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FARMERS MARKET

MICHIGAN POTASH OPERATING, LLC

JOHNSON ET AL 1-6D
NON-HAZARDOUS NON-COMMERCIAL
PART 625 MINERAL WELL, BRINE INJECTION

AMENDED AND DATED MARCH 2024

APPLICATION FOR PERMIT TO DRILL AND OPERATE
MECOSTA COUNTY, MICHIGAN

THE UNITED STATES POTASH PROJECT

A Submission to

EGLE

PERMIT APPLICATION SUPPLIMENT

TABLE OF CONTENTS

The U.S. Potash Project

1 Describe in detail the purpose of the well and its anticipated life expectancy

NEED FOR PROPOSED ACTION

Potassium is one of the three primary nutrients essential to support carbohydrate production and plant life. It a natural fertilizer to improve productivity, efficiency, and yields of agribusiness.

The major source of potassium is potash (potassium chloride), extracted form sylvinite, a naturally occurring mineral containing both potassium chloride (potash) and sodium chloride (table salt). Since 1965, world consumption of potash grew from 14 million to an approximate 80 million short tons today. In 50 years, potash consumption has increased over 5 fold, and is necessary for global food security. In the last two decades, potash consumption has more than doubled.

The American farmer, the most efficient in the world, consumes about ten million short tons of potash annually. Over 96% of U.S. potash consumption is imported. Domestic potash supply comes principally from the Designated Potash Area in New Mexico; established in 1939 as a strategic resource. Over the past 80 years, the Designated Potash Area has become critically depleted, producing less than 300,000 tons of muriate of potash, or 3% of the US needs.

Despite being required for food growth, potash is the world's tightest controlled commodity. It is utilized throughout the globe, but commercial production occurs in only 12 countries and from 11 companies, creating high concentration risk. Current supply chain disruption has increased potash prices by 300% in two years, resulting in increased food prices, creating a global fertilizer, food, and inflationary security crisis.

The State of Michigan controls *one of three* domestic supplies for potash. Michigan potash was discovered in 1980, making it the youngest global commercial deposit of sylvinite. Potash is a U.S. Department of the Interior designated Strategic and Critical Mineral, and shortage of which poses critical and national harm. Michigan has the only proven and probable, commercial, potash available and ready for development.

Fertilizer is the American farmer's greatest cost of production. A Further increase in U.S. imports and tighter control of potash has resulted in a currently distressed supply chain. This has resulted in less staple crop growth, which in turn is quickly leading to global food shortages, price instability, and significantly higher costs and food costs, and food shortages.

Michigan's potash is critically important to the American farmer, who provides our food.

- The State of Michigan, as a contributive part of the U.S. soybean and corn belt, is a large producer of sugar beats and potatoes, and resides within the greatest potash demand region in all of North America.
- There are 53,000 Farms in Michigan. A 91 Billion dollar economic contribution to the State.
- The State of Michigan contains the world's purest and highest grade potash and it resides in the U.S. corn belt, closest to the U.S. farmer.
- Discovered in 1980, and successfully produced between 1989 and 2013, this concentrated area is only *one of three* known potash producing regions in the United States. The other two have been critically depleted. There is only one, marginal potash producer in the United States.
- The known, delineated, deposit in Michigan has the capability to more than triple domestic potash production for over a century.

The proposed action will:

- Create a competitive potassium fertilizer price for the US farmer, which helps the noblest of professions. Helping our farmer, means supporting their choice to 'keep the farm' and grow food for us.
- Potassium levels and crops the most critical component to a farmer's water management, allowing growers to get the most efficient use of what water they have available for a specific crop.
- Reduce over-irrigation, and increase crop water use and efficiency.
- Provide domestic production of a material critical to the US farmer, the nation's agricultural health, and the nation's food security.
- Reduce the need for import and improve the nation's balance of trade.
- Reduce transportation costs to key agricultural areas throughout the US.
- Create a new and sizable opportunity in Rural Western Michigan, providing jobs directly and indirectly to an area with a great need.

ALTERNATIVES TO THE PROPOSED ACTION

There are no commercial alternatives for potash. 50% of the worlds supply is controlled by nations, that are, on occasion, antagonistic to our initiatives (Russia, Belarus, China). The application location and proposed wellbore conversion is a result of years of mitigant, alternative, and permitting considerations that are dictated by geological subsurface control. Proper consideration of alternatives and mitigants enables the protection of surface resources, human quality of life without harm, while also providing a need for human society.

THE PROPOSED ACTION

The proposed action is the perpetuation of pre-established potash production from Hersey Michigan, where production has occurred since 1989, but ceased in 2013. The MPC team was historically responsible for the development of the Hersey area potash, and maintains a continuity of expertise particular to the subsurface, surface, and environmental stewardship.

Michigan potash deposits occur at great depths, over 7,600' below ground level. Therefore, deep, directionally drilled wells are utilized to access the deposit. This creates a favorable means of potash and salt extraction, which impacts less than 1.0% of the surface. In other words, there is minimal to no surface disturbance, substantially reducing environmental impact and risk.

During the manufacturing of potash, sodium chloride, or "table salt", is also made. Michigan Potash Operating does make food grade quality salt, but there is an excess, and therefore, some salt has to be re-dissolved and re-injected. Although expressly clean brine, small increases in Magnesium and Calcium (natural human supplements) reduce operating and water conservation efficiency in the MPC process, and therefore are removed from the system so as to maintain upwards of 96% water recycling efficiency.

This is the purpose of the subject Part 625 NON-HAZARDOUS, NON COMMERCIAL injection permit application. The Proposed Action requires that excess salt water, or an increases in 'Hard Water' by magnesium or calcium be re-injected. The disposed water, is cleaner than the resident displaced water.

The drilling and operation of Part 625 brine injection well (EPA Class I, Non Hazardous, Non Commercial) in the state of Michigan are currently subject to approval and permitting processes governed separately by the U.S. Environmental Protection Agency (EPA) and the Michigan Department of Environment, Great Lakes, and Energy (EGLE).

In the state of Michigan, there are numerous Part 625 operations; principally for extracting sodium chloride, which has a long history in Michigan. One such area, is immediately offset and currently operating less than one and a half (1.5) miles away.

The Michigan Department of Environment, Great Lakes, and Energy calls for the submittal of comprehensive project supporting data in the form of a series of attachments and project clarifications, respectfully submitted hereto.

Michigan Potash Operating proposes to develop the proposed Part 625 brine injection wells (as defined 324.62501(d).

The anticipated life of the projected well is 20 years, subject to operating conditions, which may enable it to exist for a longer or shorter duration.

The proposed injection horizon is the Dundee formation and the subgroup Reed City Dolomite, from 39 – 4200 feet.

Extensive work has been performed to identify and understand the lowermost underground source of drinking water ("USDW") within the Area of Review ("AOR"). The lowest possible USDW is the base of the glacial till. The deepest occurrence of glacial till in the AOR is 668 feet. Below the glacial till and into the Jurassic redbeds, TDS is typically in excess of 35,000. The AOR is basin centered, whereby, TDS tends to increase rapidly in the Jurassic redbeds. Over 308 historical hydrological test holes and approximately 60 piezometers, and 50 drawdown tests, cataloging over 33,833 feet of groundwater and soil data was amalgamated for the purposes of adequately understanding and protecting groundwater within the Michigan Potash Area of Review ("AOR"). This area has been extensively studied and consists of one of the highest density gatherings of data of glacial till and hydrogeological in Michigan.

Operating procedures, and environmental, health, and safety precautions are well established due to well understood and best practice operations currently in the immediate area of review; where active Part 625 injection wells and artificial brine wells are currently active and have been since 1984.

2 Notification: At the same time as submitting the permit application, mail via first-class United States mail, a copy of the first page of the permit application and cover letter to the clerk of the township and the surface owner of record of the land on which the well is to be located.

Notification to Chippewa Township and the surface owner submitted in October of 2022 are attached. Provided the length of time that has passed, a new submission is being provided simultaneously with the submission of this amended application. Both are attached here for review.

The surface lands are also under a Surface Use Agreement (“SUA”).

MICHIGAN POTASH OPERATING, LLC

October 5, 2022

Kristin Lytle
19171 4th St
PO Box 26
Chippewa Lake, MI 49320

Re: Notification of Drilling Operations:
Johnson Etal 1-6 Well
Township 16 North, Range 8 West, Chippewa Township
Section 6: NW/4 SW/4
Mecosta County, Michigan

VIA CERTIFIED MAIL, CONFIRMATION REQUESTED

Dear Ms. Lytle:

This Letter shall serve as notification by Michigan Potash Operating, as per Michigan Statute R324.201(2)(d) of drilling operations for the non-hazardous brine disposal well, the Johnson Etal 1-6 at the location described above. Michigan Potash Operating, LLC operations are estimated to begin within the next 120 days pending receipt of the required permits, approval of title and drilling rig availability.

Please see first page of the drilling application enclosed herewith.

Should you have any questions, please feel free to contact me directly at the below listed phone number.

Sincerely

Michigan Potash Operating, LLC

Theodore A. Pagano
General Manager
970 590 3944 (cell)

600 17th Street, Suite 2300
Denver, CO 80203

MICHIGAN POTASH OPERATING, LLC

October 5, 2022

Donald & Lisa Johnson
2450 Solomon Rd.
Middleville, MI 49333

Re: Notification of Drilling Operations:
Johnson Etal 1-6 Well
Township 16 North, Range 8 West, Chippewa Township
Section 6: NW/4 SW/4
Mecosta County, Michigan

VIA CERTIFIED MAIL, CONFIRMATION REQUESTED

To Whom It May Concern:

In accordance with Michigan Statute R324.201(2)(d), this letter serves as a written notice by Michigan Potash Operating of its intention to drill the Johnson Etal 1-6 well from the above captioned location. Michigan Potash Operating, LLC operations are estimated to begin within the next 120 days pending receipt of the required permits, approval of title and drilling rig availability.

As the surface owner, it is your responsibility to notify any affected tenant farmer, lessee or other party that may own or have an interest in any crops or surface improvements that could be affected by these proposed operations.

Please see the drilling application enclosed herewith.

If you have any questions, please don't hesitate to call me at 970-590-3944 (cell).

Sincerely

Michigan Potash Operating, LLC

Theodore A. Pagano
General Manager

600 17th Street, Suite 2300
Denver, CO 80203

MICHIGAN POTASH OPERATING, LLC

February 14, 2024

Kristin Lytle
19171 4th St
PO Box 26
Chippewa Lake, MI 49320

Re: Notification of Drilling Operations:
Johnson Etal 1-6 Well
Township 16 North, Range 8 West, Chippewa Township
Section 6: NW/4 SW/4
Mecosta County, Michigan

VIA CERTIFIED MAIL, CONFIRMATION REQUESTED

Dear Ms. Lytle:

This Letter shall serve as notification by Michigan Potash Operating, as per Michigan Statute R324.201(2)(d) of the intent to modify the Michigan Potash Operated well for the non-hazardous brine disposal, the Johnson Etal 1-6 at the location described above. Michigan Potash Operating, LLC operations are estimated to begin within the next 120 days pending receipt of the required permits, approval of title and drilling rig availability.

Please see first page of the drilling application enclosed herewith.

Should you have any questions, please feel free to contact me directly at the below listed phone number.

Sincerely

Michigan Potash Operating, LLC

Theodore A. Pagano
General Manager
970 590 3944 (cell)

600 17th Street, Suite 2300
Denver, CO 80203

MICHIGAN POTASH OPERATING, LLC

February 14, 2024

Donald & Lisa Johnson
2450 Solomon Rd.
Middleville, MI 49333

Re: Notification of Drilling Operations:
Johnson Etal 1-6 Well
Township 16 North, Range 8 West, Chippewa Township
Section 6: NW/4 SW/4
Mecosta County, Michigan

VIA CERTIFIED MAIL, CONFIRMATION REQUESTED

To Whom It May Concern:

In accordance with Michigan Statute R324.201(2)(d), this letter serves as a written notice by Michigan Potash Operating of its intention to modify the Michigan Potash Operated wellbore, the Johnson Etal 1-6 well for non-hazardous brine disposal. Michigan Potash Operating, LLC operations are estimated to begin within the next 120 days pending receipt of the required permits, approval of title and drilling rig availability.

As the surface owner, it is your responsibility to notify any affected tenant farmer, lessee or other party that may own or have an interest in any crops or surface improvements that could be affected by these proposed operations.

Please see the drilling application enclosed herewith.

If you have any questions, please don't hesitate to call me at 970-590-3944 (cell).

Sincerely

Michigan Potash Operating, LLC

Theodore A. Pagano
General Manager

600 17th Street, Suite 2300
Denver, CO 80203

JOHNSON ET AL 1-6D

MICHIGAN POTASH OPERATING, LLC

3 Form EQP 7200-1, Application for Permit to Drill, Deepen, Operate, with an original signature from the applicant or the applicant's agent. See instructions on reverse of form.

EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY - OIL, GAS, AND MINERALS DIVISION

APPLICATION FOR PERMIT TO:
☒ DRILL ☐ DEEPEN ☒ CONVERT AND OPERATE A WELL

By authority of Part 615 or Part 625 of Act 451 PA 1994, as amended. Non-submission and/or falsification of this information may result in fines and/or imprisonment.

1a. Part 615 Supervisor of Wells
☐ Oil and Gas
☐ Brine Disposal
☐ Hydrocarbon Storage
☐ Injection for Secondary Recovery

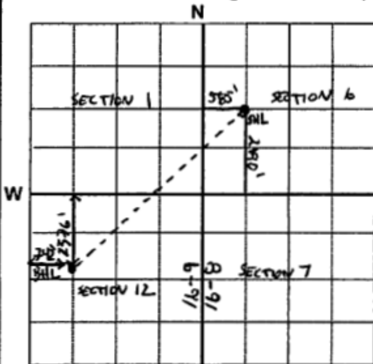
1b. Part 625 Mineral Wells
☒ Waste Disposal
☐ Brine Production
☐ Processed brine disposal
☐ Storage
☐ Test, fee sched. on rev.

1c. Fee enclosed
☐ Yes
☒ No, revision of application
☐ No, leg of horz drainhole

2. List all previous permit numbers: 36067 or 1385-821-354

3. Fed. ID. No. (do not use SSN): 81-1570592

Locate well and outline drilling unit on section plat



4. Conformance bond: ☒ Blanket ☐ Single well

5. ☐ Attached ☒ On file

6. Bond number: DEPN0114507721

7. Bond amount: 440,000

8. Applicant (name of permittee as bonded): Michigan Potash Operating, LLC

9. Address:
Michigan Potash Operating, LLC
C/O Steptoe Johnson
600 17th Street, Suite 2300
Denver, CO 80203

Phone: 2315779619

I authorize EGLE 4 additional days to process this application. ☒ Yes ☐ No

10. Lease or well name (be as brief as possible): JOHNSON ET EL

Well number: 1-6

11. Surface owner ☒ Private ☐ State ☐ Federal ☐ Indian ☐ Other, identify
Donald W. Johnson, Jr. and Lisa J. Johnson

12. Surface location: NE 1/4 of NW 1/4 of SW 1/4 of Sec 06 T 16N R 08W — Township: Chippewa — County: Mecosta

13. If directional, bottom hole location: SE 1/4 of SW 1/4 of NW 1/4 of Sec 12 T 16N R 09W — Township: Grant — County: Mecosta

14. The surface location for this well is
2190 feet from nearest (N/S) S section line AND 585 feet from nearest (E/W) W section line

15. Is this a directional well? ☐ No ☒ Yes If yes, complete line15. The bottom hole location for this well is
2376 feet from nearest (N/S) N section line AND 742 feet from nearest (E/W) W section line

16. The bottom hole location (whether straight or directional) of this well is
NA feet from nearest (N/S) drilling unit line AND feet from nearest (E/W) drilling unit line

17. Kind of tools: ☒ Rotary ☐ Cable ☐ Combination

18. Is sour oil or gas expected? ☐ No ☒ Yes ☐ H_2S Cont. plan enclosed

19. Base of lowest known fresh water aquifer: Formation Drift — Depth 638

20. Intended total depth: MD 10745 TVD 4180

21. Formation at total depth: Dundee/Reed City

22. Producing/injection formation(s): Dundee/Reed City

23. Objective pool, field, or project: Evart Potash

24. PROPOSED DRILLING, CASING AND CEMENTING AND SEALING PROGRAM

HOLE			CASING			CEMENT			MUD	
Depth (MD)	Geol. Formation	Bit Dia.	O.D. Size	Wt/Ft Grade Condition	Depth (MD)	Sacks	T.O.C.	W.O.C	Wt.	Vis.
904	Michigan	16	13 3/8	48# H40 Existing	904	950	Surface		NA	NA
5550	Dundee	12 1/4	9 5/8	40# L80 Existing	5550	833	2148			
4180 PBTD				CIBP						
4393	Dundee	8 3/4	7	23# L80 New	4393	640	3100	10.5	9.5	28+
10745	Dundee	6 1/8	4 1/2	11.6# J55 New	4003	NA	NA	NA	9.5	40+

25. DETAIL CEMENTING PROGRAM. IDENTIFY ALL CEMENT CLASSES, ADDITIVES, AND VOLUMES (IN CU. FT.) FOR EACH CASING STRING.

Surface Previously cemented to surrface

Intermediate 9 5/8" previously cemented and remediated. New 7" Lead 470 sk 1.69 cuft/sk & Tail 170 sk 1.18 cuft/sk, all 30% ex

Production/Injection Open hole injection, no cement, 4 1/2" injection string to surface. Packer set in the Bell Shale at 4003 MD

26. Send correspondence and permit to
Name Theodore A. Pagano — E-mail tpagano@miptoash.com
Address C/O Steptoe Johnson, 600 17th Street, Suite 2300 Denver, CO 80203 — Phone 231-577-9616

CERTIFICATION "I state that I am authorized by said applicant. This application was prepared under my supervision and direction. The facts stated herein are true, accurate and complete to the best of my knowledge."

Enclose the receipt of electronic payment or a check made payable to State of Michigan.The permit fee is $300 for Part 615 wells; $2,500 for a Part 625 waste disposal well; $500 for brine production, processed brine disposal, or storage

Cashier use only.

27. Application prepared by (print or type): Theodore A. Pagano, P.E., P.G. — Phone 231-775-3000

28. Signature — Date 2/15/2024

Oil, Gas, and Minerals Division Use Only

Permit number	API number	Date issued	Owner number

EQP 7200-1 (rev. 4/2021) PLEASE SEE INSTRUCTIONS FOR COMPLETING AND PROCESSING ON REVERSE

4 Form EQP 7200-2, Survey Record of Well Location signed and sealed by a surveyor licensed in the state of Michigan which identifies:

A. A readily visible stake or marker must be set at the well location. If the well will be directionally drilled also identify the bottom hole location.

B. A flagged route or explanation of how the well location may be reached.

C. Footages of the surface location (and if directionally drilled, the bottom hole location) from the nearest property and section lines.

D. Identification of the existing local zoning designation of the surface location of the well.

E. The surveyor must include an attached plat that shows all of the following information relative to the approximate distances and directions from the stake or marker to special hazards or conditions, including all of the following:

i. Surface waters and other environmentally sensitive areas within 1,320 feet of the proposed well.

ii. Floodplains associated with surface waters within 1,320 feet of the proposed well.

iii. Wetlands, as identified by the provisions of Part 303 of the NREPA, within 1,320 feet of the proposed well.

iv. Natural rivers, as identified by the provisions of Part 305 of the NREPA, within 1,320 feet of the proposed well.

v. Threatened or endangered species, as identified by the provisions of Part 365 of the NREPA, within 1,320 feet of the proposed well.

vi. All buildings, recorded fresh water wells and reasonably identifiable fresh water wells utilized for human consumption, public roads, railroads, pipelines, power lines and other man-made objects that lie within 600 feet of the proposed well location.

vii. All public water supply wells identified as type I and II that lie within 2,000 feet of the proposed well location and type IIb and III that lie within 800 feet of the proposed well location, as defined in Act No. 399 of the Public Acts of 1976, as amended, being 325.1001 et seq. of the Michigan Compiled Laws.

14001984.25

EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY - OIL, GAS, AND MINERALS DIVISION

SURVEY RECORD OF WELL LOCATION

This information is required by authority of Part 615 Supervisor of Wells, or Part 625 Mineral Wells, of Act 451 PA 1994, as amended, in order to obtain a drilling permit.

Applicant: Michigan Potash Operating

Well name and number: Johnson Et Al 1-6

1a. Surface location

NE 1/4 of NW 1/4 of SW 1/4 of section 06 T 16N R 08W — Township: Chippewa — County: Mecosta

1b. If this is a directional well, bottom hole location will be

SE 1/4 of SW 1/4 of NW 1/4 of section 12 T 16N R 09W — Township: Grant — County: Mecosta

Instructions: Outline drilling unit for oil/gas wells (Part 615) or property boundary for mineral wells (Part 625) and spot well location on plat shown. Locate the well in two directions from the **nearest** section, quarter section, and unit (or property, Part 625) lines.

2. The surface location is

2190 ft. from nearest (N/S) South section line

585 ft. from nearest (E/W) West section line

and

460 ft. from nearest (N/S) North quarter section line

1752 ft. from nearest (E/W) East quarter section line

3. Bottom hole will be (if directional)

2376 ft. from nearest (N/S) North section line

742 ft. from nearest (E/W) West section line

and

282 ft. from nearest (N/S) South quarter section line

1938 ft. from nearest (E/W) East quarter section line

4. Bottom hole will be (directional or straight)

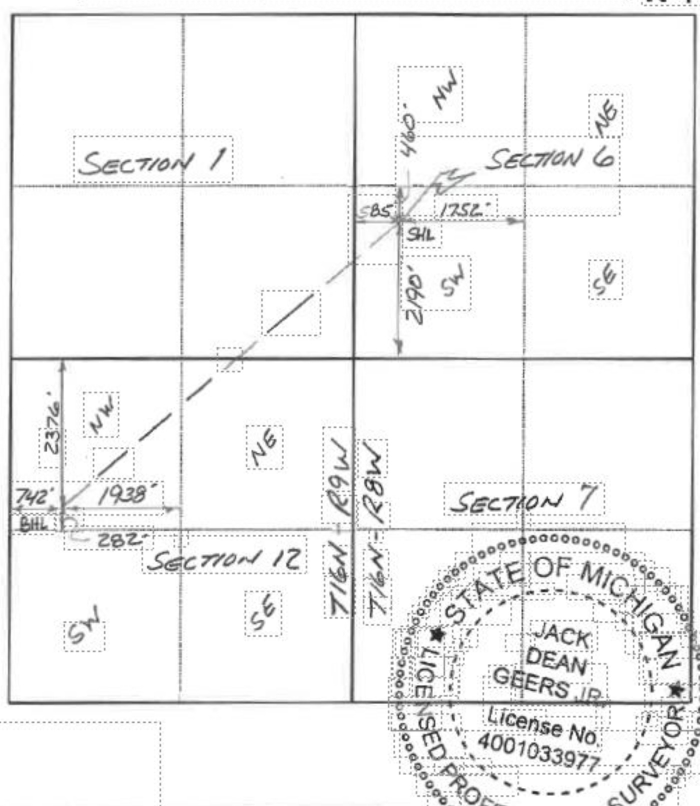
NA ft. from nearest (N/S) NA drilling unit line

NA ft. from nearest (E/W) NA drilling unit line

5. Show access to stake on plat and describe if it is not readily accessible. From the intersection of 23 Mile Rd and 120th Ave, go north on 120th Ave ±2200' to overhead powerline, go southeast ±600' along OHPL access trail, go north ±100' through open field to well head.

PLAT BELOW REPRESENTS ONE FULL SECTION (1 MILE SQUARE)

N ↑



6. Zoning ☐ Residential, effective date ____________

Initial date of residential zoning ____________

☒ Other Agricultural/Forestry

ON SEPARATE PLAT OR PLOT PLAN, LOCATE, IDENTIFY AND SHOW DISTANCES TO:

A. All roads, power lines, buildings, residences, fresh water wells, and other man-made features, within 600 feet of the stake.

B. All lakes, streams, wetlands, drainage-ways, floodplains, environmentally sensitive areas, natural rivers, critical dune areas, and threatened or endangered species within 1320 feet of the stake.

C. All type I and IIa public water supply wells within 2000 feet and all type IIb and III public water supply wells within 800 feet of the well stake.

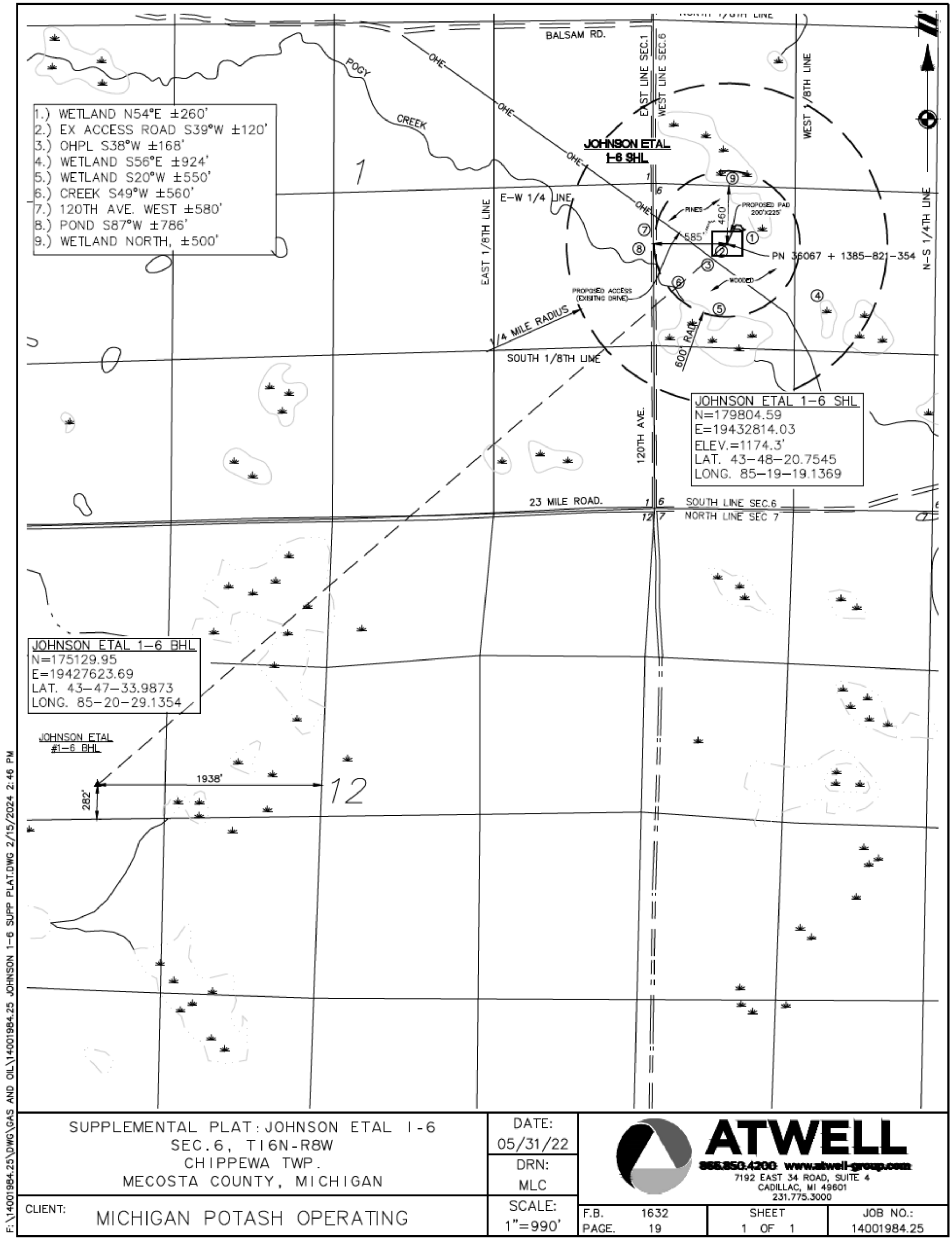
Name of individual who surveyed site: J. Dean Geers — Company: Atwell — Date of survey: 5-10-2022

Address: 7192 E. 34 Road, Suite 4, Cadillac, MI 49601 — Phone: 231-775-300

I CERTIFY THE ABOVE INFORMATION IS COMPLETE AND ACCURATE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

Signature of licensed surveyor (affix seal) — Date: 2-13-24

EQP 7200-2 (rev. 4/2021) ENCLOSE WITH APPLICATION TO DRILL OR DEEPEN



1.) WETLAND N54°E ±260'
2.) EX ACCESS ROAD S39°W ±120'
3.) OHPL S38°W ±168'
4.) WETLAND S56°E ±924'
5.) WETLAND S20°W ±550'
6.) CREEK S49°W ±560'
7.) 120TH AVE. WEST ±580'
8.) POND S87°W ±786'
9.) WETLAND NORTH, ±500'
BALSAM RD.
POGY CREEK
OHE
EAST LINE SEC.1
WEST LINE SEC.6
WEST 1/8TH LINE
JOHNSON ETAL 1-6 SHL
E-W 1/4 LINE
EAST 1/8TH LINE
PINES
PROPOSED PAD 200'X225'
460'
585'
PN 36067 + 1385-821-354
N-S 1/4TH LINE
WOODED
PROPOSED ACCESS (EXISTING DRIVE)
1/4 MILE RADIUS
600' RAD.
SOUTH 1/8TH LINE
JOHNSON ETAL 1-6 SHL
N=179804.59
E=19432814.03
ELEV.=1174.3'
LAT. 43-48-20.7545
LONG. 85-19-19.1369
120TH AVE.
23 MILE ROAD.
SOUTH LINE SEC.6
NORTH LINE SEC 7
JOHNSON ETAL 1-6 BHL
N=175129.95
E=19427623.69
LAT. 43-47-33.9873
LONG. 85-20-29.1354
JOHNSON ETAL #1-6 BHL
1938'
282'
12
F:\14001984.25\DWG\GAS AND OIL\14001984.25 JOHNSON 1-6 SUPP PLAT.DWG 2/15/2024 2:46 PM
SUPPLEMENTAL PLAT: JOHNSON ETAL 1-6
SEC.6, T16N-R8W
CHIPPEWA TWP.
MECOSTA COUNTY, MICHIGAN
DATE: 05/31/22
DRN: MLC
ATWELL
866.850.4200 www.atwell-group.com
7192 EAST 34 ROAD, SUITE 4
CADILLAC, MI 49601
231.775.3000
CLIENT: MICHIGAN POTASH OPERATING
SCALE: 1"=990'
F.B. 1632
PAGE. 19
SHEET 1 OF 1
JOB NO.: 14001984.25

5 Form EQP 7200-4, Wellhead Blowout Control System.

EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY - OIL, GAS, AND MINERALS DIVISION

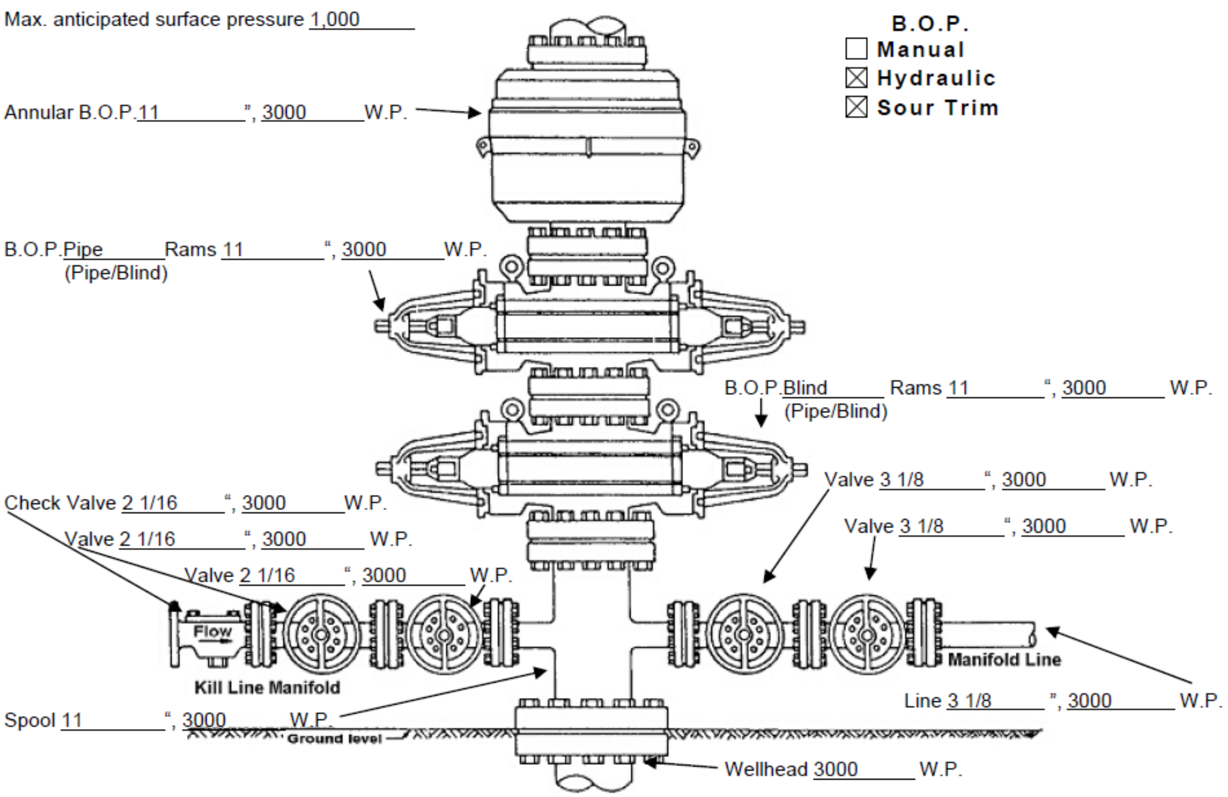
WELLHEAD BLOWOUT CONTROL SYSTEM

Worksheet supplement for "Application for Permit to Drill or Deepen a Well"

This information is required by authority of Part 615 Supervisor of Wells or Part 625 Mineral Wells, Act 451 PA 1994, as amended, in order to obtain a permit.

