image: Cable tool
			6 USE: Domostic Type I Public Type II Public
		\$	☐ Irrigetion · ☐ Type Ha Public ☐ Heat pump ☐ Test Well ☐ Type Ha Public ☐
			7 CASING: A Steel Type in Fubic Lineaded Height: Above/Below
	THICKNESS	DEPTH TO	V In to the depth of the depth
2 POHMATION DESCHIPTION	OF STRATUM	BOTTOM OF STRATUM	in. toft. depth lbs./ft.
SMI	90	90	in. 10 ft. depth Drive Shoe Ves
Water SANd	90	110	SCREEN:
	а.		Slol/Gauze 10 Length 4 fee 1
			Set betweenf1 andf1. FITTINGS:K-Packer Lead Packer Bremer Check
			Blank above screen It. Other
			ft. below land surface [] Flow
			10 PUMPING LEVEL: below land surface
585 E 255			ft. after hrs. pumping ot G P M.
			COMPLETION: Priless adapter 12" above grade Basement offset Approved pit
			12 WELL GROUTED? No XY Yes From to ft.
			Neal comont Bentanite Other An Hurs
			No. of bags of cement Additives
			Type Septic Distance SO IL Direction
			Well disinfected upon completion? Yes No Was old well plugged?
		· · ·	14 PUMP: Not installed. Pump Installation Only
			Model number HP // Volts
· · · · · · · · · · · · · · · · · · ·			Length of Drop Pipeft. capacity G.P.M.
			PRESSURE TANK:
USE A 2ND SHEET IF NEEDED		ļ	Model number Capacity 16 Callons
15. Remarks, elevation, source of data, etc.		16. WATER This well	WELL CONTRACTOR'S CERTIFICATION: was drilled under my jurisdiction and this report is true
		AC	KS well Otilling 1617
17. Rig Operator's Namo:		▼ Ri Adoress _	EGISTERED BUSINESS NAME REGISTRATION NO.
		Signed 🖌	John Serenki Dalo 5-15-95
		1	AUTHORIZED REPRESENTATIVE Authority: Act 368 PA 1978
	GEOLOGICA	a. Survey	COPY Convision of a violation of any provision is a

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WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor. Well ID: 05000000600 Township: Star Permit No: 00-265 County: Antrim Tax No: 05-13-024-008-20 Town/Range: 30N 05W Section: French Claim: WSSN: Fraction: SW14 SW14 NW14 24 Distance and Direction from Road Intersection: 4/10 MILE SOUTH OF C-42 Well ID: 0500000600 Elevation: Well Name: Latitude: 44.98354657 Well Owner: Harvey Britton Well Address: **Owner Address**: Longitude: -84.86856011 5765 OLD ALBA ROAD GAYLORD MI 49735 3455 PATTERSON ROAD

Drilling Method: Other	· · · · ·	Pump installed: Yes	Pump Insta	llation only:	No	
Well Depth: 113.00 ft.	Well Use: Household	Pump Installation date:	HP: 0.75			
Well Type: New	Date Completed: 7/22/2000	Manufacturer: Goulds	Pump Type: Submersible			
Casing Type: Steel - black		Model Number: 105B05422	Pump Capa	city: 10.00	GPM	
Casing Joint: Welded		Length of Drop Pipe: 104.00 ft.	ld of Well:	•		
Diameter: 4.00	in. to 109.00 ft. depth	Diameter of Dron Pipe: Unknown in.				
		Draw Down Seal Used: No				
Bore Diameter 1: 7.00 in	to 113.00 ft. depth	Pressure Tank Installed Yes				
Bore Diameter 2:		Brossure Tank Type: Unknown				
Bore Diameter 3:		Manufacturer: Goulds				
Height: 1.00 ft. above grad	de	Madul Number : V 60	Tank C	anacity - 999	9 Gallons	
Casing Fitting: None		Bressura Rolief Valve Installed 1 No				
Statia Water Level: 97.00	# Bolow Grada (Not Flowing)	riessure itensi ruite instance i ite			Depth to	
Viold Test Mathed: Test P	II. BERW Grade(Not Flowing)	Formation Description		Thickness	Bottom	
Measurement Taken Burin	nnp na Buma Test	Brown Sand Medium	· · · · · · · · · · · · · · · · · · ·	20.00	20.00	
88.00 ft offer 1.00 bre p	umping at 16.00 GPM	Brown Sand Medium W/Gravel	<u>_</u> _,,,, .=	20.00	40.00	
	anging at 10,00 of m	Yellow Sand Medium W/Gravel	_	20.00	60.00	
		Light Brown Sand Medium		27.00	87.00	
Abandoned Well Rivgged	No	Light Brown Cand Medium Motor Rearing		11.00	98.00	
Reason for not plugging V	Nell	Light Brown Sand Weddun Water Dearing		15.00	113.00	
Readinition not plugging i	FGII.	Light Brown Sand Coarse Water Bearing		15.00	113.00	
Abandoned well ID:						
Screen Installed: Yes	Well Intake:					
Filter Packed: No				ļ		
Screen Diameter: 3.00 in.	Length: 4.00 ft.					
Screen Material Type: Sta	Inless steel-wire wrapped					
Black: 0.50 ff Abovo	an 109.00 ft. and 133.00 ft.					
Eiffinne:						
Neonrene packer						
Well Grouted: Yes Grou	ting Method: Unknown					
No of Page: 5	Additives: Other	Geology Remarks:				
Crouting Motorials	Additives. Other					
Bontonito alurni	From 5.00 ft to 99.00 ft					
	110m 3.00 m 10 33.00 m					
Well Head Completion	Difless adapter					
Weil Head Completion:	T licas adapter	Contractor Type: Water well drilling cont	ractor			
		Registration Number: 617				
Nearest source of possibl	le contamination:	Business Name: K&T DRLG, INC.				
Туре	Distance Direction	Business Address				
Septic tank	70.00 ft. Northeast	WATER WELL CONTRACT	OR'S CERT	IFICATION:	-	
		I This well was drilled under my jurisdiction	and this repa	JULIS TILLE TO T	e Dest Of	
Drilling Machine Operator		iny knowledge and beller.				
Uniting machine Operator	Hane, KEN KUSUIELNIAK	Signature of Registered Representative) e	Date		
Employment: Employee						
Canasai Bastanian		1				
OTHER REMARKS	ng Method: AUGER/RORED Additio	ves: EZ-MUD		· ·		
EOD 2017C (2/2000)				2/1	4/2002 08:16	
EQF 20176 (2/2000)		ELL OWNER: FILE WITH DEED				



Service of the servic

Beeland Group, LLC Disposal Well No. 1 30N, 5W, SI4 1/2 mile Property Owners Antrim County Community Center

Parcel 05-13-013-001-20

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): BIEHL LARRY R Property Address: 11290 WOODSIDE STREET ELMIRA, MI 49730 Mailing Address: 1070 SOUTH RIDGE TRAVERSE CITY, MI 49686

Property Information

Current Taxable Value: \$3,354

Current Assessment: \$4,200 Current Homestead: 0% Current Property Class: 40 - Residential

Last Year's Assessment: \$4,050 Last Year's Homestead: 0% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$25 Village Tax: \$0 Township Tax: \$111

Property Sale Information

Sale Date: 6/19/1995 Sale Amount: \$9,500 Liber and Page: 436-398

Legal Description

PARCEL 201-A..COM AT THE E 1/4 COR OF SEC 13; TH S 163.88 FT; TH N 88 DEG W 3539.36 FT TO POB; TH CONT N 88 DEG W 150.40 FT; TH S 200 FT; TH N 88 DEG E 150.40 FT; TH N 200 FT; TH S 88 DEG E 170 FT TO POB SEC 13 T30N R5W 0.69 A M/L

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Antrim County Community Center

Parcel 05-13-013-001-55

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Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): WESTPHAL CHARLES E & AGNES V Property Address: 11357 WOODSIDE STREET ELMIRA, MI 49730 Mailing Address: 11357 WOODSIDE ST ELMIRA, MI 49730

Property Information

Current Taxable Value: \$36,595

Current Assessment: \$51,250 Current Homestead: 100% Current Property Class: 40 - Residential

Last Year's Assessment: \$48,350 Last Year's Homestead: 100% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$278 Village Tax: \$0 Township Tax: \$579

Legal Description

PARCEL 121 COM AT E 1/4 COR, TH S 163.88 FT, TH N 88 DEG W 2759.1 FT FOR POB, TH N 1406 FT, TH N 88 DEG W 310.22 FT, TH S 1406 FT, TH S 88 DEG E 310.22 FT TO POB SEC 13 T30N R5W 10 A M/L

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Parcel 05-13-013-001-58

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Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): WESTPHAL CHARLES E & AGNES V Property Address: 11345 WOODSIDE STREET ELMIRA, MI 49730 Mailing Address: 11357 WOODSIDE ST ELMIRA, MI 49730

Property Information

Current Taxable Value: \$4,459

Current Assessment: \$12,500 Current Homestead: 100% Current Property Class: 40 - Residential

Last Year's Assessment: \$11,500 Last Year's Homestead: 100% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$34 Village Tax: \$0 Township Tax: \$70

Legal Description

PARCEL 122 COM AT E 1/4 COR, TH S 163.88 FT, TH N 88 DEG W 3069.32 FT FOR POB, TH N 1406 FT, TH N 88 DEG W 310.22 FT, TH S 1406 FT, TH S 88 DEG E 310.22 FT TO POB SEC 13 T30N R5W 10 A M/L

Parcel 05-13-013-001-60

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): MIDDLETON GREEN B & JACQUELINE Property Address: 11311 WOODSIDE STREET ELMIRA, MI 49730 Mailing Address: 11311 WOODSIDE ST ELMIRA, MI 49730

Property Information

Current Taxable Value: \$71,174

Current Assessment: \$72,900 Current Homestead: 100% Current Property Class: 40 - Residential

Last Year's Assessment: \$69,050 Last Year's Homestead: 100% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$540 Village Tax: \$0 Township Tax: \$1,125

Property Sale Information

Sale Date: 6/27/2000 Sale Amount: \$18,000 Liber and Page: 549-1127

Legal Description

PARCEL 123 COM AT E 1/4 COR, TH S 163.88 FT, TH N 88 DEG W 3379.54 FT FOR POB, TH N 1406 FT, TH N 88 DEG W 310.22 FT, TH S 1406 FT, TH S 88 DEG E 310.22 FT TO POB SEC 13 T30N R5W 10 A M/L

Parcel 05-13-013-001-63

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): BARRETT JULIE K & RODNEY A Property Address: 11352 WOODSIDE STREET ELMIRA, MI 49730 Mailing Address: 22503 DOWNING ST CLAIR SHORES, MI 48080

Property Information

Current Taxable Value: \$12,500

Current Assessment: \$12,500 Current Homestead: 0% Current Property Class: 40 - Residential

Last Year's Assessment: \$11,500 Last Year's Homestead: 0% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$58 Village Tax: \$0 Township Tax: \$253

Property Sale Information

Sale Date: 9/24/2005 Sale Amount: \$25,000 Liber and Page: 741-1156

Sale Date: 5/5/2003 Sale Amount: \$10,000 Liber and Page: 664-433

Sale Date: 7/19/2000 Sale Amount: \$10,000 Liber and Page: 615-374

Legal Description

PARCEL 202..COM AT THE E 1/4 COR OF SEC 13; TH S 0 DEG W 163.88 FT ALG E SEC LINE; TH N 88 DEG W 2996.60 FT TO POB; TH S 0 DEG W 1169.49 FT; TH N 88 DEG W 372.78 FT; TH N 0 DEG E 1170.51 FT; TH S 88 DEG E 372.80 FT TO POB SEC 13 T30N R5W 10.01 A M/L

Parcel 05-13-013-001-65

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): WORKMAN JIM F JR Property Address: 11450 WOODSIDE STREET ELMIRA, MI 49730 Mailing Address: 1328 S HOLLY RD FENTON, MI 48430

Property Information

Current Taxable Value: \$9,285

Current Assessment: \$20,000 Current Homestead: 0% Current Property Class: 40 - Residential

Last Year's Assessment: \$18,600 Last Year's Homestead: 0% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$70 Village Tax: \$0 Township Tax: \$308

Property Sale Information

Sale Date: 8/18/1998 Sale Amount: \$10,100 Liber and Page: 496-395

Legal Description PARCEL 203 COM AT E 1/4 COR, TH S 163.88 FT, TH N 88 DEG W 2623.6 FT FOR POB, TH CONT N 88 DEG W 373 FT, TH S 1169.49 FT, TH S 88 DEG E 372.98 FT, TH N 1168.47 FT TO POB SEC 13 T30N R5W 10 A M/L

Parcel 05-13-013-001-68

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): PATTEN DAVID & KIMBERLY A Property Address: 11560 WOODSIDE STREET ELMIRA, MI 49730 Mailing Address: 11535 WILLIAM TAYLOR, MI 48180

Property Information

Current Taxable Value: \$7,736

Current Assessment: \$15,200 Current Homestead: 0% Current Property Class: 40 - Residential

Last Year's Assessment: \$14,050 Last Year's Homestead: 0% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$59 Village Tax: \$0 Township Tax: \$256

Property Sale Information

Sale Date: 9/30/1995 Sale Amount: \$11,000 Liber and Page: 434-791

Legal Description

PARCEL 204; COM AT E 1/4 COR, TH S 163.88 FT, TH N 88 DEG W 2250.1 FT FOR POB, TH CONT N 88 DEG W 393.5 FT, TH S 1168.47 FT, TH S 88 DEG E 373.48 FT, TH N 1167.35 FT TO POB SEC 13 T30N R5W 10 A M/L



Parcel 05-13-013-001-85

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): BIEHL LARRY R Mailing Address: 1070 SOUTH RIDGE TRAVERSE CITY, MI 49686

Property Information

Current Taxable Value: \$4,761

Current Assessment: \$9,400 Current Homestead: 0% Current Property Class: 40 - Residential

Last Year's Assessment: \$8,400 Last Year's Homestead: 0% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$36 Village Tax: \$0 Township Tax: \$158

Legal Description

PARCEL 201-B..COM AT THE E 1/4 COR OF SEC 13; TH S 163.88 FT; TH N 88 DEG W 3369.4 FT FOR POB; TH CONT N 88 DEG W 170 FT; TH S 200 FT; TH N 88 DEG W 150.40 FT; TH S 00 DEG W 971.39 FT; TH S 88 DEG E 320.33 FT; TH N 00 DEG E 1170.51 FT TO POB SEC 13 T30N R5W 7.92 A M/L

Parcel 05-13-013-002-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): GROLEAU LOUIS D Mailing Address: 1822 HAMMOND RD EAST TRAVERSE CITY, MI 49686

Property Information

Current Taxable Value: \$83,600

Current Assessment: \$83,600 Current Homestead: 0% Current Property Class: 40 - Residential

Last Year's Assessment: \$83,600 Last Year's Homestead: 0% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$655 Village Tax: \$0 Township Tax: \$2,862

Property Sale Information

Sale Date: 4/17/2004 Sale Amount: \$1 Liber and Page: 709-1315

Legal Description W 1/2 OF NW 1/4 SEC 13 T30N R5W 80 A.





Parcel 05-13-013-003-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): MARTELL KEITH R & CATHERINE L Mailing Address: 205 ARROWHEAD TRL GAYLORD, MI 49735

Property Information

Current Taxable Value: \$17,682

Current Assessment: \$83,600 Current Homestead: 0% Current Property Class: 40 - Residential

Last Year's Assessment: \$83,600 Last Year's Homestead: 0% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$134 Village Tax: \$0 Township Tax: \$586

Property Sale Information

Sale Date: 4/17/1995 Sale Amount: \$65,000 Liber and Page: 426-158

Legal Description W 1/2 OF SW 1/4 SEC 13 T30N R5W 80 A



Parcel 05-13-013-005-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): AVERY JAMES W - WILHELM JOANNE Mailing Address: P O BOX 1232 GAYLORD, MI 49735

Property Information

Current Taxable Value: \$8,077

Current Assessment: \$38,000 Current Homestead: 100% Current Property Class: 10 - Agricultural

Last Year's Assessment: \$40,000 Last Year's Homestead: 100% Last Year's Property Class: 10 - Agricultural

Property Tax Information

Taxable Year: 2005 Summer Tax: \$61 Village Tax: \$0 Township Tax: \$128

Legal Description SE 1/4 OF SW 1/4 SEC 13 T30N R5W 40 A.