Applicant
Michigan Potash Operating, LLC

Well name and number
Johnson 1-6D



Fill above blanks with applicable information. If not applicable, enter "N.A." or cross-out item shown.
Describe test pressures and procedure for conducting pressure test. Identify any exceptions to R324.406 being requested.

All BOPS by drilling contractor will be no less than 3000 psi working pressure. Blowout prevention equipment, including the pipe and blind rams, and annular preventor, will be tested to a pressure commensurate with the expected formation pressure and according to EGLE regulations.

Initial BOP test will be conducted after nippling up to the 9-5/8 (prior to TIH) and will be pressure tested to 1500 psi for 20 minutes. Subsequent BOP tests should be conducted at 72-hour intervals with rams and annular tested to 1500 psi for 20 minutes.

EQP 7200-04 (Rev. 4/2021)

6 Form EQP 7500-3, Environmental Impact Assessment for Mineral Wells and Surface Facilities.

EGLE

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY - OIL, GAS, AND MINERALS DIVISION

ENVIRONMENTAL IMPACT ASSESSMENT FOR MINERAL WELLS AND SURFACE FACILITIES

To be submitted with an application for a well permit pursuant to Part 625, 1994 PA 451, as amended or prior to construction of associated surface facilities located more than 300 feet from the proposed well. Check all boxes and fill in all blanks that apply to the proposed well(s) or proposed surface facility.

This EIA is for (check one)

☒ Well only. Complete Parts A, B, D, E, F, G, H, and I.
☐ Surface facility only (to be constructed more than 300 feet from the well). Complete Parts A1, A2, C, D, E, F, G, H, & I.
☐ Well and surface facility. Complete all Parts.

A. PROJECT DESCRIPTION

1. Applicant
Michigan Potash Operating, LLC

2. Well name and number
Johnson ET AL 1-6D

3. Well type
☐ Artificial brine production well
☐ Natural brine production well
☐ Test well greater than 250' deep or penetrating below deepest freshwater aquifer
☐ Blanket test well(s) Number of proposed wells __ Anticipated maximum depth ____________
☒ Processed brine disposal well
☐ Single-source, non-commercial, waste disposal well
☐ Multi-source commercial non-hazardous waste disposal well
☐ Multi-source commercial hazardous waste disposal well
☐ Storage well

4. ☐ **Yes** ☒ **No Is this well a replacement for an existing well?**
If Yes, list
Existing well name and number
Current owner
Existing well type and status
Existing well location
Reason for replacement
Disposition of existing well

5. ☒ **Yes** ☐ **No Is this well a reentry of an existing well?**
If Yes, list
Existing well name and number Johnson ET AL 1-6
Current owner MPO
Existing well type and status: Temporarily Abandoned
Reason for reentry: convert to a disposal well

6. ☒ **Yes** ☐ **No Is the well expected to encounter hydrogen sulfide (H_2S)?**
If Yes, list formations expected to contain H_2S and anticipated depths to tops of formations Dundee/Reed City 3913 TVD; Marked 'Yes,' at the direction of EGLE out of an abundance of caution, although encountering H2S is unlikely.

7. ☒ **Yes** ☐ **No Is the well expected to encounter oil or gas?**
If Yes, list formations expected to contain oil or gas and anticipated depths to tops of formations
Antrim 3100' (trace gas)
Traverse Lime 3600' (trace gas)
RC Dolomite 3980' (trace gas)

8. ☒ **Yes** ☐ **No Will the well be drilled from an existing drill pad?**
If Yes, list well name, number, permit number and status of all existing wells on the drill pad (if no wells, write "none")
Johnson Etal 1-6 PN36067 & 1385-82-354: Wellbore casing has been uncovered and a wellhead installed. Drill pad area is in place. There are no existing facilities or items at the location currently, except for the wellhead. The ground is relatively flat in all directions for 110 feet from the well. General drainage is southwesterly.

Show proposed well and all existing wells on accompanying scale map identified as applying to Part A1 of the EIA.

B. DRILLSITE

1. Drill site access route dimensions 10 feet x 600 feet.

Provide a detailed description of topography, drainage, soil type(s), direction and percentage of slopes, land cover and present land use for the drill site access route. Show route on accompanying scale map labeled **Part B1**.

There is an existing access road running along the OHPL which will be used to access the well pad. The road rises at ±4% for ±600' to the well pad. Surface is stone and gravel. The area is wooded and used for recreation.

2. Drill site dimensions 200 feet x 225 feet.

Provide a detailed description of topography, drainage, soil types(s), direction and percentage of slopes, land cover and present land use for the drill site. Show well site on accompanying scale map labeled **Part B2** The previous well pad area is an open field and will be used as it is. The pad is flat in all directions for 110', then drops away to the east, south and west. Land use is recreational. Soils are Columa sand.

NOTE: If any "Yes" box in items B3, B4, B5, B6, B7 or B8 is checked, the corresponding feature(s) must be identified on an accompanying scale map identified as applying to Part B of the EIA.

3. ☐ **Yes** ☒ **No Are drain tiles present on the drill site?**

If Yes, how they will be handled if they are encountered?

4. Are any of the following located within 600 feet of the proposed wellhead?

☐ Yes ☒ No Buildings

☐ Yes ☒ No Domestic fresh water wells

☒ Yes ☐ No Public roads

☐ Yes ☒ No Railroads

☒ Yes ☐ No Power lines

☐ Yes ☒ No Pipelines

☒ Yes ☐ No Other man-made features (list individual features)

Access Road S39W ±120'
OHPL S38W ±168'
120th Ave N90W ±580'

5. Are any of the following located within 800 feet of the proposed wellhead?

☐ Yes ☒ No Type IIB public water wells (Type II is a non-community water supply with ≥ 15 service connections or ≥ 25 individuals for not less than 60 days per year. Type IIB have an average daily water production of less than 20,000 gallons per day)

☐ Yes ☒ No Type III public water wells (Type III is a public water supply which is neither Type I nor type II.)

6. Are any of the following located within 1320 feet of the proposed wellhead?

☒ Yes ☐ No Surface waters and other environmentally sensitive areas

☐ Yes ☒ No Floodplains associated with surface waters

☒ Yes ☐ No Wetlands, as identified by sections 30301 to 30323 of the Act.

☐ Yes ☒ No Natural rivers, as identified by sections 30501 to 30515 of the Act

☐ Yes ☒ No Threatened or endangered species as identified by sections 36501 to 36507 of the Act

7. Are any of the following located within 2000 feet of the proposed wellhead?

☐ Yes ☒ No Type I public water wells (Type I is a community water supply with year-round service, ≥ 15 living units or ≥ 25 residents.)

☐ Yes ☒ No Type IIA public water wells (Type II is a non-community water supply with ≥ 15 service connections or ≥ 25 individuals for not less than 60 days per year. Type IIA have an average daily water production of greater than 20,000 gallons per day)

8. ☐ **Yes** ☒ **No Are Great Lakes shorelines located within 1500 feet of the proposed wellhead?**

9. ☒ **Yes** ☐ **No Will fresh water be used to drill this well?**

If Yes, will the water be supplied from

☐ A "permanent" water well, to be retained after final completion OR used for drinking water (to be drilled and installed pursuant to Part 127 of 1979 PA 368, as amended) **OR**

☐ A "temporary" water well, to be plugged upon final completion and not used for drinking water **OR**

☒ Another source (identify) Off location private water well ID 67000007651, or another TBD.

If No, identify the drilling fluid to be used.

EQP 7500-3 (rev. 5/2019) Page 2 of 5

10. Drilling fluid pit location and handling and disposal of drill cuttings, muds and fluids

Anticipated depth to groundwater _> 10'_ Depth determined by _map interpretation_

Pit type

☐ On site in-ground pit. Anticipated dimensions: L ___ W ___ D ___

Show proposed pit location on accompanying scale map labeled **Part B10**.

☐ Remote in-ground pit. Anticipated dimensions: L ___ W ___ D ___

Attach approval of landowner and show remote pit location on accompanying scale map labeled **Part B10**.

☒ On-site steel tanks with no in-ground pits (complete 10a and 10d below, do not complete 10b and 10c)

a. ☐ Yes ☒ No Will the well be drilled into or through bedded salt deposits?

If Yes,

☐ Yes ☒ No Will the drill cuttings contain solid salt?

If Yes, describe plans for handling and disposing of drill cuttings.

b. ☐ Yes ☐ No Will the drilling fluid pit contents be solidified after drilling?

If Yes, identify the pit solidification contractor and pit solidification method.

c. ☐ Yes ☐ No Will the drilling fluid pit contents be removed after drilling?

If Yes, identify the site for disposal of the removed material.

d. ☒ Yes ☐ No Will any pit fluid be disposed by a licensed liquid waste hauler?

If Yes, identify the waste hauler.

Any remaining drilling fluids will be disposed of by an applicable handler to Northern Oaks RDF Landfill. Waste Mangement of Michigan, or other licensed liquid waste hauler, or RCRA exempt liquid handler to be determined.

If No, describe disposal plans for pit fluids.

C. SURFACE FACILITY

1. ☒ Yes ☐ No Will the well have associated surface facilities?

If No, Do not complete the remainder of Part C.

If Yes,

☐ Yes ☒ No Does a surface facility currently exist?

If Yes, show facility location relative to the wellhead on a scale map labeled Part C1. Do not complete the remainder of Part C.

If No,

☐ Yes ☒ No Has a location for the surface facility been chosen?

If Yes, complete Parts C2 through C10

If No, at least 60 days prior to beginning construction, submit an EIA for the Surface Facility (this form), a facility plan, and a Soil Erosion and Sedimentation Control Plan (EQP 7200-18) to the Oil, Gas, and Minerals Division District Supervisor.

2. ☐ Yes ☐ No Is the proposed surface facility site more than 300 feet from the wellhead?

If Yes, complete Parts C3 through c10 and submit a map showing the location of the surface facility site relative to the wellhead.

If No, do not complete the remainder of Part C.

3. Dimensions of surface facility access road: ___feet x ___feet.
Describe the topography, drainage, soil type(s), direction and percentage of slopes, land cover and present land use:

4. Dimensions of surface facility site: ___feet x ___feet.
Describe the topography, drainage, soil type(s), direction and percentage of slopes, land cover and present land use:

NOTE: If any "Yes" box in items C5, C6, C7, C8, C9, or C10 is checked, the corresponding feature(s) must be identified on an accompanying scale map identified as applying to the appropriate section of Part C of the EIA.

5. ☐ **Yes** ☐ **No Are drain tiles present on the proposed surface facility site?**
If Yes, discuss how they will be handled if they are encountered?

6. Are any of the following located within 600 feet of the proposed surface facility site?
- ☐ Yes ☐ No Buildings
- ☐ Yes ☐ No Domestic fresh water wells
- ☐ Yes ☐ No Public roads
- ☐ Yes ☐ No Railroads
- ☐ Yes ☐ No Power lines
- ☐ Yes ☐ No Pipelines
- ☐ Yes ☐ No Other man-made features (list individual features)

7. Are any of the following located within 800 feet of the proposed surface facility site?
- ☐ Yes ☐ No Type IIB public water wells. (Type II is a non-community water supply with ≥ 15 service connections or ≥ 25 individuals for not less than 60 days per year. Type IIB have an average daily water production of less than 20,000 gallons per day)
- ☐ Yes ☐ No Type III public water wells. (Type III is a public water supply which is neither Type I nor type II.)

8. Are any of the following located within 1320 feet of the proposed surface facility site?
- ☐ Yes ☐ No Surface waters and other environmentally sensitive areas
- ☐ Yes ☐ No Floodplains associated with surface waters
- ☐ Yes ☐ No Wetlands, as identified by sections 30301 to 30323 of the Act.
- ☐ Yes ☐ No Natural rivers, as identified by sections 30501 to 30515 of the Act
- ☐ Yes ☐ No Threatened or endangered species as identified by sections 36501 to 36507 of the Act

9. Are any of the following located within 2000 feet of the proposed surface facility site?
- ☐ Yes ☐ No Type I public water wells. (Type I is a community water supply with year-round service, ≥ 15 living units or ≥ 25 residents.)
- ☐ Yes ☐ No Type IIA public water wells (Type II is a non-community water supply with ≥ 15 service connections or ≥ 25 individuals for not less than 60 days per year. Type IIA have an average daily water production of greater than 20,000 gallons per day).

10. ☐ Yes ☐ No **Are Great Lakes shorelines located within 1500 feet of the proposed surface facility site?**

EQP 7500-3 (rev. 5/2019) Page 4 of 5

D. FLOWLINE

☒ Yes ☐ No **Will the well have an associated flow line?**

If Yes,

Flow line rout dimensions __________ feet x Facility and associated flow line route are undetermined at this time

Show flow line route from well to the surface facility, junction with an existing flowline or gathering system, on a scale map labeled **Part C2.**

Anticipated maximum operating pressure (psig): __________

Describe leak detection program, including schedules of periodic pressure testing and periodic flowline patrols.

Flow line material: ______________________________

Describe the topography, drainage, soil type(s), direction and percentage of slopes, land cover and present land use along the flow line route.

☐ Yes ☐ No **Will the flowline be buried?**

If Yes

Burial depth: ______ feet

Describe flowline route marking scheme.

If No, describe measures to protect flowline from vehicular damage.

E. MITIGATION OF IMPACTS FROM DRILLING AND/OR PRODUCTION

Describe additional measures to be taken to protect environmental and/or land use values Soil erosion and sedimenetation control measures will be utilized to control water runoff. Work will not curtail the use of the surrounding environment. Minimal long term environmental impact is anticipated. A BOP will be installed. All fluids will be containted. No production will occur.

F. ADDITIONAL PERMITS

Identify additional permits to be sought None

G. SOIL EROSION AND SEDIMENTATION PLAN

Submit a soil erosion and sedimentation plan (form EQP 7200-18) which addresses **each** well site, surface facility, and flow line route identified in this application. (Refer to requirements under Part 91, 1994 PA 451)

H. ALTERNATE WELL AND SURFACE FACILITY LOCATIONS

Were alternate surface locations considered for this well or surface facility?

☒ No, alternate sites did not seem necessary or more desirable

☐ Yes, the following locations were considered

Why were they rejected in favor of the proposed location?

I. CERTIFICATION

"I state that I am authorized by said applicant to prepare this document. It was prepared under my supervision and direction. The facts stated herein are true, accurate and complete to the best of my knowledge."

J. Dean Geers, Atwell, Agent	[signature]	2-15-24
Name and title (printed or typed)	Authorized Signature	Date

Enclose with *Application For Permit To Drill*

EQP 7500-3 (rev. 5/2019) Page 5 of 5

7 Form EQP 7200-18, Soil Erosion and Sedimentation Control Plan

EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY – OIL, GAS, AND MINERALS DIVISION

SOIL EROSION & SEDIMENTATION CONTROL PLAN

By authority of Part 91, and Part 615 or Part 625 of Act 451 PA 1994, as amended. Non-submission and/or falsification of this information may result in fines and/or imprisonment. Applicants for multisource commercial hazardous waste disposal wells under Part 625 are required to obtain a Part 91 permit from a county or local enforcing agency

☐ Part 615 Oil/Gas Well ☒ Part 625 Mineral Well

1. Name and address of applicant
Michigan Potash Operating, LLC
600 17th Street, Suite 2300
Denver, CO 80203
Phone: (231) 577-9619 Fax: ( )

2. Well or project name: Johnson Et Al 1-6

3. Well or project location: Section(s) 6 T16N R08W

4. Name and address of County or local Enforcement Agent (CEA)
Soil Erosion and Sedimentation Control
14485 Northland Dr.
Big Rapids, MI
Phone: (231) 592-0103 Fax: (231) 592-9446

5. Township: Chippewa

6. County: Mecosta

7. Date earth changes expected to start: Within 30 days of permit issuance, weather permitting

8. Date of expected completion: Within 90 days of well completion, weather permitting

9. Name and address of person responsible for earth change:
Not yet selected
Phone: ( ) Fax: ( )

10. Name and address of person responsible for maintenance:
Mr. Theodore Pagano
1225 17th Street, Suite 2200
Denver, CO 80203
Phone: (231) 577-9616 Fax: ( )

11. Send copies of supplemental plat required by Part 615, R 324.201(2)(b) or R 324.504(4), and this form and all attachments, to CEA. For Part 625 Mineral Wells, send to CEA only as instructed by OGMD staff.
Date sent to CEA 2-16-24

EARTH CHANGE ACTIVITIES

12. Project description: (Project activities may be permitted sequentially.)
a. Number of well sites 1 , ±1.0 acres
b. Number of surface facility sites 0 , 0 acres
c. New access roads 0 feet, 0 acres
d. Flow line(s) trenched in off well site* 0 feet, 0 acres
e. Flow line(s) plowed in off well site* 0 feet, 0 acres
*Contact CEA for fee schedule

13. Describe sites for which permits are being sought under Part 301 (Inland Lakes & Streams) None
Describe sites for which permits are being sought under Part 303 (Wetlands) None
List file numbers if known

14. Attach detail map at scale of 1"=200' or larger, with contour lines at a minimum of 20' intervals OR percent slope descriptions.

15. Areas requiring control structures

Will earth changes occur in areas with slopes of 10% or greater; areas where runoff water is likely, such as runs greater than 500' of moderate slope (5% to 10%), narrow valley bottoms, etc.; areas within 500' of a lake or stream; or other areas where sedimentation to a wetland or drainage way may occur?
☐ Yes ☒ No

Indicate any of the following erosion control structures that will be utilized. Identify location on detail map and attach detail plan.
Indicate on plan whether erosion control structures are temporary or permanent.
☐ Diversions ☐ Culverts ☒ Sediment basins ☒ Silt fences ☐ Rip-rap ☒ Berms ☐ Check dams
☐ Other

16. Site restoration
☒ Topsoil will be segregated from subsoil and stockpiled OR ☐ No topsoil on site
☒ Recontour and revegetate as soon as weather permits. Seed mix per land owners request
☐ Describe other proposed methods of restoration

17. Application prepared by (name) J. Dean Geers, Agent, Atwell Signature [signature] Date 2-15-24

FOR USE OF COUNTY OR LOCAL ENFORCING AGENT

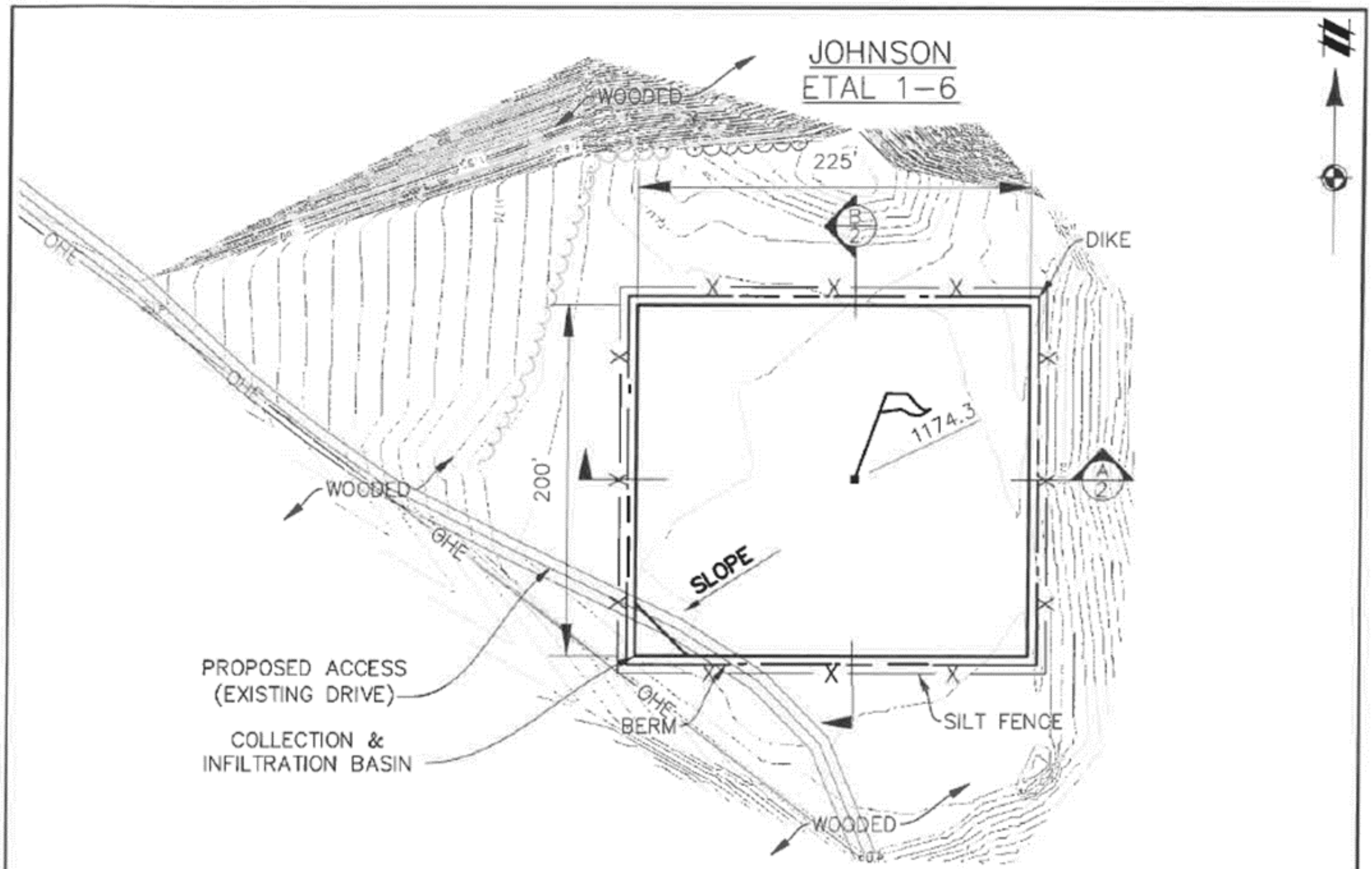
INSTRUCTIONS TO COUNTY OR LOCAL ENFORCMENT AGENT: Copies of supplemental plat required by Part 615, R324.201(2)(b) or R324.504(4), and this form and all attachments are provided for CEA review and informational purposes only. For activities issued under Part 615, local permitting for SESC is not necessary; OGMD staff will evaluate and enforce SESC measures (SEE R324.9115 (3) of Part 91, Soil Erosion and Sedimentation Control, NREPA, PA 451 of 1994). Submittal to CEA is not a requirement under Part 615 or 625. Part 615 and 625 Permits to Drill and Operate include erosion control plan approval for well sites, access roads, flow lines, and surface facilities. Return this form to the applicable field or district office of the Oil, Gas, and Minerals Division (OGMD) within 30 days of receipt. OGMD will consider all comments and recommendations in reviewing the application.

17. Comments

☐ Conducted on-site inspection Date
☐ Inspected site with representative of applicant Date

CEA (name) Date

EQP 7200-18 (rev. 5/2019) ENCLOSE WITH APPLICATION FOR PERMIT TO DRILL



NOTES:

1.) EROSION AND SEDIMENTATION CONTROL DEVICES SHALL BE IN PLACE PRIOR TO START OF GRADING OPERATIONS.

2.) EROSION AND SEDIMENTATION CONTROL DEVICES SHALL BE CLEANED AND/OR REPLACED WHEN THEY REACH 40% CAPACITY (INCLUDING INFILTRATION BASIN).

3.) ALL EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE INSTALLED PER ACT 347, P.A.1972 AS AMENDED.

4.) SET ELEVATIONS FOR WELL PAD TO MINIMIZE MASS GRADING QUANTITY (1174.3±).

5.) SLOPE WELL PAD SOUTHWESTERLY AT ±2% TO MAINTAIN A WELL DRAINED WORK AREA DURING DRILLING OPERATIONS.

6.) A COLLECTION & INFILTRATION BASIN SHALL BE CONSTRUCTED AT THE SOUTHWEST CORNER OF PAD IF NEEDED.

7.) SLOPES SHALL BE FINE GRADED TO MAXIMUM SLOPE TO 2:1 TO MINIMIZE EROSION. IN ALL FILL AREAS, THE EDGES SHALL BE DIKED TO PREVENT EROSION. CUT SLOPES SHALL BE CONTOURED AND COMPACTED.

8.) AN UPSLOPE DIVERSION BERM AND DIVERSION CHANNEL SHALL BE CONSTRUCTED ALONG THE SOUTH AND WEST SIDES OF THE LOCATION.

9.) ARMOR, SILT FENCING OR OTHER SOIL EROSION CONTROL MEASURES SHALL BE UTILIZED AS NEEDED.

10.) ALL DISTURBED AREAS SHALL BE SEEDED AND MULCHED FOLLOWING THE COMPLETION OF GRADING OPERATIONS, WEATHER PERMITTING.

EROSION CONTROL PLAN: JOHNSON ETAL 1-6 SEC.6, T16N-R8W CHIPPEWA TWP. MECOSTA COUNTY, MICHIGAN	DATE: 05/31/22 DRN: MLC	ATWELL 866.850.4200 www.atwell-group.com 7192 EAST 34 ROAD, SUITE 4 CADILLAC, MI 49601 231.775.3000
CLIENT: MICHIGAN POTASH OPERATING	SCALE: 1"=100'	F.B. 1632 PAGE. 19 / SHEET 1 OF 2 / JOB NO.: 14001984.25

EROSION CONTROL PLAN: JOHNSON ETAL 1-6
SEC.6, T16N-R8W
CHIPPEWA TWP.
MECOSTA COUNTY, MICHIGAN

DATE: 05/31/22
DRN: MLC
SCALE: 1"=60'

ATWELL
866.850.4200 www.atwell-group.com
7192 EAST 34 ROAD, SUITE 4
CADILLAC, MI 49601
231.775.3000

CLIENT: MICHIGAN POTASH OPERATING

F.B. 1632
PAGE. 19
SHEET 2 OF 2
JOB NO.: 14001984.25

8 Provide a conformance bond.

Michigan Potash Operating, LLC has a blanket bond for disposal, storage, or brine production. The bond number is DEPN0114507721.

9 The permit application fee as specified by statute.

Michigan Potash Operating, LLC has paid the $500 for a disposal well for processed brine. The receipt is below.