Parcel 05-13-013-006-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): HINTZ LOUIS E & SHARLENE J Property Address: 11405 ALBA HIGHWAY ELMIRA, MI 49730 Mailing Address: 11405 ALBA HWY ELMIRA, MI 49730

Property Information

Current Taxable Value: \$49,345

Current Assessment: \$53,800 Current Homestead: 100% Current Property Class: 40 - Residential

Last Year's Assessment: \$49,000 Last Year's Homestead: 100% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$374 Village Tax: \$0 Township Tax: \$780

Property Sale Information

Sale Date: 9/10/2003 Sale Amount: \$15,000 Liber and Page: 684-35

Sale Date: 8/15/2003 Sale Amount: \$85,000 Liber and Page: 680-1389

Sale Date: 7/30/2002 Sale Amount: \$85,000 Liber and Page: 621-1388

Sale Date: 1/23/2002 Sale Amount: \$0 Liber and Page: 601-1233

Sale Date: 8/21/2001 Sale Amount: \$0 Liber and Page: 587-261





Legal Description

PARCEL A..BEG AT THE S 1/4 COR OF SEC 13; TH N 00 DEG E 420 FT ALG N-S 1/4 LINE; TH S 88 DEG E 300 FT; TH S 00 DEG W 420 FT; TH N 88 DEG W 300 FT ALG S SEC LINE & C/L OF ALBA HWY TO POB; BEING PART OF THE SW 1/4 OF THE SE 1/4 SEC 13 T30N R5W 2.892 A M/L

Parcel 05-13-013-006-50

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): STAPLETON JOHN C & ELAINE L Mailing Address: 70827 ROMEO PLANK RD ARMADA, MI 48005

Property Information

Current Taxable Value: \$14,513

Current Assessment: \$14,750 Current Homestead: 0% Current Property Class: 40 - Residential

Last Year's Assessment: \$14,050 Last Year's Homestead: 0% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$110 Village Tax: \$0 Township Tax: \$481

Property Sale Information

Sale Date: 1/12/2004 Sale Amount: \$32,500 Liber and Page: 699-972

Legal Description

PARCEL F..COM AT THE S 1/4 COR OF SEC 13; TH N 00 DEG E 420 FT ALG N-S 1/4 LINE TO THE POB; TH CONT N 00 DEG E 906.89 FT; TH S 88 DEG E 483.02 FT; TH S 00 DEG W 776.30 FT; TH S 88 DEG E 136.26 FT; TH S 00 DEG W 130 FT; TH N 88 DEG W 685 FT TO THE POB; BEING PART OF THE SW 1/4 OF THE SE 1/4 SEC 13 T30N R5W 11.829 A M/L

Parcel 05-13-014-002-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): MARSHALL ROBIN & JACALYN J Property Address: 2342 PATTERSON ROAD ELMIRA, MI 49730 Mailing Address: 2342 PATTERSON RD ELMIRA, MI 49730

Property Information

Current Taxable Value: \$18,694

Current Assessment: \$43,550 Current Homestead: 100% Current Property Class: 40 - Residential

Last Year's Assessment: \$40,150 Last Year's Homestead: 100% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$142 Village Tax: \$0 Township Tax: \$296

Property Sale Information

Sale Date: 3/24/2004 Sale Amount: \$37,500 Liber and Page: 708-806

Sale Date: 10/5/1998 Sale Amount: \$37,500 Liber and Page: 500-1378

Sale Date: 5/12/1998 Sale Amount: \$132,000 Liber and Page: 488-936

Legal Description COM 330 FT SOUTH OF NE COR OF SE 1/4 OF NE 1/4, TH W 330 FT, TH S 264 FT, TH E 330 FT, TH N TO POB SEC 14 T30N R5W 2 A M/L

Parcel 05-13-014-002-10

Clase This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): ACER PARADISE INC Mailing Address: P O BOX 758 MANCELONA, MI 49659

Property Information

Current Taxable Value: \$15,477

Current Assessment \$40,000 Current Homestead: 0% Current Property Class: 40 - Residential

Last Year's Assessment: \$40,000 Last Year's Homestead: 0% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$117 Village Tax: \$0 Township Tax: \$513

Property Sale Information

Sale Date: 5/12/1998 Sale Amount: \$132,000 Liber and Page: 488-936

Legal Description

SE 1/4 OF NE 1/4 EXC COM 330 FT S OF NE COR FOR POB, TH W 330 FT, TH S 264 FT, TH E 330 FT, TH N TO POB SEC 14 T30N R5W 38 A M/L



Parcel 05-13-014-003-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): CHIPPA MICHAEL A & JANICE K Mailing Address: 10303 ALBA HWY ELMIRA, MI 49730

Property Information

Current Taxable Value: \$8,530

Current Assessment: \$38,000 Current Homestead: 100% Current Property Class: 10 - Agricultural

Last Year's Assessment: \$40,000 Last Year's Homestead: 100% Last Year's Property Class: 10 - Agricultural

Property Tax Information

Taxable Year: 2005 Summer Tax: \$65 Village Tax: \$0 Township Tax: \$135

Legal Description SW 1/4 OF NE 1/4 SEC 14 T30N R5W 40 A.



Parcel 05-13-014-006-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): CROFT LLC Mailing Address: 121 E FRONT ST STE 200 TRAVERSE CITY, MI 49684

Property Information

Current Taxable Value: \$17,508

Current Assessment: \$76,000 Current Homestead: 0% Current Property Class: 40 - Residential

Last Year's Assessment: \$76,000 Last Year's Homestead: 0% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$133 Village Tax: \$0 Township Tax: \$580

Property Sale Information

Sale Date: 12/31/2004 Sale Amount: \$0 Liber and Page: 728-2462

Legal Description S 1/2 OF NW 1/4 SEC 14 T30N R5W 80 A M/L



Parcel 05-13-014-007-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): CHIPPA MICHAEL A & JANICE K Property Address: 10303 ALBA HIGHWAY ELMIRA, MI 49730 Mailing Address: 10303 ALBA HWY ELMIRA, MI 49730

Property Information

Current Taxable Value: \$47,064

Current Assessment: \$115,300 Current Homestead: 100% Current Property Class: 10 - Agricultural

Last Year's Assessment: \$113,350 Last Year's Homestead: 100% Last Year's Property Class: 10 - Agricultural

Property Tax Information

Taxable Year: 2005 Summer Tax: \$357 Village Tax: \$0 Township Tax: \$744

Legal Description E 1/2 OF SW 1/4 SEC 14 T30N R5W 80 A.

Parcel 05-13-014-008-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): POMEROY PENNY Property Address: 10085 ALBA HIGHWAY ELMIRA, MI 49730 Mailing Address: 10085 ALBA HWY ELMIRA, MI 49730

Property Information

Current Taxable Value: \$36,646

Current Assessment: \$39,600 Current Homestead: 100% Current Property Class: 40 - Residential

Last Year's Assessment: \$36,300 Last Year's Homestead: 100% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$278 Village Tax: \$0 Township Tax: \$579

Property Sale Information

Sale Date: 6/16/2003 Sale Amount: \$0 Liber and Page: 669-320

Sale Date: 1/29/2002 Sale Amount: \$67,900 Liber and Page: 603-905

Legal Description

COM AT THE SW COR OF THE W 1/2 OF THE SW 1/4 OF SEC 14; TH E 355 FT ALG S SEC LINE TO POB; TH N 350 FT; THE E 270 FT; TH S 350 FT; TH W 270 FT TO THE POB; BEING PART OF THE SW 1/4 OF THE SW 1/4 SEC 14 T30N R5W



Parcel 05-13-014-008-05

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): SLOAN DONNA J Property Address: 2977 PRIMROSE ROAD ELMIRA, MI 49730 Mailing Address: 2977 PRIMROSE RD ELMIRA, MI 49730

Property Information

Current Taxable Value: \$36,614

Current Assessment: \$41,650 Current Homestead: 100% Current Property Class: 40 - Residential

Last Year's Assessment: \$37,100 Last Year's Homestead: 100% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$278 Village Tax: \$0 Township Tax: \$579

Property Sale Information

Sale Date: 8/28/2002 Sale Amount: \$11,000 Liber and Page: 625-645

Legal Description

BEG AT THE SW COR OF THE W 1/2 OF THE SW 1/4 OF SEC 14; TH N 350 FT; TH E 355 FT; TH S 350 FT; TH W 355 FT TO POB; BEING PART OF THE SW 1/4 OF THE SW 1/4 SEC 14 T30N R5W 2.8 A M/L





Parcel 05-13-014-008-10

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): CROFT LLC Mailing Address: 121 E FRONT ST STE 200 TRAVERSE CITY, MI 49684

Property Information

Current Taxable Value: \$13,331

Current Assessment: \$60,800 Current Homestead: 0% Current Property Class: 40 - Residential

Last Year's Assessment: \$60,800 Last Year's Homestead: 0% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$101 Village Tax: \$0 Township Tax: \$442

Property Sale Information

Sale Date: 12/31/2004 Sale Amount: \$0 Liber and Page: 728-2462

Legal Description

THE W 1/2 OF THE SW 1/4 OF SEC 14, EXC COM AT THE SW COR OF W 1/2 OF SW 1/4 DESC AS COM AT THE SW COR OF SEC, TH N 350 FT, TH E 625 FT, TH S 350 FT, TH W 625 FT TO POB, ALSO EXC COM AT THE NW COR OF THE W 1/2 OF SW 1/4 SEC 14, TH E 860 FT, TH S PARA TO THE W LINE 540 FT, TH W 860 FT TO W SEC LINE, TH N TO POB, BEING PART OF THE W 1/2 OF THE SW 1/4 SEC 14, T30N, R5W 64.32 A M/L

Parcel 05-13-014-008-20

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): GATES DALE E Property Address: 2525 PRIMROSE ROAD ELMIRA, MI 49730 Mailing Address: 2525 PRIMROSE RD ELMIRA, MI 49730

Property Information

Current Taxable Value: \$44,530

Current Assessment: \$65,600 Current Homestead: 100% Current Property Class: 40 - Residential

Last Year's Assessment: \$62,050 Last Year's Homestead: 100% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$338 Village Tax: \$0 Township Tax: \$704

Legal Description

COM AT THE NW COR OF THE W 1/2 OF THE SW 1/4 OF SEC 14 TH E 860 FT, TH S 540 FT, TH W 860 FT TO W LINE OF SEC, TH N 540 FT TO POB, BEING PART OF THE W 1/2 OF THE SW 1/4 SEC 14 T30N R5W 10.68 A M/L



Parcel 05-13-014-009-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): O'CONNELL RHONDA L DARRAH CHERYL - MASSEY ROBERT Property Address: 10577 ALBA HIGHWAY ELMIRA, MI 49730 Mailing Address: P O BOX 1 ALBA, MI 49611

Property Information

Current Taxable Value: \$165,800

Current Assessment: \$165,800 Current Homestead: 100% Current Property Class: 40 - Residential

Last Year's Assessment: \$170,550 Last Year's Homestead: 100% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$1,272 Village Tax: \$0 Township Tax: \$2,650

Property Sale Information

Sale Date: 7/26/2006 Sale Amount: \$0 Liber and Page: 755-2327

Sale Date: 2/4/2002 Sale Amount: \$0 Liber and Page: 603-535

Legal Description SE 1/4 SEC 14 T30N R5W 160 A M/L



Parcel 05-13-023-001-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): VOELKER OREITHA M LIVING TRUST Property Address: 10814 ALBA HIGHWAY ELMIRA, MI 49730 Mailing Address: 105 BOUGHEY ST TRAVERSE CITY, MI 49684

Property Information

Current Taxable Value: \$18,688

Current Assessment: \$81,650 Current Homestead: 0% Current Property Class: 40 - Residential

Last Year's Assessment: \$84,400 Last Year's Homestead: 0% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$142 Village Tax: \$0 Township Tax: \$619

Legal Description N 1/2 OF NE 1/4 SEC 23 T30N R5W 80 A

Parcel 05-13-023-002-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): MARTIN TIMOTHY G Property Address: 3384 PATTERSON ROAD ELMIRA, MI 49730 Mailing Address: 3384 PATTERSON RD ELMIRA, MI 49730

Property Information

Current Taxable Value: \$41,650

Current Assessment: \$41,650 Current Homestead: 100% Current Property Class: 40 - Residential

Last Year's Assessment: \$39,000 Last Year's Homestead: 100% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$211 Village Tax: \$0 Township Tax: \$439

Property Sale Information

Sale Date: 9/7/2005 Sale Amount: \$90,000 Liber and Page: 740-56

Legal Description

PARCEL 9, COM AT THE E 1/4 COR OF SEC 23, TH S 88 DEG W ALG THE EW 1/4 LINE 1226 FT, TH N 0 DEG E 310.80 FT, TH N 88 DEG E 1225.86 FT TO THE E LINE OF SEC 23, TH S 0 DEG W ALG SD E LINE 310.80 FT TO THE POB SEC 23 T30N R5W 8.75 A M/L



Parcel 05-13-023-002-10

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): HOSTMAN DAVID J & ELIZABETH A Property Address: 3298 PATTERSON ROAD ELMIRA, MI 49730 Mailing Address: P O BOX 158 ELMIRA, MI 49730

Property Information

Current Taxable Value: \$7,736

Current Assessment: \$15,000 Current Homestead: 100% Current Property Class: 40 - Residential

Last Year's Assessment: \$12,100 Last Year's Homestead: 100% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$59 Village Tax: \$0 Township Tax: \$122

Property Sale Information

Sale Date: 12/5/1997 Sale Amount: \$21,000 Liber and Page: 476-784

Sale Date: 5/6/1996 Sale Amount: \$0 Liber and Page: 459-1222

Legal Description

PARCEL 7..COM AT THE E 1/4 COR OF SEC 23, TH N 0 DEG E ALG THE E LINE OF SEC 23 1000.8 FT TO THE POB, TH S 88 DEG W 569.85 FT, TH N 1 DEG E 333.3 FT, TH N88 DEG E 569.6 FT TO THE E LINE OF SEC, TH S 0 DEG W ALG THE SD E LINE 333.6 FT TO THE POB SEC 23 T30N R5W 4.36 A M/L

Parcel 05-13-023-002-20

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): HOSTMAN DAVID J & ELIZABETH A Property Address: 3352 PATTERSON ROAD ELMIRA, MI 49730 Mailing Address: P O BOX 158 ELMIRA, MI 49730

Property Information

Current Taxable Value: \$15,001

Current Assessment: \$22,900 Current Homestead: 100% Current Property Class: 40 - Residential

Last Year's Assessment: \$19,550 Last Year's Homestead: 100% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$114 Village Tax: \$0 Township Tax: \$237

Property Sale Information

Sale Date: 12/5/1997 Sale Amount: \$21,000 Liber and Page: 476-784

Legal Description

PARCEL 6 COM AT E 1/4 CORNER, TH N 0 DEG E ALG EAST SEC LINE 667.2 FT TO POB, TH S 88 DEG W 570.63 FT, TH N 1 DEG E 333.3 FT, TH N 88 DEG E 569.85 FT TO E LINE OF SEC, TH S ALG E SEC LINE 333.6 FT TO POB SEC 23 T30N R5W 4.37 A M/L



Parcel 05-13-023-002-25

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): WARREN MICHAEL J & ROBIN R Property Address: 3376 PATTERSON ROAD ELMIRA, MI 49730 Mailing Address: 3376 PATTERSON RD ELMIRA, MI 49730

Property Information

Current Taxable Value: \$9,875

Current Assessment: \$18,050 Current Homestead: 100% Current Property Class: 40 - Residential

Last Year's Assessment: \$35,900 Last Year's Homestead: 100% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$186 Village Tax: \$0 Township Tax: \$387

Property Sale Information

Sale Date: 2/28/1995 Sale Amount: \$0 Liber and Page: 424-665

Legal Description

PARCEL 5-1..COM AT THE E 1/4 COR OF SEC 23; TH N 00 DEG E 310.80 FT ALG E SEC LINE TO POB; TH S 88 DEG W 1225.88 FT; TH N 01 DEG E 355.21 FT; TH N 88 DEG E 1025.03 FT; TH S 00 DEG W 150 FT; TH N 88 DEG E 200 FT TO E SEC LINE; TH S 00 DEG W 206.40 FT TO POB; BEING PART OF THE NE 1/4 SEC 23 T30N R5W 9.31 A M/L



Parcel 05-13-023-002-30

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): BRADLEY ANTHONY W Property Address: 3322 PATTERSON ROAD ELMIRA, MI 49730 Mailing Address: 3322 PATTERSON RD ELMIRA, MI 49730

Property Information

Current Taxable Value: \$24,159

Current Assessment: \$33,400 Current Homestead: 0% Current Property Class: 40 - Residential

Last Year's Assessment: \$31,850 Last Year's Homestead: 0% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$183 Village Tax: \$0 Township Tax: \$801

Legal Description

PARCEL 11 COM AT THE E 1/4 COR OF SEC, TH S 88 DEG W ALG E-W 1/4 LINE 1226.6 FT, TH N 01 DEG E 666.01 FT TO POB, TH S 88 DEG W 655 FT, TH N 01 DEG E 665.42 FT, TH N 88 DEG E 655 FT, TH S 01 DEG W 666.01 FT TO THE POB SEC 23 T30N R5W 10.01 A M/L

Parcel 05-13-023-002-40

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): HOSTMAN DAVID J & ELIZABETH A Mailing Address: P O BOX 158 ELMIRA, MI 49730

Property Information

Current Taxable Value: \$5,057

Current Assessment: \$11,000 Current Homestead: 0% Current Property Class: 40 - Residential

Last Year's Assessment: \$10,500 Last Year's Homestead: 0% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$38 Village Tax: \$0 Township Tax: \$168

Property Sale Information

Sale Date: 10/27/2004 Sale Amount: \$8,500 Liber and Page: 725-1971

Sale Date: 9/24/1998 Sale Amount: \$8,500 Liber and Page: 499-860

Legal Description

PARCEL 8 COM AT THE E 1/4 COR OF SEC 23, TH N 0 DEG E ALG E SEC LINE 667.2 FT, TH S 88 DEG W 570.63 FT TO THE POB, TH CONT S 88 DEG W 654.4 FT, TH N 01 DEG E 666.01 FT, TH N 88 DEG E 654.4 FT, TH S 01 DEG W 666.6 FT TO THE POB SEC 23 T30N R5W 10.01 A M/L

Parcel 05-13-023-002-50

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): KASSUBA EVELYN M Mailing Address: 520 N TOWNLINE RD GAYLORD, MI 49735

Property Information

Current Taxable Value: \$2,489

Current Assessment: \$11,000 Current Homestead: 0% Current Property Class: 40 - Residential

Last Year's Assessment: \$10,500 Last Year's Homestead: 0%

Last Year's Property Class: 40 - Residential

Property Tax Information

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Taxable Year: 2005 Summer Tax: \$19 Village Tax: \$0 Township Tax: \$82

Legal Description

PARCEL 10 COM AT THE E 1/4 COR OF SEC 23, TH S 88 DEG W ALG EW 1/4 LINE 1226.6 FT TO THE POB, TH CONT S 88 DEG W ALG EW 1/4 LINE 655 FT, TH N 01 DEG E 665.4 FT, TH N 88 DEG E 655 FT, TH S 01 DEG W 666.01 FT TO THE EW 1/4 LINE AND POB SEC 23 T30N R5W 10.01 A M/L

Parcel 05-13-023-002-60

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): LAMOREAUX DAWN Mailing Address: 1906 SPRUCE ST WEST POINT, GA 31833

Property Information

Current Taxable Value: \$5,057

Current Assessment: \$11,000 Current Homestead: 0% Current Property Class: 40 - Residential

Last Year's Assessment: \$10,500 Last Year's Homestead: 0% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$38 Village Tax: \$0 Township Tax: \$168

Property Sale Information

Sale Date: 5/15/2002 Sale Amount: \$7,500 Liber and Page: 618-476

Sale Date: 9/4/1998 Sale Amount: \$7,500 Liber and Page: 502-563

Sale Date: 9/16/1998 Sale Amount: \$0 Liber and Page: 502-562

Legal Description

PARCEL 13 COM AT THE E 1/4 COR OF SEC 23, TH S 88 DEG W ALG EW 1/4 LINE 1881.6 FT TO THE POB, TH CONT S 88 DEG W ALG SD EW 1/4 LINE 655.6 FT TO THE CENTER 1/4 COR OF SD SEC, TH N 01 DEG E ALG THE NS 1/4 LINE 664.83 FT, TH N 88 DEG E 655.6 FT, TH S 01 DEG W 665.42 FT TO THE EW 1/4 LINE AND THE POB, BEING PART OF THE SW 1/4 OF THE NE 1/4 SEC 23 T30N R5W 10.01 A M/L

Parcel 05-13-023-002-70

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): KASSUBA EVELYN M Mailing Address: 520 N TOWNLINE RD GAYLORD, MI 49735

Property Information

Current Taxable Value: \$2,489

Current Assessment: \$11,000 Current Homestead: 0% Current Property Class: 40 - Residential

Last Year's Assessment: \$10,500 Last Year's Homestead: 0% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$19 Village Tax: \$0 Township Tax: \$82