Thank You Printable Receipt

Merchant Location Code:	00001
Payment Status:	Payment Success
Payment Date:	07/29/2022
Confirmation Number:	22072927262862
Billing Address:	Steven Happ 1340 Stoneham St Superior, CO 80027 (303) 968-9659
E-Mail Address:	shapp@mipotash.com
Total Amount:	500.00 USD
Card Type:	VISA
Account #:	x0031
Authorization Code:	029761
Reference:	JOHNSON ET AL 1-6

Exit

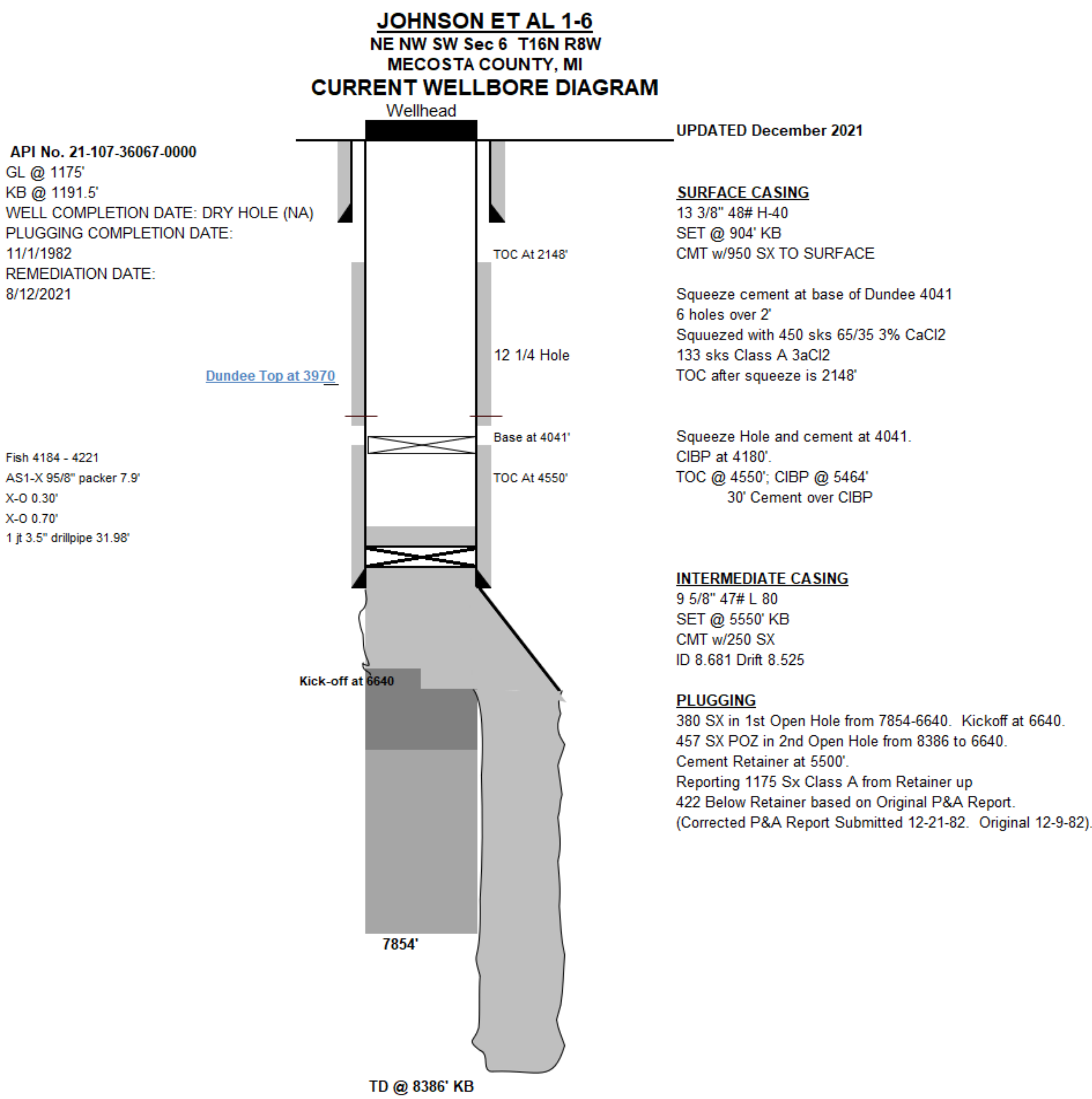
10 An organization report, form EQP 7200-13, if not on file with the supervisor.

Michigan Potash Operating, LLC has form EQP 7200-13 filed with EGLE.

11 Description of the drilling program, including the drilling fluid and mud program, how the fluids will be handled and ultimate disposition of the drilling fluids. Include a discussion of whether over pressured zones are anticipated and how the mud program will be modified to accommodate such a condition.

The Johnson ET AL 1-6 was a MPO re-entry. When the well was originally drilled, cement was brought to 4,550' behind the production string. Michigan Potash Operating, LLC re-entered the well and performed a cement squeeze to bring cement above substantially above the Dundee formation, bringing the top of cement to 2,148' (CBL Verified). This was done so that the wellbore could be converted to a disposal well in the Dundee formation. A casing integrity run was made at the request of EGLE, and the casing was found to be in 'like new' condition. The log demonstrated excellent wall thickness for the entire length. The post cement squeeze bond log showed excellent bond and a successful cement squeeze. Below is a diagram of the current wellbore.

Existing and Current Wellbore Diagram



This is a picture of the proposed well, following a horizontal wipstock, setting of 7” casing to surface, and a 4 ½” horizontal liner through the Reed City Dolomite portion of the Dundee formation.

Proposed Wellbore Diagram

JOHNSON ET AL 1-6

SURFACE: 43.805767, -85.321836

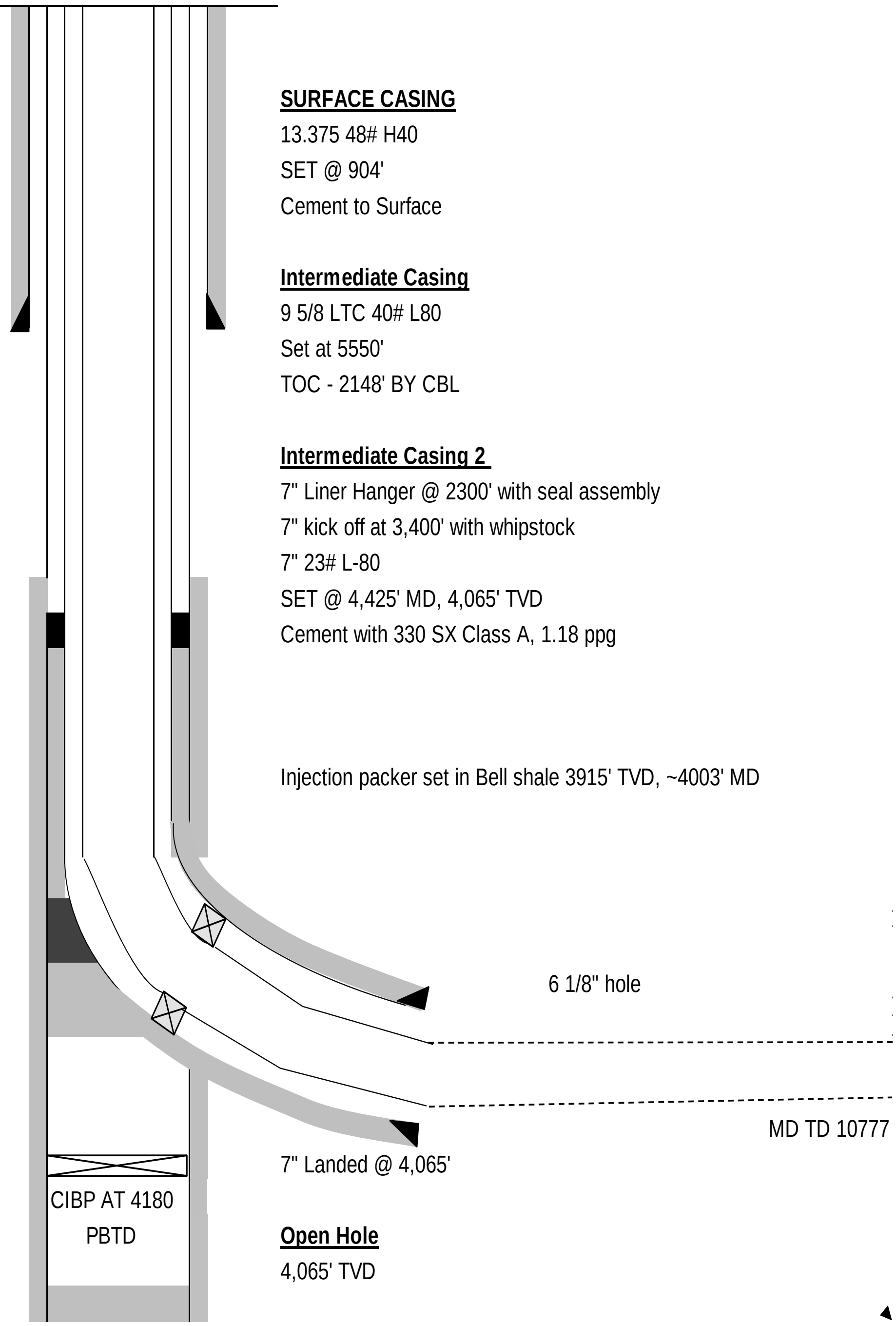
BOTTOM: 43.792777, -85.341280

MECOSTA COUNTY, MI

PROPOSED HORIZONTAL WELLBORE DIAGRAM

GL @ +/-1,175'

Geological Zone	TVD	MD
Quaternary H	0	0
Quaternary G	93	93
Quaternary F1	154	154
Quaternary F	182	182
Quaternary E	346	346
Quaternary E/1	432	432
Quaternary D	509	509
Jurrasic Red Beds	638	638
Michigan	1318	1318
Marshall Sandstone	1762	1762
Coldwater Shale	1938	1938
Antrim Shale	2681	2681
Traverse Formation	3329	3329
Bell Shale	3913	3913
Dundee	3971	3971
Reed City Dolomite	**4050**	**4050**
Detroit River Group	4202	



UPDATED 2/2024 BY TAP

SURFACE CASING

13.375 48# H40

SET @ 904'

Cement to Surface

Intermediate Casing

9 5/8 LTC 40# L80

Set at 5550'

TOC - 2148' BY CBL

Intermediate Casing 2

7" Liner Hanger @ 2300' with seal assembly

7" kick off at 3,400' with whipstock

7" 23# L-80

SET @ 4,425' MD, 4,065' TVD

Cement with 330 SX Class A, 1.18 ppg

Injection packer set in Bell shale 3915' TVD, ~4003' MD

7" Landed @ 4,065'

Open Hole

4,065' TVD

The proposed injection wells will be drilled and cased according to the following construction procedure.

Construction Procedure:

1. Provide 48 hour notice of move in rig up to all regional, State, and Federal authorities.
2. Move in Rig Up drilling rig
3. Nipple up 5K blow out preventer, hydraulics over pipe.
4. Set whipstock to drill out of casing. Drill and dress window.
5. PU 8 3/4" drill bit along with directional assembly.
6. Drill out casing and through the curve. See direction plans below. No anticollision necessary.
7. Run 7" 23# L80 BTC casing with liner hanger and set. Cement. RIH with 7" seal assembly.
8. Drill the 6 1/8" hole to TD
9. Run 4.5" casing and slotted liner. A liner hanger will be placed just before the curve starts.
10. Rig down move out Drilling Unit.

Stimulation Procedure:

1. MIRU coil tubing unit and acid treatment. Various concentration of HCl will be used based on the lithology of the proposed injection zone. Higher concentrations of HCl will be utilized for dolomite.
2. RIH to toe, spot acid pill(s) while pulling to heel.
3. Pump 1,000 gallon increments of 15% HCl into the well.

a. Pump occasional 50 gallons of soap in the well if hydrocarbon plugging is suspected
b. Displace acid pills by pressuring up back side and pumping salt water for displacement.
c. Repeat as necessary to treat the horizontal leg.
d. Initiate injection tests.

Proposed Injectivity Step Rate Test:

Run Step Rate injection test as follows:

a. Install a calibrated pressure gauge and recorder on the discharge line of the pump.
b. Pump water into well at increasing rates and pressure, obtaining stabilized injection pressures. The duration of this test will be variable. Record rates, pressures, and time duration of entire test.
c. Plot data and determine formation parting pressure.

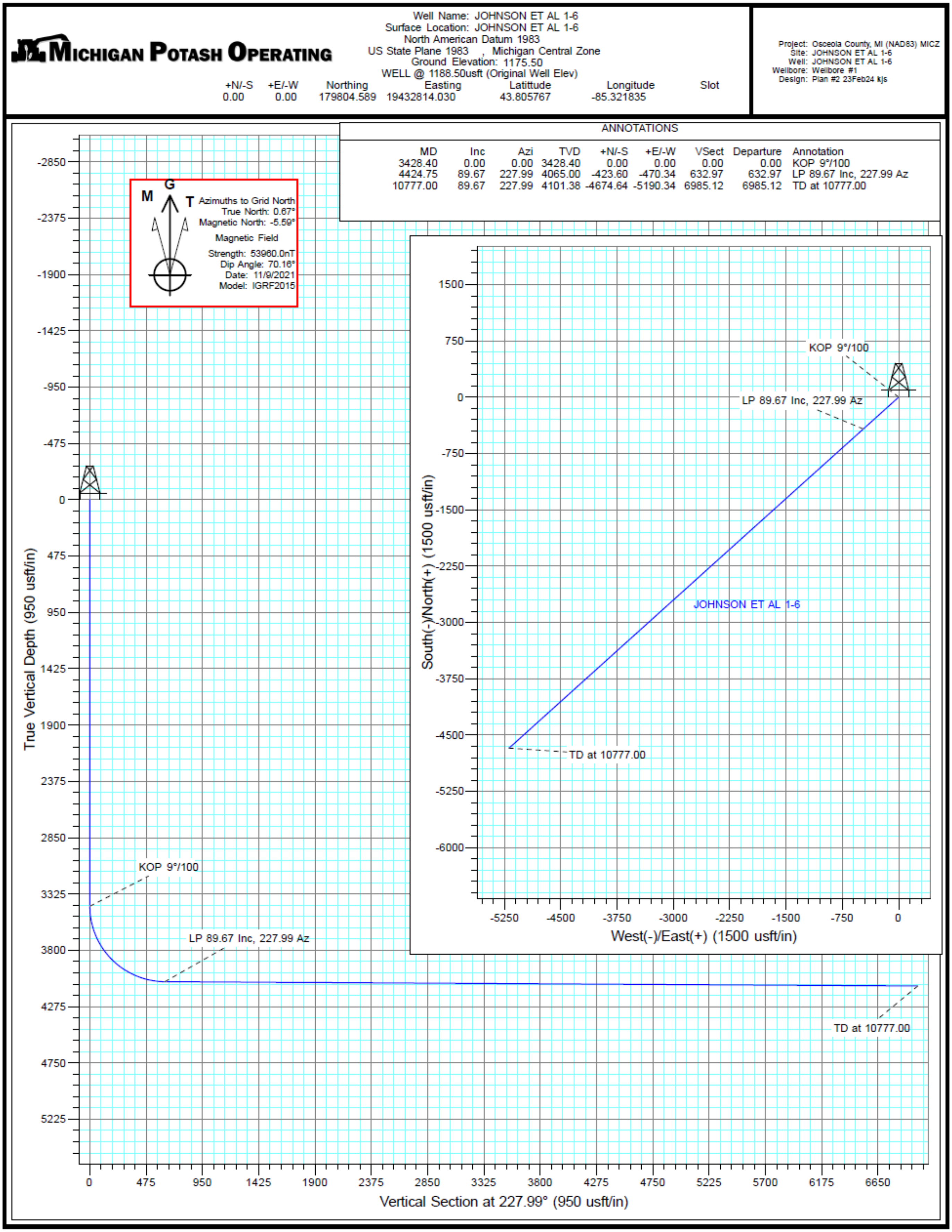
Conduct pressure fall-off test. After injection test is completed, shut well in and record the pressure until a stabilized pressure is obtained, or pressure drops below zero gauge pressure. If it is below zero gauge pressure, measure the fluid level. If test results prove unsatisfactory, additional stimulation may be done to improve the effective permeability at the well bore. This may include additional acid treatment.

Proposed Mud Program

All drilling is to be done via a closed loop circulation system. Any solid salts brought to surface will be dissolved via a salt washing screen, which will dissolve residual salt, or salt on the cuttings with freshwater, tuning the salt to brine. The brine will then be stored on location specifically for another well. All cuttings are to be dried on location and hauled directly to a landfill as necessary. There are no overpressured zones anticipated.

The drilling fluid will consist of a 9.0 – 9.6+ ppg water based mud system with 40-50 viscosity units and less than 10 fluid loss units. LCM pills will be pumped when required. Barite will be on location if any pressure is encountered. At TD the hole will be circulated clean with 2-3 sweeps.

Proposed Directional Plan:



MICHIGAN POTASH OPERATING

MICHIGAN POTASH OPERATING, LLC

Osceola County, MI (NAD83) MICZ
JOHNSON ET AL 1-6
JOHNSON ET AL 1-6

Wellbore #1

Plan: Plan #2 23Feb24 kjs

Standard Planning Report - Geographic

23 February, 2024

MICHIGAN POTASH OPERATING

Planning Report - Geographic

Database:	EDM 5000.15 Single User Db	**Local Co-ordinate Reference:**	Well JOHNSON ET AL 1-6
Company:	MICHIGAN POTASH OPERATING, LLC	**TVD Reference:**	WELL @ 1188.50usft (Original Well Elev)
Project:	Osceola County, MI (NAD83) MICZ	**MD Reference:**	WELL @ 1188.50usft (Original Well Elev)
Site:	JOHNSON ET AL 1-6	**North Reference:**	Grid
Well:	JOHNSON ET AL 1-6	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #2 23Feb24 kjs		

Project	Osceola County, MI (NAD83) MICZ		
Map System:	US State Plane 1983	**System Datum:**	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Michigan Central Zone		

Site	JOHNSON ET AL 1-6					
Site Position:		**Northing:**	179,784.190 usft	**Latitude:**	43.805710
From:	Lat/Long	**Easting:**	19,432,770.302 usft	**Longitude:**	-85.322000
Position Uncertainty:	0.00 usft	**Slot Radius:**	13-3/16 "	**Grid Convergence:**	-0.67 °

Well	JOHNSON ET AL 1-6					
Well Position	**+N/-S**	0.00 usft	**Northing:**	179,804.589 usft	**Latitude:**	43.805767
	+E/-W	0.00 usft	**Easting:**	19,432,814.030 usft	**Longitude:**	-85.321836
Position Uncertainty		0.00 usft	**Wellhead Elevation:**		**Ground Level:**	1,175.50 usft

Wellbore Wellbore #1

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	11/9/2021	-6.27	70.16	53,960.04941347

Design Plan #2 23Feb24 kjs

Audit Notes:

Version: **Phase:** PLAN **Tie On Depth:** 0.00

Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.00	0.00	0.00	227.99

Plan Survey Tool Program **Date** 2/23/2024

	Depth From (usft)	Depth To (usft)	Survey (Wellbore)	Tool Name	Remarks
1	0.00	10,777.00	Plan #2 23Feb24 kjs (Wellbore #	MWD OWSG MWD - Standard	

Plan Sections

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
3,428.40	0.00	0.00	3,428.40	0.00	0.00	0.00	0.00	0.00	0.00	
4,424.75	89.67	227.99	4,065.00	-423.60	-470.34	9.00	9.00	0.00	227.99	
10,777.00	89.67	227.99	4,101.38	-4,674.64	-5,190.34	0.00	0.00	0.00	0.00	

MICHIGAN POTASH OPERATING

Planning Report - Geographic

Database:	EDM 5000.15 Single User Db	**Local Co-ordinate Reference:**	Well JOHNSON ET AL 1-6
Company:	MICHIGAN POTASH OPERATING, LLC	**TVD Reference:**	WELL @ 1188.50usft (Original Well Elev)
Project:	Osceola County, MI (NAD83) MICZ	**MD Reference:**	WELL @ 1188.50usft (Original Well Elev)
Site:	JOHNSON ET AL 1-6	**North Reference:**	Grid
Well:	JOHNSON ET AL 1-6	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #2 23Feb24 kjs		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
0.00	0.00	0.00	0.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
100.00	0.00	0.00	100.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
200.00	0.00	0.00	200.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
300.00	0.00	0.00	300.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
400.00	0.00	0.00	400.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
500.00	0.00	0.00	500.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
600.00	0.00	0.00	600.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
700.00	0.00	0.00	700.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
800.00	0.00	0.00	800.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
900.00	0.00	0.00	900.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
1,000.00	0.00	0.00	1,000.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
1,100.00	0.00	0.00	1,100.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
1,200.00	0.00	0.00	1,200.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
1,300.00	0.00	0.00	1,300.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
1,400.00	0.00	0.00	1,400.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
1,500.00	0.00	0.00	1,500.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
1,600.00	0.00	0.00	1,600.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
1,700.00	0.00	0.00	1,700.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
1,800.00	0.00	0.00	1,800.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
1,900.00	0.00	0.00	1,900.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
2,000.00	0.00	0.00	2,000.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
2,100.00	0.00	0.00	2,100.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
2,200.00	0.00	0.00	2,200.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
2,300.00	0.00	0.00	2,300.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
2,400.00	0.00	0.00	2,400.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
2,500.00	0.00	0.00	2,500.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
2,600.00	0.00	0.00	2,600.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
2,700.00	0.00	0.00	2,700.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
2,800.00	0.00	0.00	2,800.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
2,900.00	0.00	0.00	2,900.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
3,000.00	0.00	0.00	3,000.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
3,100.00	0.00	0.00	3,100.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
3,200.00	0.00	0.00	3,200.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
3,300.00	0.00	0.00	3,300.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
3,400.00	0.00	0.00	3,400.00	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
3,428.40	0.00	0.00	3,428.40	0.00	0.00	179,804.589	19,432,814.030	43.805767	-85.321836
KOP 9°/100									
3,500.00	6.44	227.99	3,499.85	-2.69	-2.99	179,801.897	19,432,811.041	43.805760	-85.321847
3,600.00	15.44	227.99	3,597.93	-15.38	-17.08	179,789.205	19,432,796.948	43.805725	-85.321900
3,700.00	24.44	227.99	3,691.84	-38.19	-42.40	179,766.400	19,432,771.628	43.805661	-85.321994
3,800.00	33.44	227.99	3,779.25	-70.54	-78.33	179,734.045	19,432,735.704	43.805571	-85.322129
3,900.00	42.44	227.99	3,858.03	-111.65	-123.97	179,692.937	19,432,690.060	43.805457	-85.322300
4,000.00	51.44	227.99	3,926.23	-160.50	-178.21	179,644.087	19,432,635.821	43.805321	-85.322503
4,100.00	60.44	227.99	3,982.18	-215.89	-239.71	179,588.699	19,432,574.323	43.805168	-85.322734
4,200.00	69.44	227.99	4,024.48	-276.45	-306.95	179,528.136	19,432,507.079	43.804999	-85.322986
4,300.00	78.44	227.99	4,052.11	-340.70	-378.29	179,463.890	19,432,435.745	43.804821	-85.323253
4,400.00	87.44	227.99	4,064.38	-407.05	-451.95	179,397.542	19,432,362.078	43.804636	-85.323529
4,424.75	89.67	227.99	4,065.00	-423.60	-470.34	179,380.985	19,432,343.694	43.804590	-85.323598
LP 89.67 Inc, 227.99 Az									
4,500.00	89.67	227.99	4,065.44	-473.96	-526.25	179,330.626	19,432,287.780	43.804450	-85.323807
4,600.00	89.67	227.99	4,066.01	-540.88	-600.55	179,263.705	19,432,213.475	43.804265	-85.324086
4,700.00	89.67	227.99	4,066.58	-607.81	-674.86	179,196.783	19,432,139.171	43.804079	-85.324364
4,800.00	89.67	227.99	4,067.15	-674.73	-749.16	179,129.861	19,432,064.866	43.803893	-85.324643
4,900.00	89.67	227.99	4,067.73	-741.65	-823.47	179,062.939	19,431,990.562	43.803707	-85.324921

2/23/2024 12:01:32PM *Page 3* *COMPASS 5000.15 Build 88*

MICHIGAN POTASH OPERATING

Planning Report - Geographic

Database:	EDM 5000.15 Single User Db	**Local Co-ordinate Reference:**	Well JOHNSON ET AL 1-6
Company:	MICHIGAN POTASH OPERATING, LLC	**TVD Reference:**	WELL @ 1188.50usft (Original Well Elev)
Project:	Osceola County, MI (NAD83) MICZ	**MD Reference:**	WELL @ 1188.50usft (Original Well Elev)
Site:	JOHNSON ET AL 1-6	**North Reference:**	Grid
Well:	JOHNSON ET AL 1-6	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #2 23Feb24 kjs		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
5,000.00	89.67	227.99	4,068.30	-808.57	-897.77	178,996.018	19,431,916.258	43.803521	-85.325199
5,100.00	89.67	227.99	4,068.87	-875.49	-972.08	178,929.095	19,431,841.953	43.803335	-85.325478
5,200.00	89.67	227.99	4,069.44	-942.42	-1,046.38	178,862.173	19,431,767.649	43.803149	-85.325756
5,300.00	89.67	227.99	4,070.02	-1,009.34	-1,120.69	178,795.251	19,431,693.344	43.802963	-85.326035
5,400.00	89.67	227.99	4,070.59	-1,076.26	-1,194.99	178,728.330	19,431,619.040	43.802777	-85.326313
5,500.00	89.67	227.99	4,071.16	-1,143.18	-1,269.29	178,661.408	19,431,544.735	43.802591	-85.326591
5,600.00	89.67	227.99	4,071.73	-1,210.10	-1,343.60	178,594.486	19,431,470.431	43.802405	-85.326870
5,700.00	89.67	227.99	4,072.31	-1,277.02	-1,417.90	178,527.565	19,431,396.126	43.802219	-85.327148
5,800.00	89.67	227.99	4,072.88	-1,343.95	-1,492.21	178,460.643	19,431,321.822	43.802033	-85.327427
5,900.00	89.67	227.99	4,073.45	-1,410.87	-1,566.51	178,393.721	19,431,247.517	43.801847	-85.327705
6,000.00	89.67	227.99	4,074.03	-1,477.79	-1,640.82	178,326.799	19,431,173.213	43.801661	-85.327983
6,100.00	89.67	227.99	4,074.60	-1,544.71	-1,715.12	178,259.878	19,431,098.908	43.801475	-85.328262
6,200.00	89.67	227.99	4,075.17	-1,611.63	-1,789.43	178,192.956	19,431,024.604	43.801289	-85.328540
6,300.00	89.67	227.99	4,075.74	-1,678.55	-1,863.73	178,126.034	19,430,950.300	43.801103	-85.328818
6,400.00	89.67	227.99	4,076.32	-1,745.48	-1,938.04	178,059.112	19,430,875.995	43.800917	-85.329097
6,500.00	89.67	227.99	4,076.89	-1,812.40	-2,012.34	177,992.191	19,430,801.691	43.800731	-85.329375
6,600.00	89.67	227.99	4,077.46	-1,879.32	-2,086.64	177,925.269	19,430,727.386	43.800545	-85.329654
6,700.00	89.67	227.99	4,078.03	-1,946.24	-2,160.95	177,858.347	19,430,653.082	43.800359	-85.329932
6,800.00	89.67	227.99	4,078.61	-2,013.16	-2,235.25	177,791.425	19,430,578.777	43.800173	-85.330210
6,900.00	89.67	227.99	4,079.18	-2,080.08	-2,309.56	177,724.504	19,430,504.473	43.799987	-85.330489
7,000.00	89.67	227.99	4,079.75	-2,147.01	-2,383.86	177,657.582	19,430,430.168	43.799801	-85.330767
7,100.00	89.67	227.99	4,080.32	-2,213.93	-2,458.17	177,590.660	19,430,355.864	43.799615	-85.331045
7,200.00	89.67	227.99	4,080.90	-2,280.85	-2,532.47	177,523.739	19,430,281.559	43.799429	-85.331324
7,300.00	89.67	227.99	4,081.47	-2,347.77	-2,606.78	177,456.817	19,430,207.255	43.799243	-85.331602
7,400.00	89.67	227.99	4,082.04	-2,414.69	-2,681.08	177,389.895	19,430,132.950	43.799057	-85.331880
7,500.00	89.67	227.99	4,082.61	-2,481.62	-2,755.38	177,322.973	19,430,058.646	43.798871	-85.332159
7,600.00	89.67	227.99	4,083.19	-2,548.54	-2,829.69	177,256.052	19,429,984.342	43.798685	-85.332437
7,700.00	89.67	227.99	4,083.76	-2,615.46	-2,903.99	177,189.130	19,429,910.037	43.798499	-85.332716
7,800.00	89.67	227.99	4,084.33	-2,682.38	-2,978.30	177,122.208	19,429,835.733	43.798314	-85.332994
7,900.00	89.67	227.99	4,084.91	-2,749.30	-3,052.60	177,055.286	19,429,761.428	43.798128	-85.333272
8,000.00	89.67	227.99	4,085.48	-2,816.22	-3,126.91	176,988.365	19,429,687.124	43.797942	-85.333551
8,100.00	89.67	227.99	4,086.05	-2,883.15	-3,201.21	176,921.443	19,429,612.819	43.797756	-85.333829
8,200.00	89.67	227.99	4,086.62	-2,950.07	-3,275.52	176,854.521	19,429,538.515	43.797570	-85.334107
8,300.00	89.67	227.99	4,087.20	-3,016.99	-3,349.82	176,787.599	19,429,464.210	43.797384	-85.334386
8,400.00	89.67	227.99	4,087.77	-3,083.91	-3,424.12	176,720.678	19,429,389.906	43.797198	-85.334664
8,500.00	89.67	227.99	4,088.34	-3,150.83	-3,498.43	176,653.756	19,429,315.601	43.797012	-85.334942
8,600.00	89.67	227.99	4,088.91	-3,217.75	-3,572.73	176,586.834	19,429,241.297	43.796826	-85.335221
8,700.00	89.67	227.99	4,089.49	-3,284.68	-3,647.04	176,519.913	19,429,166.993	43.796640	-85.335499
8,800.00	89.67	227.99	4,090.06	-3,351.60	-3,721.34	176,452.991	19,429,092.688	43.796454	-85.335777
8,900.00	89.67	227.99	4,090.63	-3,418.52	-3,795.65	176,386.069	19,429,018.384	43.796268	-85.336056
9,000.00	89.67	227.99	4,091.20	-3,485.44	-3,869.95	176,319.147	19,428,944.079	43.796082	-85.336334
9,100.00	89.67	227.99	4,091.78	-3,552.36	-3,944.26	176,252.226	19,428,869.775	43.795896	-85.336612
9,200.00	89.67	227.99	4,092.35	-3,619.28	-4,018.56	176,185.304	19,428,795.470	43.795710	-85.336891
9,300.00	89.67	227.99	4,092.92	-3,686.21	-4,092.86	176,118.382	19,428,721.166	43.795524	-85.337169
9,400.00	89.67	227.99	4,093.49	-3,753.13	-4,167.17	176,051.460	19,428,646.861	43.795338	-85.337447
9,500.00	89.67	227.99	4,094.07	-3,820.05	-4,241.47	175,984.539	19,428,572.557	43.795152	-85.337726
9,600.00	89.67	227.99	4,094.64	-3,886.97	-4,315.78	175,917.617	19,428,498.252	43.794966	-85.338004
9,700.00	89.67	227.99	4,095.21	-3,953.89	-4,390.08	175,850.695	19,428,423.948	43.794780	-85.338282
9,800.00	89.67	227.99	4,095.79	-4,020.82	-4,464.39	175,783.773	19,428,349.643	43.794594	-85.338561
9,900.00	89.67	227.99	4,096.36	-4,087.74	-4,538.69	175,716.852	19,428,275.339	43.794408	-85.338839
10,000.00	89.67	227.99	4,096.93	-4,154.66	-4,613.00	175,649.930	19,428,201.035	43.794222	-85.339117
10,100.00	89.67	227.99	4,097.50	-4,221.58	-4,687.30	175,583.008	19,428,126.730	43.794036	-85.339395
10,200.00	89.67	227.99	4,098.08	-4,288.50	-4,761.60	175,516.086	19,428,052.426	43.793850	-85.339674
10,300.00	89.67	227.99	4,098.65	-4,355.42	-4,835.91	175,449.165	19,427,978.121	43.793664	-85.339952
10,400.00	89.67	227.99	4,099.22	-4,422.35	-4,910.21	175,382.243	19,427,903.817	43.793478	-85.340230

2/23/2024 12:01:32PM *Page 4* *COMPASS 5000.15 Build 88*

MICHIGAN POTASH OPERATING

Planning Report - Geographic

Database:	EDM 5000.15 Single User Db	**Local Co-ordinate Reference:**	Well JOHNSON ET AL 1-6
Company:	MICHIGAN POTASH OPERATING, LLC	**TVD Reference:**	WELL @ 1188.50usft (Original Well Elev)
Project:	Osceola County, MI (NAD83) MICZ	**MD Reference:**	WELL @ 1188.50usft (Original Well Elev)
Site:	JOHNSON ET AL 1-6	**North Reference:**	Grid
Well:	JOHNSON ET AL 1-6	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #2 23Feb24 kjs		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
10,500.00	89.67	227.99	4,099.79	-4,489.27	-4,984.52	175,315.321	19,427,829.512	43.793292	-85.340509
10,600.00	89.67	227.99	4,100.37	-4,556.19	-5,058.82	175,248.400	19,427,755.208	43.793106	-85.340787
10,700.00	89.67	227.99	4,100.94	-4,623.11	-5,133.13	175,181.478	19,427,680.903	43.792920	-85.341065
10,777.00	89.67	227.99	4,101.38	-4,674.64	-5,190.34	175,129.948	19,427,623.689	43.792777	-85.341280
TD at 10777.00 - BHL JOHNSON ET AL 1-6									

Design Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
BHL JOHNSON ET AL 1 - plan hits target center - Point	0.00	0.00	4,101.38	-4,674.64	-5,190.34	175,129.948	19,427,623.689	43.792777	-85.341280

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Comment
3,428.40	3,428.40	0.00	0.00	KOP 9°/100
4,424.75	4,065.00	-423.60	-470.34	LP 89.67 Inc, 227.99 Az
10,777.00	4,101.38	-4,674.64	-5,190.34	TD at 10777.00

12 Description of the cementing program including the type, properties and compressive strength of cement to be used on each casing string. Indicate if DV tools will be used.