Legal Description

PARCEL 12 COM AT THE E 1/4 COR OF SEC 23, TH S 88 DEG W ALG THE E-W 1/4 LINE OF SD SEC 655.6 FT TO THE N-S 1/4 LINE OF SEC, TH N 01 DEG E ALG N-S 1/4 LINE 664.83 FT, TH N 88 DEG E 655.6 FT, TH S 01 DEG W 665.23 FT TO THE POB SEC 23 T30N R5W 10.01 A M/L

Parcel 05-13-023-003-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): CROFT LLC Property Address: 10426 ALBA HIGHWAY ELMIRA, MI 49730 Mailing Address: 121 E FRONT ST STE 200 TRAVERSE CITY, MI 49684

Property Information

Current Taxable Value: \$22,244

Current Assessment: \$118,100 Current Homestead: 0% Current Property Class: 30 - Industrial

Last Year's Assessment: \$124,300 Last Year's Homestead: 0% Last Year's Property Class: 30 - Industrial

Property Tax Information

Taxable Year: 2005 Summer Tax: \$169 Village Tax: \$0 Township Tax: \$737

Property Sale Information

Sale Date: 12/31/2004 Sale Amount: \$0 Liber and Page: 0-0

Legal Description

THE N 3/4 OF E 1/2 OF W 1/2 EXC COM AT THE N 1/4 POST OF SEC 23, TH S 87 DEG W 828.6 FT FOR POB, TH S 87 DEG W 436.28 FT, TH S 1 DEG W ON THE W 1/8 LINE OF SD SEC 500 FT, TH N 87 DEG E 436.28 FT, TH N 1 DEG E 500 FT TO THE POB, BEING PART OF THE NE 1/4 OF THE NW 1/4 EXC COM AT N 1/4 COR OF SEC 23, TH S 87 DEG W ALG N LINE 50.05 FT TO NE COR FOR POB, TH S 0 DEG W 295.17 FT, TH S 87 DEG W 295.17 FT, TH N 0 DEG E 295.17 FT TO A PT ON N LINE OF SD SEC 23, TH N 87 DEG LINE 295.17 FT TO POB...... SEC 23 T30N R5W.....113 A M/L





Parcel 05-13-023-003-10

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): CHIPPA MICHAEL A & REBECCA M Property Address: 10266 ALBA HIGHWAY ELMIRA, MI 49730 Mailing Address: 10266 ALBA HWY ELMIRA, MI 49730

Property Information

Current Taxable Value: \$30,835

Current Assessment: \$34,300 Current Homestead: 100% Current Property Class: 10 - Agricultural

Last Year's Assessment: \$29,850 Last Year's Homestead: 100% Last Year's Property Class: 10 - Agricultural

Property Tax Information

Taxable Year: 2005 Summer Tax: \$234 Village Tax: \$0 Township Tax: \$487

Property Sale Information

Sale Date: 7/18/1997 Sale Amount: \$7,000 Liber and Page: 466-1402

Sale Date: 2/23/1996 Sale Amount: \$21,000 Liber and Page: 441-1164

Legal Description

COM AT THE N 1/4 POST OF SEC 23, TH S 87 DEG W ON SEC LINE 828.6 FT FOR POB, TH S 87 DEG W 436.28 FT, TH S 1 DEG W ON THE W 1/8TH LINE OF SD SEC 500 FT, TH N 87 DEG E 436.28 FT, TH N 1 DEG E 500 FT TO POB, BEING PART OF THE NE 1/4 OF THE NW 1/4 SEC 23 T30N SEC 23 T30N R5W 5 A M/L

Parcel 05-13-023-003-20

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): THURSTON TODD M & DEANNA L Property Address: 10464 ALBA HIGHWAY ELMIRA, MI 49730 Mailing Address: 615 W SHELDON ST GAYLORD, MI 49735

Property Information

Current Taxable Value: \$16,400

Current Assessment: \$16,400 Current Homestead: 100% Current Property Class: 40 - Residential

Last Year's Assessment: \$13,600 Last Year's Homestead: 100% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$70 Village Tax: \$0 Township Tax: \$146

Property Sale Information

Sale Date: 12/27/2005 Sale Amount: \$35,450 Liber and Page: 745-313

Sale Date: 12/17/2001 Sale Amount: \$0 Liber and Page: 597-835

Sale Date: 3/16/2000 Sale Amount: \$15,000 Liber and Page: 543-85

Legal Description

COM AT N 1/4 COR OF SEC 23, TH S 87 DEG W ALG N LINE OF SD SEC 50.05 FT FOR POB, TH S 0 DEG W 295.17 FT, TH S 87 DEG W 295.17 FT TH N 0 DEG E 295.17 FT TO A PT ON N SEC LINE, TH N 87 DEG E ALG N SEC LINE 295.17 FT TO POB, BEING PART OF NE 1/4 OF NW 1/4..... SEC 23 T30N R5W.....2 A M/L

Parcel 05-13-023-004-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): CROFT LLC Mailing Address: 121 E FRONT ST STE 200 TRAVERSE CITY, MI 49684

Property Information

Current Taxable Value: \$1,592

Current Assessment: \$31,350 Current Homestead: 0% Current Property Class: 40 - Residential

Last Year's Assessment: \$41,250 Last Year's Homestead: 0% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$12 Village Tax: \$0 Township Tax: \$53

Property Sale Information

Sale Date: 12/31/2004 Sale Amount: \$0 Liber and Page: 728-2464

Sale Date: 12/20/1996 Sale Amount: \$0 Liber and Page: 457-1386

Legal Description

SW 1/4 OF THE NW 1/4; EXC THE N 1/2 OF THE N 1/2 OF THE SW 1/4 OF THE NW 1/4 SEC 23 T30N R5W 30 A M/L


Parcel 05-13-023-004-10

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): RAY JAMES L Property Address: 9972 ALBA HIGHWAY ELMIRA, MI 49730 Mailing Address: 9972 ALBA HWY ELMIRA, MI 49730

Property Information

Current Taxable Value: \$59,061

Current Assessment: \$71,700 Current Homestead: 74% Current Property Class: 40 - Residential

Last Year's Assessment: \$69,100 Last Year's Homestead: 74% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$448 Village Tax: \$0 Township Tax: \$1,200

Property Sale Information

Sale Date: 8/17/2000 Sale Amount: \$54,293 Liber and Page: 553-16

Sale Date: 6/18/1999 Sale Amount: \$47,000 Liber and Page: 553-15

Sale Date: 1/14/1997 Sale Amount: (\$100) Liber and Page: 460-1328

Legal Description

COM AT THE NW COR OF SEC 23; TH S 200 FT ALG W SEC LINE TO THE POB; TH S 1120 FT; TH E 660 FT; TH N 1120 FT; TH W 660 FT TO THE POB; BEING PT OF THE NW 1/4 OF THE NW 1/4 SEC 23 T30N R5W 17 A M/L



Parcel 05-13-023-004-15

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): CROFT LLC Mailing Address: 121 E FRONT ST STE 200 TRAVERSE CITY, MI 49684

Property Information

Current Taxable Value: \$5,653

Current Assessment: \$24,050 Current Homestead: 0% Current Property Class: 40 - Residential

Last Year's Assessment: \$24,050 Last Year's Homestead: 0% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$43 Village Tax: \$0 Township Tax: \$187

Property Sale Information

Sale Date: 12/31/2004 Sale Amount: \$0 Liber and Page: 728-2464

Legal Description

BEG AT THE NW COR OF THE NW 1/4 OF THE NW 1/4; TH E 1320 FT; TH S 1320 FT; TH W 660 FT; TH N 1120 FT; TH W 660 FT TO W SEC LINE; TH N 200 FT ALG SD LINE TO THE POB; BEING PT OF THE NW 1/4 OF THE NW 1/4 SEC 23 T30N R5W 23 A M/L

Parcel 05-13-023-004-20

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): CROFT LLC Mailing Address: 121 E FRONT ST STE 200 TRAVERSE CITY, MI 49684

Property Information

Current Taxable Value: \$7,417

Current Assessment: \$13,750 Current Homestead: 0% Current Property Class: 40 - Residential

Last Year's Assessment: \$12,650 Last Year's Homestead: 0% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$56 Village Tax: \$0 Township Tax: \$246

Property Sale Information

Sale Date: 12/31/2004 Sale Amount: \$0 Liber and Page: 0-0

Sale Date: 12/9/1999 Sale Amount: \$15,000 Liber and Page: 535-714

Sale Date: 12/9/1997 Sale Amount: (\$100) Liber and Page: 460-1327

Legal Description THE N 1/2 OF THE SW 1/4 OF THE NW 1/4 SEC 23 T30N R5W 10 A M/L





Parcel 05-13-024-002-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): TAYLOR ROBERT W FAMILY TRUST Mailing Address: P O BOX 120401 ARLINGTON, TX 76012

Property Information

Current Taxable Value: \$30,749

Current Assessment: \$114,950 Current Homestead: 0% Current Property Class: 40 - Residential

Last Year's Assessment: \$114,950 Last Year's Homestead: 0% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$233 Village Tax: \$0 Township Tax: \$1,019

Property Sale Information

Sale Date: 2/3/2003 Sale Amount: \$0 Liber and Page: 651-931

Legal Description W 1/2 OF NE 1/4; ALSO NE 1/4 OF NE 1/4; EXC E 10 ACRES SEC 24 T30N R5W 110 A M/L



Parcel 05-13-024-006-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): VOELKER OREITHA M LIVING TRUST Mailing Address: 105 BOUGHEY ST TRAVERSE CITY, MI 49684

Property Information

Current Taxable Value: \$10,631

Current Assessment: \$37,700 Current Homestead: 0% Current Property Class: 40 - Residential

Last Year's Assessment: \$42,650 Last Year's Homestead: 0% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$81 Village Tax: \$0 Township Tax: \$352

Legal Description

NW 1/4 OF NW 1/4 EXC THE W 1/2 OF NW 1/4 OF NW 1/4 OF NW 1/4 SEC 24 T30N R5W 35 A M/L

Parcel 05-13-024-006-10

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): HUNLEY ROBERT & ANNETTE Property Address: 3121 PATTERSON ROAD ELMIRA, MI 49730 Mailing Address: 3121 PATTERSON RD ELMIRA, MI 49730

Property Information

Current Taxable Value: \$34,344

Current Assessment: \$47,600 Current Homestead: 100% Current Property Class: 40 - Residential

Last Year's Assessment: \$42,400 Last Year's Homestead: 100% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$261 Village Tax: \$0 Township Tax: \$543

Property Sale Information

Sale Date: 9/24/2003 Sale Amount: \$85,000 Liber and Page: 686-686

Sale Date: 9/24/2003 Sale Amount: \$87,500 Liber and Page: 686-687

Sale Date: 9/19/2001 Sale Amount: \$85,000 Liber and Page: 679-1303

Sale Date: 9/5/2001 Sale Amount: \$0 Liber and Page: 591-445

Sale Date: 9/5/2001 Sale Amount: \$0 Liber and Page: 591-446



Sale Date: 6/9/2000 Sale Amount: \$10,900 Liber and Page: 548-156

Sale Date: 7/1/1999 Sale Amount: \$0 Liber and Page: 521-892

Sale Date: 6/23/1998 Sale Amount: \$5,700 Liber and Page: 498-1355

Legal Description

THE W 1/2 OF THE NW 1/4 OF THE NW 1/4 OF THE NW 1/4; EXC THE N 250 FT OF THE W 174.24 FT OF THE W 1/2 OF NW 1/4 OF NW 1/4 OF THE NW 1/4 SEC 24 T30N R5W 4 A M/L

Parcel 05-13-024-006-15

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): MILBOCKER TERRANCE AA MATHEY CARRIE A Property Address: 11030 ALBA HIGHWAY ELMIRA, MI 49730 Mailing Address: 11030 ALBA HWY ELMIRA, MI 49730

Property Information

Current Taxable Value: \$25,297

Current Assessment: \$53,050 Current Homestead: 100% Current Property Class: 40 - Residential

Last Year's Assessment: \$50,650 Last Year's Homestead: 100% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$192 Village Tax: \$0 Township Tax: \$400

Legal Description THE N 250 FT OF THE W 174.24 FT OF THE W 1/2 OF THE NW 1/4 OF NW 1/4 OF NW 1/4 SEC 24 T30N R5W

Parcel 05-13-024-007-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): AVERY JAMES W - WILHELM JOANNE WILD WINGS GAME FARM Property Address: 11378 ALBA HIGHWAY ELMIRA, MI 49730 Mailing Address: P O BOX 1232 GAYLORD, MI 49735

Property Information

Current Taxable Value: \$55,402

Current Assessment: \$117,500 Current Homestead: 100% Current Property Class: 10 - Agricultural

Last Year's Assessment: \$114,900 Last Year's Homestead: 100% Last Year's Property Class: 10 - Agricultural

Property Tax Information

Taxable Year: 2005 Summer Tax: \$420 Village Tax: \$0 Township Tax: \$876

Legal Description E 1/2 OF NW 1/4 SEC 24 T30N R5W.

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): BRITTON HARVEY & KIMBERLY Mailing Address: 3455 PATTERSON RD ELMIRA, MI 49730

Property Information

Current Taxable Value: \$7,187

Current Assessment: \$8,600 Current Homestead: 0% Current Property Class: 40 - Residential

Last Year's Assessment: \$7,600 Last Year's Homestead: 0% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxabie Year: 2005 Summer Tax: \$55 Village Tax: \$0 Township Tax: \$238

Property Sale Information

Sale Date: 10/31/2002 Sale Amount: \$22,000 Liber and Page: 634-77

Legal Description

COM AT THE W 1/4 COR OF SEC 24, TH N 0 DEG E ALG THE W LINE OF SD SEC 1069.8 FT TO THE POB, TH CONT N ALG W LINE OF SD SEC 264.5 FT, TH S 88 DEG E 1225.46 FT, TH S 262.6 FT, TH N 88 DEG W 1224.92 FT TO THE W LINE AND THE POB, BEING PART OF THE SW 1/4 OF NW 1/4 PARCEL 1....SEC 24 T30N R5W.....7.4 A M/L

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): BRITTON HARVEY & KIMBERLY Property Address: 3351 PATTERSON ROAD ELMIRA, MI 49730 Mailing Address: 3455 PATTERSON RD ELMIRA, MI 49730

Property Information

Current Taxable Value: \$25,562

Current Assessment: \$28,750 Current Homestead: 0% Current Property Class: 40 - Residential

Last Year's Assessment: \$22,450 Last Year's Homestead: 0% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$160 Village Tax: \$0 Township Tax: \$700

Property Sale Information

Sale Date: 10/31/2002 Sale Amount: \$30,000 Liber and Page: 634-767

Legal Description

COM AT THE W 1/4 COR OF SEC 24, TH N 0 DEG E ALG THE W LINE OF SD SEC 713.2 FT TO THE POB, TH CONT N 0 DEG E ALG THE W LINE OF SD SEC 356.6 FT, TH S 88 DEG E 1224.92 FT, TH S 0 DEG W 356.6 FT, TH N 88 DEG W 1224.2 FT TO THE W LINE AND POB, BEING PART OF THE SW 1/4 OF NW 1/4 PARCEL 2.....SEC 24 T30N R5W 10.01 A M/L



Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): HUFFMAN TERRY L - WOOLLEY LISA Property Address: 3393 PATTERSON ROAD ELMIRA, MI 49730 Mailing Address: 4001 W SILVERSPRING BLVD OCALA, FL 34482

Property Information

Current Taxable Value: \$10,776

Current Assessment: \$19,100 Current Homestead: 100% Current Property Class: 40 - Residential

Last Year's Assessment: \$17,900 Last Year's Homestead: 100% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$82 Village Tax: \$0 Township Tax: \$170

Property Sale Information

Sale Date: 2/23/2001 Sale Amount: \$174 Liber and Page: 568-803

Sale Date: 1/29/2001 Sale Amount: \$0 Liber and Page: 564-733

Legal Description

PARCEL 3 COM AT THE W 1/4 COR OF SEC 24, TH N 0 DEG E ALG W LINE OF SEC 356.6 FT TO THE POB, TH CONT N 0 DEG E 356.6 FT, TH S 88 DEG E 1224.2 FT, TH S 0 DEG W 356.6 FT, TH N 88 DEG W 1223.5 FT TO THE W LINE OF SEC AND THE POB, SEC 24 T30N R5W 10.01 A M/L

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp Owner Name(s): BRITTON HARVEY & KIMBERLY Property Address: 3455 PATTERSON ROAD ELMIRA, MI 49730 Mailing Address: 3455 PATTERSON RD ELMIRA, MI 49730

Property Information

Current Taxable Value: \$55,776

Current Assessment: \$58,600 Current Homestead: 100% Current Property Class: 40 - Residential

Last Year's Assessment: \$54,700 Last Year's Homestead: 100% Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005 Summer Tax: \$423 Village Tax: \$0 Township Tax: \$882

Property Sale Information

Sale Date: 9/18/1998 Sale Amount: \$10,000 Liber and Page: 499-205

Legal Description

PARCEL 4 COM AT THE W 1/4 COR OF SD SEC 24, TH N 0 DEG E ALG THE W LINE OF SD SEC 24 356.6 FT, TH S 88 DEG E 1223.5 FT, TH S 0 DEG W 356.6 FT TO THE EW 1/4 LINE OF SD SEC, TH N 88 DEG W ALG SD EW 1/4 LINE 1222.79 FT TO THE W LINE OF SEC AND THE POB, BEING PART OF THE SW 1/4 OF NW 1/4 SEC 24 T30N R5W 10.01 A M/L





TAX NO:	WATER Completion is require	WELL A	ND PUM	P RECORD PERMIT NO: art 127 Act 368 PA 1978	<u>_</u>
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Street Address & City of Well Local	on	-		Address Same as Well Location 😥 Yes 📮	No
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INDIANAPOLIS . MISHAWAKA . LANSING

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EX PERMANENT		Job 1	lo	2636
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Clay & gravel	57	61	4	
Clay very little gravel	61	69	8	
Clay & gravel	69	81	2	
Gravel & some clay	81	86	5	
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Coarse gravel very little clay	103	105	2	
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MICHIG	N DEPART	MENT O	E PUBLIC HEALTH
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USE A 2ND SHEET IF NEEDED 15. Remarks, elevation, source of data, etc.		16. WATER	Model number Capacity Gallon
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17. Rig Operator's Namo: Jack		Address .	REGISTERED BUSINESS NAME REGISTRATION NO.
De7d 2/89	<u> </u>	Signed	AUTHORIZED REPRESENTATIVE Date 3-15-95
	GEOLOGICA	// survey را	Authority: Act 368 PA 1978 Completion: Required Penalty: Conviction of a violatic of adap provision is a

2.D MAPS AND CROSS SECTIONS OF USDWs

Submit maps and cross sections indicating the vertical limits of all underground sources of drinking water 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 activities.