Please see 3 Form EQP 7200-1.
The 7” casing will be set at the bottom of the curve and cemented to 2300’ TVD, with 150’ of allowance to ensure the 9 5/8” casing can be plugged accordingly.

1.18 lb/gallon, 330 SX, 1.18 Yield, 30% Excess

(4,425’ Measured Depth - 3,400 KOP, in Open Hole) + 900’ In Casing x 1.3 Excess = 330 SX.

If there are lost circulation problems a LCM might get added.

No DV tool will be used.

Compressive Strength	=	2400 psi at 24 hrs
To Estimated TOC	=	2300’

The 4.5” injection string will not be cemented.

13 Description of the proposed wireline logging program.

During drilling, a MWD gamma ray log will be ran. It will also take a temperature reading.

GR Neutron Density Log will be run.

A CBL will be run through the curve to the liner to ensure cement coverage.

14 Description of the testing program, including pressure tests on casing strings, and any planned drill stem tests.

The 9 5/8” string was pressure tested following the remediation job.

The mechanical integrity of the production string on all the proposed injection wells will be tested according to the requirements of R 299.2391, Part 625. All testing shall also be in compliance with United States EPA 40 CFR 146.8(c)(3-4). Operating tests for mechanical integrity shall be conducted at the required frequency and dictated by permit and according to pro-active best practice.

Notice will be made to the EGLE prior to the date of the schedule MIT. Tests must be witnessed by a representative of EGLE. A written report of the results of the MIT will be made to EGLE within 45 days following completion of the MIT.

No drill stem test will be performed.

15 Description of any planned coring program.

There are no cores planned on the subject well.

Additional information required for an application for a permit to drill and operate a disposal well or to convert a previously drilled well to such a well:

1 Form EQP 7200-14, Injection Well Data.

EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY - OIL, GAS, AND MINERALS DIVISION

INJECTION WELL DATA

Supplemental information for drilling or converting to an injection well
By authority of Part 615 or Part 625 of Act 451 PA 1994, as amended.
Non-submission and/or falsification of this information may result in fines and/or imprisonment.

INSTRUCTIONS: Complete all portions of form which apply to this well.
Attach supplemental documents as needed.

Applicant: Michigan Potash Operating, LLC

Well name and number: Johnson 1-6D

1. Notification information: provide name and address of the permittee of each oil, gas, and injection well and permitted location(s) within 1,320 feet of this proposed well, and the name and address of the last surface owner(s) of record within 1,320 feet of this proposed well.
2. File a separate plat which identifies the depth and location of this proposed well and all oil, gas, injection, and abandoned well within 1,320 feet. Also identify the permittee of each producing well within 1,320 feet of this proposed well, the surface owner(s) of record of the lands within 1,320 feet of this proposed well, and all freshwater, irrigation, and public water supply wells within 1,320 feet of this proposed well.
3. Enclose a copy of the completion reports for all wells and the plugging records for all plugged wells shown on the plat. Identify what steps will be necessary to prevent injected fluids from migrating up or into inadequately plugged or completed wells.
4. If this is an existing well to be converted to an injection well, enclose this form with a full permit application package per EQC 7200. Also enclose a copy of the completion report and geologic description and electric logs for this well.
5. Identify and describe all faults, structural features, karst, mines, and lost circulation zones within the area of review that can influence fluid migration, well competency, or induced seismicity. Include a plan for mitigating risks of identifiable features.
6. Attach a proposed plugging and abandonment plan (EQP 7200-6), along with a schematic detailing the depths, volumes, and types of cement and mechanical plugs, and depths where casing will be recovered.
7. Provide information demonstrating that construction of the well will prevent the movement of fluid that causes endangerment to an Underground Source of Drinking Water (USDW).

8. Type of fluids to be injected
☒ Brine ☐ Natural Gas (omit #10 & #15)
☐ Fresh Water (omit #15) ☐ Other ________

9. Maximum anticipated daily injection rate (bbls/day or MCF/day)
40,115 bbl/day

10. Specific gravity of injected fluid 1.20 w/0.05 safety factor = 1.25

11a. Maximum anticipated injection pressure at 1.25 SG

11b. Maximum injection pressure 1052 at 0.8 fpg

Show calculations (see R324.807) Part 625 Mineral Well
[{0.8-(0.433*(1.2+0.05))}*4065]

12. Maximum bottom hole injection pressure 3252
Show calculations
1,052+(1.25*.433 psi/ft) * 4,065 ft

13. Fracture pressure of confining interval 3,130
Show calculations (Top of Confining Interval)
3,913 ft * 0.80 psi/ft FG

14. Fracture pressure of injection interval 3252
Show calculations (Top of Injection Interval)
4065 * 0.8 (default); Offsets Demonstrate 4065 * 1.17 = 4756

15. Chemical analysis of representative samples of injected fluid
Specific conductance ________

Cation (mg/l)		Anions (mg/l)	
Calcium	<0.2%	Chloride	Var
Sodium	Var	Sulfate	<0.4%
Magnesium	<0.2%	Sulfide	<30 mg/l
Total Iron	<10 mg/l		
Barium	8 mg/l	Bicarbonate	220 mg/l

What was the source of this representative sample?
Adjacent Well

16. Is this well to be completed in a potential, previous, or current oil or gas producing formation? ☐ Yes ☒ No
If yes, provide a list of all offset permittees and proof of service of notification of this application to all permittees by certified mail.

Schematic of wellbore construction

Complete bottom of diagram as needed to conform with proposed construction (e.g. show rat hole below casing, open hole completion, packer loc. etc.)

Underground Source(s) of Drinking Water formation name(s), top & bottom depths
USDW(s) Glacial Till
Depth to top 0 (215' productive interval)
Depth to base 638

Vertical distance (in feet) between top of injection interval and base of deepest USDW
3427

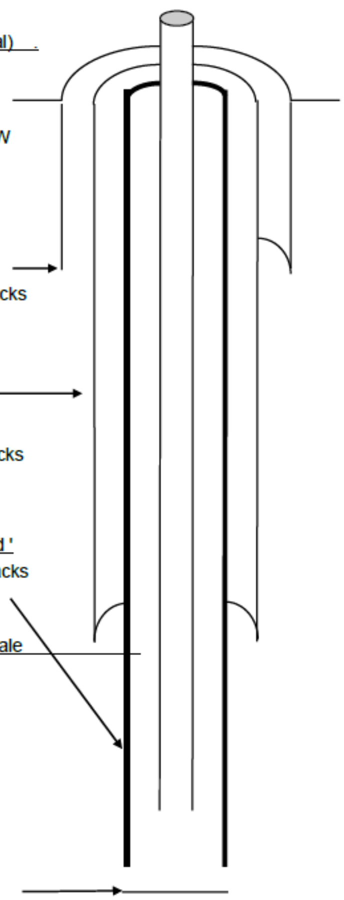
Surface casing 13 3/8 "x 904 '
Amount of cement ________ sacks
T.O.C. Surface

Intermediate casing (if applicable)
9 5/8 "x 5550 '
Amount of cement 833 sacks
T.O.C. 2148

Long string casing 7 "x 4425 md '
Amount of cement 330 x 1.18 sacks
T.O.C. 2300 tvd

Confining Interval(s) Dundee Lime/Belle Shale
Depth to top 3913
Depth to base 4030

Injection Interval(s) Reed City
Depth to top 4065
Depth to base ________
Tubing ______ " x ______ '
Packer Depth ________
Bottom TD or PBTD ________ ft



17. Application prepared by (print or type): Theodore Pagano, P.E., P.G.
Signature
Date 3/23/2024

EQP 7200-14 (rev. 5/2019) Enclose with *APPLICATION FOR PERMIT TO DRILL* or CONVERT

1. Notification information: provide name and address of the permittee of each oil, gas, and injection well and permitted location(s) within 1,320 feet of this proposed well, and the name and address of the last surface owner(s) of record within 1,320 feet of this proposed well.

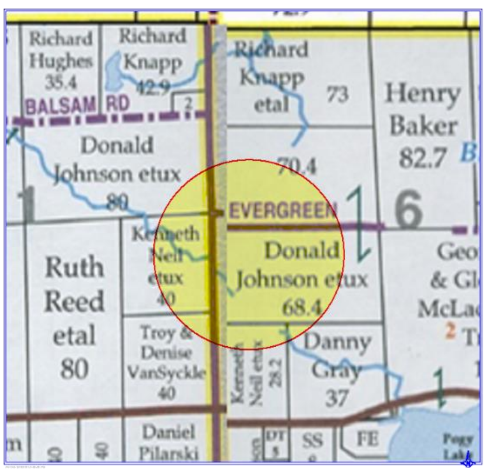
There are no oil, gas, or injection operators, or permitted locations within 1,320 feet of the proposed well (please see Figure A8, Tables and).

Surface Owner and Mailing Address within 1320 feet of the Proposed Well
Don Johnson, Jr., 4707 W State Road, Middleville, MI 49333
Kenneth Neil, 2362 N. M-43 Hwy, Hastings, MI 49058
Troy and Denise Vansykle, 4658 200th Ave, Reed City, MI 49677
Danny and Rose Grey, PO Box 924, 11640 11 Mile Road, Evart, MI 49631

2. File a separate plat: which identifies the depth and location of this proposed well and all oil, gas, injection, and abandoned well within 1,320 feet. Also identify the permittee of each producing well within 1,320 feet of this proposed well, the surface owner(s) of record of the lands within 1,320 feet of this proposed well, and all freshwater, irrigation, and public water supply wells within 1,320 feet of this proposed well.

Please see supplemental plat submitted as a part of 7200-2, Page 19.

There are no producing wells within 1,320 feet. Surface owners are illustrated below as per Mecosta County Plat map.



3. Enclose a copy of the completion reports: for all wells and the plugging records for all plugged wells shown on the plat. Identify what steps that will be which identifies the depth and location of this proposed well and all oil, gas, injection, and abandoned well within 1,320 feet.

Please see Appendix 1, for the extended AOR, which includes all wells within 1,320 feet of the proposed wells.

4. If this is an existing well: to be converted to an injection well, enclose this form with a full permit application package per EQC 7200. Also enclose a copy of the completion report and geologic description and electric logs for this well.

N/A. The electric logs available are those one within possession of EGLE currently.

5. Identify and describe all faults, structural features, karst, mines, and lost circulation zones: within the area of review that can influence fluid migration, well competency, or induced seismicity. Include a plan for mitigating risks of identifiable features.

Please reference this supplemental report herein; as the AOR is expressly large. There are no faults, structural features, karsts, mines, or lost circulation zones that can influence fluid migration, well competency, or induced seismicity. There are no identifiable features.

6. Attach a proposed plugging and abandonment plan (EQP 7200-6): along with a schematic detailing the depths, volumes, and types of cement and mechanical plugs, and depths where casing will be recovered.

Please see section 14.

7. Provide information demonstrating that construction of the well will prevent the movement of fluid: that causes endangerment to an Underground Source of Drinking Water (USDW).

Please reference sections this supplemental report in its entirely.

2 A calculation of the area of review in the injection interval over the anticipated life of the well.

"Area of review" means either of the following:

A. For a well disposing of non-hazardous waste, that area the radius of which is the greater of 1/4 mile or the lateral distance in which the pressures in the injection zone are sufficient to increase hydrostatic head in the injection zone above the base of the lowermost underground source of drinking water, but not more than 2 miles.

B. For a well disposing of hazardous waste that area the radius of which is the greater of 2 miles or the lateral distance in which the pressures in the injection zone are sufficient to increase hydrostatic head in the injection zone above the base of the lowermost underground source of drinking water.

The proposed well is a non-hazardous brine well, and therefore the area of review ("AOR") is to be the radius of which is greater of ¼ mile or the lateral distance in which the pressures in the injection zone are sufficient to increase hydrostatic head in the injection zone above the base of the lowermost underground source of drinking water, but not more than 2 miles.

The Area of Review has been set at 2 Miles from any injection point along the radial horizontal length of the Johnson 1-6D, which is conformance with the US EPA and EGLE requests, as per A above for non-hazardous waste.

The **area of influence**, is expressly differentiated from the AOR. Provided all wells are reviewed within 2 miles of any injection point along the horizontal length of the Johnson 1-6D well, a calculation of cricital pressure rise, or potential area of influence at the 2 mile length is provided below.

A calculation of the area of influence in the injection interval over the anticipated life of the well:

A calculation of critical pressure rise is given at the 2 mile boundary, beyond the Area of Review.

In conjunction with the University of Missouri Rolla, the National Water Well Association and the Municipal Experimental Research Laboratory, and Robert S. Kerr Environmental Research Laboratory, of the EPA, Warner and Lehr established and contributed a means of knowledge essential to establish and enforce control standards on deep water injection, the method of calculation for which is demonstrated herein. 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 provided a hypothetical pathway that penetrates all the confining intervals between the injection zone and the base of the lowermost USDW.

The pathway for this theoretical fluid movement must assume a hypothetical, deep, open, and abandoned well, which has penetrated all of the numerous confining zones between the postulated injection zone and the lowermost USDW.

The following calculations are being demonstrated voluntarily by the applicant, and show that in the event of a hypothetical open path to surface, a cone of influence exceeding the calculated critical pressure is unlikely to exist in the postulated operation; meaning, migration to a USDW would not overcome resident hydrostatic pressure, even in the event of a hypothetical open path.

The critical pressure rise is determined via the following;

$$Pc = 0.433 * [SG_i * (D_i - D_{usdw}) + SG_{usdw} * (D_{usdw} - WL)] - Po;$$

where

Pc = Critical Pressure rise, psi

SG_i	= Specific Gravity of the injectate or resident water, unitless
D_i	= Depth injection interval, feet
D_{usdw}	= Depth to the base of the lowermost USDW
SG_{usdw}	= Specific Gravity of the USDW, unitless
WL	= observed water level below groundlevel, feet
Po	= original reservoir pressure in the injection horizon, psi

EPA 600/2-77-240, equation 3-9a expresses the pressure rise in injection wells after Warner and Leher, 1977; whereby the rise in pressure in relation as a function of time and distance is given as per the following;

$$dP\ (t,r) = \frac{162.6Qu}{\overline{K}b} * \left[\log \frac{\overline{K}t}{\overline{\emptyset}cr^2} - 3.23\right]$$

where

dP (t,r)	= Change is reservoir pressure as a function of time, days and radius, feet
Q	= Rate of injection, barrels per day
u	= viscosity of injectate, centipoise
$\overline{K}$	= Average permeability of the injection zone, md
t	= time since injection began, hours
b	= injection zone thickness, feet
c	= injection zone compressibility, 1/psi
$\overline{\emptyset}$	= average injection zone porosity, percent,
r	= radial distance from wellbore, feet

Information summarized and applied in in the following calculations have been determined from real core data, real historical operating data, real historical drilling data, and site specific geophysical logs. The values and calculations are utilized to establish an estimated, theoretical output according to the laws of diffusivity and dispersion following 20 years of theoretical uninterrupted, continuous injection at the site specific location.

The range of inputs can be changed as approximations, ultimately being refined with real, observed site specific injectivity tests, fall off, and step rate tests via real time reservoir monitoring as is done on all brine injection wells during the course of operation.

Base of the Lowermost USDW

The lowermost base of the USDW at the Johnson 1-6A and in the immediate area has been determined to be 638' in the subject well based on sample picks during the original drilling of the 1-6A.

As Per Michigan Statute, Part 625 R 299.2302(u) defines "Fresh water" as water which is free of contamination in concentrations that may cause disease or harmful physiological effects and which is safe for human consumption.'

R 299.2304(k) defines Underground Source of Drinking Water, which defines total dissolved solids to not exceed 10,000 mg/L TDS, similar to those standards posed by the U.S. EPA at CFR 40 146.3, which also sets TDS at greater than 10,000 total dissolved solids.

It is known that intervals deeper than 200' in the area of review, may contain naturally occurring arsenic and are not suitable for safe drinking as per Part 625 R 299.2302 (See section 6), and the deeper E-1 aquifer in the glacial till tends to be high in TDS, and calcium sulfate. As per Figure D2, the deepest slotted well in the 2 mile AOR is 340' and is utilized for potash/salt solution mining purposes and is not an underground source of drinking water. A conservative regulatory approach sets the USDW at the base of the glacial till at 638; rather than at the deepest probable source of 'Fresh Water' which is safe for human consumption. As a result, Surface casing setting depths have been designed to be set at 900', which 270' below the base of the glacial till.

Site Specific Variables and Critical Pressure Rise

Injection Well Data Form EQP 7200-14 and the variables requested therein, conform to the range as specified in the table below:

Parameter	Value	Comment/Source
SG_i	1.23	Site specific resident water from the Ward 1-11 from the Reed City Formation (1.211) and Injectate high side (1.25) average
D_i	4056'	Top of Reed City Dolomite from site specific geophysical logs.
D_{usdw}	640'	Conservative selection of site specific measured depth of USDW as per US EPA CFR 40 146.3, at 10,000 TDS. Base of the Glacial Till by samples.
SG_{usdw}	1.05	fresh water
WL	97.5	Site specific average as observed in the nearest water wells (120, 75, 105, 90)
Po	1695	0.433 psi/ft
U	0.95	24% NaCl saturated brine at injection horizon site specific temperature of 125 degrees F
B	135	Site specific observed net porosity thickness based on real geophysical well logs
C	0.0000052	Dimensionless per psi, dolomite
$\bar{\emptyset}$	15.0%	Site specific determination based on real geophysical well logs. Effective porosity cross plot average as discussed in part 9.D.
$\bar{K}$	536	Average determination based on permeability determination from step rate data from the Thomas and Woodward (907 md avg) the Park Well Logs (1-12) vs real core observed (~ 350 md average) and measured in DST in the area (Ward 362 md, Pilarski 166 md).

Parameter	Value	A Value/ B Value, Comment/Source
Pc	341	Critical Pressure Rise, Calculated

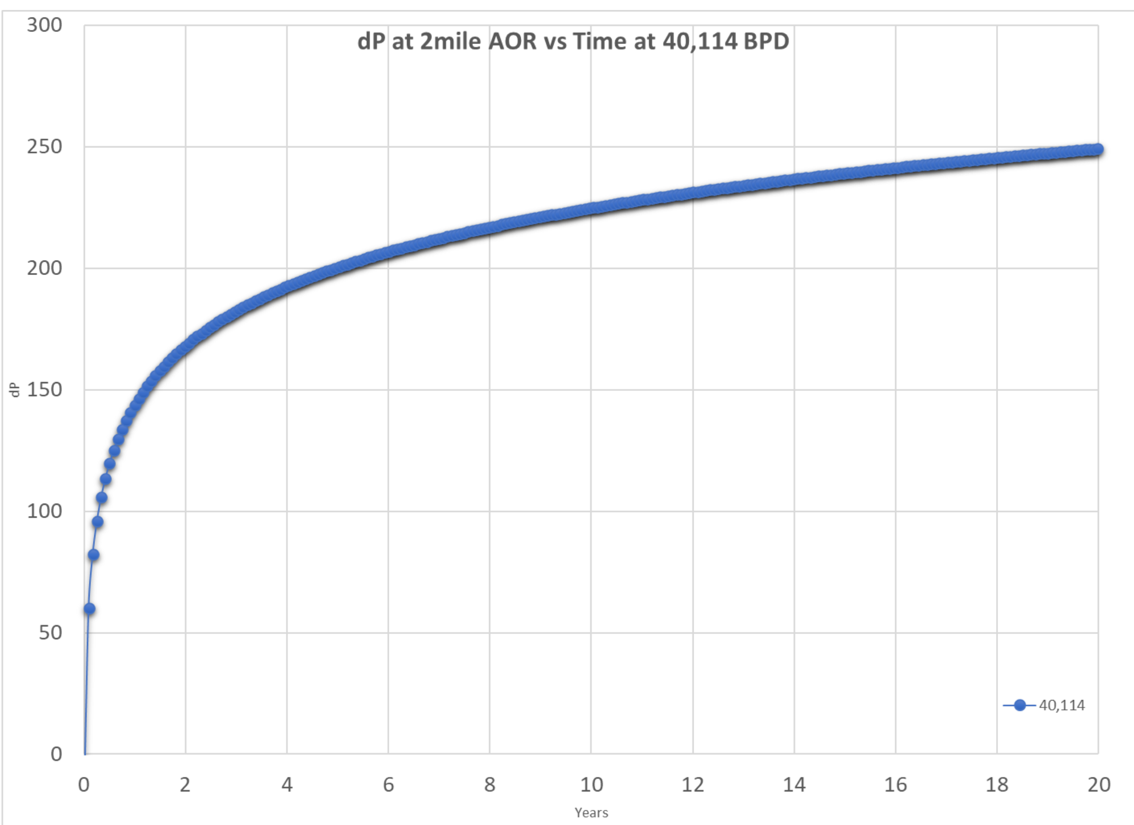
EPA 600/2-77-240, equation 3-9a expresses the pressure rise in injection wells after Warner and Leher, 1977; whereby the rise in pressure in relation as a function of time and distance is given as per the following;

$$dP\ (t,r) = \frac{162.6Qu}{\overline{K}b} * \left[\log \frac{\overline{K}t}{\overline{\emptyset}cr^2} - 3.23 \right]$$

where

dP (t,r)	= Change is reservoir pressure as a function of time, days and radius, feet
Q	= Rate of injection, barrels per day
u	= viscosity of injectate, centipoise
$\overline{K}$	= Average permeability of the injection zone, md
t	= time since injection began, hours
b	= injection zone thickness, feet
c	= injection zone compressibility, 1/psi
$\overline{\emptyset}$	= average injection zone porosity, percent,
r	= radial distance from wellbore, feet

And therefore, the pressure rise at a 2 mile radial distance away from the well, at the maximum injection rate versus time is expressed below:



Now, considering EPA 600/2-77-240 can be adjusted (in part) for a horizontal well, as to its productivity index as:

$$q_o = \frac{7.08\times10^{-3}kh}{B\mu\left(\ln\frac{2r_e}{L_h}+\ln(2)+F\right)}\left(p_i - p_{wf}\right)$$

where F is

$$F = -\frac{h}{L_h}\sqrt{\frac{k_x}{k_z}}\ln\left\{4\sin\left[\frac{\pi}{2h}\left(2z_w + r_w\right)\sqrt{\frac{k_z}{k_y}}\right]\sin\left(\frac{\pi}{2h}r_w\sqrt{\frac{k_z}{k_y}}\right)\right\}$$

and where

L/h	= Horizontal well, feet
$\overline{kx}$	= Average permeability of the injection zone x direction, md
$\overline{ky}$	= Average permeability of the injection zone y direction, md
$\overline{kz}$	= Average permeability of the injection zone z direction (1/10), md
B	= Fluid compressibility, reservoir bbl /standard bbl
rw	= radius of the wellbore, feet
$\overline{\emptyset}$	= average injection zone porosity, percent,
r	= radial distance from wellbore, feet

The productivity index, when -Q equals injection, the change in pressure (pressure rise) can be inferred by the ratio of the Productivity index of the vertical well versus the horizontal well in the same formation with the same features.

The productivity of a vertical well with the observed reservoir characteristics approximates

Jv = 58 Q/(detla p)

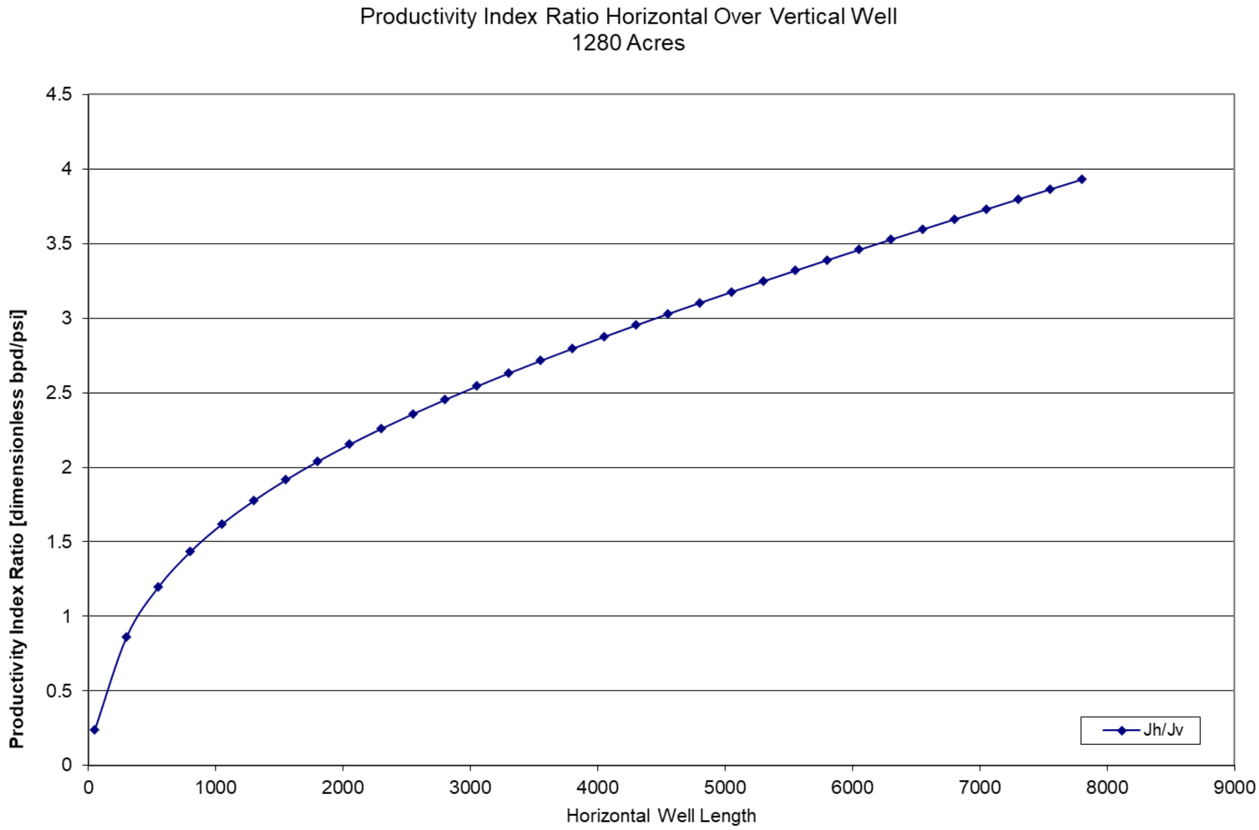
And the productivity index of a horizontal well with the proposed length of the Johnson 1-6A, at 7100, is

Jh = 220 Q/(delta p)

And therefore the performance of the horizontal well, as it concerns the acceptance of fluid at the same pressure is expressed as

Jv/Jh = 3.7 times more fluid intake

This horizontal advantage is graphically illustrated here, at varying lengths. It would be implied then, that the horizontal well substantially reduces critical pressure rise (in this case, potentially by 3.7 times).


Productivity Index Ratio Horizontal Over Vertical Well
1280 Acres
Productivity Index Ratio [dimensionless bpd/psi]
Horizontal Well Length
Jh/Jv
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
0
1000
2000
3000
4000
5000
6000
7000
8000
9000

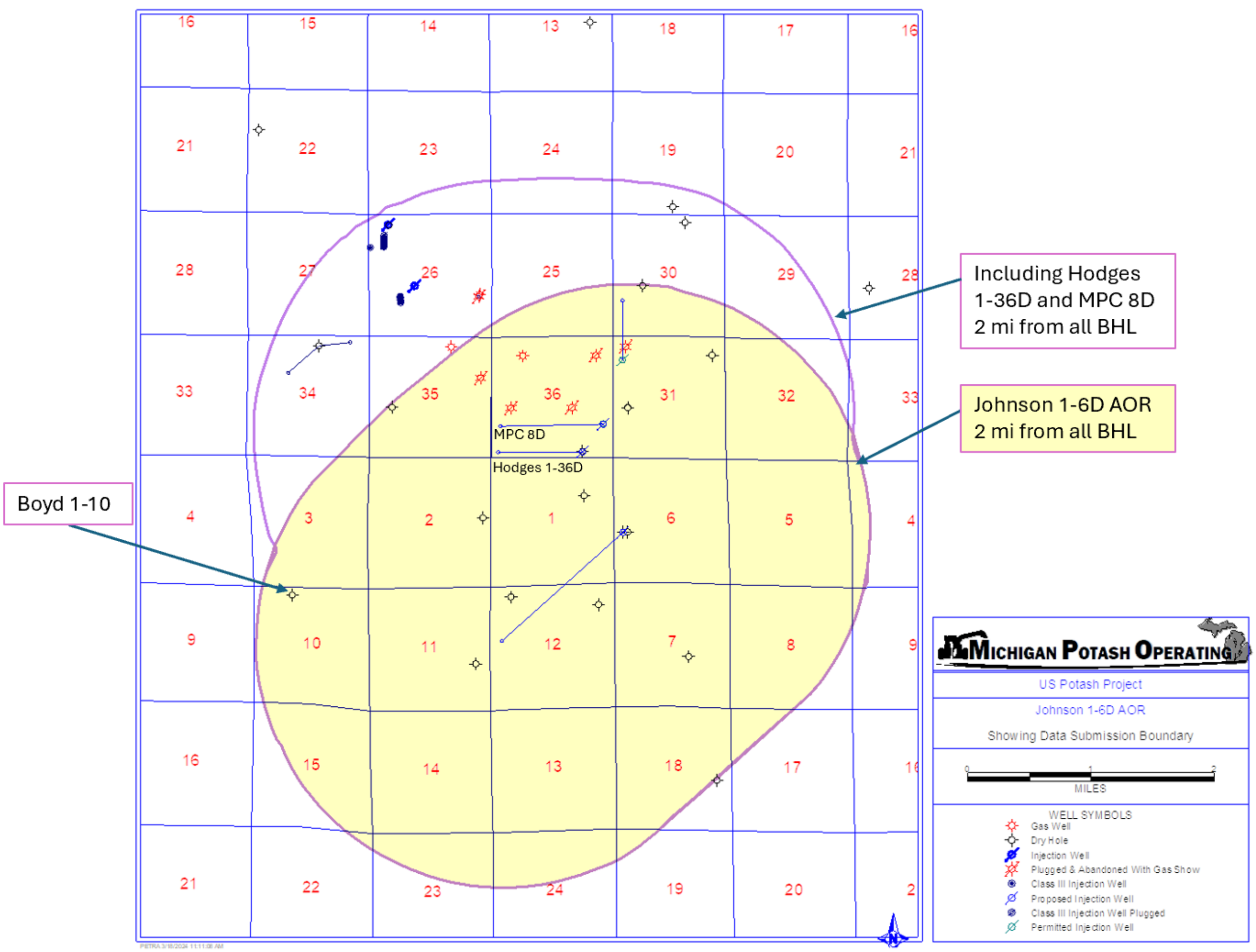
3 A discussion of the affect of injection on the present and potential mineral resources in the area of review.

A description of the Area of Review

The **Area of Review** ("AOR"), by the applicant is expressly differentiated from the area of influence of the subject well.

The AOR, is hereby surrendered, graphically and technically when expressly requested as a two mile radial distance along the lateral trajectory of the propositioned Johnson 1-6D; and concurrently with a two mile radial distance along the lateral trajectory of the *proposed* Hodges 1-36D, and MPC 8D. The Hodges 1-36D, and the MPC 8D are two proposed project wells for similar purpose to the subject well.

Appendix 1.0 includes a visual demonstration of the AOR, including a 2 mile AOR around the lateral length of the Johnson 1-6D. Further, it also includes all wells in an expanded AOR, which includes the MPC 8D, and Hodges 1-36D. The MPC 8D and Hodges 1-36D are contemporaneous submissions by the applicant to EGLE; as per the following:



To illustrate, the following maps are hereby surrendered for consideration.

- **Figure A1 is a locator map**, showing the proposed surface well location for the Johnson 1-6D, as well as the Hodges 1-36D, and the MPC 8D. The well names are shown, as are roads, water bodies, and townships.
- **Figure A2 is a map** illustrating a 2 mile radius along the lateral trajectory of the Johnson 1-6D, also showing the PLSS system and all deep wells that penetrate the confining horizon.
- **Figure A3 is a map** illustrating a 2 mile radius along the lateral trajectory of the Johnson 1-6D, the Hodges 1-36D, and the MPC 8D, project wells that are concurrently contemplated with the Johnson 1-6D application, and the selected "AOR" as surrendered herein.

<u>A discussion of the affect of injection on the present and potential mineral resources in the area of review.</u>

The postulated injection operation in the AOR, as graphically illustrated in Figure A2 and Figure A3 will not impact present or potential mineral resources in the area of review, but rather promulgate and enable the development of the potash and salt mineral resources. The proposed action is necessary to administer the production of potash and high grade salt.

The AOR includes three marginally producing, depleted oil and gas wells from the deep Clinton formation at 8100' or greater.

Injection into the Dundee formation does not interfere with any oil and gas interest, postulated mineral development or offset salt production from the Salina salt formations. Provided surface disturbance is limited to a single drilling pad, surface resources are also preserved.

For ease of reference and review, multiple graphical maps have been illustrated over the AOR. All of the maps in this section include the proposed injection well locations and the Public Land Survey System ontop of the United States Geological Survey Topographic Quadrangle for the AOR.

- **Figure A4 shows all producing wells** in relation to the proposed injection wells in the AOR. The Public Land Survey System is included ontop of the United States Geological Topographic Quadrangle. There are three producing wells.

It is important to recollect, that the propositioned operation is immediately adjacent to two (2) ongoing and analogous Part 625 brine disposal wells completed in the Reed City Dolomite formation, which is equivalent to the proposed zones and has been active for 35 years.

- **Figure A5 shows active Class I NON-HAZARDOUS Injection Wells**; the Thomas 1-26 (NW4NW4 Section 26) and the Woodward 1-26 (NE4SW4 Section 26), both operated by Cargill, Inc. and recently repermitted 11/20/2020. Also shown are permitted injection wells the MPC 1D, MPC 2D, which share a similar pad location, and the proposed 8D shares a pad location with the MPC 3D.

It is important to recollect, that the propositioned operation is immediately adjacent to ongoing Part 625 artificial brine operations, which began in 1989 and remains active.

- **Figure A6 shows established Class III AREA Injection Permit No. MI-133-3G-A0002 & MI-133-3G-0028;** Class III Injection Permit No. MI-133-3G-A0002 (Yellow NW-SE Cross Hatch) and established

Class III Injection Permit No. MI-133-3G-0028 (Yellow NE-SW Cross Hatch). Active Class III Injection Wells are also shown, which occur only on MI-133-3G-A0002.

As illustrated above, this area has been the subject of extensive prior injection, permitting, operations, and regulatory supervision, since 1980.

The AOR has been the subject of extensive and comprehensive prior geological and environmental review, and re-review by all interested stake holders and regulatory agencies and predecessor companies to Michigan Potash Operating, LLC, having been the subject of prior permit applications for both EPA regulated Class I and Class III non hazardous injection and also Part 625 artificial brine wells and Part 625 brine disposal wells. Predecessor owners of interest include (either offset or in the MPO AOR) Kalium Chemicals, Ltd., IMC Kalium, Ltd., PPG Industries, Inc, Mosaic Hersey Potash, LLC, Michigan Potash Operating, and Cargill Incorporated.

The proposed operation is immediately adjacent to an ongoing Part 625 brine injection operation occurring at equivalent depths and are for similar purpose (potash and salt) identical to the one applied for.

After 33 years of successful operation, there has not be an indication that the regulatory scheme failed to identify every wellbore or that any wellbore serves as a hypothetical conduit that can increase the hydrostatic head in a USDW.

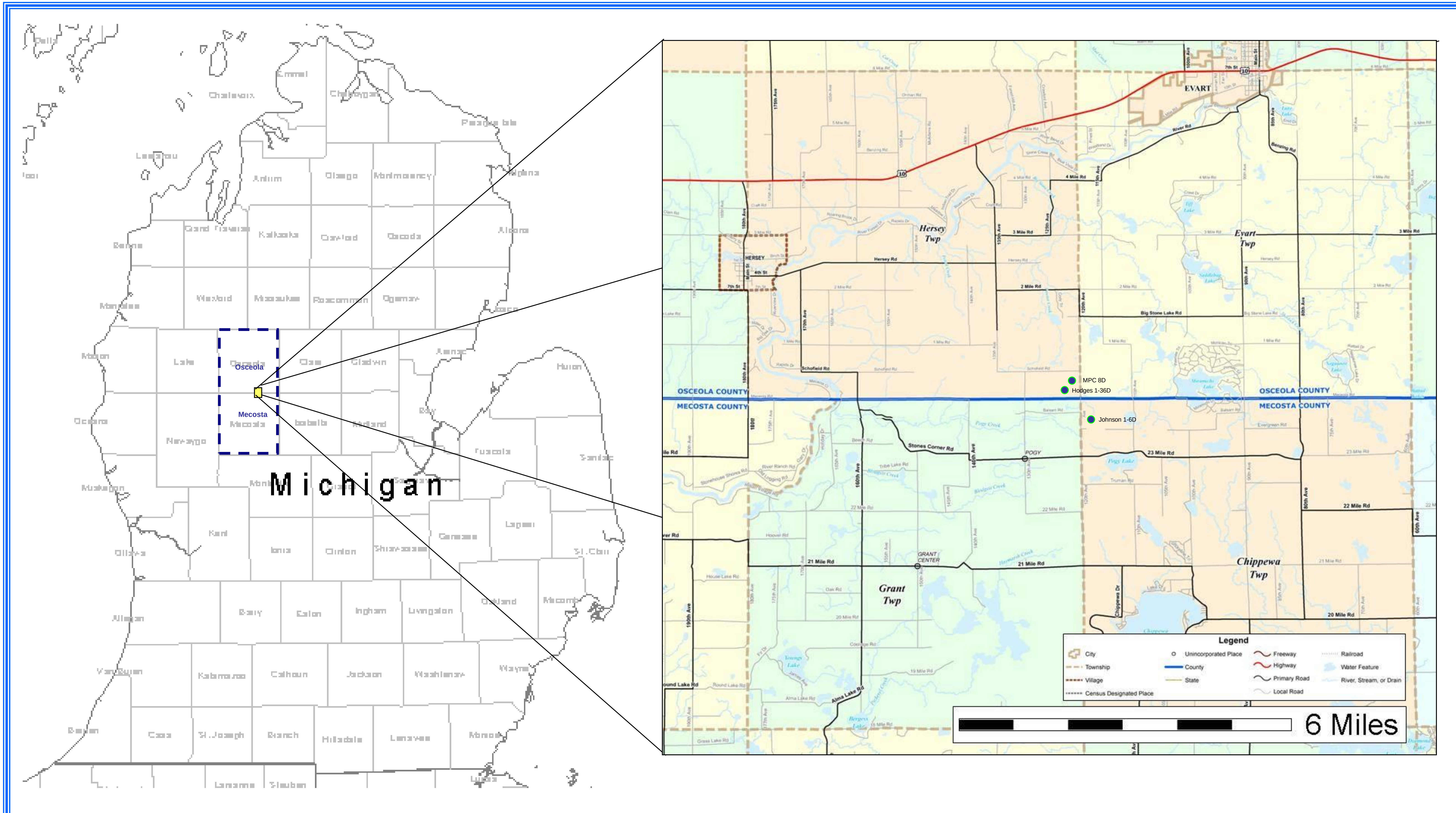


Figure A1. Locator Map, showing the proposed surface well locations for the Johnson 1-6D. The well names are shown, as are roads, water bodies, and townships.

MICHIGAN POTASH OPERATING, LLC

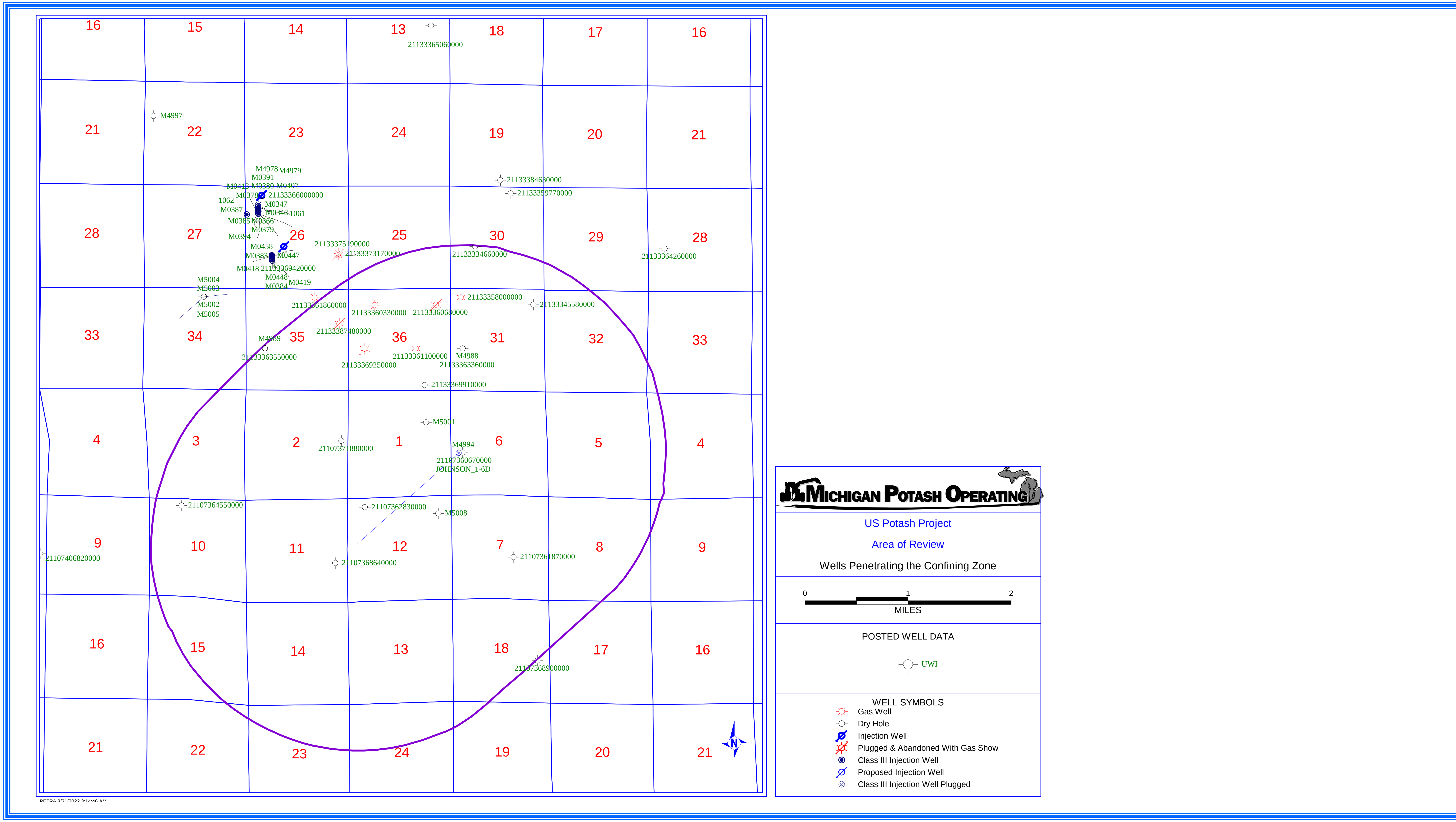


Figure A2 is a map illustrating a 2 mile radius along the lateral trajectory of the Johnson 1-6D, also showing the PLSS system and all deep wells that penetrate the confining horizon.

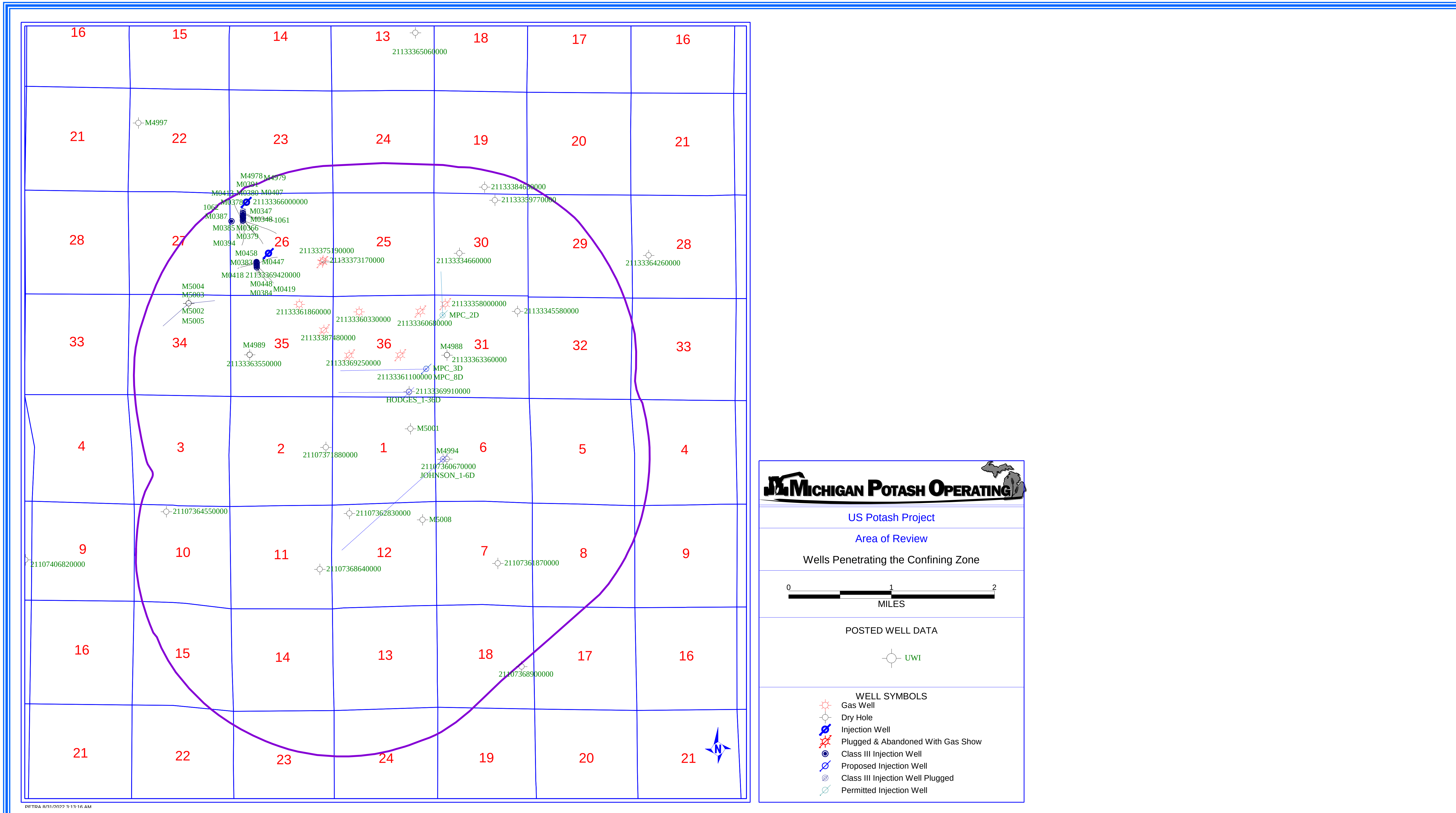


Figure A3 is a map illustrating a 2 mile radius along the lateral trajectory of the Johnson 1-6D, the Hodges 1-36D, and the MPC 8D, project wells that are concurrently contemplated with the Johnson 1-6D application, and the selected "AOR" as surrendered herein.

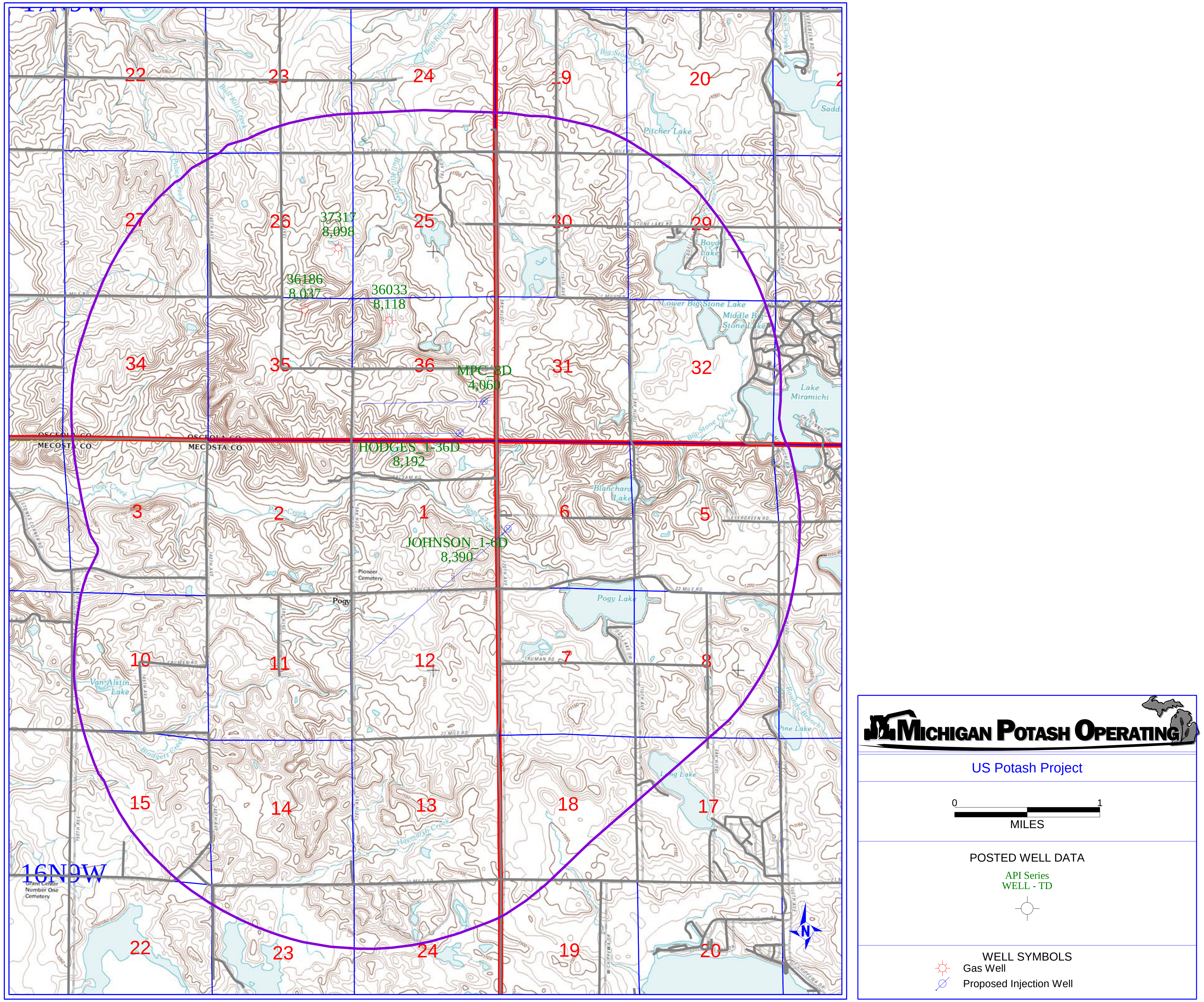


Figure A4 . Map showing all producing wells in relation to the proposed injection wells. Public Land Survey System is included. A blue box measures one section, or one square mile.

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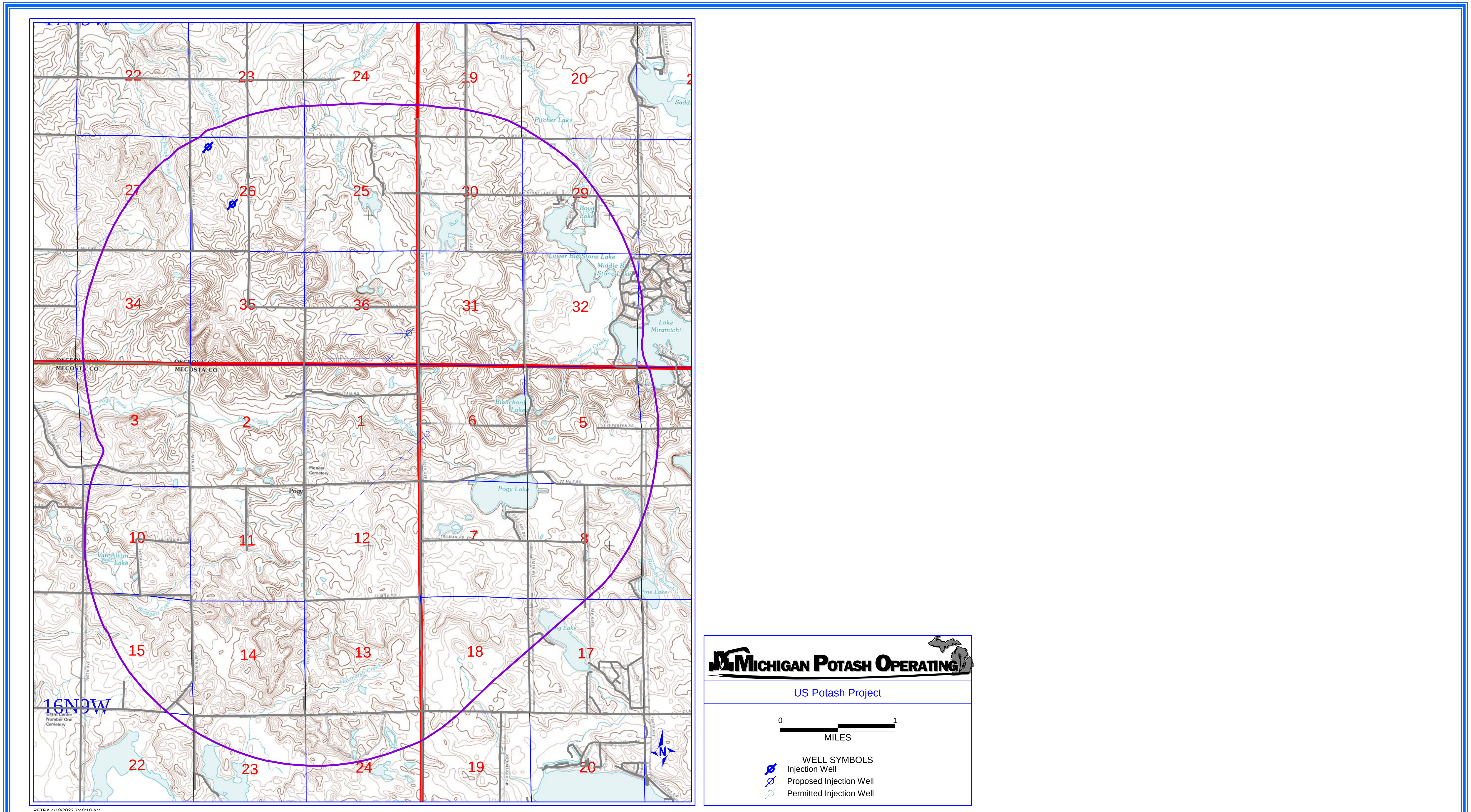

Figure A5. Map showing Existing Class I NON-HAZARDOUS Injection Wells, the Thomas 1-26 (NW4NW4 Section 26) and the Woodward 1-26 (NE4SW4 Section 26). Also shown are permitted injection wells the MPC 1D, MPC 2D, and MPC 3D. The Proposed 8D shares a pad location with the MPC 3D.

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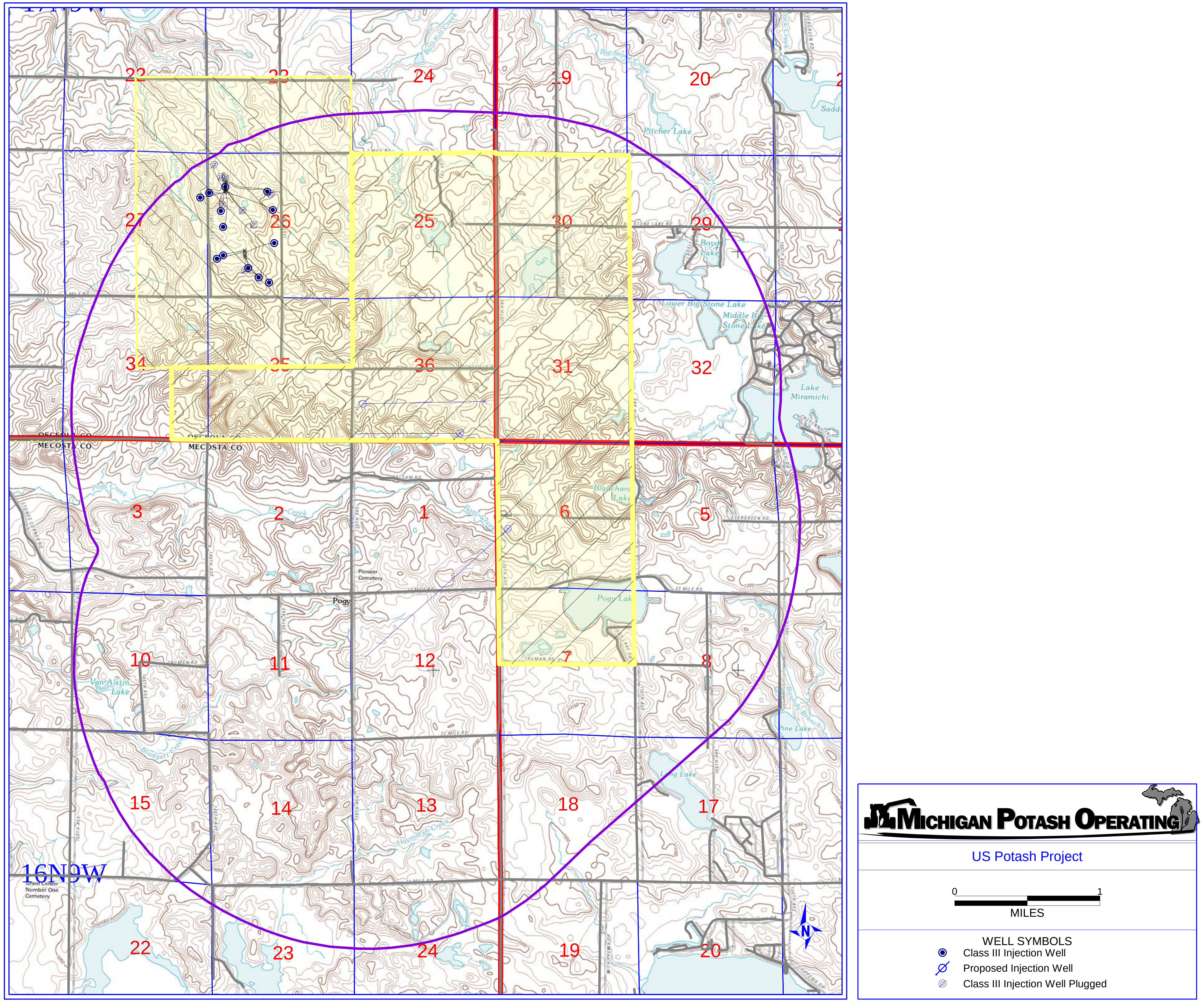

Figure A6. Map showing established Class III Injection Permit No. MI-133-3G-A0002 (Yellow NW-SE Cross Hatch) and established Class III Injection Permit No. MI-133-3G-0028 (Yellow NE-SW Cross Hatch). Active Class III Injection Wells are also shown, which occur only on MI-133-3G-A0002 at the time of the application.

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4 A plat which shows the location and total depth of the proposed well, shows each abandoned, producing, or dry hole within the area of review, and each operator of a mineral or oil and gas well within the area of review.

- **Figure A7 is a map showing all plugged wells**, shallow (that do not penetrate any confining horizon) or deep (that penetrate confining horizon) within the area of review. Total Depths are listed. There are several shallow Michigan Stray wells that do not penetrate the injection or confining horizon.

- **Figure A8 is a plat map** showing third party survey, with a ¼ mile area around the well path. Also showing a 1 mile radius from the wellhead locaiton. There are no oil and gas operators within the ¼ mile length of the subject well, or within the one mile boundary beyond the facility property boundary. The plat also illustrates the project injection well(s), well pad(s).