RESPONSE

The location of the lowest potential USDW is considered to be the base of the Glacial Drift at a depth that is estimate to be approximately 850 to 900 feet BGL. The lower portions of the Glacial Drift in the area have not been explored for water quality because of plentiful fresh water supplies are present in the upper 200 feet of the section. Locally, water wells completed at depths of less than 200 feet can produce at sufficient rates. Records of typical water wells are attached at the end of Response 2.D for wells within one mile of the proposed Beeland well that are representative of water wells in the area. In order to provide conservative projections, the entire Glacial Drift is considered here to be a USDW. Below the Glacial Drift lies more than 300 feet of section that is dominated by low permeability units including a variety of shale layers. Below this sequence is the Añtrim Shale, which based on significant gas production activities in the area, has been shown to contain hydrocarbon accumulations and brines with total dissolved solids contents in the range of 100,000 mg/liter.

Potential USDWs are defined for the purpose of regulatory protection as aquifers that can yield producible quantities of water that have total dissolved solids (TDS) concentrations of less than 10,000 mg/l or ppm (parts per million). Within the two-mile radius AOR, the Coldwater, Sunbury, Bedford and Ellsworth Shales are the first "bedrock" units encountered. These units are considered aquitards, not aquifers. The Marshall and the Saginaw Aquifers are not present in the vicinity. This is consistent with Figures D-1, and D-2 from USGS publications that provide data regarding potential USDWs.

Below the Antrim, the Traverse Group, and the Bell Shale are present before the Dundee Limestone is encountered. Below the Dundee, the Detroit River and Salina Groups are encountered, containing saline bines, salt layers and stringers, and massive anhydrites. Dundee Water Quality Data.

The USGS Produced Water Database (<u>http://energy.cr.usgs.gov/prov/prodwat/data2.htm</u>) was queried to identify Michigan wells for which Dundee water quality was available. The query identified 133 individual wells in Michigan for which Dundee water samples had been taken; 132 of the 133 samples exhibited water quality between 91,333-398,470 TDS. The single well that exhibited a TDS less than 10,000 is located in Northwest Michigan more than a dozen miles northwest of the proposed well location in closer proximity to the unit outcrop, thus offering a possible explanation why this well exhibited relatively anomalous water quality. Further, while there are no Dundee brine concentration data points available specifically at the proposed well location, data from a well to the east of the proposed location completed in the Detroit River group had a TDS of about 300,000 ppm. Also, a well to the south and east of the proposed well and completed in the Traverse Group exhibited a water quality of about 65,000 ppm TDS. It is also noted that the proposed Beeland well location is surrounded by currently active Class II injection wells that utilize the Dundee for produced brine disposal. These data indicate that brines within the Dundee is expected to be much greater than 10,000 TDS at the proposed well location. See Appendix A for water quality data.

As discussed in Responses 2.1. and 2.L., during installation of the Beeland Disposal Well No. 1, geophysical well logs will be run, and fluid samples will be taken from the Dundee Formation to confirm the salinity of the injection interval and for correlations of the base of the USDW.





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2.E NAME AND DEPTH OF USDWs

For Class II Well (Not Applicable to this Application)

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Petrotek

2.F MAPS AND CROSS SECTIONS OF GEOLOGIC STRUCTURE

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.

RESPONSE

The proposed Beeland Disposal Well No. 1 is to be located in the northwestern Michigan Basin in an area extensively explored for oil and gas resources. A variety of literature and public well data are available regarding the nature of the structure and stratigraphy in Antrim County.

Stratigraphy and Lithology

The strata in this region consist of almost fifteen thousand feet of sandstones, shales, limestones, conglomerates and clays. The relatively extensive knowledge of the deep geology of the northeastern portion of the Michigan Basin is primarily based on data gathered from the installation of many oil and gas exploration wells that have been drilled since the 1920's in this vicinity of Michigan. Figure F-1 presents an MDEQ figure showing the stratigraphic column in Michigan. Table F-1 presents a listing of projected depths (BGL) to top of formations based on a ground level of approximately 1,335 feet as determined by interpretation of data from surrounding wells by state of Michigan Geologic and Land Management Division personnel.

TABLE F-1 PROPOSED BEELAND NO. 1 WELL PROJECTED FORMATION DEPTH SUMMARY

	Mich. GLMD
UNIT	(feet) BGL
GLACIAL DRIFT	0
ELLSWORTH*	850-950
ANTRIM – (UPPER MBR)	1,200
TRAVERSE FORMATION	1,350
TRAVERSE LIMESTONE	1,400
BELL SHALE	2,050
DUNDEE	2,150
DETROIT RIVER GROUP	2,350
BASS ISLANDS	3,700

* Coldwater and Sunbury Shales have also been reported in this part of the stratigraphic column

Figures F-1 through F-5 are presented to provide additional information regarding the regional geologic setting, and the injection and arrestment intervals. Figures F-6 and F-7 present local cross-sections to the base of the proposed injection interval based on data from the MDEQ well database. An index of these cross-section orientations is presented in Figure B-2. From the base of the injection zone upward, the following major intervals are anticipated to be penetrated at the Proposed Beeland Well No. 1 location:

Detroit River Group (lower injection and arrestment)

It has been customary to include the Devonian-age Bois Blanc, Sylvania, Amherstburg, Lucas and Anderdon Formations in the Detroit River Group. The base of the openhole completion of the Beeland Well No. 1 will be completed within the Detroit River Group above the top of the Amherstburg Formation. The Amherstburg is typically a dark brown to black carbonaceous limestone. It is poorly bedded, dense and may be up to 200 feet thick in the vicinity of the proposed well. Where dominated by limestone, it is an aquiclude and typically has low effective porosities and permeability. General practice has been to call the portion of the column between the top of the Amherstburg and the base of the Dundee Limestone the "Detroit River" although it is also known as the Lucas and/or Anderdon Formations to the east of the site and includes a wide variety of lithologies and several distinct members. For example, the Richfield Zone has been described as a basal member of the Lucas/Detroit River sequence and is comprised of interbedded limestone dolomite and anhydrite. Above the Richfield is the Massive Anhydrite that is, in turn, overlain by a thick halite-bearing evaporite sequence, the Horner Member of the Lucas Formation. In the vicinity of the Beeland well, the Horner Member likely consists of a series of limestone and anhydrite layers with limited dolomite stringers. The dolomite stringers can have low, but measurable permeability, but the majority of the interval that is comprised of limestone, anhydrite and halite serves as an excellent confining unit. The top of the Detroit River can be difficult to determine both on logs and in samples. In the local vicinity of the Beeland Well No. 1 area, the units immediately below the Dundee (i.e. upper Detroit River of Lucas) have been described as light to dark brown limestones and dolomites that are micro crystalline to very finely crystalline with traces of intercrystalline porosity.

Dundee Limestone (injection interval)

The Devonian age Dundee is predominately a carbonate section ranging from dense, fine-grained, light colored limestones on the east side of the state to coarse-textured bioclastic limestone (with portions secondarily dolomitized) in the central part of the state. The top of the Dundee is easily picked on geophysical logs in the area of the proposed well because the Bell Shale is present. In the vicinity of the Proposed WDW Beeland Well No. 1, the Dundee is a predominantly limestone formation that ranges from a light to dark brown with a basal dolomite section. Figures F-2 and F-3 present regional Dundee information.

Bell Shale (arrestment interval)

The Devonian age Bell Shale is typically a soft, gray, gummy and silty shale containing scattered fossil fragments. In the local vicinity, the Bell Shale is projected to be comprised of almost 75 to 100 feet of medium green to green-gray shale overlain by a sequence that transitions to a limestone and dolomite dominated sequence. Transmissive fractures are not known to be present in this shale.

Traverse Group

The Traverse Group occurs above the Bell shale, and includes what is locally described as the Traverse Limestone and Traverse Formation. Figures F-4 and F-5 present regional Traverse information. Both formations are described below.

Traverse Limestone

In the western part of the State, the Devonian-age Traverse Limestone is dominantly gray to gray-grown limestone with lesser gray shales. A few anhydrite stringers may also be present. To the east, the Traverse Limestone becomes increasingly shaly, and in southeastern Michigan the unit is composed almost entirely of shale. The Traverse Limestone is a poor marker both on logs and in samples. In the vicinity of the proposed Beeland Well No.1, the Traverse Limestone is described as a thin buff to brown, medium to very finely crystalline layer that overlies a 350-foot plus clean, thick tan to brown very fine to microcrystalline limestone

Petrotek

with a trace crystalline porosity and trace of pyrite.

Traverse Formation

Above the Traverse Limestone is the Traverse Formation, which is comprised of a 50-foot thick interbedded limestone and shale that is described as gray-tan and calcareous. Within the Traverse Formation there exists limestone stringers that may make picking the underling Traverse Limestone difficult, and the Traverse Formation is also sometimes interbedded with the overlying Antrim shale.

Antrim Shale

The Devonian age Antrim Shale is typically a black to brown, brittle, platy shale. It is characterized by high radioactivity and is easily recognized on gamma ray logs, and can be identified on electric logs by its unusually high resistivity. In the southeastern part of the state, several large tongues or interbeds of gray shale are present in the middle part of the Antrim. Locally, near the proposed Beeland Well No. 1 location, the Antrim (sometimes referred to as the Antrim-Dark) is gray-brown to gray-green and blocky, with both silt interbeds and significant limestone interbeds. The upper member of the Antrim is reported as a 100-foot plus thick blocky gray-brown shale, pyretic, with scattered tasmanites.

Devonian-Mississippian Shales

Local geologic data suggest that a shale sequence occurs between the tops of the Antrim and base of the Glacial Drift. Available geologic data indicate that the Ellsworth (Bedford) shale is likely present immediately above the Antrim, and suggest that the Ellsworth may either extend to the Glacial Drift, or may be capped by the Coldwater/Sunbury Shales. Both the Ellsworth and Coldwater/Sunbury are described below, noting that regardless of nomenclature, both units are predominantly shale and provide additional confinement between the Dundee and Glacial till.

Ellsworth (Bedford)

The Devonian Ellsworth is a greenish-gray shale that occurs in the western portion of the state. The Bedford shale occurs in the eastern portion of the state, and may inter-tongue with the Ellsworth Shale in the vicinity of Alba several miles from the proposed Beeland Well No. 1 location. The Bedford is a gray shale immediately overlying the radioactive Antrim shale in the eastern half of the basin. The Bedford has a fairly uniform, moderate shale response on gamma ray curves. Although the Bedford is listed here under the Devonian, it may well be of Mississippian age.

Coldwater and Sunbury Shales

The Mississippian age Sunbury and Coldwater shales are described as two distinct intervals. The Coldwater is locally an interbedded light to medium gray firm, flaky and platy shale with a trace of pyrite and a brown very finely crystalline argillaceous limestone at its base in the vicinity. The deeper Sunbury, where present in the vicinity of the proposed Beeland Well No. 1 location, is likely to be a dark brown firm, brittle, carbonaceous shale with a trace of fluorescence.

Glacial Drift

See Response 2.D regarding the USDW for information pertaining to the Glacial Drift.

Faulting

There is no evidence of significant faulting in the immediate vicinity of the Proposed Beeland Well No. 1. The

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Hydrogeologic Atlas of Michigan (Plate 16) is referenced regarding this matter. Additionally, Ryder (1996) constructed a structure contour map on the Traverse in Antrim County. This map showed there to be no mappable faults transecting the Traverse at the proposed well location.

Seismic Activity

The Alba area of northwestern Michigan Basin has been designated as a relatively minor seismic risk area by the USGS(<u>http://earthquake.usgs.gov/regional/states/michigan/hazards.php</u>). The proposed area has a peak acceleration of 0-2 percent g, and no earthquakes have been identified in the Alba area over the past 100 years. A category VI earthquake occurred in southern Michigan in 1947, but USGS data do not suggest that this event was felt north of Cadillac, Michigan.

Reference:

Ryder, Robert T, Fracture Patterns and their Origin in the Upper Devonian Antrim Shale Gas Reservoir of the Michigan Basin: a Review, USGS Open File Report 96-23, 1996.

	GEO	LOGIC	TIME	OUTCR	OP NOMENC	LATURE	DOMINANT LITHOLOGY	SUBSURFACE N	OMENCLATURE
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STRATIGRAPHIC NOMENCLATURE FOR MICHIGAN

Michigan Dept. of Environmental Quality **Geological Survey Division** Harold Fitch, State Geologist and

Michigan Basin Geological Society



Stratigraphic Nomenclature Project Committee: Dr. Paul A. Catacosinos, Co-chairman Mr. Mark S. Wollensak, Co-chairman

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2000

Acimoretadgements This work is the product of the combined efforts of the geological communities of Michigan and the sumcurating states and provinces. Below are given just a representative few of the contributors:

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4 complete listing of all contributors will be found in the Statigraphic Lasticon for Victigan, of which this column is an integral part.

RELATED TERM CORRELATION

Lona Fm Juranic Fed Beds Lona Controls, Brow Lime, Stay Colomite, Stay Sendston, Strey-Stay Sandston, Stay Colomite, Stay Sendston, Strey-Stay Sandston, Tiple Oyp Colomatar Sh Colomatar Field Fock, Special Dolomite, Warkshame, Stay Stary Stary Standston, Tiple Oyp Colomatar Sh Colomatar Field Fock, Special Dolomite, Warkshame, Stary Stary Stary Stary Stary Stary Stary Stary Stary, Stary Stary Stary Stary Stary Stary Stary Stary, Stary Stary Stary Stary Stary Stary Colomatar Field Fock, Special Dolomite, Warkshame, Lower Black, Lower Anthrom, Nedde Cary Stale, Lohi TA, Luhi TL, Corpo Carel Grey Zhang, Dala Mendar, Madde Cary Stale, Luhi TL, Luhi TC, Corpo Carel Grey Stary Stark, Marthar, Luhi TC, Corpo Carel Grey Stary Stark, Barthame, Stark Menther, Medalware Sati/Ardyckin, Scort Zona, Bie Anthrom, Madde Stary Stark, Stark Stark, Stark Menther, Medalware Sati/Ardyckin, Scort Zona, Bie Anthrom, Madde Cary Starkstone, Medimum Menther, Back Limit St. Ipnece Octomite Satins A Dia Kanana, Fabble Band, Stark Ruff Formation Satins A Dia Kanana, Field Formation Satins A Dia Kanana, Field Formation Satins A Dia Kanana, Field Formation Calins Fm Satins A Dia Kanana, Field Formation Calins Fm Satins A Dia Kanana, Field Star, Field Star, Calins Fm Calins Fm Satins A Dia Kanana, Field Romma Manana, Field Marker, Barwen Magara, Magara, Magara, Field, Pressie Reet, Engeline Dolomite Cary Nagara, Metha Magara Barwen Magara, Metha Magara Barwen Kidagara, Magara, Flack, River Stafe Garweood Fm	STRATICIRAPHIC POSITION	RELATED TERMS
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Lucas Fm Free Sandstorn, Horner Menner, Kat Menhor, Headwork SatVarlahler, Sour Zen, Be Andrets, Heinsbo SatVarlahler, Sour Zen, Be Andrets, Reichfeld Zone Manner, Sandstorn, Big Sat Anthestikung Fm File Sandstone. Medinarn Mensker, Back Linte Satina B Und Big Sath R Sath Raif Formation Satina A 1 Carbonate. Rabbit Eare Antydrille, Cain Fm Carp Nagara, Write Mingara Reef, Princele Reef, Engedine Öslemite Gruy Ragara, Write Mingara Barnt Barth Sr Clinton Formation Trenton Fm Cap Datomite Baroper Sandstorne, Jorden Sandstorn, Koor Sandstorne, Jorden Sandstorn, Koor Sandstorne, Jorden Sandstorn, Koor Sandstorne, Jorden Sandstorn, Temperateur, Temperateur, Temperateur, Baroper Sandstorne, Calesville, Sa Cressach Sandstorne, Calesville, Sa Cressach Sandstorne, Pres. M. Baron Classics Precision Preside Gu Chien Gr	Dundes Ls	Read City Member/Dalamite/Ashydrite
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LEGEND

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Seismic Hazard Map of Michigan

USGS National Seismic Hazard Maps

Earthquake History of Michigan

The earliest record of earthquake tremors felt in Michigan Territory (statehood came in 1837) were from the great series of shocks centered near New Madrid, Missouri in 1811 and 1812. As many as nine tremors from the New Madrid earthquake series were reported felt distinctly at Detroit.

A damaging earthquake, apparently centered between Montreal and Quebec in the Saint Lawrence Valley, occurred on October 20, 1870. This shock was felt over an area estimated to be at least a million square miles including Sault Sainte Marie.

Between 1872 and 1883 a number of moderate earthquakes were centered within Michigan. On February 6, 1872, three shocks lasting 30 seconds were reported at Wenona. No additional information is known about these tremors. Reports from Redford and Greenfield Village, not far from Detroit, indicated a minor earthquake occurred on August 17, 1877. It was noted that horses were frightened during this shock. Some persons reported hearing a noise like a train. On February 4, 1883, an earthquake cracked windows and shook buildings at Kalamazoo (intensity VI). This shock was felt in southern Michigan and northern Indiana. Cities as distant as Bloomington, Illinois and St. Louis, Missouri also reported feeling this earthquake.

The destructive earthquake that hit <u>Charleston, South Carolina</u> on August 31, 1886, was felt as far north as Milwaukee, Wisconsin and probably in parts of Michigan. On <u>October 31, 1895, Charleston, Missouri</u> experienced a major earthquake. Considered the severest shock in the central U.S. region since the 1811 - 1812 earthquakes, the 1-million-square-mile felt area included parts of Michigan. A moderate earthquake of intensity V was felt at Menominee on March 13, 1905.

A series of unusual occurrences in the Keweenaw Peninsula mining area form a significant part of the seismic history of Michigan. The first disturbance was on July 26, 1905 at about 6:20 in the evening. At Calumet there occurred what appeared to be a terrific explosion. Chimneys fell with a crash and plate glass windows were broken (intensity VII). The explosion was heard far down in a mine and the shock was felt all over the Keweenaw Peninsula area and as far away as Marquette, about 70 miles southeast across Lake Superior. Ten months later, on May 26, 1906, a similar phenomenon occurred. Train rails were twisted, and there was a notable sinking of the earth above the Atlantic mine. The disturbance was reported felt over an area about 30 to 40 miles in diameter. Another shock occurred in the same region on January 22, 1909. A rumbling tremor was felt around Houghton and was believed to be caused by the crushing of pillars in a mine.

The earthquake of <u>August 9, 1947</u>, damaged chimneys and cracked plaster over a large area of south-central Michigan and affected a total area of about 50,000 square miles, including points north to Muskegon and Saginaw and parts of Illinois, Indiana, and Wisconsin. The cities of Athens, Bronson, Coldwater, Colon, Matteson Lake, Sherwood,


and Union City in the south-central part of the State all experienced intensity VI effects. Reports of damage to chimneys and some instances of cracked or fallen plaster, broken windows, and merchandise thrown from store shelves were common over the epicentral area.