- **Figure A9 is a map showing all well types**, active and inactive, within the Area of Review. Shown in blue highlight are surface water bodies. Roads are also shown (black). PLSS is also shown (Blue).
  Well API series, and Total Depth are listed in GREEN. Mineral Wells are preceded with an M.

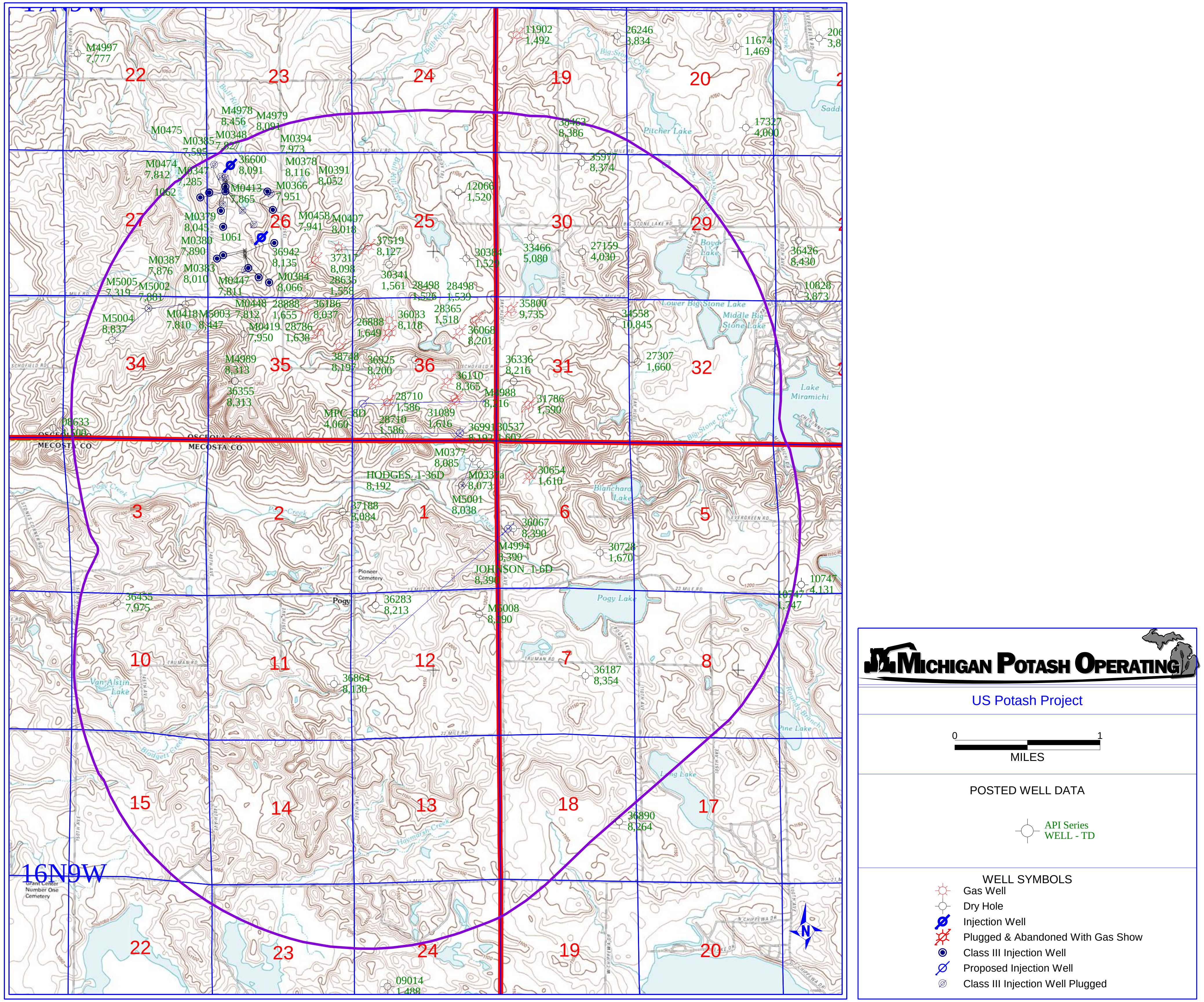

Figure A7. Map showing all plugged wells, shallow (that do not penetrate any confining horizon) or deep (that penetrate confining horizon) within the area of review. Total Depths are listed. There are several shallow Michigan Stray wells that do not penetrate the injection or confining horizon.

MICHIGAN POTASH OPERATING, LLC

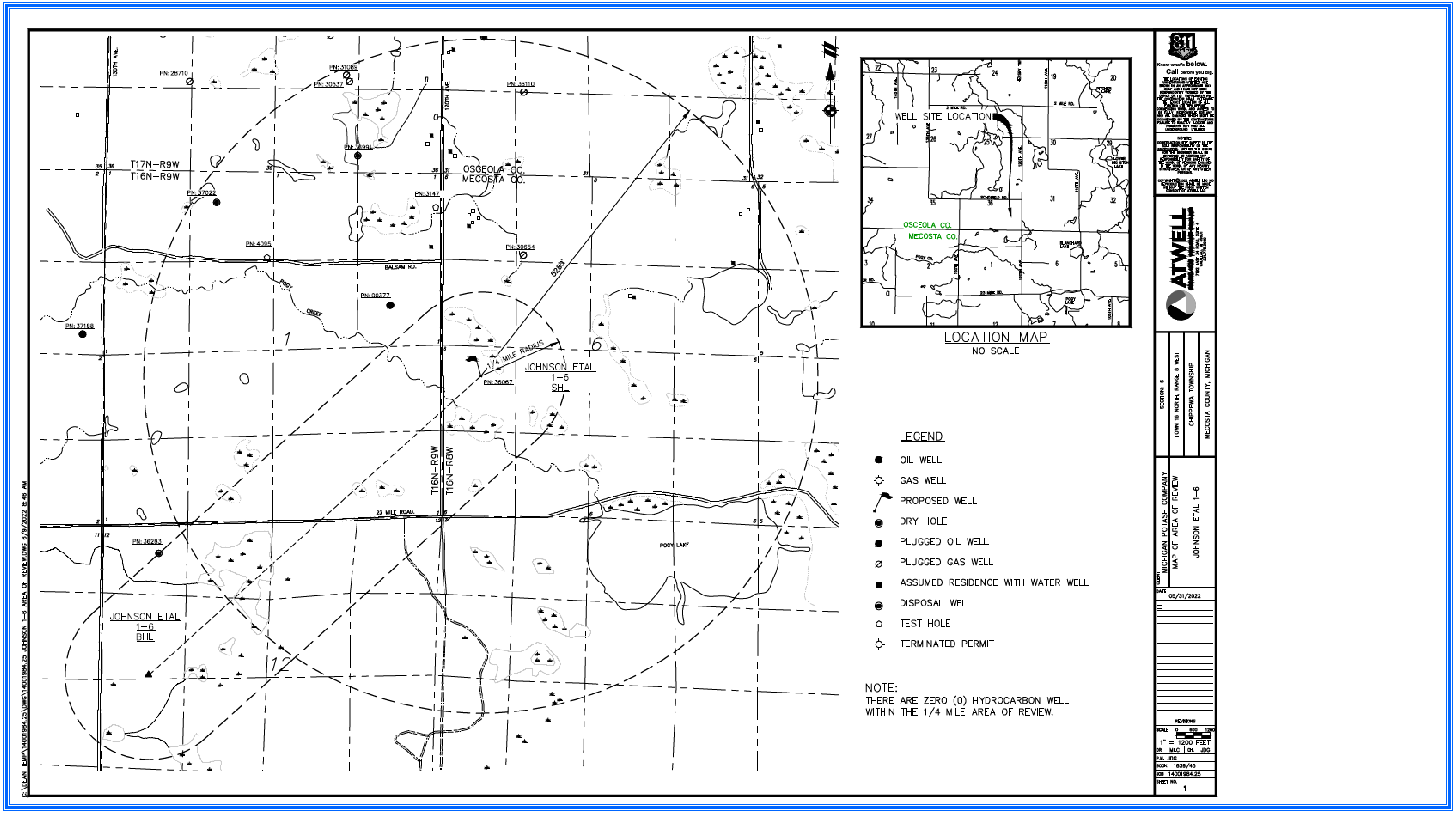

Figure A8. Plat showing third party survey, with a ¼ mile area around the well path. Also showing a 1 mile radius from the wellhead locaiton. There are no oil and gas operators within the ¼ mile length of the subject well, or within the one mile boundary beyond the facility property boundary. The plat also illustrates the project injection well(s), well pad(s).

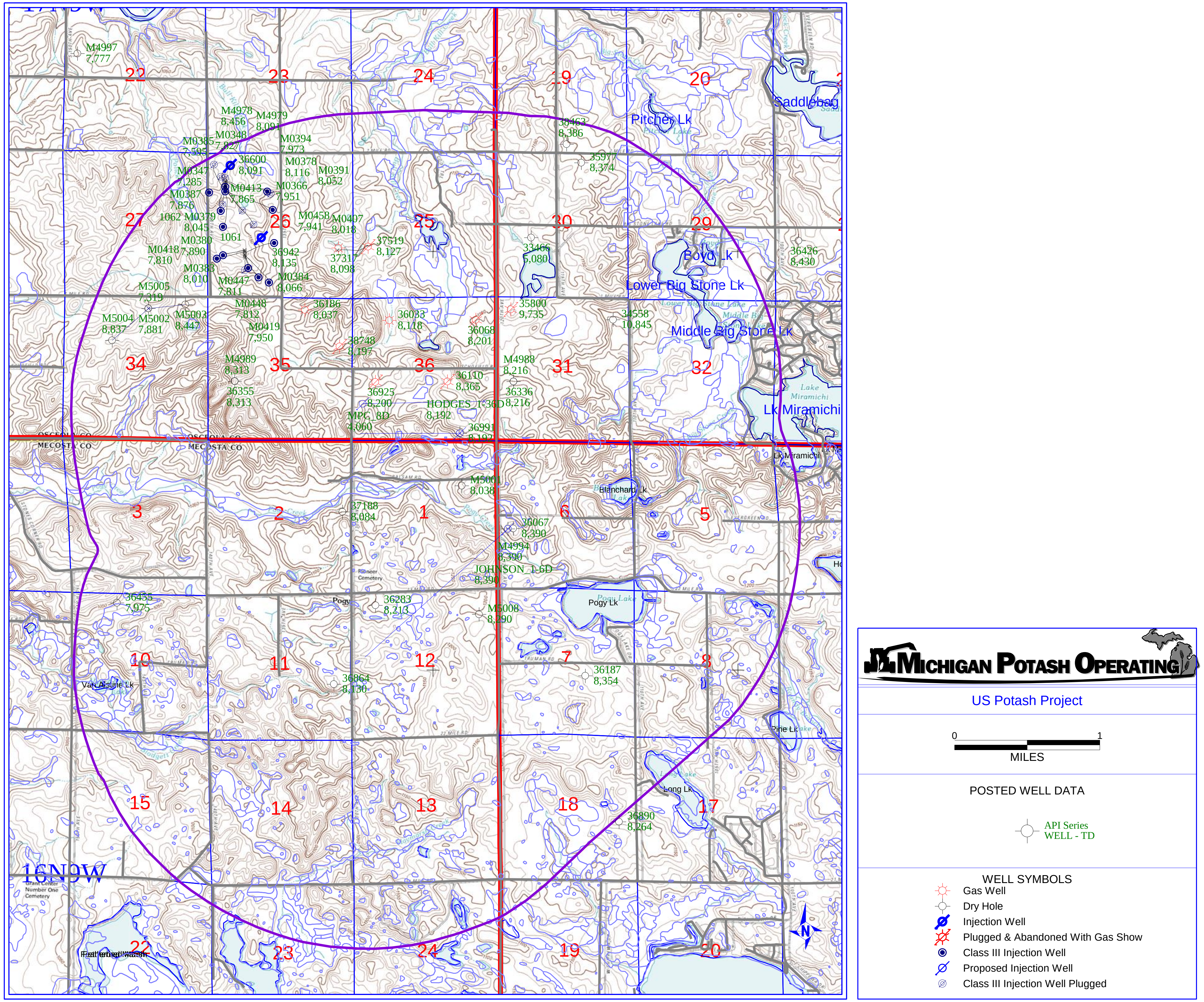

Figure A9. Map showing all well types, active and inactive, within the Area of Review. Shown in blue highlight are surface water bodies. Roads are also shown (black). PLSS is also shown (Blue). Well API series, and Total Depth are listed in GREEN. Mineral Wells are preceded with an M.

Michigan Potash Operating, LLC

For ease of reference, a tabulation of the existing drilled wells in the AOR are provided as follows:

Tabulation of active producing oil and gas wells are as follows:

Records of oil and gas producing wells the state of Michigan are maintained by the EGLE Division of Oil and Gas and Minerals and the Geological Survey Division. Well permits, completions, and plugging records filed with this agency are organized by county, township, range, and section number.

TRS	API Number	Permit Number	Well Name and Number	Total Depth	Formation at Total Depth	Drill Date	Well Status	Well Type	WH_Lat	WH_Long	Operator Name
17N-9W-36	21-133-36033-00-00	36033	GREIN ET AL 2-36	8141	CABOT HEAD	Aug-83	ACTIVE	NATURAL GAS WELL	43.82640	-85.33910	Mccool John E
17N-9W-35	21-133-36186-00-00	36186	PAINE 1-35	8309	CINCINNATIAN	Dec-82	ACTIVE	NATURAL GAS WELL	43.82740	-85.35080	Mccool John E
17N-9W-26	21-133-37317-00-00	37317	PAINE 1-26	8095	CABOT HEAD	Feb-84	ACTIVE	NATURAL GAS WELL	43.83360	-85.34620	Mccool John E

Cross Reference with **Figure A3 and Figure A4,** which shows all producing wells in relation to the proposed injection locations.

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Tabulation of Part 625 Mineral Brine Disposal Injection Wells

Within the AOR, there are two qualifying classes of injection well: Part 625 Non Hazardous Brine Disposal Wells (EPA Class I NON HAZARDOUS) and Part 625 Artificial Brine (EPA Class III Solution Wells). They are listed here separately for ease of reference. Records of injection wells are maintained by the US EPA and the state of Michigan EGLE Division of Oil and Gas and the Geological Survey Division. Well permits, completions, and plugging records filed with this agency are organized by county, township, range, and section number.

Active Part 625 Non Hazardous Brine Disposal Wells (EPA Class I, Non Hazardous Injection Wells) are as follows:

TRS	API Number	Permit Number	Well Name and Number	Total Depth	Formation at Total Depth	Drill Date	Well Status	Well Type	WH_Lat	WH_Long	Operator Name
17N-9W-26	21-133-00349-70-00	349	WOODWARD 1-26	8140	A-1 SALT	Oct-83	ACTIVE	PART 625, CLASS I NON HAZARDOUS	43.83460	-85.35680	Cargill Salt – Hersey
17N-9W-26	21-133-00350-70-00	350	THOMAS 1-26	8091	A-1 SALT	Jan-84	ACTIVE	PART 625, CLASS I NON HAZARDOUS	43.84180	-85.36110	Cargill Salt – Hersey

Cross Reference **Figure A3 and Figure A5** shows active Part 625 Non-Hazardous Brine Dispsoal Wells, and Class I NON-HAZARDOUS Injection Wells; the Thomas 1-26 (NW4NW4 Section 26) and the Woodward 1-26 (NE4SW4 Section 26), both operating by Cargil Incorporated.

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Tabulation of Part 625 Mineral Production Injection Wells

Within the AOR, there are two qualifying classes of injection well: Class I NON HAZARDOUS and Class III NON HAZARDOUS. This section lists here Class III wells only for ease of reference. Records of injection wells are maintained by the US EPA and the state of Michigan EGLE Division of Oil and Gas and the Geological Survey Division. Well permits, completions, and plugging records filed with this agency are organized by county, township, range, and section number.

Active Class III, Part 625 Injection Wells are as follows:

TRS	API Number	Permit Number	Well Name and Number	Total Depth	Formation at Total Depth	Drill Date	Well Status	Well Type	WH_Lat	WH_Long	Operator Name
17N-9W-26	21-133-00449-70-00	449	KALIUM HERSEY 2042	UNK	A-1 SALT	Jun-00	ACTIVE	PART 625, CLASS III	43.83310	-85.35910	Cargill Salt – Hersey
17N-9W-26	21-133-00474-70-00	474	I M C POTASH HERSEY 1061	UNK	A-1 SALT	Jan-02	ACTIVE	PART 625, CLASS III	43.83910	-85.36170	Cargill Salt – Hersey
17N-9W-26	21-133-00384-70-00	384	KALIUM 2061	8066	A-1 SALT	May-85	ACTIVE	PART 625, CLASS III	43.83290	-85.35920	Cargill Salt – Hersey
17N-9W-26	21-133-00391-70-00	391	KALIUM HERSEY 1044	8052	A-1 SALT	Nov-93	ACTIVE	PART 625, CLASS III	43.83950	-85.36190	Cargill Salt – Hersey
17N-9W-26	21-133-00383-70-00	383	KALIUM 2031	8010	A-1 SALT	Mar-85	ACTIVE	PART 625, CLASS III	43.83330	-85.35920	Cargill Salt – Hersey
17N-9W-26	21-133-00366-70-00	366	KALIUM 1041	7951	A-1 EVAPORITE	May-90	ACTIVE	PART 625, CLASS III	43.84020	-85.36190	Cargill Salt – Hersey
17N-9W-26	21-133-00409-70-00	409	KALIUM HERSEY 2062	7950	A-1 SALT	Aug-96	ACTIVE	PART 625, CLASS III	43.83300	-85.35920	Cargill Salt – Hersey
17N-9W-26	21-133-00380-70-00	380	KALIUM 1051	7890	A-1 SALT	May-85	ACTIVE	PART 625, CLASS III	43.83990	-85.36190	Cargill Salt – Hersey
17N-9W-26	21-133-00387-70-00	387	KALIUM HERSEY 1054	7876	A-1 SALT	Aug-93	ACTIVE	PART 625, CLASS III	43.83980	-85.36190	Cargill Salt – Hersey
17N-9W-26	21-133-00403-70-00	403	KALIUM HERSEY 1014	7865	A-1 SALT	Jul-95	ACTIVE	PART 625, CLASS III	43.83920	-85.36180	Cargill Salt – Hersey
17N-9W-26	21-133-00408-70-00	408	KALIUM HERSEY 2032	7810	A-1 SALT	Jul-96	ACTIVE	PART 625, CLASS III	43.83340	-85.35920	Cargill Salt – Hersey
17N-9W-26	21-133-00385-70-00	385	KALIUM HERSEY 1013	7595	A-1 SALT	May-92	ACTIVE	PART 625, CLASS III	43.83960	-85.36190	Cargill Salt – Hersey

Cross Reference **Figure A2 and Figure A5** shows all established Class III *AREA* Injection Permit No. MI-133-3G-A0002 (Yellow Cross Hatch) and Active and Inactive Class III Injection Wells. The AOR has undergone extensive prior regulatory review provided the pre-established injection activity within the AOR.

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Tabulation of Well Data for all Abandoned Wells, Plugged Wells, and Dry Holes

Records of abandoned wells, plugged wells, and dry holes in the state of Michigan are maintained by the EGLE and the Geological Survey Division. Well permits, completions, and plugging records filed with this agency are maintained by county, township, range, and section number. Locations of wells were searched in the following AOR sections:

The last two wells highlighted in green are new wells submitted by the applicant. The Lutz fall within the AOR of the Thomas and Woodward, and therefore has been reviewed. The Boyd 1-10 is a new submission that may not have fallen in a previously reviewed AOR. The Stein 1-18 is outside the applicant's AOR, but included here due to its proximity.

The following is a list of wells found within or near to the AOR.

TRS	API Number	Permit Number	Well Name and Number	Total Depth	Formation at Total Depth	Drill Date	Well Status	Well Type	WH_Lat	WH_Long	Operator Name
17N-9W-26*	21-133-00397-70-00	397	Kalium Hersey 1032	8366	A-1 SALT	Nov-94	INACTIVE	PART 625, CLASS III	43.8393	-85.3618	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26*	21-133-00438-70-00	438	Kalium Hersey 2082	8366	A-1 SALT	Jun-07	INACTIVE	PART 625, CLASS III	43.8327	-85.3592	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26*	21-133-00347-70-00	347	Kalium 1012	8366	A-1 SALT	Jan-85	INACTIVE	PART 625, CLASS III	43.8405	-85.3619	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-36	21-133-36068-00-00	36068	BABCOCK ET AL 1-36	8200	CABOT HEAD	Sep-83	INACTIVE	NATURAL GAS WELL	43.8265	-85.3272	Marathon Oil Co.
17N-9W-36	21-133-36925-00-00	36925	BALDINO 1-36	8200	CABOT HEAD	Sep-83	INACTIVE	NATURAL GAS WELL	43.8203	-85.341	Marathon Oil Company
17N-9W-36	21-133-36991-00-00	36991	HODGES ET AL 1-36	8198	CLINTON	Oct-83	INACTIVE	DRY HOLE	43.8152	-85.3294	Marathon Oil Co.
17N-9W-36	21-133-26888-00-00	26888	GREIN, DONALD 1	1649	BROWN LIMESTONE	Aug-67	INACTIVE	DRY HOLE	43.8225	-85.3356	Consumers Energy Company
17N-9W-36	21-133-31089-00-00	31089	THOMPSON, DON; HODGES, FRANK; SMITH, RALPH 2-36	1616	MICHIGAN STRAY	Jul-76	INACTIVE	NATURAL GAS WELL	43.8186	-85.3301	Mutch Harry L
17N-9W-36	21-133-30537-00-00	30537	THOMPSON, DON; HODGES, FRANK; SMITH, RALPH 1-36	1602	MARSHALL	Nov-75	INACTIVE	NATURAL GAS WELL	43.8183	-85.3299	Mutch Harry L
17N-9W-36	21-133-2871-00-000	28710	THOMPSON & RANDOLPH 1	1586	MICHIGAN STRAY	Dec-71	INACTIVE	NATURAL GAS WELL	43.8182	-85.3394	Mutch Harry L
17N-9W-36	21-133-28710-01-00	28710	THOMPSON & RANDOLPH 1	1586	MICHIGAN STRAY	Dec-71	INACTIVE	NATURAL GAS WELL	43.8182	-85.3394	Mutch Harry L
17N-9W-36	21-133-28498-01-00	28498	GREIN, DONALD 1	1539	MICHIGAN STRAY	Aug-71	INACTIVE	NATURAL GAS WELL	43.8252	-85.3392	Hersey Oil and Gas Co.
17N-9W-36	21-133-28498-00-00	28498	GREIN, DONALD 1	1526	MICHIGAN STRAY	Aug-71	INACTIVE	NATURAL GAS WELL	43.8252	-85.3392	Hersey Oil and Gas Co.
17N-9W-36	21-133-28365-00-00	28365	THOMPSON, EDITH 1	1518	MICHIGAN STRAY	Jun-71	INACTIVE	NATURAL GAS WELL	43.8253	-85.3295	Mutch Harry L
17N-9W-35	21-133-36627-00-00	36627	STATE HERSEY 1-35			Apr-83	INACTIVE	LOCATION	43.8167	-85.3509	Rovsek Aldolph E and Muskegon Development Company
17N-9W-35	21-133-36355-00-00	36355	STATE HERSEY 2-35	8310	CINCINNATIAN	Jan-83	INACTIVE	DRY HOLE	43.8203	-85.3604	Marathon Oil Co.
17N-9W-35	21-133-38748-00-00	38748	GREIN 1-35	8206	CABOT HEAD	Jun-85	INACTIVE	NATURAL GAS WELL	43.8238	-85.346	Marathon Oil

17N-9W-35	21-133-28888-00-00	28888	RANDOLPH & PAINE & THIEL UNIT 1	1655	MICHIGAN STRAY	Jul-72	INACTIVE	DRY HOLE	43.825	-85.3592	Mutch J O
17N-9W-35	21-133-28786-00-00	28786	GREIN, DONALD & PAINE, HENRY 1	1638	MICHIGAN STRAY	Mar-72	INACTIVE	NATURAL GAS WELL	43.8251	-85.349	Hersey Oil and Gas Co.
17N-9W-26	21-133-37519-00-00	37519	MILLER 1-25	8425	CABOT HEAD	Aug-84	INACTIVE	NATURAL GAS WELL	43.8334	-85.3463	Marathon Oil Co.
17N-9W-26	21-133-36942-00-00	36942	WOODWARD ET AL 1-26	8135	CABOT HEAD	Oct-83	INACTIVE	DRY HOLE	43.8346	-85.3568	PPG Oil and Gas Company, Inc.
17N-9W-26*	21-133-00378-70-00	378	KALIUM 1042*	8116	A-1 SALT	Feb-85	INACTIVE	PART 625, CLASS III	43.8401	-85.3619	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26*	21-133-366-00-0000	36600	THOMAS 1-26*	8085	CABOT HEAD	Jan-84	INACTIVE	DRY HOLE	43.8418	-85.3611	PPG Oil and Gas Company, Inc.
17N-9W-26*	21-133-00379-70-00	379	KALIUM 1052*	8045	A-1 SALT	Mar-85	INACTIVE	PART 625, CLASS III	43.8398	-85.3619	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26*	21-133-00394-70-00	394	KALIUM HERSEY 1031*	7973	A-1 SALT	Oct-94	INACTIVE	PART 625, CLASS III	43.8394	-85.3618	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26*	21-133-00448-70-00	448	KALIUM HERSEY 2041*	7941	A-1 SALT	Jun-00	INACTIVE	PART 625, CLASS III	43.8332	-85.3591	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26*	21-133-00348-70-00	348	KALIUM 1011*	7827	A-1 EVAPORITE	Nov-84	INACTIVE	PART 625, CLASS III	43.8405	-85.3615	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26*	21-133-00437-70-00	437	KALIUM HERSEY 2081*	7811	A-1 SALT	7-Jun	INACTIVE	PART 625, CLASS III	43.8327	-85.3592	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26*	21-133-00381-70-00	381	KALIUM 1031*	4800	A-1 SALT	Feb-92	INACTIVE	PART 625, CLASS III	43.8396	-85.3619	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26	21-133-28635-00-00	28635	PAINE, HENRY 1	1558	MICHIGAN STRAY	Nov-71	INACTIVE	NATURAL GAS WELL	43.8324	-85.3494	Mutch Harry L
17N-9W-25	21-133-30341-00-00	30341	MILLER, DOUGLAS & THIEL, HAULDAH 1-25	1561	BROWN LIMESTONE	Aug-75	INACTIVE	DRY HOLE	43.8319	-85.3392	Mutch Harry L
17N-9W-25	21-133-30384-00-00	30384	JOHNSON, WALT & MILLER, DOUG & THIEL, H 1-25	1529	MICHIGAN STRAY	Aug-75	INACTIVE	DRY HOLE	43.8326	-85.3286	Mutch J O
17N-9W-25	21-133-12066-00-00	12066	JOHNSON-CODY ET AL COMM. 1	1520	MARSHALL	Jan-46	INACTIVE	DRY HOLE	43.8392	-85.3297	Oryx Energy Co. and Carter Oil Co.
17N-8W-32	21-133-27307-00-00	27307	MANEY, NORMAN 1	1660	MARSHALL	Jul-68	INACTIVE	DRY HOLE	43.8223	-85.3049	Consumer Power and Michigan Consolidated Gas
17N-8W-31	21-133-34558-00-00	34558	FREUDENBURG 1-31	10858	PRAIRIE DU CHIEN	Jul-81	INACTIVE	DRY HOLE	43.8265	-85.3083	JEM Petroleum Corp.
17N-8W-31	21-133-358-00-0000	35800	GRAY 1-31	9769	PRAIRIE DU CHIEN	Aug-82	INACTIVE	NATURAL GAS WELL	43.8275	-85.3224	Marathon Oil Co.
17N-8W-31	21-133-36336-00-00	36336	PARK 1-31	8216	CLINTON	Feb-84	INACTIVE	DRY HOLE	43.8203	-85.322	Marathon Oil Co.
17N-8W-31	21-133-34558-01-00	34852	FREUDENBURG 1-31A	8183	DUNDEE	Aug-81	INACTIVE	DRY HOLE	43.8265	-85.3083	JEM Petroleum Corp.
17N-8W-31	21-133-31786-00-00	31786	KNAPP, GERALD & PARKS, ROBERT 1-31	1590	MICHIGAN STRAY	Sep-77	INACTIVE	NATURAL GAS WELL	43.818	-85.32	Hersey Oil and Gas Co.
17N-8W-30	21-133-35977-00-00	35977	WARK 1-30	8371	CINCINNATIAN	Sep-82	INACTIVE	DRY HOLE	43.8421	-85.3128	Willmet Inc.
17N-8W-30	21-133-33466-00-00	33466	MANEY, NORMAN 1-30	5080	AMHERSTBURG	Feb-80	INACTIVE	DRY HOLE	43.8347	-85.3196	Dart Oil and Gas Co.
17N-8W-30	21-133-27159-00-00	27159	MADDERN, H 1	4030	DUNDEE	Feb-68	INACTIVE	DRY HOLE	43.8333	-85.3126	Madlou Inc.

17N-8W-19	21-133-38463-00-00	38463	VUKIN UNIT 1-19	8385	CINCINNATIAN	Feb-85	INACTIVE	DRY HOLE	43.844	-85.3148	PPG Oil and Gas Company, Inc. and Amoco Production Co.
17N-8W-19	21-133-38463-70-00	5006	VUKIN UNIT 1-19	8385		Dec-84	INACTIVE	DRY HOLE	43.844	-85.3148	PPG Oil and Gas Company, Inc. and Amoco Production Co.
16N-9W-2*	21-107-37188-00-00	37188	JENSEN 1-2*	8085	CABOT HEAD	Nov-83	INACTIVE	DRY HOLE	43.8073	-85.3455	Marathon Oil Co.
16N-9W-12	21-107-00340-70-00	340	PILARSKI 1-12	8318	CINCINNATIAN	Aug-84	INACTIVE	DRY HOLE	43.7974	-85.3266	PPG Industries, Inc.
16N-9W-12*	21-107-36283-00-00	36283	PARK 1-12*	8215	CINCINNATIAN	Jan-83	INACTIVE	DRY HOLE	43.798	-85.3409	Willmet Inc.
16N-9W-11	21-107-00339-70-00	339	WARD 1-11*	8121	CINCINNATIAN	Aug-84	INACTIVE	DRY HOLE	43.7901	-85.3466	PPG Industries, Inc.
16N-9W-1	21-107-00377-70-00	377	JOHNSON 2-1	8085	A-1 SALT	Apr-84	INACTIVE	DRY HOLE	43.8098	-85.3291	PPG Industries, Inc.
16N-9W-1	21-107-00337-70-00	337	JOHNSON 3-1	8073	A-1 EVAPORITE	May-84	INACTIVE	DRY HOLE	43.8098	-85.329	PPG Industries, Inc.
16N-8W-7	21-107-36187-00-00	36187	STEIN 1-7	8380	CINCINNATIAN	Nov-82	INACTIVE	DRY HOLE	43.7911	-85.312	Willmet Inc.
16N-8W-6	21-107-36067-00-00	36067	JOHNSON ET AL 1-6	8386	CINCINNATIAN	Oct-82	INACTIVE	DRY HOLE	43.8057	-85.322	Marathon Oil Co.
16N-8W-6	21-107-30728-00-00	30728	MCLACHLAN, GEORGE 1-6	1670	MICHIGAN STRAY	May-76	INACTIVE	DRY HOLE	43.8033	-85.3101	Mutch Harry L
16N-8W-6	21-107-30654-00-00	30654	KNAPP, GERALD & JOHNSON, DON 1-6	1610	MICHIGAN STRAY	Dec-75	INACTIVE	NATURAL GAS WELL	43.8109	-85.3198	Mutch Harry L
16N-8W-18*	21-107-3689-00-000	36890	STEIN 1-18 **(Outsdie the AOR)**	8264	CINCINNATIAN	Aug-83	INACTIVE	DRY HOLE	43.7765	-85.3074	PPG Oil and Gas Company, Inc.
16N-9W-10	21-107-36455-00-00	36455	BOYD 1-10	7975	CINCINNATIAN	May-83	INACTIVE	DRY HOLE	43.7982	-85.37647	Willmet Inc.
17N-9W-34	21-133-61237-70-00	61237	LUTZ 1-34, 34A, 34B, 34C	8837	NIAGARAN	Jun-84	INACTIVE	DRY HOLE	43.8275	-85.37228	PPG Oil and Gas Company, Inc.