A number of other earthquakes centered outside the State have been felt in Michigan. Noteworthy among these are the following: .

February 28, 1925

St. Lawrence River region northwest of Murray Bay (La Malbaie), Quebec, Canada; felt area approximately 2 million square miles; intensity V at Grand Rapids, Newberry, and Whitefish Point, Michigan.

November 1, 1935

Timiskaming, Quebec, Canada; 1-million-square-mile felt area; intensity V at Alpena, Hillman, Mount Clemens, Pellston, and Port Huron, Michigan.

March 2 and 8, 1937

Western Ohio; 150,000-square-mile felt area (second shock); felt at many places in southern Michigan.

September 4, 1944

St. Lawrence River region between Massena, New York and Cornwall, Ontario, Canada; 175,000-square-mile felt area (in the U.S.); felt at Alpena, Detroit, Grand Rapids, Lansing, Saginaw, and Sault Sainte Marie, Michigan.

Š.);

November 9, 1968

South-central Illinois; felt area approximately 580,000 square miles (including all or portions of 23 states); felt throughout southern Michigan.

Abridged from Earthquake Information Bulletin, Volume 5, Number 6, November - December 1973. by Carl A. von Hake.

For a list of earthquakes that have occurred since this article was written, use the Earthquake Search.

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8

Historic Earthquakes

Southern Michigan 1947 08 10 02:46:41.3 UTC (local 08/09) Magnitude 4.60 Intensity VI

Largest Earthquake in Michigan

Isoseismal Map

Isoseismals are based on intensity estimates from data.



Abridged from Seismicity of the United States, 1568-1989 (Revised), by Carl W. Stover and Jerry L. Coffman, U.S. Geological Survey Professional Paper 1527, United States Government Printing Office, Washington: 1993.

2.G GEOLOGICAL DATA ON INJECTION AND CONFINING ZONES

For Class II Well (Not Applicable to this Application)

Petrotak

2.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 well, source and analysis of the chemical, physical, radiological and biological characteristics, including density and corrosiveness, of injection fluids. If the information is proprietary, maximum concentrations only may be submitted, but all records must be retained.

RESPONSE

Maximum Injection Pressure

The well has been designed for operation on a vacuum or with a small injection pump. It is probable that no injection pump will be required to dispose of desired volumes of fluid. However, a pump may be installed to increase capacity if necessary. Although no site specific data are available, Region 5 USEPA Guidance #7 includes a value of 0.8 psi for the fracture gradient of the Dundee Limestone. If injection fluid is assumed to be comprised of a brine with a maximum specific gravity of 1.15 that fills the tubing from the surface to a depth of 2,150 feet, a maximum wellhead injection pressure of 649 psi is calculated based on this Region 5 assigned gradient. No allowances for tubing friction are included in this calculation. Note that the average specific gravity is expected to be in the 1.01 to 1.05 range.

Based on a calculated wellhead fracture pressure value of 648 psi (assuming a maximum continuous specific gravity of 1.15), it is requested that a maximum wellhead injection pressure of 150 psi be authorized for future injection activities without additional testing.

If necessary, subsequent testing may be conducted in the future to justify the use of pressures above 150 psi at the wellhead during future disposal operations. At the current time, it is believed that restriction to flow under gravity conditions are likely to provide for insufficient operational flexibility and could contribute to unwarranted compliance complications.

Average Rates, Volumes and Pressures

The range of injection rates and pressures is expected to fluctuate depending on the demands of the groundwater remediation project along with variables related to the well and the reservoir conditions. Injection rates are projected to average between 50 and 200 gpm based on continuous operations. However, injection may occur in a periodic or "batch mode" depending on demand.

Average injection pressures during active operations are expected to range from approximately –12 to 100 psi depending on the history of recent well capacity demands and the condition of the well and the injection reservoir.

Annulus Pressure

Annulus pressure will be maintained at a minimum of 100 psi above injection pressure, even during shutdown, <u>except</u> during the course of workovers and/or maintenance operations.

Nature of Annulus Fluid

In the proposed Beeland Well, the annulus space between the injection tubing and the well protection casing will be sealed and filled with fresh water containing a corrosion inhibitor, an oxygen scavenger and a biocide. Annulus fluids will include Baker Petrolite CRW0037F or Unichem Technihib 366W corrosion inhibitors and

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bactericides, CRW 132 oxygen scavenger A-303 corrosion inhibitor, Knockout 50 oxygen scavenger, and Bacban 3 Biocides or suitable equivalents. No permit condition regarding specific brands or fluid additives are requested at this time.

Monitoring the pressure changes in the sealed annulus space is a means of verifying the continued mechanical integrity of the well. It must be non-corrosive, not subject to biologic degradation, and preferably non-freezing at winter temperatures. At this time, methanol, diesel, heat tracing, and/or a wellhouse heater may be used at the wellhead and annulus tank system to manage any potential for weather related problems.

The well is to be operated, and operating data reported, according to the following requirements:

Characteristic	Value	Minimum Monitoring Frequency	Minimum Reporting Frequency
Average Injection Rate	6,857 bpd max.	Continuous	monthly
Instantaneous Injection Rate	10 bpm max.	Continuous	monthly
Cumulative Volume	6,857 bpd max.	Continuous	monthly
Max. Injection Pressure	150 psig	Continuous	monthly
Ave. Injection Pressure	0 psig	Continuous	monthly
Annulus Pressure	100 psig min.	Continuous	monthly
Annulus/Tubing Pressure Differential	100 psig min.	Continuous	monthly
Sight Glass Level	Visible	daily when operated	monthly
Annulus Fluid Addition Or Removal		Daily	monthly
Chemical Composition of Injected Fluids ¹		Variable	within 30 days of sampling
Physical Characteristics of Injected Fluids ¹		Variable	within 30 days of sampling

TABLE H-1OPERATING, MONITORING AND REPORTING REQUIREMENTSBEELAND GROUP, LLC DISPOSAL WELL NO. 1

¹ As specified in the Waste Analysis Plan.

Injectate Characteristics

As discussed in Attachment U, groundwater remediation project related non-hazardous wastes are to be brought to the Alba, Michigan facility. A Waste Analysis Plan intended to comply with USEPA Region V Guideline #8 is presented in Response 2.P of this permit application. Fluid from the remediation project will be sampled on a quarterly basis. Attached at the end of Response 2.H is a copy of typical analysis for the fluid generated by this remediation project. Historically, fluids from this remediation project have been managed as non-hazardous via both injection and surface discharge after treatment. Fluids typically have contained various levels of total dissolved solids and are expected to range from 2,500 mg/l to 25,000 mg/l. Specific gravity is expected to range from 1.00 to 1.05, and pH is typically expected to range from 7.0 to 10.0.

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TABLE H-2 EXAMPLE ANALYSIS OF INJECTATE FROM BAY HARBOR, MICHIGAN REMEDIATION

Units	Results	Method	Date	Analyst
mV	296	Field	9/28/2004	EB
s.u.	7.42	Field	9/28/2004	EB
°C	19.1	Field	9/28/2004	EB
mg/L	0	310.1	9/30/2004	REG
mg/L	1,620	310.1	9/30/2004	REG
mg/L	0	Calc.	9/30/2004	REG
mg/L	1,620	Calc.	9/30/2004	REG
mg/L	0	Calc.	9/30/2004	REG
mg/L	260	415.1	10/5/2004	BA
mg/L	88	415.1	10/5/2004	BA
mg/L	32,800	160.1	9/29/2004	REG
mg/L	123	160.2	9/29/2004	REG
mg/L	*	405.1	10/8/2004	PJC
mg/L	992	410.1	9/30/2004	REG
mg/L	1.4	365.2	9/30/2004	REG
mg/L	< 1	300	9/2 9 /2004	DMJ
mg/L	0.97	300	9/29/2004	DMJ
mg/L	0.74	300	9/29/2004	DMJ
mg/L	8.5	350.1	10/1/2004	BEK
mg/L	29	351.2	10/1/2004	BA
mg/L	19.8	6020	10/3/2004	EB
mg/L	< 0.05	6020	10/3/2004	EB
mg/L	0.237	6020	10/3/2004	EB
mg/L	0.017	6020	10/3/2004	EB
mg/L	< 0.005	6020	10/3/2004	EB
mg/L	< 0.001	6020	10/3/2004	EB
mg/L	0.029	6020	10/3/2004	EB
mg/L	< 0.015	6020	10/3/2004	EB
mg/L	0.024	6020	10/3/2004	EB
mg/L	1.42	6020	10/3/2004	EB
1				
	Units mV s.u. °C mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	Units Results mV 296 s.u. 7.42 °C 19.1 mg/L 0 mg/L 1,620 mg/L 1,620 mg/L 0 mg/L 0 mg/L 260 mg/L 288 mg/L 32,800 mg/L 123 mg/L 123 mg/L 14 mg/L 14 mg/L 1.4 mg/L 0.97 mg/L 0.97 mg/L 0.74 mg/L 0.97 mg/L 0.017 mg/L 0.029 mg/L 0.017 mg/L 0.005 mg/L 0.0017 mg/L 0.029 mg/L 0.029 mg/L 0.024 mg/L 0.024	Units Results Method mV 296 Field s.u. 7.42 Field °C 19.1 Field mg/L 0 310.1 mg/L 1,620 310.1 mg/L 1,620 Calc. mg/L 1,620 Calc. mg/L 260 415.1 mg/L 32,800 160.1 mg/L 32,800 160.1 mg/L 32,800 160.1 mg/L 32,800 160.1 mg/L 123 160.2 mg/L 123 160.2 mg/L 1.4 365.2 mg/L 1.4 365.2 mg/L 0.97 300 mg/L 0.74 300 mg/L 0.74 300 mg/L 0.74 300 mg/L 29 351.2 mg/L 19.8 6020 mg/L 0.05 6020	Units Results Method Date mV 296 Field 9/28/2004 s.u. 7.42 Field 9/28/2004 °C 19.1 Field 9/28/2004 mg/L 0 310.1 9/30/2004 mg/L 1,620 310.1 9/30/2004 mg/L 0 Calc. 9/30/2004 mg/L 260 415.1 10/5/2004 mg/L 260 415.1 10/5/2004 mg/L 32,800 160.1 9/29/2004 mg/L 123 160.2 9/30/2004 mg/L 1.4 365.2 9/30/2004 mg/L 0.97 300 9/29/2004 mg/L 0.97 300 9/29/2004 mg/L

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Parameter	Units	Results	Method	Date	Analyst
Mercury	mg/L	0.0008	245.1	10/20/2004	Merit
Manganese	mg/L	0.088 .	6020	10/3/2004	EB
Nickel	mg/L	0.223	6020	10/3/2004	EB
Selenium	mg/L	0.063	6020	10/3/2004	EB
Silver	mg/L	0.0005	6020	10/3/2004	EB
Strontium	mg/L	. 0.034	6020	10/3/2004	EB
Zinc	mg/L	0.019	6020	10/3/2004	EB
Silica, Reactive as SiO2	mg/L	16.8	370.1	10/4/2004	REG
Total Silicon as SiO2	mg/L	66.3	6020	10/2/2004	EB
Calcium	mg/L	12.1	6020	10/3/2004	EB
Magnesium	mg/L	< 0.5	6020	10/3/2004	EB
Potassium	mg/L	13,800	6020	10/3/2004	EB
Sodium	mg/L	889	6020	10/3/2004	EB
Bromide	mg/L	15.2	300	9/29/2004	DMJ
Chloride	mg/L	1,730	300	9/29/2004	DMJ
Fluoride	mg/L	18.1	300	9/29/2004	DMJ
Sulfide	mg/L	1.29	376.2	10/5/2004	Merit
Sulfate	mg/L	14,500	300	9/29/2004	DMJ

Impact of Injection

Based on historical operating data from surrounding Class II injection wells in Antrim County, it appears that well capacity is likely to be sufficient for proposed disposal operations. Until actual data are obtained from installation of the well, conservative estimates of formation properties have been assigned, along with projected operational parameters, to generate an estimate of the fluid front for the Beeland well. Standard equations for the volume of a porous cylinder can be used with the following parameters to generate a piston-like displacement fluid front radius: 100-foot net thickness, 10 percent effective porosity, and 2,103,840,000 gallons of injectate estimated based on twenty years of continuous injection at a rate of 200 gpm. This yields a 100 percent injected fluid front radial distance of approximately 2,992 feet from the well. It is noted that "continuous" injection rates are more likely to be less than 125 gpm based on historical operation of the groundwater remediation project. Although dispersion will play a role in spreading this plume over a slightly larger area, even a relatively large dispersivity combined with a low concentration of interest would yield a plume that is less than one mile radially from the well. This is substantially smaller than the required Region 5 minimum two-mile AOR conducted for this site.

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2.I FORMATION TESTING PROGRAM

Describe the proposed formation testing program. For Class I well 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.

RESPONSE

The Beeland Disposal Well No. 1 is to be installed and tested in 2007 according to applicable regulations and permit requirements. Static pressure of the Dundee and estimates of various injection interval characteristics are to be determined via pressure transient testing, while native brine chemistry and characteristics are to be determined based on acquisition of a fluid sample. Characteristics of the injection interval are also to be evaluated based on conducting geophysical well logging. Additional details regarding the well logging are presented in Response 2.L, construction details.

After the open hole has been drilled, but prior to conducting any injection testing, injection interval fluid will be produced from the well using either a submersible pump or swabbing equipment. Based on fluid loss during drilling and field conditions, target production volumes for obtaining representative samples will be adjusted in the field. Field parameters including pH and conductivity will also be monitored at surface as fluid is recovered to determine when representative sampling is practical. Fluid will be subjected to analysis for the following parameters:

Alkalinity, Arsenic, Barium, Bicarbonate, Cadmium, Calcium, Carbonate, Chloride, Chromium, Conductivity, Copper, Hardness, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Nitrate, as (N), pH, Potassium, Radium 226, Radium 228, Selenium, Silica as SiO2, Sodium, Specific Gravity, Strontium, Sulfur, TDS, TSS, Zinc

Annual Part I mechanical integrity testing for the Beeland well will include reservoir monitoring as specified in 40 CFR 146.13 (d) in addition to static annulus pressure testing. Beeland will provide the agency with a minimum of 30 days notice of annual testing. Notice is to include proposed procedures for testing. Although test procedures or methods may be changed based on approval by Region 5 USEPA staff, the following procedure will be utilized for the first such testing to be performed:

- 1. Conduct Wellsite Safety Meeting
 - A. Prior to commencement of field activities, conduct safety meeting with contractors and personnel to be involved with field services and MIT testing. Ensure that all safety procedures are understood and review days work activities.
- 2. Conduct Fall-Off Test
 - A. Record data regarding test well injection at typical operating conditions (constant rate). Rate, temperature and specific gravity versus time will be sampled and recorded during the injection period. Cumulative volume injected should also be recorded. Continue injection for a minimum of approximately five hours. Note that significant rate variations may yield poor quality data or require more complicated analysis techniques.
 - B. Rig-up pressure gauge.
 - C. Obtain final stabilized injection pressure for a minimum of one hour. Ensure that the gauge temperature readings have also stabilized.

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- D. After gauge recordings are stable, cease injection and monitor pressure fall-off. Instantaneous shut-in yields best results. Continue monitoring pressure for a minimum of five hours or until a valid observation of fall-off curve is observed.
- E. Stop test data acquisition, rig-down and release equipment.
- 3. Annulus Pressure Test
 - A. Stabilize well pressure and temperature.
 - B. Arrangements will be made for a representative from the USEPA to be present to witness this testing.
 - C. Install ball valve or similar type "bleed" valve on annulus gate valve. Pressurize annulus to a minimum of 100 psig with liquid and shut-in pump side gate valve. If typical operating annulus pressures are above 100 psi, higher pressures acceptable to the agency and compatible with the well completion configuration will be utilized in this testing. Pressure to be used will be detailed in proposed procedures supplied with notification of testing. Install USEPA-certified gauge on "bleed" type valve. The annulus may need to be pressurized and bled off several times to ensure an absence of air. Monitor and record pressure for one hour. Pressure may not fluctuate more than 3 percent during the one-hour test. At the conclusion of the test, lower the annulus pressure to normal operating pressure.

2.J STIMULATION PROGRAM

Outline any proposed stimulation program.

RESPONSE

No specific stimulation program is currently scheduled for the proposed Beeland well. Class II injection in the immediate vicinity has been historically successful in the proposed Dundee Formation injection interval. Based on typical oilfield operations, hydrochloric acid stimulation of the injection interval may be required as part of the original completion or as maintenance during operations. If necessary to maintain desired injectivity, mechanical well clean out or acidization of a similar nature to programs used in other Class I or Class II injector in Michigan may be conducted to reduce injection pressures. The USEPA will be notified prior to any stimulation activities being conducted in the well.

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2.K INJECTION PROCEDURES

Describe the proposed injection procedures including pump, surge tank, etc.

RESPONSE

The Beeland Group, LLC well is to be dedicated to the injection of fluids derived from the Bay Harbor groundwater remediation project. Details regarding the waste stream, surface equipment and practices to be followed for operation of the well are presented in this attachment. Note that additional details regarding the wellhead, annulus components and surface facilities of the system are provided in Response 2.M of this document. Additional details regarding operating parameters for the system are included in Attachment H of this document.

Surface Facility Description

The Beeland Group, LLC facility is located east of Alba, Michigan in Antrim County. The facility is to be entered via a dedicated site access road from the north side of the Alba Highway, approximately five miles east of US 131. The site access road will lead to a concrete unloading pad, which will be installed with sufficient curbs and drainage slopes to allow the containment and collection of any possible leakage during transport unloading operations. All traffic entering and exiting the pad will pass an office/shop building on site and through a gate at the highway entrance, which provide location security.

Figure K-1 is a process flow diagram of the major surface facility components. They consist of the abovementioned unloading pad, an unloading manifold, screen and filters, pumps, tank battery (consisting of between 20,000 and 200,000 gallons of storage) and flow line piping.

Injection Procedures

Fluids will be collected at the Bay Harbor remediation facilities and transported via tanker truck to the Alba, Michigan site. Upon arrival, necessary paperwork documenting each shipment will be completed, and transports will be directed to the concrete unloading pad. Loads will then pumped through screens and routed to the desired storage tank. Fluids collected from the unloading pad and well site and storage tank containment areas may also be collected and routed to the storage tanks. Fluids will then be moved between tanks as necessary under gravity flow or using transfer pumps. Depending on fluid quality and well performance, fluids may be routed through filters prior to injection into the well under gravity flow. In the future, if transfer pumps and/or injection pumps become necessary, fluids will be transferred from a final head tank to the suction end of an injection pump. Injection will take place at desired flow rates, with a maximum injection pressure not to exceed 150 psi as previously indicated in this document (see Response 2.H). Figure K-1 also presents a general flow diagram of proposed instrumentation.

Well Operating Procedures, Alarms and Annulus Pressure Maintenance

It is anticipated that the well will be automated, but may also be operated manually for disposal. Operators will start the injection process by opening necessary valves to allow the pumps to be started, or for the well to draw fluid from the storage tanks under gravity flow. Restraints will be incorporated into the well monitoring systems to meet UIC regulations and permit conditions. The automated control system will include control switches to alarm the operator if certain operating conditions are encountered. For regulatory purposes, a high injection pressure switch (set below the permit maximum) and a low annulus differential switch (set above the permit minimum) will shut-off any injection pump power and alarm the operator so that manual valves can be actuated to stop injection. In the event that any of the permit condition related set points are exceeded, injection operations will cease until the problem is identified, corrected, and the system is manually restarted by an operator.

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Annulus pressure in the well system will be maintained with a nitrogen bottle attached to an annulus fluid reservoir (head tank). Annulus fluid level can be monitored in the annulus fluid head tank by the use of a level indicator or a sight glass, and additions or subtractions of fluid from the annulus tank will be recorded for monitoring purposes and reported on a monthly basis per permit requirements.

If the proposed Beeland Well is monitored and operated remotely, the following special conditions shall be applicable. For the purpose of this permit, remote monitoring is defined as injection into the well when a trained operator is not present on site property and able to perceive shut-down alarms and able to physically respond to the well controls or the wellhead within 15 minutes of a compliance alarm condition.

- 1. Local operating system and remote monitoring system: If remote monitoring is to be used to operate the well, an automatic pager designed to alert designated on-call, off-site personnel in the event of a well alarm or shut-in shall be onsite and equipped with a back-up power supply.
- 2. Response to automatic shut-downs: Alarm shut-downs of the operating well related to permit compliance conditions of the well under Part II (B) (5) shall be investigated on-site by a trained operator within one (1) hour of pager notification of the occurrence.
- 3. Loss of power to the control system: In the event of a power failure beyond the capability of the back-up power supply shuts down the control system, the well shall be shut-in.
- 4. Loss of dial tone: If the automatic pager cannot get a dial tone for 30 minutes, the well shall automatically be shut-in.
- 5. Restart of the well after an automatic shut-in: Restart of the well after an shut-in related to a permit condition alarm (including, but not limited to, injection pressure, annulus differential pressure, loss of dial tone for more than 30 minutes or control system power failure) shall require the physical presence of the operator on-site before the well can be restarted.
- 6. Restart of the well after non-permit condition related or scheduled shut-ins: If the well is shut-in for more than 48 hours for circumstances unrelated to permit conditions, restart of the well shall require the physical presence of the operator on-site.
 - Weekly operator inspections: If fluid injection occurs during the period of any week and the well is being monitored remotely, **at a minimum frequency of notices that once periods at the site to inspection shall verify the correct** operation of the remote monitoring system by review of items such as, but not limited to, a comparison of the values shown on mechanical gauges with those reported by the remote operating system. Unless annulus pressure changes by more than 10 percent per week while the well is injecting, only one annulus fluid level per week shall be required to be taken, recorded and reported when injection takes place.
 - When the well is not actively being used for injection, one annulus tank fluid level measurement shall be taken, recorded and reported per week unless annulus fluid pressure decreases more than 10 percent per week. In such cases of increased annulus pressure change, annulus fluid level measurements shall be taken, recorded and reported twice per week.
- 9. When not in use by a trained well operator, offloading connections shall be secured and shall be locked at the valves leading to waste water tanks so that access is restricted to trained well operators.
- 10. Offloading of fluid from transports can only occur with a trained operator physically present on

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site. A waste related log sheet and/or waste manifest file will be maintained documenting that a trained well operator allowed fluid to be unloaded. At a minimum, waste log entries are to include operator name, date, time, truck identification and approximate volume.

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2.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 programs, and proposed annulus fluid (Request and submission of justifying data must be made to use an alternative to a packer for Class I).

RESPONSE

The proposed Beeland Well No. 1 is to be a newly installed Class I well. Well No. 1 will be located in the Southeast 1/4 of Section 14, Township 30 North, Range 5 West, Antrim County, Michigan. Ground level is estimated to be approximately 1,335 feet above sea level (ASL) with Kelly Bushing (KB) that will be dependent on rig availability. The well will be drilled to a Total Depth (TD) of approximately 2,450 feet BGL into the top of the Detroit River Group and will be completed openhole in the Dundee formation.

Drilling, Casing and Testing Program

The conductor casing, 13-3/8-inch, 61 lb/ft, J-55 grade, ST&C, or equivalent will be driven to refusal in the Glacial Drift to a maximum depth of approximately 175 feet BGL.

After a rotary rig is brought to the location, a 12¼-inch hole will be drilled out of the surface casing to a depth of approximately 950 feet. The intermediate casing shoe will be targeted at a minimum of 100 feet below the base of the Glacial Drift. After the shallow openhole logging program is complete (see attached table), the hole will be conditioned and minimum 9 5/8-inch, 36 lb/ft, J-55, ST&C, or equivalent surface casing will be installed to a depth of approximately 950 feet. The cementing program will be determined based on field conditions, but will likely consist of a mixture of 273 sacks (based on a gauge hole) of Michigan equivalent Class A standard cement with <u>3 percent CaCl2</u> and additives. Appropriate excess cement will be pumped based on field conditions. It is anticipated that a float shoe will be used plus a float collar one joint up from the bottom and that centralizers are to be placed a minimum of one every fourth joint.

After the intermediate casing string has been cemented, a cement bond log will be conducted to document cement circulation to surface. The cement will be drilled out of the intermediate string and an 8 1/2-inch hole will then drilled to approximately 2,150 feet BGL. The top of the Dundee injection formation will be penetrated in this stage of the drilling process. After the deep openhole logging program is complete (see attached table), the hole will be conditioned and minimum 7-inch, 26 lb/ft, J-55, ST&C, or equivalent long-string casing will be installed to a depth of approximately 2,150 feet. The cementing program for the long string will be determined based on field conditions, but will likely consist of a mixture of 264 sacks (based on a gauge hole) of Michigan equivalent Class A standard cement with 3 percent CaCl2 and additives. Appropriate excess cement will be pumped based on field conditions. It is anticipated that a float shoe will be used plus a float collar one joint up from the bottom and that centralizers are to be placed a minimum of one every fourth joint.

The final stage of drilling will be conducted using a 6-1/4-inch drill bit to drill out cement and complete the well as an openhole to a depth of approximately 2,450 feet. After drilling is complete, additional openhole logging will be conducted to obtain data regarding the Dundee injection interval. A cement bond log and a baseline casing inspection log will be conducted in the long-string casing, and a directional survey will be conducted to a depth of approximately 2,100 feet inside the 7-inch long string casing. Four and one-half inch injection tubing is proposed for the completion. As noted in Response 2.1., fluid will then be swabbed from the well to obtain a sample of injection interval fluids. A radioactive tracer survey and a temperature log will then be conducted to establish baseline conditions and initial external mechanical integrity. A pressure transient test will also be conducted to derive estimates of formation pressure and properties (See Response 2.1). A proposed schematic for the Beeland Well is presented in Figure M-1.

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TABLE L-1 LIST OF PROPOSED LOGS BEELAND GROUP, LLC WELL NO. 1

Description	Depth Run
Dual Laterolog Gamma Ray, Formation Density, and Caliper Logs (openhole before intermediate casing)	100-950'
Cement Bond Log (intermediate casing)	surf-950'
Dual LateroLog, SP, Gamma Ray, Formation Density, Compensated Neutron, and Caliper Log (openhole before long string casing and in openhole completion)	950- TD(2,450')
If required, Fracture Finder ID Log (openhole before long-string casing)	1,950-2,150'
Cement Bond Log, Casing Inspection Log and Directional Survey (long-string casing)	surf-2,150'
Temperature Log	surf-TD (2,450')
Radioactive Tracer Log	long string casing
Pressure/Temperature Gradient and Pressure Transient Falloff test	2,150

Nature of Annulus Fluid

In the proposed Beeland well, the annulus space between the injection tubing and the well protection casing will be sealed and filled with fresh water containing a corrosion inhibitor, an oxygen scavenger and a biocide. Annulus fluids will include Baker Petrolite CRW0037F or Unichem Technihib 366W corrosion inhibitors and bactericides, CRW 132 oxygen scavenger A-303 corrosion inhibitor, Knockout 50 oxygen scavenger, and Bacban 3 Biocides or suitable equivalents. No permit conditions regarding specific brands or fluid additives are requested at this time.

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2.M CONSTRUCTION DETAILS

Submit schematic or other appropriate drawings of the surface and subsurface construction details of the well.

RESPONSE

Figure M-1 presents a schematic of the proposed subsurface construction details of the well. Figure M-2 and K-1 present details regarding the wellhead, annulus and the surface facilities associated with the well.

Proposed Subsurface Well Construction Details

The proposed Well No. 1 is to be drilled, tested and completed during 2007.

Surface Well Construction Details

Wellhead

The proposed wellhead will consist of a standard 7-inch slip-on weld casing head or equivalent. The wellhead will include a 7-inch by 4½-inch tubing hanger and slips, pack-off and flanged fitting which act as the upper seal to the 7-inch by 4½-inch annulus. There will be two, 2-inch welded NPT nipples on the 7-inch casing for access to the annulus. Annulus fluid can be added through a 2-inch valve and annulus sampling can be conducted opposite the annulus valve through a ½-inch quick connect coupling or equivalent. A 4-inch flow-line is to be connected to a 4-inch ball valve or gate valve, which will be coupled to a 4-inch tee. This tee will also be connected to a 4-inch valve that is coupled to the tubing and this valve will be connected to a swedge that allows for connection of a pressure gauge or bullplug at the top of the wellhead. The tee or the flow line will also have a ½-inch needle valve tap to allow wellhead waste sampling. Figure M-2 is a diagram of the proposed wellhead assembly.

Annulus Monitoring System

The proposed annulus monitoring system will consist of an annulus fluid tank with a level indicator or site glass, pressure transducers and gauges, a nitrogen regulator and a nitrogen supply cylinder. The systems will be installed on the wellhead, in the wellhouse building, or in the immediately adjacent facilities building.

As specified in all Region 5 Class I permits, the annulus pressure will be designed to exceed the injection pressure throughout the length of the wellbore at all times. This will serve to ensure that, in the unlikely event of a mechanical integrity failure related to downhole tubulars, injected fluid will not enter the annulus to contact the long-string casing. Annulus fluid will enter into the injection tubing rather than the injected fluids entering into the annulus. Continuous monitoring of the annulus pressure will be required to ensure this pressure is maintained.

In addition to the positive annulus pressure operating and monitoring requirements, an interlock system will be installed to prevent the well from being operated if permit conditions are exceeded or if unsafe conditions exist. Several operating systems will have preset limits, which can be adjusted depending upon specific operating conditions and reporting requirements.

The following engineering restraints are proposed for incorporation into the well monitoring system to meet current UIC regulations and likely permit conditions.

1. Set points to ensure that the annulus pressure is maintained a minimum of 100 psig above the injection pressure all times.

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- 2. The differential pressure will be controlled so that:
 - a) The annulus pressure exceeds the injection pressure at all depths.
 - b) The injection pressure and annulus pressure will not exceed the mechanical limits of the downhole tubulars and will not have sufficient force to unseat the packer.
 - c) In the event of a disruption of differential pressure, the monitoring equipment will activate an alarm.
 - d) A high differential pressure will cause a pressure relief valve located on the annulus reservoir tank to open.
- 3. A high injection pressure switch will activates an alarm and terminate power to any transfer or injection pump if the maximum allowable injection pressure is exceeded.

Annulus pressure in this system will be maintained with a nitrogen blanket supplied from pressurized nitrogen cylinders. In the event of power failure, positive pressure can still be maintained on the annulus at all times.

A computerized data acquisition system will be used to monitor injection rate, injection pressure, annulus pressure and simultaneous differential pressure. Maximum, minimum and average values for each of the four parameters along with total volume will be digitally recorded at least once every five minutes. A chart recorder will also be used to record the annulus pressure, injection pressure and injection flow rate. Pressure transducers located near the wellhead and downstream of any pumping devices will be used to measure pressures. Flow rate is to be measured utilizing an inline turbine meter and totalizer or equivalent. Well operators will be required to visually inspect the recorder and computer on a daily basis when injection occurs to verify proper operation. The annulus tank level and any annulus fluid added to the system will be recorded daily by the well operators.

A backup power source (battery) will be used to ensure continuous collection of operating and well alarm data for up a minimum of 30 minutes should power failure occur. In the event that a power failure persists past the ability of the battery systems to allow power, the well will be shut-in, and annual readings recorded a minimum of once every six hours until power is restored to the monitoring equipment.

The annulus tank will sufficient reservoir capacity to accommodate double the anticipated volume fluctuations due to temperature and pressure limitations. Pressure will be maintained through the use of high-pressure nitrogen cylinders. The cylinders will be replaced and recharged as required. The annulus tank is to be equipped with a level indicator or a full length armored reflex sight glass, a pressure relief valve, and an independent liquid fill nozzle.

In the event that any of the permit conditions are exceeded, including injection pressure or differential pressure a visual alarm light will be illuminated at the well building. In addition, the computerized data acquisition system will be coupled to a telephone autodialer that will send a page to the operator to ensure that the condition is communicated. Upon an alarm condition, injection will be stopped by the operator until the problem is identified, corrected, and the system manually restarted.

Mechanical Integrity

Part I and Part II mechanical integrity demonstrations will be conducted as discussed in Response 2.L of this document when the well is completed.

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	_		
	\bigcirc	CEMENT, VOLUMES, FLUIDS and HOLE SIZE	
		TUBULARS and COMPONENTS	
	A	12 1/4" Hole, Cemented to Surface with 273 sacks Class A	2
	В	8 1/2" Hote, Cemented to Surface with 264 sacks Class A	
	C	Annulus Fluid: Fresh water with Inhibitor and scavenger	
	0	Completion: 61/4" Open Hole; total depth @ +/-2,450	
	1	Surface Casing: 13 3/8", 61#/ft., Driven to refusal as deep as 175'	
	2	Intermediate Casing: 9 5/8", 36 lb/ft., K-55 or J-55, Set @ approximately 95	
	3	Long String Casing: 7", 26 lb/ft., J-55 or K-55, Set @ approximately 2,150'	
	4	Injection Tubing: 41/2", 11.6 lb/ft., J-55	
	5	Packer: 7" x 4 1/2" Large Bore, Set @ approximately 2,100'	
T			
			5 Beli Shale
			Reliefe -
			Figure M-1
			Beeland Group, LLC. Alba, Michigan Facility
		2	WELL SCHEMATIC DISPOSAL WELL NO. 1
		·	SCALE: NONE DATE: 10/06

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UIC Permit Application Beeland Group, LLC October 6, 2006

2.N CHANGES IN INJECTED FLUID

For Class III well (Not Applicable to this Application)

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2.0 PLANS FOR WELL FAILURES

Outline contingency plans (proposed plans, if any, for Class II) to cope with all shut-ins or well failures, so as to prevent migration of fluids into any USDW.

RESPONSE

The proposed Beeland Group, LLC Well No. 1 will be operated from limited tank storage at relatively low injection pressures. Depending on rate requirements and well conditions, injection may take place via gravity flow. The following summarizes the plan to address failure of the well to protect the surface environment and prevent migration of injected fluids into any USDW:

Beeland Group, LLC Alba, Michigan Proposed Well No. 1 Contingency Plan

- 1. Monitoring and periodic routine investigative procedures will be performed on the injection well as required by applicable laws, permits and regulations. Pertinent data will be forwarded to the agencies as required. Monitoring and testing will be designed to assure well integrity and safe operations.
- 2. If the well fails required monitoring or periodic testing standards, the well will be shut-in and the agency notified according to applicable regulations and permit conditions. After investigation into the cause for the failure, work plans will be prepared and reviewed with the regulators for repairing the problem.
- 3. If a workover is performed on a well, mechanical integrity testing will be conducted as required by applicable regulations before the well is returned to service. Copies of all work reports and logs will be forwarded to the regulatory agencies per applicable requirements.
- 4. During the period of time required for a well workover or for shut-ins due to MIT failure, the contingency plans of the facility will include the following:
 - a. If shut-in period is sufficiently brief, the fluids accumulated during this period of time will be held in storage at the facility.
 - b. If required due to length of shut-in, fluids will no longer be generated or accepted at the facility and remaining fluids in on-site tanks will be removed from the facility via licensed transport vehicles and managed according to applicable regulations.

Should the mode of failure be beyond the limits of economic feasibility to repair, the guidelines for plugging and abandonment in Attachment Q will be followed.

2.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.

RESPONSE

The monitoring program proposed for injection operations at this site focuses on the active injection well itself. No monitoring program specifically focused on the investigation of injectate containment via dedicated monitor wells is in place nor is one proposed. The primary injection interval is the Dundee Limestone (formation top approximately 2,100 to 2,150 feet BGL). The thickness of the overlying arrestment interval, including the Bell Shale and a portion of the Traverse Limestone in addition to the additional protection provided by the overlying Devonian and Mississippian Formation through the top of the Coldwater Shale create a large separation between the injectate and the waters of the USDW quality water above the based of the Glacial Drift. This separation distance (projected to be in excess of 1,200 feet), coupled with the absence of faults in the area, the significant under-pressure projected for the injection interval, and the suitability of well construction and operation requirements indicate that no groundwater monitoring program is required at this facility.

However, a variety of data is collected to monitor the injection well operations. This monitoring takes place through utilizing both periodic and continuous techniques.

Mechanical Integrity and Periodic Testing

Periodic monitoring is to be performed to conform to both Part I and Part II mechanical integrity requirements. Annual testing including reservoir monitoring and annulus pressure testing will be conducted once each calendar year in addition to Part II testing which will be performed once each fifth calendar year and will include one of the following logs (temperature, noise or oxygen activation) per applicable non-hazardous well regulations. Casing inspection logs may be conducted to investigate corrosion if it is determined to be necessary due to operational or regulatory concerns when tubing is already removed from the borehole during a workover or stimulation.

Annual Part I mechanical integrity testing for Well No. 1 will include reservoir monitoring as specified in 40 CFR 146.13 (d) in addition to static or dynamic annulus pressure testing. Although test procedures or methods may be changed based on request of the permittee and approval by Region 5 USEPA staff, the following procedure is expected to be typical for such monitoring. The Beeland Group will provide the agency with a minimum of 30 days notice of annual testing (when practical) to allow the agency to witness testing. Such notice is to include proposed procedures for testing.