Cross reference **Figure A2 8,** which shows all plugged wells, shallow or deep within the area of review. Total depths of the each well is listed next to its well symbol. Also shown on this map are the API Serial number. The serial number is illustrated below:

State	–	County	–	**Serial**	–	Completion
21	-	133	-	#####	-	00-00

Mineral wells available to the public record or made known to the applicant are also shown. These wells are preceded with the letter “M” before the listed Serial No. The State of Michigan has adapted a ‘pseudo API No,’ utilizing the mineral permit number as an API Serial No. As an example; M4999 would have the equivalent Mineral Well API designation of :

State	–	County	–	**Serial**	–	Completion
21	-	133	-	0**4999**	-	**70**-00

These numbers can be quickly cross referenced with public records, and or the tabular section above.

4 If a well is proposed to be converted to a disposal well, a copy of the completion report, together with the written geologic description log or record and borehole and stratum evaluation logs for the well.

The original completion report is below.

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES

DEC 14 1982

LOG OF OIL, GAS, DISPOSAL OR STORAGE WELL (ACT 61)

Submit in **DUPLICATE** Within 30 Days after Well Completion

PERMIT NUMBER: 36067

DEEPENING PERMIT NUMBER:

NAME(S) & ADDRESS OF OWNER(S) SHOWN ON PERMIT:
Willmet, Inc
2250 Enterprise Drive
Mt. Pleasant, MI 48858

NAME & ADDRESS OF DRILLING CONTRACTOR(S):
T. D. Provins Drilling Company
2113 Enterprise Drive
Mt. Pleasant, MI 48858

LEASE NAME(S) & WELL NUMBER(S)-ROWS ON PERMIT: Johnson #1-6

DIRECTIONALLY DRILLED: YES ☐ NO ☒

SURFACE LOCATION	SECTION	TOWNSHIP	RANGE	TOWNSHIP NAME
NE NW SW	6	16N	8W	Chippewa

FOOTAGES (North/South): 460 Ft. from North Line and 585 Ft. from West Line of quarter section (East/West)

COUNTY NAME: Mecosta

SUBSURFACE LOCATION	SECTION	TOWNSHIP	RANGE	TOWNSHIP NAME

FOOTAGES (North/South) ____ Ft. from ____ Line and ____ Ft. from ____ Line of quarter section (East/West)

COUNTY NAME:

DATE				ELEVATIONS
DRILLING BEGUN: 9-23-82	TOTAL DEPTH OF WELL: Driller 8386 Log 8390	TYPE WELL: Dry Hole		
DRILLING COMPLETED: 10-29-82	FORMATION AT T.D.: Cincinnatian	FT. DRLD. ROTARY TOOLS: From 0 To 8390	K.B. 1191.5	H.F.
WELL COMPLETED:	PRODUCING FORMATION(S):	FT. DRLD. CABLE TOOLS: From ____ To ____	R.T.	Grd. 1175

CASING, CASING LINERS AND CEMENTING

SIZE	WHERE SET	CEMENT	Ft. Pulled
24"	60	0	--
13 3/8	904	904	--
9 5/8	5550	250 Sx	

PERFORATIONS

DATE	NUMBER HOLES	INTERVAL PERFORATED	OPEN YES	OPEN NO
		NONE		

GROSS PAY INTERVALS

FORMATION	OIL / GAS	FROM	TO
NONE			

ALL OTHER OIL AND GAS SHOWS OBSERVED OR LOGGED

FORMATION	OIL OR GAS	DEPTH	Samples	Drill	Pits	Mud Line	Gas Log	Fill Up
Antrim	Gas	3200					X	
Sour Zone	Gas	4676					X	
Burnt Bluff	Gas	8160					X	

STIMULATION BY ACID OR FRACTURING

DATE	Interval Treated	Materials and amount used
	NONE	

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

FORMATION	F.U.	L.C.	DEPTH	AMOUNT
NONE				

MECHANICAL LOGS, LIST EACH TYPE RUN

Brand	(X)	LOG TYPES	LOGGED INTERVALS
Schlumberger	X	LDT-CNL-GR	200-8390
Birdwell		Sonic	200-8390
		DLL-MLL	3300-8390

DEPTH CORRECTION / DEVIATION SURVEY / PLUGGED BACK

DEPTH	CORRECTN	RUN AT	DEGREES	YES	NO	DEPTH
		3586	1¼°			
		6761	1½°			
		8098	3°			

PRODUCTION TEST DATA

Bbls/day	GRAVITY	API	COND. Bbls/day	GAS MCF/day	WATER Bbls/day	H_2S Grains 100 cu. ft.	B.H.P. AND DEPTH

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

DATE: 12/6/82 NAME AND TITLE (PRINT): William E. Booker, Geologist SIGNATURE: William Book

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

R 7210 Rev. 3/77

Original Geological cutting descriptions

WILLMET, INC.
Johnson #1-6
NE NW SW, Sec. 6, T16N R8W
Chippewa Twp., Mecosta Co.

SAMPLE DESCRIPTION

0 - 638	Drift
	Michigan Group @ 638 Sch
638 - 700	Shale, red, soft, calcareous with gypsum.
700 - 900	Sandstone, transparent to white, to red, medium grained, subround, fairly well sorted, becoming well cemented to base.
900 - 1180	Shale, gray to black, finely crystalline, firm, tight, trace pyrite, non-calcareous.
1180 - 1260	Shale, black to brown, firm with sandstone white, transclucent, very finely grained, subround, calcareous cement.
1260 - 1465	Shale, black, blue gray, firm, calcareous, highly organic, trace anhydrite.
	Triple Gyp @ 1465 Sch
1465 - 1537	Anhydrite, white, firm with shale, black, firm.
	Brown Lime @ 1537 Sch
1537 - 1652	Dolomite, brown to dark brown, very finely crystalline, compact, trace intercrystalline porosity, trace anhydrite.
	Stray Sand @ 1652 Sch
1652 - 1762	Sandstone, white, translucent, subangular, calcareous cement, well cemented, with shale dark gray.
	Marshall @ 1762 Sch
1762 - 1920	Sandstone, red very fine grained, subround, calcareous cement, well cemented, sahle, blue gray, firm, red stain, slightly calcareous.
	Coldwater @ 1920 Sch
1920 - 2678	Shale, dark gray, gray, firm, calcareous.
	Sunbury @ 2678 Sch
2678 - 2780	Shale, black, gray, firm, calcareous, highly organic.

WILLMET, INC.
Johnson #1-6
NE NW SW, Sec. 6, T16N R8W
Chippewa Twp., Mecosta Co.

Page 2.

	Ellsworth @ 2780 Sch
2780 - 3170	Shale, black, blue gray, firm, trace pyrite, slightly calcareous.
	Antrim @ 3170 Sch
3170 - 3332	Shale, black, dark brown, very organic, non-calcareous, firm.
	Traverse Formation @ 3332 Sch
3332 - 3392	Shale, light gray, brown, becoming very calcareous, becoming more limy.
	Traverse Limestone @ 3392 Sch
3392 - 3580	Limestone, white to buff, very fine to finely crystalline, trace intercrystalline porosity, no fluorescence or stain.
3580 - 3913	Limestone, white, mottled, dark brown, very finely crystalline, trace stain, trace fluorescence, poor intercrystalline porosity.
	Bell Shale @ 3913 Sch
3913 - 3971	Shale, dark gray, gray, blue gray, firm, non-calcareous.
	Dundee @ 3971 Sch
3971 - 4041	Limestone, brown, white, mottled, very finely crystalline, moderately argillaceous.
	Reed City Anhydrite @ 4041 Sch
4041 - 4058	Anhydrite, white.
	Reed City Dolomite @ 4058 Sch
4058 - 4200	Limestone, tan to buff to dark brown, very fine to finely crystalline, argillaceous in part, trace stain and fluorescence, intercrystalline porosity.
	Detroit River Anhydrite @ 4200 Sch
4200 - 4263	Anhydrite, white, firm.
	Detroit River Salt @ 4263 Sch
4263 - 4643	Salt (none in samps), with anhydrite and dolomite, brown to tan, very finely crystalline, compact, trace stain, no fluorescence.

WILLMET, INC.
Johnson #1-6
NE NW SW, Sec. 6, T16N R8W
Chippewa Twp., Mecosta Co.

Page 3.

	Base Detroit River Salt @ 4643 Sch
4643 - 4804	Anhydrite, white to light gray with dolomite, tan, very finely crystalline, fair intercrystalline porosity, slightly argillaceous, no fluorescence.
	Massive Anhydrite @ 4804 Sch
4804 - 4866	Anhydrite, white, firm.
	Richfield @ 4866 Sch
4866 - 5052	Anhydrite, white, firm, with dolomite, brown-tan-buff, very finely crystalline, compact, tight, trace stain and fluorescence.
	Base Richfield Anhydrite @ 5052 Sch
5052 - 5130	Dolomite, gray, black, trace white, very finely crystalline, tight, trace stain and fluorescence, no cut.
	Black Limestone @ 5130 Sch
5130 - 5225	Dolomite, black, dark gray, finely microcrystalline, trace intercrystalline porosity, argillaceous, wackstone, trace DDO and fluorescence, no cut.
	Sylvania @ 5225 Sch
5225 - 5342	Sandstone, white, gray, very fine grained, well cemented, sub round, calcareous cement.
	Bois Blanc @ 5342 Sch
5342 - 5512	Limestone, dark gray-gray, microcrystalline, good porosity in part, with dolomite, dark gray-gray, microcrystalline, trace chert.
	Bass Island @ 5512 Sch
5512 - 5797	Dolomite, brown-gray, becoming black, very finely crystalline, 37% intercrystalline porosity, not stain or fluorescence.
	Salina @ 5797 Sch
5797 - 5806	Dolomite, black, dark brown, very finely crystalline, compact, argillaceous.
	F Unit @ 5806 Sch
5806 - 5848	Dolomite dark brown, gray, very finely crystalline compact, argillaceous.

WILLMET, INC.
Johnson #1-6
NE NW SW, Sec. 6, T16N R8W
Chippewa Twp., Mecosta Co.

Page 4.

F Salt @ 5848 Sch

5848 - 6403 Salt, with shale, gray, soft.

E Unit @ 6403 Sch

6403 - 6538 Dolomite, brown, very finely crystalline, trace intercrystalline, porosity, compact, moderately argillaceous, with shale, gray, soft.

D Salt @ 6538 Sch

6538 - 6582 Salt.

C Shale @ 6582 Sch

6582 - 6674 Shale, siltstone, red, gray, firm, dolic.

B Salt @ 6674 Sch

6674 - 7047 Salt, massive, trace shale, gray, soft.

A2 Carbonate @ 7047 Sch

7047 - 7183 Limestone, brown-dark brown, very fine to finely crystalline, trace intercrystalline porosity, no stain or fluorescence.

A2 Evaporite @ 7183 Sch

7183 - 7551 Salt, massive.

A1 Carbonate @ 7551 Sch

7551 - 7606 Dolomite, black, white, gray, fine to microcrystalline, argillaceous, wackstone.

A1 Evaporite @ 7606 Sch

7606 - 7952 Salt, massive.

Niagaran @ 7952 Sch

7952 - 8076 Limestone, light gray, white, very finely crystalline.

Clinton (Manistique) @ 8076 Sch

8076 - 8140 Limestone, light gray, white finely crystalline, trace intercrystalline porosity, compact, wackstone, trace chert.

WILLMET, INC.
Johnson #1-6
NE NW SW, Sec. 6, T16N R8W
Chippewa Twp., Mecosta Co.

Page 5.

	Burnt Bluff @ 8140 Sch
	Cored - See Description
	Cabot Head @ 8205 Sch
8205 - 8284	Shale, gray-dark gray, firm, very calcareous.
	Manitoulin @ 8284 Sch
8284 - 8312	Limestone, dark gray-gray brown, white, clear, sucrosic, no stain, trace fluorescence.
	Cincinnatian @ 8312 Sch
8312 - 8390	Shale, deep red, iron stained, firm, with dolomite, blue gray, very finely crystalline.

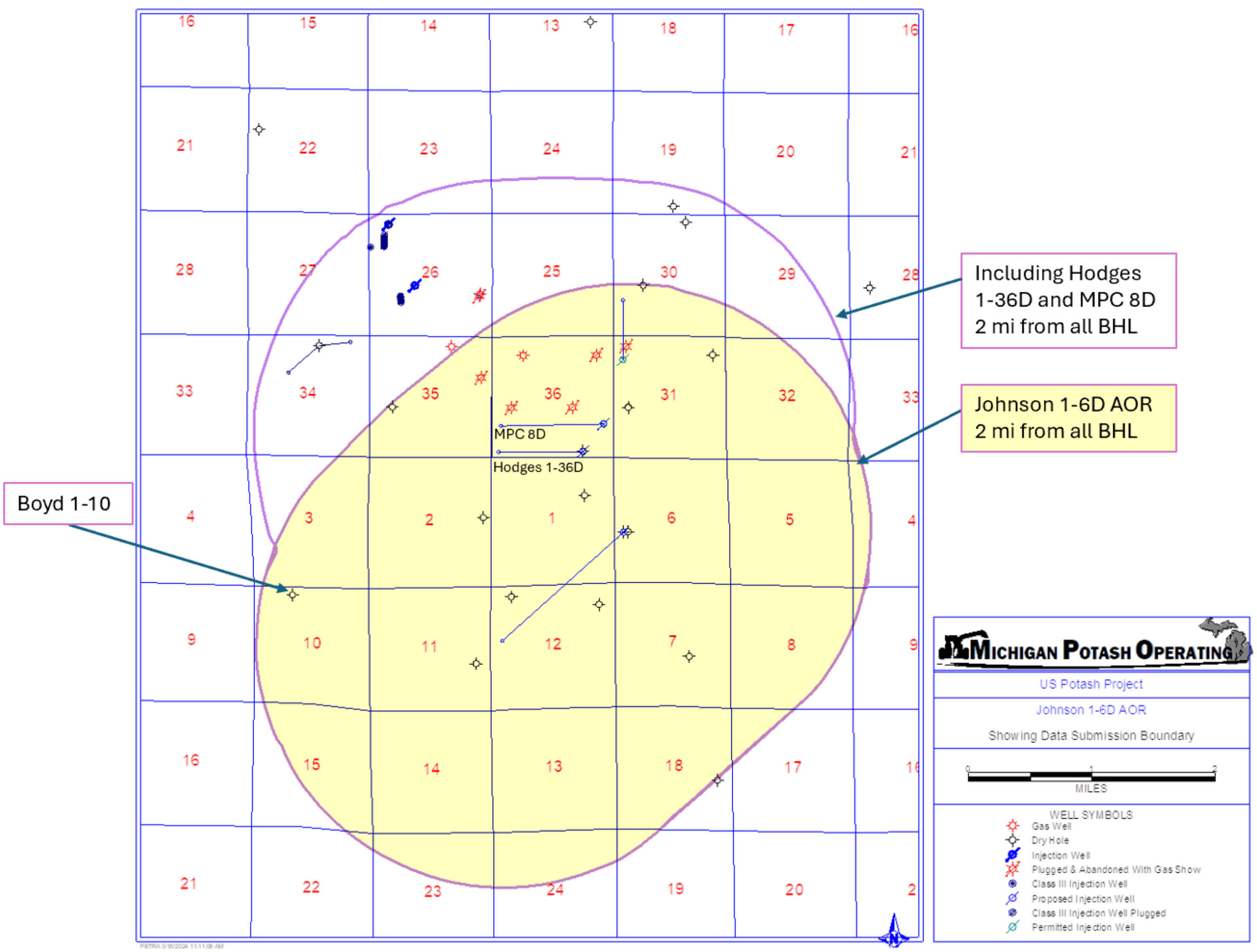
5 Plugging records of all abandoned wells and casing, sealing, and completion records of all other wells and artificial penetrations within the area of influence of the proposed well location and a map identifying all such artificial penetrations. An applicant shall also submit a plan reflecting the steps or modifications believed necessary to prevent proposed injected waste products from migrating up, into, or through inadequately plugged, sealed, or completed wells.

There are no perceived modifications necessary to prevent proposed brine injection from migration.

Appendix 1.0 has been attached to the application, and has is titled APPENDIX 1.0; CEMENT, PLUGGING, AND WELL HISTORIES OF ALL WELLS IN THE AOR THAT PENETRATE THE INJECTION OR CONFINING HORIZONS. Appendix 1.0 includes a visual demonstration of the AOR, including a 2 mile AOR around the lateral length of the Johnson 1-6D. Further, it also includes all wells in an expanded AOR, which includes the MPC 8D, and Hodges 1-36D. The MPC 8D and Hodges 1-36D are contemplated, pending submissions by the applicant to EGLE.

All wells within the Johnson 1-6D AOR, MPC 8D AOR, and Hodges 1-36D AOR have been reviewed by EGLE for either the MPC 1D, MPC 2D, MPC 3D, and Cargil Thomas 1-26 and Cargil Woodward 1-26; except the

Boyd 1-10; API 21-107-36455-00-00.



6 A map showing the vertical and areal extent of surface waters and subsurface aquifers containing water with less than 10,000-ppm total dissolved solids. A summary of the present and potential future use of the waters must accompany the map.

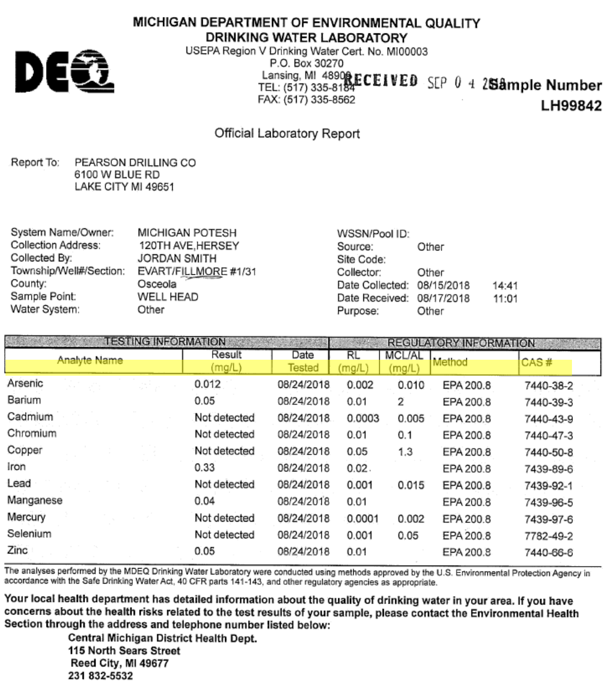
Surface water features and their areal extent are expressly highlighted on **Figure A7**.

- **Figure B1 shows the vertical and area extent of subsurface aquifers,** within the immediate extent of the AOR, containing water with less than 10,000-ppm total dissolved solids. They are shown in proportion to the depth associated with the proposed injection horizon. This cross section is intentionally shown on a 1:1 ratio, with no vertical exaggeration. This is for the purpose of illustrating the amount of interlayered and non-permeable intervals between any potential injection zone and any potential USDW.

- **Figure B2 is a map showing the static water level** as encountered in every water well within the AOR. The static water level is shown as feet below ground level. These contours are generated principally from reported and measured static water levels as extensively gathered and made available by the Michigan State ground water mapping project and Michigan Department of Environment Great Lakes and Energy, Water Division. These piezometric readings are used to determine the general flow direction of water through the AOR

- **Figure B3 is a surface soil map** compiled from soil surveys from over 308 hydrological test holes and approximately 60 piezometers cataloging over 33,833 feet of groundwater and soil data compiled by W.A. Menley over the AOR. Contours showing the observed water table of the Upper Unit F are shown ontop of the soil catalogue. This water table maps also demonstrate the direction of flow of water through the AOR.

A Underground Source of Drinking Water is defined by the EPA as 10,000 ppm TDS or less; however a 2018 hydrological investigation identified unsafe levels of naturally occurring arsenic below +/- 200'. Although below 10,000 ppm, this source is prohibited from human consumption, or a source of underground drinking water and can only be used for industrial or agricultural purpose.



DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER LABORATORY
USEPA Region V Drinking Water Cert. No. MI00003
P.O. Box 30270
Lansing, MI 48909
TEL: (517) 335-8184
FAX: (517) 335-8562

RECEIVED SEP 0 4 2018

Sample Number
LH99842

Official Laboratory Report

Report To: PEARSON DRILLING CO
6100 W BLUE RD
LAKE CITY MI 49651

System Name/Owner: MICHIGAN POTESH
Collection Address: 120TH AVE,HERSEY
Collected By: JORDAN SMITH
Township/Well#/Section: EVART/FILLMORE #1/31
County: Osceola
Sample Point: WELL HEAD
Water System: Other

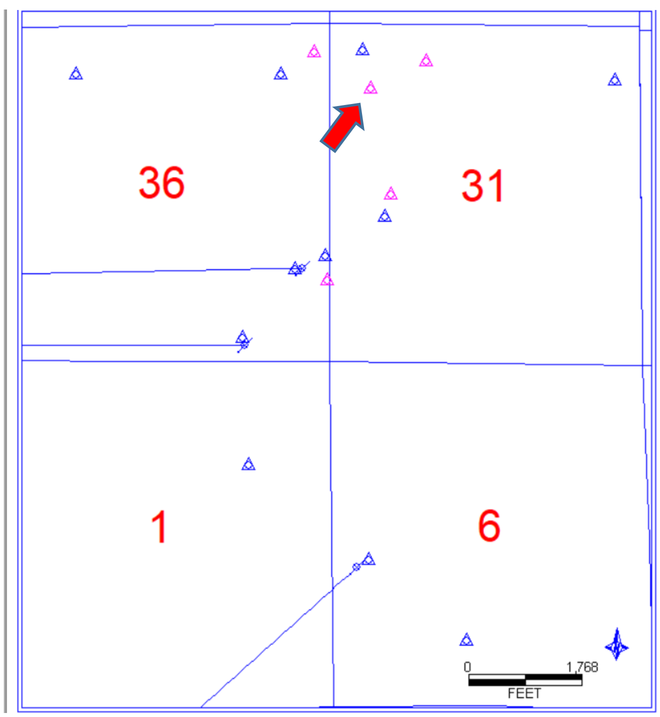
WSSN/Pool ID:
Source: Other
Site Code:
Collector: Other
Date Collected: 08/15/2018 14:41
Date Received: 08/17/2018 11:01
Purpose: Other

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Arsenic	0.012	08/24/2018	0.002	0.010	EPA 200.8	7440-38-2
Barium	0.05	08/24/2018	0.01	2	EPA 200.8	7440-39-3
Cadmium	Not detected	08/24/2018	0.0003	0.005	EPA 200.8	7440-43-9
Chromium	Not detected	08/24/2018	0.01	0.1	EPA 200.8	7440-47-3
Copper	Not detected	08/24/2018	0.05	1.3	EPA 200.8	7440-50-8
Iron	0.33	08/24/2018	0.02		EPA 200.8	7439-89-6
Lead	Not detected	08/24/2018	0.001	0.015	EPA 200.8	7439-92-1
Manganese	0.04	08/24/2018	0.01		EPA 200.8	7439-96-5
Mercury	Not detected	08/24/2018	0.0001	0.002	EPA 200.8	7439-97-6
Selenium	Not detected	08/24/2018	0.001	0.05	EPA 200.8	7782-49-2
Zinc	0.05	08/24/2018	0.01		EPA 200.8	7440-66-6

The analyses performed by the MDEQ Drinking Water Laboratory were conducted using methods approved by the U.S. Environmental Protection Agency in accordance with the Safe Drinking Water Act, 40 CFR parts 141-143, and other regulatory agencies as appropriate.

Your local health department has detailed information about the quality of drinking water in your area. If you have concerns about the health risks related to the test results of your sample, please contact the Environmental Health Section through the address and telephone number listed below:

Central Michigan District Health Dept.
115 North Sears Street
Reed City, MI 49677
231 832-5532



The well log showing the screened depth at 240-280 in the F Unit with arsenic is shown below.

DEQ

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No: 67-05-036-010-00 | Permit No: JBES-AY4LKH | County: Osceola | Township: Evart

Well ID: 67000007649

Elevation:
Latitude: 43.826035
Longitude: -85.322044
Method of Collection: GPS Std Positioning Svc SA Off

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
17N 08W	31	Active		

Distance and Direction from Road Intersection:
Filmore Well. Approx 1/4 mile north of intersection of 120th Ave and Schofield Road east side of 120th Ave.

Well Owner: Double ZS Ranch

Well Address:
243 120th Ave
Hersey, MI 49639

Owner Address:
900 NW Monroe
Grand Rapids, MI 49503

Drilling Method: Rotary
Well Depth: 282.00 ft. Well Use: Irrigation
Well Type: New Date Completed: 8/10/2018
Casing Type: PVC plastic Height: 1.00 ft. above grade
Casing Joint: Spline joint/CertaLok
Casing Fitting: None

Diameter: 6.90 in. to 100.00 ft. depth SDR: 21.00
6.90 in. to 240.00 ft. depth SDR: 17.00

Borehole: 10.62 in. to 283.00 ft. depth

Pump Installed: No
Pressure Tank Installed: No
Pressure Relief Valve Installed: No

Static Water Level: 117.00 ft. Below Grade
Well Yield Test: Yield Test Method: Test pump
Pumping level 206.50 ft. after 2.00 hrs. at 298 GPM

Screen Installed: Yes Filter Packed: Yes
Screen Diameter: 5.00 in. Blank: 0.00 ft. Above
Screen Material Type: Stainless steel-wire wrapped

Slot	Length	Set Between
20.00	42.00 ft.	240.00 ft. and 282.00 ft.

Fittings: Other

Well Grouted: Yes Grouting Method: Grout pipe outside casing

Grouting Material	Bags	Additives	Depth
Bentonite slurry	24.00	None	0.00 ft. to 230.00 ft.

Wellhead Completion: Pitless adapter

Formation Description	Thickness	Depth to Bottom
Brown Clay	10.00	10.00
Sand	3.00	13.00
Brown Clay	4.00	17.00
Sand Fine To Medium	22.00	39.00
Gray Clay	57.00	96.00
Sand & Gravel	9.00	105.00
Gray Clay Soft	10.00	115.00
Sand Fine To Medium	6.00	121.00
Gray Clay	19.00	140.00
Sand Fine To Medium	9.00	149.00
Gray Clay	2.00	151.00
Sand Fine	9.00	160.00
Gray Clay	4.00	164.00

(Continued On Page 2)

Geology Remarks:

Nearest Source of Possible Contamination:

Type	Distance	Direction
None		

Drilling Machine Operator Name: John Pearson
Employment: Employee

(Continued on page 2)

General Remarks:
Other Remarks: Screen Fittings:6.25"x6"x5"fpt

EQP-2017 (4/2010) Page 1 of 2 Contractor 8/20/2018 12:07 PM

DEQ

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No: 67-05-036-010-00	Permit No: JBES-AY4LKH	County: Osceola			Township: Evart	
Well ID: 67000007649		Town/Range: 17N 08W	Section: 31	Well Status: Active	WSSN:	Source ID/Well No:

Elevation:

Latitude: 43.825597

Longitude: -85.324105

Method of Collection: GPS Std Positioning Svc SA Off

Distance and Direction from Road Intersection:
Filmore Well. Approx 1/4 mile north of intersection of 120th Ave and Schofield Road east side of 120th Ave.

Well Owner: Double ZS Ranch

Well Address:
243 120th Ave
Hersey, MI 49639

Owner Address:
900 NW Monroe
Grand Rapids, MI 49503

(Continued from Page 1)

Formation Description	Thickness	Depth to Bottom
Sand Silty	11.00	175.00
Gray Clay	3.00	178.00
Sand Fine To Coarse	17.00	195.00
Gray Clay	2.00	197.00
Sand Fine To Medium	20.00	217.00
Gray Clay	1.00	218.00
Sand Fine To Medium	12.00	230.00
Gray Clay	4.00	234.00
Sand Fine Silty	7.00	241.00
Sand Fine To Medium	41.00	282.00
Gray Clay W/Gravel	11.00	293.00
Gray Clay	6.00	299.00
Sand Fine To Medium	3.00	302.00
Gray Clay Hard	56.00	358.00

OTHER REMARKS:
Screen Fittings:6.25"x6"x5"fpt

Contractor Type: Water Well Drilling Contractor **Reg No:** 57-1943
Business Name: Pearson Drilling Co
Business Address: 6100 W Blue Road, Lake City, MI, 49651

Water Well Contractor's Certification

This well/pump was constructed under my supervision and I hereby certify that the work complies with Part 127 Act 368 PA 1978 and the well code.