- 1. Conduct Well Site Safety Meeting
 - A. Prior to commencement of field activities, conduct safety meeting with contractors and personnel to be involved with field services and MIT testing. Ensure that all safety procedures are understood and review days work activities.
- 2. Conduct Reservoir (Fall-Off or Static) Pressure Test
 - A. For fall-off, record data regarding test well injection at typical operating conditions (constant rate). Rate, temperature and fluid consistency will be recorded during the injection period. Cumulative volume injected should also be recorded. Continue

2-58



injection for a minimum of approximately twelve hours. Note that significant rate variations may yield poor guality data or require more complicated analysis techniques.

- B. Rig-up pressure gauge and run in well to a depth of approximately 2,100 feet or other depth approved by USEPA consistent with historical measurements.
- C. For pressure transient fall-off, obtain final stabilized injection pressure for a minimum of 1 hour. Ensure that the gauge temperature readings have also stabilized.
- D. After gauge recordings are stable, cease injection and monitor pressure fall-off. Continue monitoring pressure for a minimum of four hours or until a valid observation of fall-off curve is observed. For static survey, the well will be shut-in for a minimum of 48 hours before testing. Static data will be collected by using downhole gauges at an approved depth consistent with past measurements as approved by USEPA.
- E. Stop test data acquisition, rig-down and release equipment.
- 3. Annulus Pressure Test
 - A. Stabilize well pressure and temperature.
 - B. As practical, arrangements will be made for a representative from the USEPA to be present to witness this testing.
 - C. Pressurize annulus to a minimum of 500 psig or 100 psig above maximum permitted operating pressure with liquid and shut-in valve. Install certified gauge on "bleed" type valve. The annulus may need to be pressurized and bled off several times to ensure an absence of air. Monitor and record pressure for one hour. Pressure may not fluctuate more than 3 percent during the one-hour test. At the conclusion of the test, lower the annulus pressure to normal operating pressure.

Part II (5 year) mechanical integrity demonstration for the well will be accomplished via an approved test method(s) such as temperature log, or noise log, or oxygen activation log. The Beeland Group will provide the agency with a notice of Part II testing to allow the agency to witness data collection activities. Although Beeland may utilize any acceptable method per USEPA procedure approval, at this time it is proposed that temperature logging be utilized for future Part II mechanical integrity testing. Differential temperature logging to be conducted as follows:

- 1. Conduct Differential Temperature Log.
 - A. Shut-in well for stabilization (minimum of 36 hours) prior to running base temperature log.
 - B. Rig-up temperature log and run base log from surface to total depth. Pull tool to surface and shut-in master valve.
 - C. Rig down equipment and return the well to normal operations.

Continuous and Operational Monitoring

The proposed well will have one long string protective casing extending into the injection interval with cement isolating all permeable intervals. All casing strings are intended to have cement circulated from each shoe to

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the surface. As previously noted in this document, the annulus area between the protective casings and injection tubing string is to be filled with treated fresh water. The annulus pressure is to be continually monitored to detect any leaks in the tubing or casing. If leaks develop during injection, pressurized annulus fluid would be injected into the permitted injection interval, and injected fluids would not be able to contact the long-string casing above the permitted injection zone. Injectate should therefore have no potential for leakage into un-permitted formations. Details regarding the proposed system components are provided in Attachments L and M of this document.

Monitoring of physical parameters associated with injection operations will be conducted pursuant to 40.CFR.146 regulations. At a minimum the monitoring will include, injection pressure, annulus pressure, injection rate, injection volume, annulus level, and injectate characteristics. Details regarding this monitoring follow. Automatic shutdown capability as specified in Attachment K of this document will be operated to ensure that maximum pressure or minimum annulus differential requirements are not exceeded.

Annulus and Injection Pressure

Both the injection pressure and the annulus pressure are continuously to be recorded for the well. Electronic pressure transducers will be placed in pressure taps on the annulus system and injection flow lines. A signal will sent from these transducers to a computer recorder and a chart recorder. The automated control system data will be visually inspected a minimum of once daily for anomalies when the well is operating. As part of the process and controls, the computer will record maximum, minimum and average information. Differential pressures are to be obtained by comparison of simultaneous readings of the annulus and injection pressure transducer readings obtained for the well.

Injection Rate and Volume

The flow rate to the well will be determined by a liquid flow meter designed for continuous monitoring. Flow rate is to be measured in the flow line to the well. The instrument will send signals to the process control system that calculates cumulative volume. Beeland reserves the right to substitute equivalent or superior equipment to fulfill these data measurement functions at any time.

Annulus Tank Levels

The annulus tank in the well system will have sufficient reservoir capacity to accommodate the anticipated volume fluctuations due to temperature and pressure limitations. The annulus tank is equipped with an armored reflex sight glass, pressure relief valve and independent liquid fill nozzle. If any annulus fluid is added, it will be recorded by the well operators on an operator log sheet. Annulus tank level is to be recorded on days when injection occurs.

Waste Characterization and Analysis

Injectate characteristics will be monitored by collecting samples per the approved waste analysis plan entered as part of the administrative record for this permit. The waste analysis to be conducted is intended to provide representative data regarding average injectate chemical constituents. A waste analysis plan prepared in accordance with applicable information from the USEPA Region 5 Waste Analysis Plan Guidance document is presented as a supplement to this attachment.

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WASTE ANALYSIS PLAN

Class I Non-Hazardous Injection Well

Beeland Group, LLC Alba, Michigan Facility

Antrim County

T30N, R5W, Section 14, SE ¹/₄ Section

EPA Permit # TBD

October 6, 2006

Prepared By:

Petrotek Engineering Corporation 9088 S. Ridgeline Boulevard, Suite 105 Littleton, Colorado 80129 Phone: (303) 290-9414 Fax: (303) 290-9580

TABLE OF CONTENTS

1.0	Introduction	1-1
1.A	Background	1-1
1.B	Waste Source	1-1
1.C	Summary	1-1
2.0	Procedures	2-1
2.A	Volume Monitoring	2-1
2.B	Waste Characterization	2-1
2.C	Sampling and Analysis	2-3
3.0	Quality Assurance/Quality Control	3-1
3.A	General Sampling and Analytical Information	3-1
3.B	Sampling Controls	3-1
3.C	Analytical Controls	3-3
3.D	Actions	3-4

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1.0 INTRODUCTION

1.A. Background

The purpose of this Waste Analysis Plan (WAP) is to characterize the non-hazardous waste-water that is injected into the proposed new Beeland Group, LLC (Beeland) No. 1 well at the Alba, Michigan facility. Beeland will be responsible for ensuring this WAP is implemented. The well is a proposed as a non-hazardous, non- commercial Class I industrial disposal well that is to be dedicated to the injection of fluids generated in association with a groundwater remediation project.

Beeland will operate the well under this Waste Analysis Plan in accordance with Title 40 of the Code of Federal Regulations (40 CFR), Section 146.13 that requires operators of Class I underground injection wells to monitor and analyze the fluids injected into the well "to yield representative data of their characteristics." This Waste Analysis Plan has been prepared to fulfill the specifications of 40 CFR 146.68 such that the plan presents parameters for which the waste will be analyzed, methods that will be used to test for these parameters, and methods that will be used to obtain a representative samples of the waste to be analyzed.

1.B. Waste Source

The Class I non-hazardous waste to be injected into the Beeland Well No. 1 under this Waste Analysis Plan include fluids that are to be recovered at the Bay Harbor, Michigan Remediation Project along with fluids generated at the disposal well facility operation itself. These fluids are to be comprised of recovered groundwater and surface waters, both treated and untreated, storm-water run-off from the Bay Harbor project and at the well facility, along with any fluids generated during the operation and maintenance of the Class I injection well and the related unloading pad and surface facilities. No commercial or oilfield waste is to be managed at the facility.

1.C. Summary

Major portions of the Beeland waste characterization and monitoring program related to the acceptance and injection of off-site fluids consist of:

Volume Monitoring Generator Certification Sampling and Analysis Quality Assurance/Quality Control

October, 2006 Waste Analysis Plan

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The WAP may be reviewed and, if necessary, revised. Revisions to the WAP, upon approval, will become part of the administrative record and constitute a minor modification of the permit.

Compatibility problems between the waste and the injection or confining zone lithologies or with the well construction materials are not anticipated. The fluids have been previously managed at both POTW and injection well locations successfully. Limited filtration or additives may be required, and stimulation of the well may also be required.

Data appropriate to evaluate compatibility will be collected only when deemed necessary by Beeland through identification based on specific process or characterization data that is collected during operations. Possible issues could include the potential for scale and corrosion problems from wastes with high pH (above 10). However, the intended operating parameters include a pH range of 7 to 10. If problematic wastes are encountered on a regular basis, periodic metal thickness monitoring via coupons or non-invasive electrical or magnetic monitoring may be implemented. Economic and well performance issues regarding well flow rate capacity and maintenance will be addressed, if necessary, by utilizing additives, settling and/or filtration of the waste prior to injection. No waste treatment at the well site for regulatory purposes is anticipated.

October, 2006 Waste Analysis Plan

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2.0 PROCEDURES

2.A. Waste Unloading and Volume Monitoring

Offloading of fluid transports delivered from the Bay Harbor collection facilities will only be conducted with a trained operator physically present on site. A log sheet will be maintained on the site documenting that a trained well operator allowed waste to be unloaded. At a minimum, log sheet entries are to include operator name, date, time, approximate volume, truck or transport identification. Similar data may be obtained and recorded by filing manifest forms for the deliveries. The log sheet(s) and/or manifests will be considered part of the plant monitoring records regarding the injection well.

As discussed in the main text of the permit application, a recorder will be utilized to continuously monitor injection pressure, annulus pressure, flow rate and totalized cumulative volumes. A summary of recorded data will be provided to the EPA and/or MDEQ per applicable permit requirements. Records of daily volume accepted from the remediation project and any fluids managed from the onsite facility will be recorded and a total monthly volume of injectate calculated based on data maintained in the records will be noted in the monthly well reports made to EPA.

2.B. Waste Characterization

At a minimum, the following composition parameters will be monitored once quarterly for any quarterly period that fluid is injected. These parameters shall include:

pН total dissolved solids total suspended solids specific gravity specific conductance total organic carbon BTEX (if unloading pad fluids are being actively managed) aluminum arsenic bicarbonate alkalinity bromide calcium chloride chromium flouride iron mercury

October, 2006 Waste Analysis Plan

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potassium silica sodium sulfate

For the purpose of this Waste Analysis Plan, the first quarter shall be considered the first three calendar months of the year, and the remaining quarters shall be considered subsequent divisions of the year into three-month segments. If fluids are not injected into the Beeland well during a calendar year, sample or analyses will be required.

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2.C. Sampling and Analysis

Beeland, or contracted personnel will collect necessary waste stream samples. All sampling procedures will be conducted at the direction of the selected, certified analytical laboratory and in accordance with acceptable US EPA procedures. The sampler's name, sampling point, and date sampled will be documented in chain-of-custody paperwork. Samples will be collected with the grab method.

The table included below summarizes the analytical method and sampling frequency for typical parameters that may be included in the waste sampling for a particular waste source.

Test Parameter	Test Method	Units
Total Dissolved Solids, TDS	EPA 160.1	mg/L
Total Suspended Solids, TSS	EPA 160.2	mg/L
Specific Gravity	ASTM 2710 F	-
Total Organic Carbon, TOC	415.1,415.2	mg/L
Specific Conductance	120.1	-
Sodium	EPA 6010B	mg/L
Calcium	EPA 6010B	mg/L
Bicarbonate	EPA 310.1	mg/L
Sulfate	EPA 300.0	mg/L
Chloride	EPA 325.3	mg/L
BTEX	EPA 5030/8020	ug/l
Iron (Fe)	EPA 200.7	mg/L

WASTE SAMPLING METHODS







Notes: Beeland reserves the right to select use of the cited method or method with equal or greater detection limit

Samples will be collected at the point of generation or at the Beeland facility from transport tanks prior to unloading wastes into the storage or injection facilities.



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3.0 QUALITY ASSURANCE/QUALITY CONTROL

3.A. General Sampling and Analytical Information

The sampling protocol will be followed by properly trained personnel conducting the sample collection and analysis. Beeland will adhere to guidelines set forth in "Test Methods for Evaluating Solid Waste", SW-846 and 'Methods for Chemical Analysis of Water and Wastes", EPA 600/4-79/020 as appropriate. Approved sample preservation techniques from 40 CFR 136.3 will be followed as appropriate. These will include preservation in plastic or glass sample containers provided by the laboratory and storage in a sample refrigerator or cooler for shipment to the laboratory. Beeland reserves the option to choose suitable laboratories for testing provided equivalent QA/QC standards are met.

Standard chain of custody protocols will be followed for waste collection, transport and analysis. Below are summaries of the minimum sampling and analysis protocols which will be followed for each characterization parameter:

Labeling

- 1. Sample name, date and time
- 2. Name of sample collector; (include sampling company name if not Beeland);
- 3. Sample collection method;
- 4. Sample collection point;

Reporting

- 1. Sample preservation technique, as appropriate;
- 2. Analytical method for parameter detection/quantification;
- 3. Analytical method accuracy and quantification limits; and
- 4. Field documentation of sampling.

The following are QA/QC parameters which will be followed to ensure the adequacy of the sampling and analytical techniques for wellhead sampling and analysis described in this plan.

3.B. Sampling Controls

1. Equipment Blanks

If possible, samples will be obtained directly from the sample tap or valve being used to

Beeland Group, LLC

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Page 3-2

access the tank or containment vessel and not be transferred to any secondary container or device before being stored in the sample container to be shipped to the laboratory. In this case, no equipment blanks will be required. If not, equipment blanks will be taken as deemed appropriate by Beeland for the purpose of detecting potential cross contamination due to improper decontamination of sampling equipment. After sampling, any secondary container or sampling device used will be decontaminated according to the sampling plan protocol. The sampling device will then be rinsed with deionized water and the rinsate collected in a sample container for transport to the laboratory for analysis of, at a minimum, the same parameters chosen in the sampling plan above.

2. Trip Blanks

In the case of suspect analysis from any laboratory, trip blanks will be used and will be sample containers filled with Type II reagent grade water at the laboratory, sealed at the laboratory, which accompany the sample containers used throughout the sampling event. The sample containers shall be handled in the same manner as the samples. Trip blank(s) will be sent to the laboratory for analysis of, at a minimum, the same parameters chosen in the sampling plan above. A minimum of one (1) trip blank per sampling event will be utilized, if necessary.

3. Sample Duplicates

On advance written demand of EPA, duplicate samples will be taken to assess the QA/QC of the laboratory conducting the analysis. Such samples will be drawn from the same site from which primary samples are taken. Duplicate samples, if taken, will be split from the original sample in a manner to emphasize sample representativeness. The duplicate will be labeled with a sample number that will not conflict with the other samples, but will not be discernable to the laboratory as a duplicate sample. If requested by EPA or MDEQ, one duplicate sample per sampling event will be taken and analyzed for the same parameters listed in the sampling plan.

4. Sample Chain-of-Custody Protocol

Sample chain-of-custody will be followed at all times during the sampling and subsequent analysis. Chain-of-custody will be used to document the handling and control necessary to identify and trace a sample from collection to final analytical results.

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3.C. Analytical Controls

1. Equipment Calibration

Selected laboratories will maintain QA/QC data in accordance with that laboratory's Q/A plan regarding the frequency and type of instrument calibration performed at the laboratory and in the field. Any calibration of thermometers, gauges, chromatographs, spectrometers and other meters will be conducted according to appropriate instrument manufacturer specifications and manufacturer recommended frequencies or as dictated by applicable laboratory Q/A plans.

2. Data Reduction

The process of transcription of the raw data into the reportable units will be conducted by the laboratory in accordance with that laboratory's Q/A plan. Data reduction utilized in the analysis and reporting process will be presented in the reports to the US EPA for each sampling event and parameter tested by the specific laboratory used at the time.

3. Data Verification

Data verification will be conducted in accordance with the selected laboratory's Q/A plan after each sampling event by assigned laboratory personnel. Typical procedures will include review of chain-of-custody forms, equipment calibration records and data completeness. Spot checks of raw data versus reported data may be performed to review math accuracy, significant numbers and reporting units. In addition, certified laboratory standard quality assurance/quality control checklists will be utilized per the selected laboratory's Q/A plan for individual test methods such as blanks, standards, and comparisons of internal lab test duplicate results. Problems with any of these items will be indicated in the report to the agency.

4. Internal Quality Control

Certified quality control samples may be run periodically in accordance with the selected laboratory's Q/A plan with sample batches obtained from appropriate commercial sources, or appropriate regulatory entities. Internal quality control will be addressed as required by the selected laboratory's Q/A plan and will typically include disclosure of the laboratory's use of blanks, blind standards, matrix spikes and matrix spike duplicates, preparation of reagents, and laboratory duplicate or replicate analyses.



October, 2006 Waste Analysis Plan

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3.D. Actions

1. Corrective Actions

Corrective actions will be implemented by laboratories if the analytical or sampling method does not achieve laboratory standards or Beeland objectives. Actions may entail re-sampling the waste stream and/or re-analyzing the fluid for a particular parameter, re-calibrating an analytical device, or other appropriate actions. Action levels will be taken in accordance with SW 846 or other approved EPA methods.

2. Reports to US EPA, Region 5 and MDEQ

Reports to US EPA and MDEQ will contain results, data and sampling descriptions regarding the accuracy, completeness and repeatability of the reported analytical results. The report will contain a table that specifies the type of sample (blank, waste, etc.), sampling date, sampling location, analytical method, method detection limit and analytical result. The results of analyses and all accompanying data, including chain-of-custody forms, will be reported to US EPA with the next monthly operating report submitted to the agency after the receipt of the final sample analysis report from the laboratory. This submittal to the agency will typically be within sixty (60) days of the sampling event, unless prior arrangements have been made with the agency due to conditions beyond the control of the operator that prohibit such reporting.

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2.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 USEPA Form 7520-14, Plugging and Abandonment Plan.

RESPONSE

The following completed copy of US EPA Form 7520-14, Plugging and Abandonment Plan, are submitted to satisfy this requirement. The modifications made to this form are to provide consistency with all available and current information. The plan for the well is also summarized in graphical form (Figure Q-1) in this response. Costs associated with the plugging and abandonment of the well per the following procedures is presented in the completed plugging forms and in Response 2.R of this document.

The following is the proposed plan for plugging and abandonment of the proposed Beeland Group, LLC nonhazardous Class I Well.

- 1. Install a test gauge on the annulus to perform a static pressure test. Ensure that the annulus is fluid filled and that the well has been shut-in for a minimum of 24 hours. Pressurize annulus to approximately 500 psig and isolate from the annulus system. Monitor annular pressure for one hour. The test will be successful if the pressure change is less than 3 percent of the starting pressure.
- 2. Prepare well and location for plugging. Remove wellhouse, well monitoring equipment and wellhead injection piping.
- 3. Move in and rig-up workover rig, mud pump, circulating pit and pipe racks as necessary. Flush well with approximately 100 bbl fresh water.
- 4. Remove wellhead and release slips.
- 5. Release injection packer. Displace annular fluid from well into injection formation by flushing with approximately 100 bbl fresh water.
- 6. Pull and lay down the injection tubing and packer.
- 7. Run cement retainer to approximately 2,100 feet.
- 8. Pump approximately 55 sacks of Class A cement with 4 percent bentonite (14.1 ppg, 1.55 cf/sx yield) below cement retainer and into 6 ¼-inch openhole.
- 9. Tag cement on top of retainer at approximately 2,100 feet.
- 10. Stage cement remainder of casing to surface in approximately 500 foot stages using the balanced plug method. Pump approximately 291 sacks of Class A cement with 4 percent bentonite (14.1 ppg, 1.55 cf/sx yield).
- 11. Cut off wellhead approximately 3 feet BGL and weld cap with permanent marker on casing.

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- 12. Rig down and move out pulling unit and equipment.
- 13. Submit required plugging records to USEPA and MDEQ.

Post-Closure Care Requirements

Beeland will provide notification of closure to USEPA, Region 5, the MDEQ and the local zoning authorities. Included with the notification will be information regarding the nature of the injected waste stream, identification of the depths of the injection and confining zones, well schematics and plugging records. Beeland will retain, for a period of three years following the well closure, records reflecting the nature, composition and volume of all injected fluids. At the discretion of the director of USEPA, Region 5, Beeland will then deliver the records to the director at the conclusion of the retention period, or dispose of such records upon written approval of the director.



Petrotek Engineering Corporation 9088 South Ridgeline Boulevard, Suite 105 Littleton, Colorado 80129 USA (303) 290-9414 FAX (303) 290-9580

October 5, 2006

Ms. Lisa Perenchio US EPA, Region 5 UIC Section, (WU-16J) 77 West Jackson Boulevard Chicago, Illinois 60604-3590

RE: Plugging and Abandonment Costs for Class I Well Proposed Beeland Group, LLC Disposal Well No. 1 Alba, Michigan

Dear Ms. Perenchio:

Petrotek has prepared procedures and a cost estimate for the plugging and abandonment of the proposed Beeland Group, LLC Class I Non-Hazardous injection well at Alba, Michigan in Antrim County. This well is to be completed as a Dundee injector at a depth of approximately 2,150' to 2,450' BGL. It is to be located in reasonably close proximity to oilfield contractor service companies in the northern Michigan Basin.

This cost estimate has been prepared based on satisfying minimum federal requirements for plugging and does not include budget for any additional integrity testing or the decommissioning of any related surface facilities. Copies of the EPA Form 7520-14 have been provided that summarize the plan. Required financial assurance amounts for this proposed well are estimated as \$26,700. Adjustments may be necessary based on actual conditions encountered during completion of the well. This includes line item budgeting as follows:

- \$ 12,900 Cement
- \$ 2,500 Rig or Pulling Unit
- \$ 500 Welder
- \$ 6,800 Cement Retainer and Top Plug
- \$ 4,000 Miscellaneous
- \$ 26,700 Total

As always, if you have any questions or require further information regarding any issues related to the wells, feel free to contact any of us at Petrotek.

Sincerely.

Petrotek Engineering Corporation Ken Cooper, PE

	CEMENT, VOLUMES, FLUIDS and HOLE SIZE		
	TUBULARS and COMPONENTS		
	A 12 1/4" Hole, Cemented to Surface with 273 sacks	2	
	B 8 1/2" Hole, Cemented to Surface with 264 sacks		
	C 291 Sacks Cement, 2,100' to surface	B B	
	D 7 Sacks Cement, 2,150' - 2,100' +/- 850' Lowermo	st USDW	
	E 48 Sacks Cement, 2,450' - 2,150' Base of Drift		
	Surface Casing: 13 3/8", Driven to refusal		
	Lintermediate Casing: 9 5/8", 36 lb/ft., K-55 or J-55, Set @ 950'		
	Long String Casing: 7", 26 lb/ft., J-55 or K-55, Set @ 2,150'	3	
	4 Mechanical Plug: Set @ 2,100' on top of cement retainer or original pact	ker C	
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Bigs of			
		4	
		E	
		Figure 0-1	
		Beeland Group, LLC.	
	•	Alba, Michigan Facility	
		WELL SCHEMATIC DISPOSAL WELL NO. 1	
		SCALE: NONE DATE: 10/0	

2.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 is available.

RESPONSE

With respect to financial assurance, a Letter of Credit in the amount of \$40,000 will be maintained as required by applicable regulations. Included as documentation for this Response are copies of an independent plugging cost estimate for the proposed Beeland Group, LLC Well No. 1, a copy of the Letter of Credit that has been secured for the required financial assurance amounts per applicable regulations. The Letter of Credit is committed to the State of Michigan, Director of Mineral Wells. A letter requesting the use of this mechanism to also satisfy federal financial assurance requirements is included in this response.

Materials to be forwarded to USEPA regarding financial assurance will be forwarded by Beeland Group, LLC to the following address:

US Environmental Protection Agency Region 5 UIC Branch, DI Section 77 West Jackson Blvd. Chicago, IL 60604-3590

With respect to continued demonstration of financial assurance, the Letter of Credit will be maintained as required by applicable regulations. Within ninety (90) days after the close of each fiscal year, the permittee will obtain verification that the amount used for financial assurance is sufficient to address updated plugging and abandonment costs and will submit updated financial assurance information if the cost of plugging and abandonment has exceeded the existing financial assurance. In such an event, the information submitted to the Director will consist of a letter from the permittee regarding the change in the financial assurance and a copy of the independent geologist or engineering estimate of the updated plugging and abandonment costs.

Petrolek



Beeland Group, LLC

One Energy Plaza Jackson, Michigan 49201

October 5, 2006

Rebecca L. Harvey, Chief **Underground Injection Control Branch** U.S. Environmental Protection Agency 77 West Jackson Boulevard, WU-16J Chicago, Illinois 60604-3590

Dear Ms. Harvey:

This letter requests that the attached Letter of Credit submitted to the State of Michigan in the total amount of \$40,000 be considered an acceptable mechanism for meeting the Federal Underground Injection Control program financial responsibility requirement for the following well:

1. Well Name:	Beeland Disposal Well No. 1
2. Well Location:	Township 30N Range 5W SE 1/4 of Section 14
·	Antrim County, Michigan
3. UIC Application:	Pending
4. Owner/Operator Name:	Beeland Group, LLC
5. Address:	One Energy Plaza
	Jackson, Michigan 49201
6. Phone:	(517) 788-9045

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document 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)

Joseph Tomasik, Vice-President

Beeland Group, LLC

<u>10/5/06</u> Date Signed

cc: Thomas Wellman, Michigan Department of Environmental Quality

OCT-06-06 08:54 FROM: INTL CUSTOMER SUPT

1. 1.2 IRREVOCABLE STANDBY LETTER OF CREDIT NUMBER SM222299W

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LETTER OP	CREDIT AMOUNT	ISSUE DATE		EXPIRY D	rte
USD	40,000.00	10/05/06		10/04/07	
BENEFICIARY: MICHIGAN DEP OFFICE OF GE 525 WEST ALL 1ST PLOOR, S LANSING, MI	ARTMENT OF ENVIRONME OLOGICAL SURVEY EGAN ST. OUTH TOWER 48933	A INTAL QUALITY C E C J	APPLICANT: MS ENERGY BEELAND GRO NE ENERGY ACKSON, MI	ON BEHALF DUP LLC PLAZA EPIC 1 49201	OF 0-431

WE HEREBY ISSUE OUR IRREVOCABLE LETTER OF CREDIT IN YOUR FAVOR ON BEHALF OF BEELAND GROUP LLC, HEREINAFTER KNOWN AS THE COMPANY, FOR A SUM OF \$40,000.00 (USD PORTY THOUSAND AND 00/100'S), AVAILABLE BY YOUR DRAFTS AT SIGHT DRAWN ON OUR INSTITUTION WACHOVIA BANK, NATIONAL ASSOCIATION, 401 LINDEN STREET, WINSTON-SALEM, NORTH CAROLINA 27101, ATTN: STANDBY LETTER OF CREDIT UNIT. DRAFTS MUST BE MARKED "DRAWN UNDER WACHOVIA BANK, NATIONAL ASSOCAITION LETTER OF CREDIT NO. SM222299W DATED 10/05/06.

THIS LETTER OF CREDIT IS ISSUED TO PROVIDE FINANCIAL ASSURANCE TO THE STATE OF MICHIGAN FOR THE WELL KNOWN AS BEELAND DISPOSAL NO. 1.

THE SUPERVISOR OF WELLS MAY DRAW ON THIS LETTER OF CREDIT IN THE EVENT (1) THAT THE DEPARTMENT OF ENVIRONMENTAL QUALITY ISSUES THAT CERTAIN NOTICE OF VIOLATION INDICATING THAT THE COMPANY HAS FAILED TO COMPLY WITH THE PROVISIONS OF THAT CERTAIN PART 615 SUPERVISOR OF WELLS, 1994 PA 451, AS AMENDED IN THE FINAL TOMPLETION OF ITS WELL OR WELLS. "FINAL COMPLETION" MEANS THE LOCATING, DRILLING, COMPLETING, PRODUCING, REWORKING, PLUGGING, FILLING OF PITS, AND CLEAN-UP OF WELL SITE, INCLUDING THE FILING OF PRESCRIBED RECORDS AND APPROVAL THEREOP BY THE SUPERVISOR OF WELLS; OR (2) THAT THE COMPANY FAILS TO PROVIDE THE SUPERVISOR OF WELL WITH AN EXTENSION OF THIS LETTER OF CREDIT OR OTHER FINANCIAL ASSURANCE OR (3) THAT THE COMPANY IS ADJUDGED INSOLVENT OR BANKRUPT. THE COMPANY SHALL BE DEEMED, FOR PURPOSES OF THIS LETTER OF CREDIT, ADJUDGED BANKRUPT UPON ANY PETITION UNDER THAT CERTAIN TITLE 11 OF THE UNITED STATES CODE, FILED ON THE DEBTORS BEHALF, AND AN OPDER FOR RELIEF GRANTED BY ANY OF THE UNITED STATES DISTRICT OR BANKRUPTCY COURTS.

IF ANY PROVISION OF THIS LETTER OF CREDIT IS CONSTRUED AS INEFFECTIVE BY A COURT OF COMPETENT JURISDICTION, ALL OTHER PROVISIONS OF THIS LETTER OF CREDIT SHALL REMAIN IN FULL EFFECT AND BE ENFORCEABLE PURSUANT TO THE EFFECTIVE PROVISIONS CONTAINED HEREIN.

THIS LETTER OF CREDIT IS SUBJECT TO THE UNIFORM CUSTOMS AND PRACTICES FOR DOCUMENTARY LETTERS OF CREDITS", 1993 REVISION OF THE INTERNATIONAL CHAMBER OF COMMERCE, PUBLICATION NO. 500, AND AS TO MATTERS NOT GOVERNED BY THE UNIFORM CUSTOMS AND PRACTICE FOR DOCUMENTARY CREDITS, AFOREMENTIONED, SHALL BE GOVERNED BY, AND CONSTRUED IN ACCORDANCE WITH THE UNIFORM COMMERCIAL CODE OF THE STATE OF MICHIGAN.

CONTINUED ON NEXT PAGE WHICH FORMS AN INTEGRAL PART OF THIS LETTER OF CREDIT

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OCI-06-06 00:55 FROM:INTL CUSTOMER SUPT

IRREVOCABLE STANDBY LETTER OF CREDIT NO. SM222299W PAGE NO. 2 10/05/06

PARTIAL DRAWINGS ARE PERMITTED WITHOUT CANCELING THE LETTER OF CREDIT BALANCE. THIS ORIGINAL LETTER OF CREDIT MUST BE SUBMITTED TO US TOGETHER WITH ANY DRAWINGS THEREUNDER FOR OUR ENDORSEMENT OF ANY PAYMENTS AFFECTED BY US AND OR CANCELLATION.

IT IS A CONDITION OF THIS LETTER OF CREDIT THAT IT SHALL BE AUTOMATICALLY EXTENDED FOR ADDITIONAL TERMS OF ONE (1) YEAR FROM THE PRESENT OR EACH FUTURE EXPIRATION DATE UNLESS WE GIVE THE SUPERVISOR OF WELLS AND THE COMPANY, AT LEAST NINETY (90) DAYS BEFORE SAID EXPIRATION DATE, WRITTEN NOTICE BY CERTIFIED MAIL, RETURN RECEIPT REQUESTED, COURIER OR HAND DELIVERY, THAT WE ELECT TO TERMINATE THIS CREDIT AT THE END OF ITS THEN CURRENT TERM.

IN THE EVENT WE GIVE NOTICE OF OUR ELECTION TO TERMINATE THIS LETTER OF CREDIT AND BEELAND GROUP LLC FAILS TO REPLACE THIS LETTER OF CREDIT WITH OTHER FINANCIAL ASSURANCES ACCEPTABLE TO THE DEPARTMENT, YOU MAY DRAW ON THIS LETTER OF CREDIT, UP TO THE AGGREGATE AMOUNT, LESS ANY PRIOR DRAFTS PRESENTED BY THE DEPARTMENT AND PAID BY US, NOT SOOMER THAN THIRTY (30) DAYS AFTER THE DATE OF SUCH NOTICE BY PRESENTATION OF A DRAFT MARKED DRAWN UNDER, WACHOVIA BANK, MATICHAL ASSOCIATIONLETTER OF CREDIT NO. SM222239W, ACCOMPANIED BY A STATEMENT PURPORTEDLY SIGNED BY AN AUTHORIZED REPRESENTATIVE OF THE DEPARTMENT READING AS FOLLOWS:

THE MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY IS MAKING THIS DRAWING BECAUSE BEELAND GROUP LLC , HAS FAILED TO REPLACE THIS LETTER OF CREDIT WITH "OTHER FINANCIAL ASSURANCES ACCEPTABLE TO THE DEPARTMENT.

WE HEREBY ENGAGE WITH YOU THAT DRAFTS IN CONFORMITY WITH THE TERMS OF THIS LETTER OF CREDIT SHALL BE DULY HONORED UPON PRESENTATION AND DELIVERY OF DOCUMENTS AS SPECIFIED TO OUR OFFICE LOCATED AT 401 LINDEN STREET, WINSTON-SALEM, NORTH CAROLINA 27101, ATTN: STANDBY LETTER OF CREDIT UNIT, ON OR AFTER OCTOBER 4, 2007 OR ANY FUTURE EXPIRATION DATE. THE AMOUNT OF EACH DRAFT MUST BE ENDORSED ON THE REVERSE OF THIS LETTER OF CREDIT BY THE NEGOTIATING FINANCIAL INSTITUTION.

FINANCIAL INSTITUTION AUTHORITY SIGNATURE

FINANCIAL INSTITUTION AUTHORITY NAME

PINANCIAL INSTITUTION AUTHORITY TITLE

PLEASE DIRECT ANY CORRESPONDENCE INCLUDING DRAWING OR INQUIRY QUOTING OUR REFERENCE NUMBER TO:

WACHOVIA BANK, NATIONAL ASSOCIATION

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WACHOVIA IPREVGLABLE STANDEY LETTER OF CHEDIT NUMBER SM222299W I LETTER OF CREDIT AMDUNT ISSUE DATE LUSD 40,000.00 10/GE/06 10/CE/07 ARPLICANT ARPLICANT BEINEFICIAEX MICHTIAN DEPARTMENT OF ENVIRONMENTAL OUALITY CAS ENERGY ON BEFALR OF OFFICE OF GEOLOGICAL SURVEY SUS MEST LILEGAN ST LANSING ME 49933

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WACHOVEA BRANK, NATIONAL ASSOCIATION

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2.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 producing, 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 144.7 and 146.04.

RESPONSE

No aquifer exemption is requested for the injection interval or injection zone at this site. The Dundee Formation is the primary injection interval while the upper members of the Detroit River Group are also anticipated to be open to the rathole of the openhole completion. The lower members of the Detroit River Group will comprise the lower arrestment interval and the Bell Shale will comprise the upper arrestment interval for the well. All formations of the injection zone are expected to contain brines with salinities significantly in excess of 10,000 ppm. The Dundee Formation is separated from the lowermost USDW by a number of hydrocarbon bearing formations that also contain brines with salinities well in excess of 10,000 ppm in the area. The Dundee Formation is used for the injection of Class II fluids in Star Township and elsewhere in Antrim County and surrounding counties. As discussed in Response 2.1., laboratory analyses of a fluid sample taken from the Dundee will be submitted as part of the completion report for this well.

Petrntek

2.T EXISTING EPA PERMITS

List program and permit number of any existing EPA permits, for example. NPDES, PSD, RCRA, etc.

RESPONSE

The Beeland Group, LLC currently retains no permits for the Alba, Michigan facility. As facility construction is pursued, applicable permits will be obtained as necessary.

Petrotek

2.U DESCRIPTION OF BUSINESS

Give a brief description of the nature of the business.

RESPONSE

The Beeland Group, LLC is a privately owned Michigan LLC that is wholly owned by CMS Energy Corporation. The limited liability company purchased the Beeland property in 2006 for the sole purpose of installing and operating a Class I non-commercial injection well. Approval is being requested to install this well to inject non-hazardous fluids generated from the operation of the remediation of groundwater and surface water at the Bay Harbor, Michigan facility managed by CMS Energy Corporation.

Petrotek



Petrotek Engineering Corporation 9088 South Ridgeline 3culevard, Suite 105 Littleton, Colorado 80129 USA (303) 290-9414 FAX (303) 290-9580

September 29, 2006

Mr. Brian Conway State Historic Preservation Officer State Historic Preservation Office Michigan Historical Center 702 West Kalamazoo Street P.O. Box 30740 Lansing, MI 48909-8240

Re: National Historic Register Determination Request New Underground Injection Well Location Well Name: Beeland Disposal Well No. 1 Well Location: Township 30N Range 5W S 1/2; SE 1/4 of Section 14 (495' SL, 1320' EL) Antrim County, Michigan

Dear Mr. Conway:

In order to apply for a United States Environmental Protection Agency (USEPA) permit for an underground injection well, the USEPA regulations require a determination that the injection well will not impact any properties listed or eligible for listing in the National Register of Historic Places. The well will be located as shown on the enclosed attachment. Please review this well location to make a determination in this matter. Please contact our office in writing at the address above with your determination so that we may forward the information to the USEPA.

Should you have any questions or require any additional information regarding this location, please feel free to call me at (303) 290-9414 ext 15.

Sincerely yours,

Petrotek Engineering Corporation Ken Cooper, PE

Enclosure: Antrim County Topo Map Showing Beeland No. 1 Location

cc: Ms. Lisa Perenchio – USEPA Region 5 Mr. Ray Vugrinovich – MDEQ