[signature] 4-24-19

Signature of Registered Contractor **Date**

EQP-2017 (4/2010) Page 2 of 2 Contractor 8/20/2018 12:07 PM

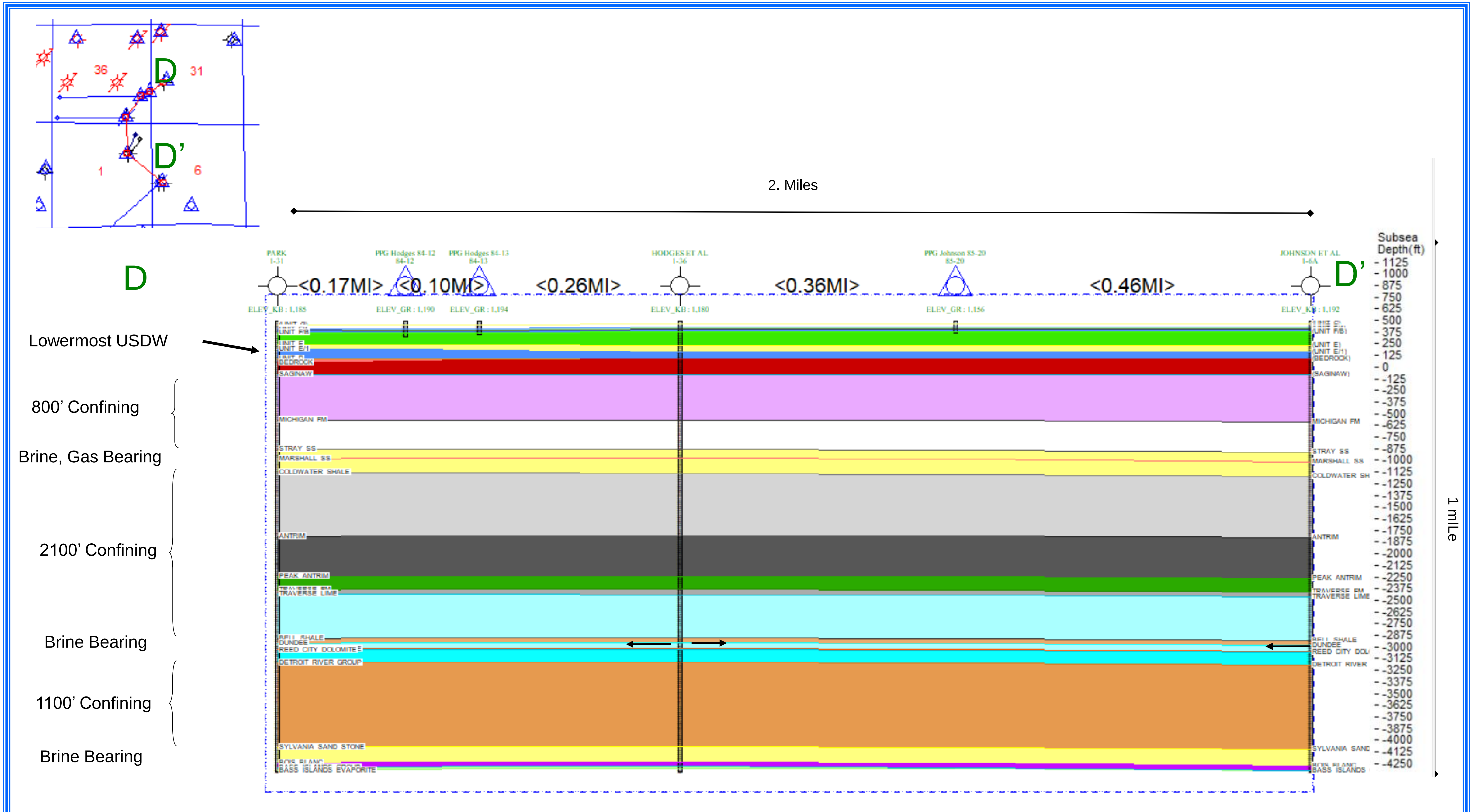


Figure B1 shows the USDWs in relation to the proposed injection zones in the immediate proximity of the PROPOSED WELLBORES. The larger cross section is intentionally shown on a 1:1 ratio, with no vertical exaggeration to illustrate the amount of inte-rlayered and non-permeable intervals between any potential injection zone and any potential USDW.

MICHIGAN POTASH OPERATING, LLC

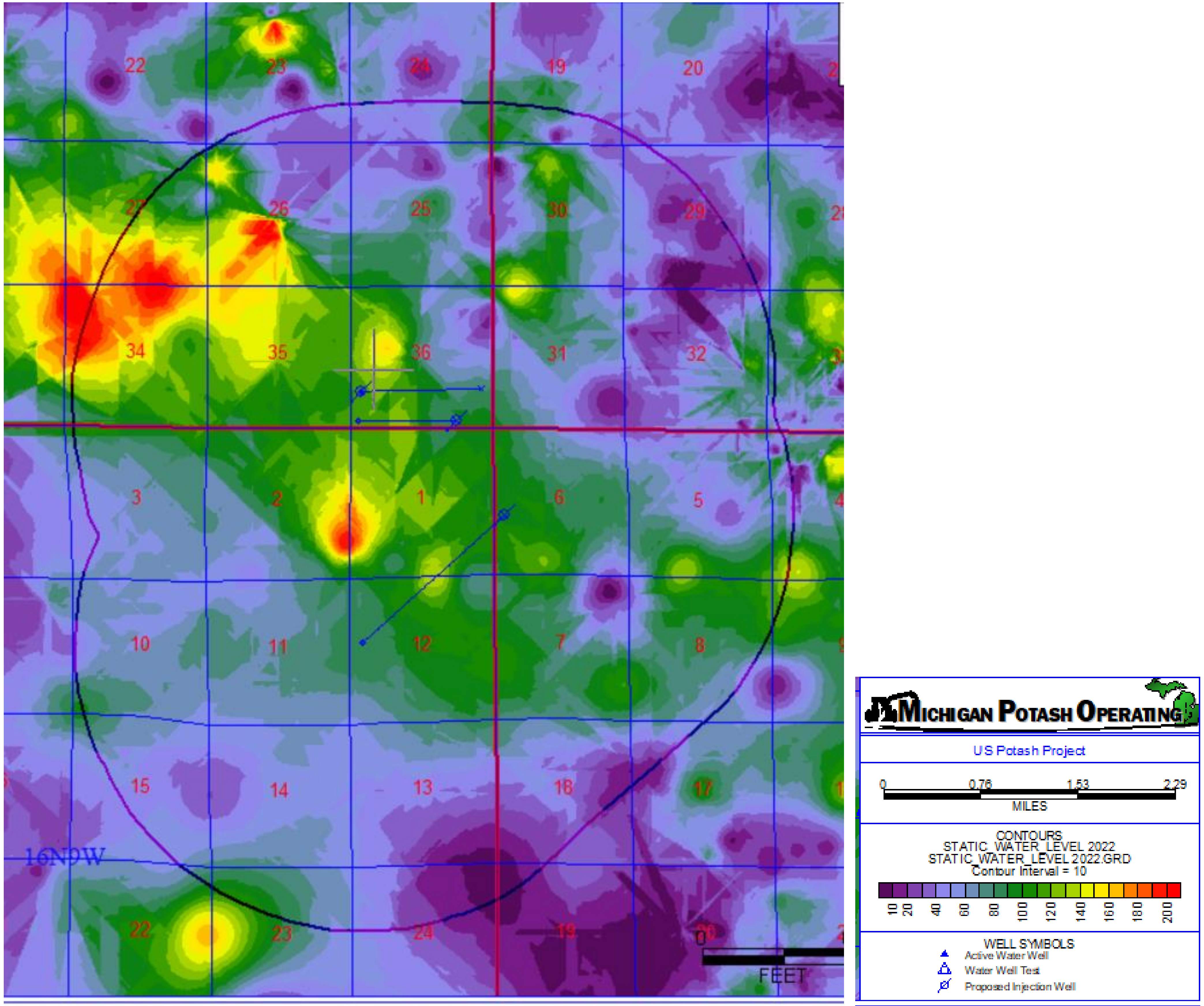


Figure B2. Static water level. Measured Depth.

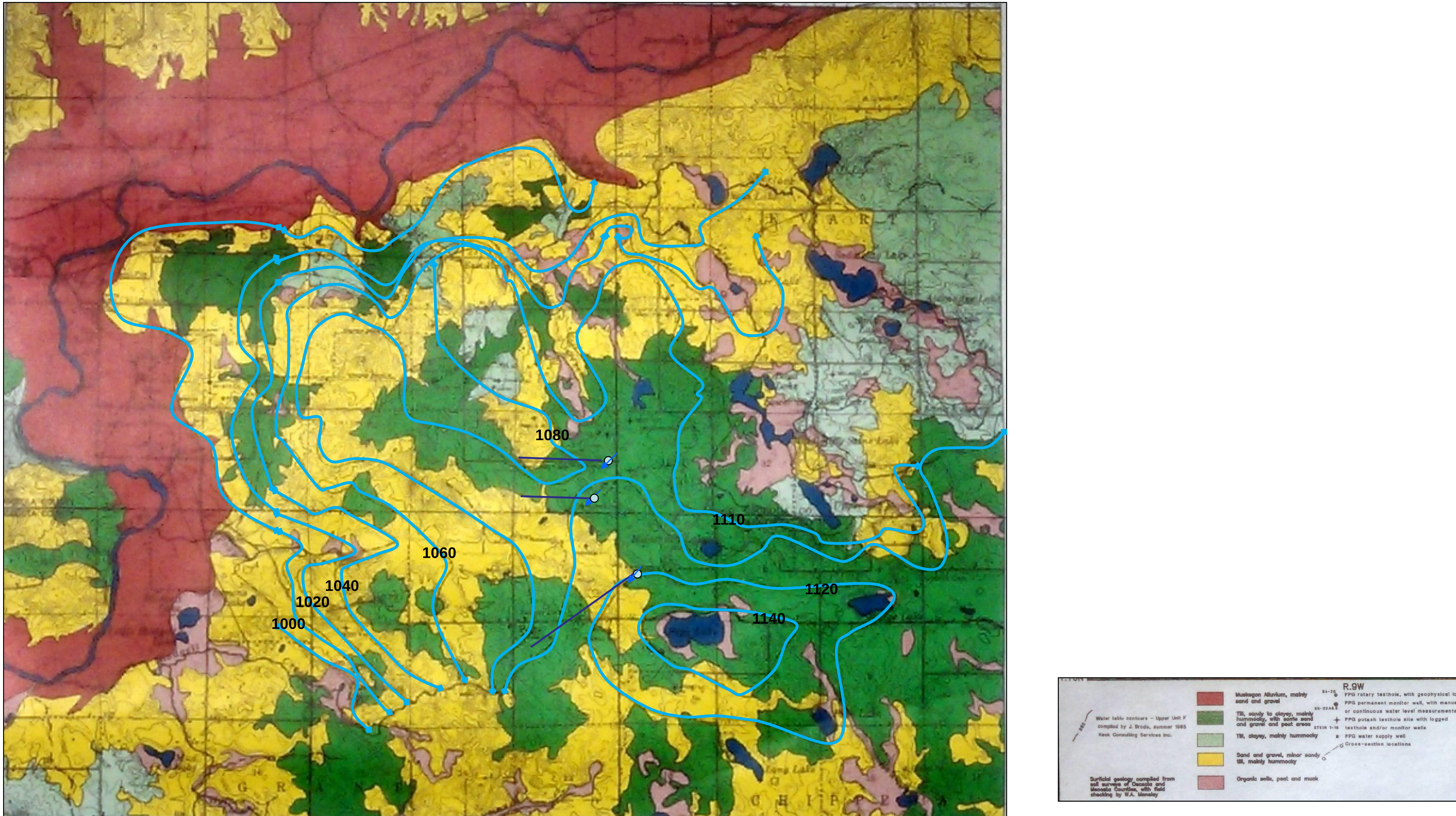


Figure B3. A surfical geological soil map compiled from soil surveys from over 308 hydrological test holes and approximately 60 piezometers cataloging over 33,833 feet of groundwater and soil data compiled by W.A. Menley over the AOR. Contours showing the observed water table of the Upper Unit F are shown on top of the soil catalogue. Each of the proposed wells are shown..

Discussion of Regional Hydrogeology

The area of the proposed facilities are mantled by glacial drift, the result of multiple glaciations of central Michigan.

The surficial geology in the area is made up of water laid moraine and outwash deposits. The area within the AOR occupies an interlobate position between the Michigan Lobe to the west and the Saginaw and Erie Lobes to the east and south during the final glaciation of Michigan. Glaciofluvial and glaciolacustrine sediments were deposited into the interlobate area and the Muskegon Valley formed the major outlet channel for glacial melt water. Because the major ice flow axes were governed by the major topographic elements of the Great Lakes Region, it is probable that similar ice lobes occupied similar positions during earlier glaciations as well. Thus, the stratigraphic sequence encountered in the surface in the plant area may be expected to have sediments which were deposited in similar interlobate depositional environments during each episode of continental glaciation of North America.

Materials representative of sedimentation in several different depositional environments have been identified within the AOR. These include: 1) till - sediment deposited directly from a glacier by lodgment or melt out and without subsequent re-sedimentation by melt water; 2) stagnant ice deposits - sediment deposited in an ice marginal environment where the ice is relatively immobile; 3) glaciolacustrine deposits - sediment deposited in ice marginal glacial 'lakes under relatively low energy conditions; and 4) glaciofluvial deposits - sediment deposited in an ice marginal environment under relatively high energy conditions.

Discussion of Local (AOR) Hydrogeology

Bedrock is identified as Jurassic age 'red-beds,' the deepest of which occurs at approximately 650' below ground level.

According to the Geologic Atlas of Michigan compiled by the Department of Geology, Western Michigan University in 1981, red beds of Jurassic age should be encountered at the bedrock surface. All of the test holes which penetrated the bedrock surface have encountered red sandstone and siltstone inter-bedded with gypsum.

The "red bed" sequence made up of red sandstone and siltstone inter-bedded with anhydrite of Jurassic age, forms the uppermost bedrock formation encountered in the AOR. The greatest depth at which potable water can be obtained is considered to be the bedrock surface (base of the glacial till).

The base of groundwater exploration, that is, the greatest depth at which potable groundwater can be obtained, has been determined to be the bedrock surface. Historically, all of the water-bearing zones tested in the AOR, at the bedrock surface or below yield saline water, with greater than > 35,000 mg/L concentration, (Hydrogeology of Part of Osceola and Mecosta Counties, Michigan, W.A. Menley 3/1985).

Between 1983 and 1989, over 308 hydrological test holes and approximately 60 piezometers cataloging over 33,833 feet of groundwater and soil data was amalgamated for the purposes of adequately understanding and protecting groundwater within the Michigan Potash Operating AOR. The area has been extensively studied from 1983 to 1989 for the sole purpose of hydrological investigation. These test holes and all the associated data has been comprehensively reviewed by the applicant and the data incorporated herein.

- **Figure B4 is a map showing hydro-geological investigation wells** (some, not all) drilled for the sole purpose of understanding, in order to protect, the groundwater and USDW within the AOR. These well locations have been used, in addition to water wells, to test and map the hydrological units and associated static ground water level.

- Figure B5 is a stratigraphic column describing the glacial till and sources of USDWs and the source of USDWs as extensively mapped and defined by W.A. Menley between 1983 and 1989. Glacial Deposits are highly variable, especially closer to ground level. Depths approximate those encountered throughout the AOR.

A detailed description of each hydrological and potential USDW follows Figure B6.

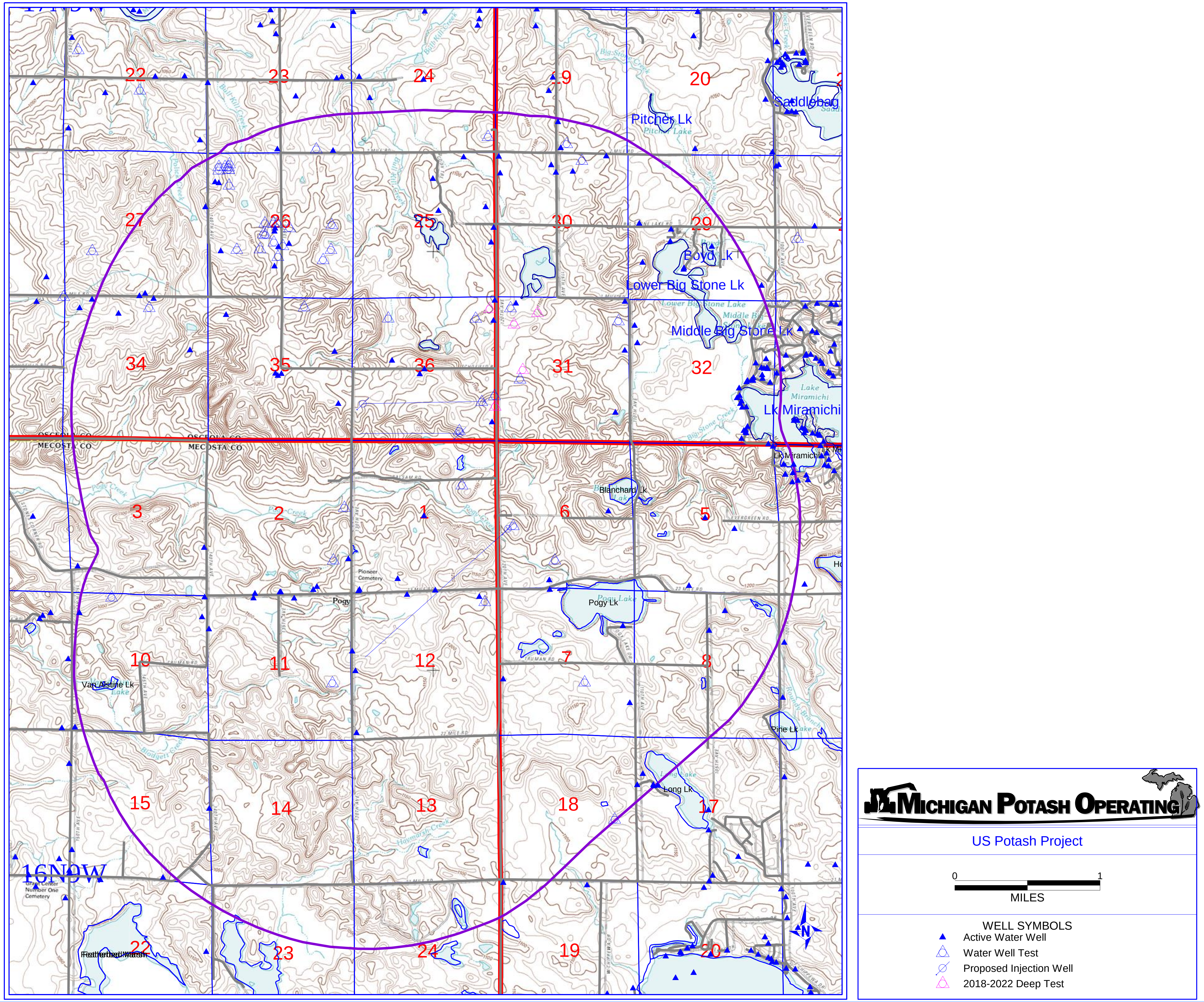


Figure B4. Map showing hydro-geological investigation wells, and water wells, and recent 2018-2022 hydrological investigation wells (some, not all) drilled for the sole puporse of understanding, in order to protect, the groundwater and USDW within the AOR.

Stratigrafic Column of the Hydrological Units

Stratigrafic Column and Nomenclature of the Hydrological Units in the AOR, as Defined by W.A. Menley

K			Valley train outwash	Sand and gravel coarsening upward, fine to v-coarse sand, pebbles and cobbles, locally cemented, typical of a high energy glacio-fluvial environment.	~ 0'-60' Below GL
J			Glaciolacustrine	Clay and silty clay, laminated to bedded, some interbeds of silt, massive silty sandy clay with pebbles common, typical of a low energy glacio-fluvial environment	~ 0'-60' Below GL
H			Stagnant ice/outwash	Silty sandy clay, some pebbles, in part stratified, typical of a stagnant ice depositional environment	~ 0'-60' Below GL
G			Till	Sandy clay till, sparse coarse fraction, typical of a sub glacial depositional environment	~ 0'-60' Below GL
		G/1	Glaciolacustrine	Clay and silty clay, laminated to bedded, some interbeds of silt, massive silty sandy clay with pebbles common.	~ 0'-60' Below GL
F	F/1	F/1/d	Outwash	Medium to coarse sand minor gravel, interbeds of silty clay	~ 60'-220' Below GL
		F/1/c	Glaciolacustrine	Clay and silty clay, laminated to bedded, some interbeds of silt, massive silty sandy clay with pebbles common.	
		F/1/b	Outwash	Medium to coarse sand minor gravel, interbeds of silty clay	
		F/1/a	Glaciolacustrine	Clay and silty clay, laminated to bedded, some interbeds of silt, massive silty sandy clay with pebbles common.	
	Lower F (F/B)		Outwash	Medium to coarse sand, minor silty clay interbeds, minor fine gravel interbeds, K= 650/gpd/sq.ft. Principle USDW when away from surface charge.	~ -80'-220' Below GL Natural Arsenic detected in AOR
E	Upper E		Stagnant ice	Silty sandy clay, some pebbles, in part stratified	~ 220'-300' Below GL
	E/1		Outwash	Medium to coarse sand minor gravel, interbeds of silty clay, K = 600 gpd/sq.ft, LOWEST USDW.	~ 300'-400' Below GL

D	Till	Sandy clay till, sparse coarse fraction	~ 400-620' Below GL
	BEDROCK	Jurassic Red Beds, >35,000 TDS "BRINE" from here to Center of the Earth	~ 580'-640' Below GL

FIGURE B5. Stratigraphic description of USDW in the AOR.

When in the immediate proximity to surface charge, such as the Muskegon River or a Lake, it is typical to find static water levels at less than 20'-30' Below GL in Units K, J, H, and/or G.
Unit F/1 serves as a plastic clay barrier and confining layer to Unit F. Above sub Unit F/1, perched water tables or unconfined aquifers may be found.

A detailed description of each glacial till deposition feature from shallowest to deepest, is as follows:

Unit K:
Unit K represents the sand and gravel deposits that form the upper part of the alluvial fill along the course of the Muskegon Valley. This unit is well exposed in the Hersey Sand and Gravel pit east of Hersey, located across the Muskegon River. The texture of this unit becomes coarser upward, with coarse clean gravel beds deposited in channels cut into the dominantly sand size overbank deposits. Excellent exposures of these channel sands and overbank deposits can be seen in the high walls of the quarry.

In the gravel pit, the sand and gravel deposits that are being quarried east of 170th Avenue and south of the washing facility are part of older glacio-fluvial deposits that make up Unit F. The sand and gravel deposits west of 170th Avenue and north of the washing plant are part of the alluvial fill along the Muskegon River (Unit K) laid down as part of the outwash deposits during the final de-glaciation of this part of Michigan.

Unit J:
During the final de-glaciation of the study area the Muskegon Valley functioned as a major melt water outlet stream. A melt water valley was incised through the previously deposited Units G and H into Unit F, eroding and removing Sub-Unit F/1 along the course of the Muskegon Valley down to an elevation of about 875 ft. Unit J is made up of fine textured silt and silty clay beds that were deposited in the channel bottom as the channel was in-filled with fine grained alluvial deposits.

Unit H:

Unit H is made up of inter-bedded sand, gravel and till which mantles the hummocky moraine upland in the eastern part of the study area. This unit represents the stagnant ice depositional environment of the final episode of de-glaciation of the study area. Most of the material in Unit H was deposited by melt water on top of stagnant ice. As the ice eventually melted out these materials were re-deposited by slumping and subject to re-sorting by runoff to form the highly variable and complex deposits which form the present land surface in the upland area east and south of the Muskegon River Valley.

Unit G:
Unit G is a silty clay till which is present beneath parts of the hummocky moraine upland east of the Muskegon River deposited during the final glaciation of the study area.

Unit F:

Unit F is a primary aquifer in the AOR. It is a thick sequence of inter-bedded sand and gravel which was encountered in all of the test holes drilled in the study area. Thin interbeds of clay, silty clay and till were encountered within this unit in all test holes. One such interbed has been separately identified as Sub-Unit F/1. The sand and gravel beds are made up mainly of subrounded clasts of igneous, metamorphic and sedimentary rocks. This unit is considered to represent deposition in a high energy glacial outwash environment.

The Muskegon Valley has been incised into Unit F exposing the sand and gravel deposits which have been quarried at the Hersey Sand and Gravel operations east of Hersey. The sand and gravel deposits east of 170th Avenue and south of Hersey Road are part of Unit F.

The hydraulic conductivity of this unit is considered to be about the same as Sub-Unit E/1, that is, k = 600 gpd/ft^2.

The specific yield is considered to be about 0.20. The specific yield is defined as the volume of water released from storage in the aquifer per unit surface area per unit decline of the water table (Freeze and Cherry, 1979, p.61).

The sand beds which overlie Sub-Unit F/1 become finer upward and more silt interbeds are present. A "perched water table" is typically present in the sand overlying Sub-Unit F/1. Similarly, unsaturated sand and gravel beds are typically present beneath Sub-Unit F/1. The presence of unsaturated sands can be detected from the resistivity log. Resistivity values > 100 ohm.ft are considered to be indicative of unsaturated sand and gravel. This interpretation has been verified by comparison of the geophysical logs with the water level in nearby wells and auger holes in which direct observation of the position of the water table can be made.

Sub-Unit F/1:

Sub-Unit F/1 is an extensive layer of plastic silty clay to clayey till that is present throughout the study area except where it has been removed by subsequent erosion along the course of the Muskegon Valley or where its continuity has been disrupted in collapse structures.

The Sub-Unit F/1 is a continuous glacio-lacustrine deposit present within Unit F throughout most of the AOR. It serves as a barrier and confining interval to aquifers below.

The Sub-Unit F/1 is a saturated, plastic, silty clay. The upper part of the clay is indistinctly laminated and mottled pink and gray, grading downward to a drab light gray color. In some test holes, floating sand grains are present in the silty clay, at other locations the texture approaches that of a silty clay till. Sub-Unit F/1 ranges in thickness from about 8 - 15 ft beneath the plant site.

In Section 36, Township 17N, Range 9W, Sub-Unit F/1 thickens to about 70 ft. It is made up of 2 to 3 distinct clay beds separated by sandy till.

In Section 26, Township 17N, Range 9W Sub-Unit F/1 is about 40 ft thick. It is made up of an upper and lower silty clay bed separated by a sandy till layer.

Unit E:

This unit is a complex mixture of inter-bedded sand, gravel, and till, characterized by highly variable resistivity and gamma ray log signatures. It is considered to represent deposition in the marginal region of a stagnant continental glacier.

Sub-Unit E/1:

Sub Unit E/1 is a principle aquifer in the AOR. This unit is present at the base of Unit E throughout the AOR. It is made up of sand and gravel which is considered to have been deposited in a high energy outwash environment. ***It is the lowermost aquifer present above the base of groundwater exploration.***

Due to the number of accessible sources of ground water above the Sub-Unit E-1, at shallower depths, it is not used as a common source of household water.

Prior to 1984, there was not a well completed in this interval. In 1984, the PPG Bass 84-06 was completed as an observation well in Sub-Unit E/1. This well provided the first information about the aquifer coefficients of Sub-Unit E/1 as well as the hydraulic head and water quality because there were no existing water wells completed in this aquifer in the AOR.

In November of 1984 a short duration pumping test was run to estimate the transmissivity of Sub-Unit E/1.

The test was conducted at a rate of 27 US gpm for 2 hrs, followed by a 40 minute recovery test, with a determinate $Transmissivity_a = T_a$ = 36,000 gpd/ft, and k = T/m = 36,000/60 = 600 gpd/ft^2

The water analysis from PPG Bass 84-06 was determined on a water sample collected January 16, 1985. The water is a calcium-sulphate/bicarbonate water having a concentration of about 730 mg/L and a specific conductance of 1,025 micro ohms/cm @ 25°C. The total hardness of the water is about 463 mg/L as $CaCO_3$.

Unit D

Unit D is glacial till which was encountered overlying the bedrock surface or Unit A throughout the study area. It is a reddish brown to pinkish gray, calcareous sandy till which has very uniform geophysical log characteristics. Unit D represents sedimentation in a glacial depositional environment, either as lodgment till or as till deposited by basal melting of a stagnant ice sheet.

Several of the deeper wells, drawing from the Quaternary Unit E/1 are of industrial purpose, owned and operated by Cargil, Inc.

80.00% of all water wells in the area are 200' or shallower.

Due to the number of accessible sources of ground water above the Sub-Unit E-1, at shallower depths, it is not used as a common source of household water.

Prior to 1984, there was not a well completed in this interval. In 1984, the PPG Bass 84-06 was completed as an observation well in Sub-Unit E/1. This well provided the first information about the aquifer coefficients of Sub-Unit E/1 as well as the hydraulic head and water quality because there were no existing water wells completed in this aquifer in the AOR.

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The water analysis from PPG Bass 84-06 was determined on a water sample collected January 16, 1985. The water is a calcium-sulphate/bicarbonate water having a concentration of about 730 mg/L and a specific conductance of 1,025 micro ohms/cm @ 25°C. The total hardness of the water is about 463 mg/L as $CaCO_3$. Similar to the F Unit in the AOR, The E/1 also has arsenic in its source in offset analysis at the existing Cargil facility. Other average elements in the F, are also shown in the table.

		E/1	F
Calcium	mg/l	122.4	76
Magnesium	mg/L	38	39
Sodium	mg/L	40.2	11
Potassium	mg/L	2.1	1.86
Bicarbonate	mg/L	205	230
Carbonate	mg/L	0	10
Sulphate	mg/L	258	29.6
Chloride	mg/l	15.8	17.5
Iron	mg/L.	1.1	1.22
Manganese	mg/1	.03	0.04
Nitrate as N	mg/L		6.3
Total Phosphorous as P, mg/L			0.023
PH			7
Specific Conductivity, uahos/cm@25C		1025	552
Concentration	mg/l	730	404
Total Hardness, mgiL as CaCO3	mg/l	463	335
Sum of cations, epm			6.97
Sum of Anions,epm			5.04

<u>Unit D</u>

Unit D is glacial till which was encountered overlying the bedrock surface or Unit A throughout the study area. It is a reddish brown to pinkish gray, calcareous sandy till which has very uniform geophysical log characteristics. Unit D represents sedimentation in a glacial depositional environment, either as lodgment till or as till deposited by basal melting of a stagnant ice sheet.

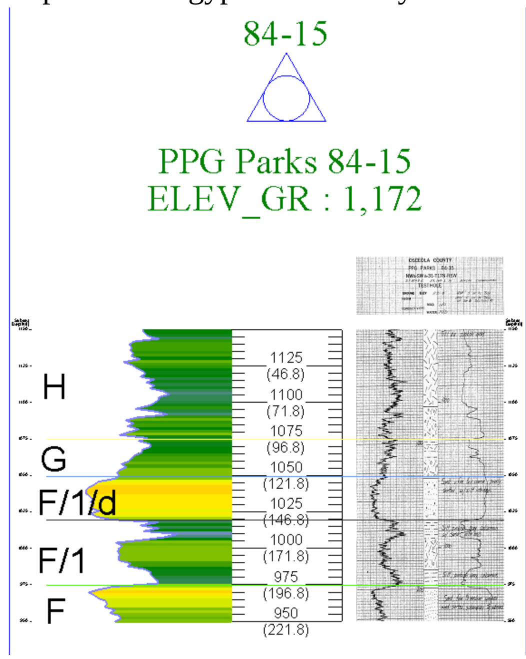
80.00% of all water wells in the area are 200' or shallower. Industrial use is preferentially taken to deeper horizons, so as to access water that is not being drawn by household use.

The area is highly rural and future possible use is limited to residential use, agricultural use, or Part 625 use within the immediate area of influence.

While the deepest screen completion depth within the AOR is no greater than 340' below ground level, another 200' of glacial till and potential sources of water with less than 10,000 TDS may occur until the Jurassic Redbeds.

The lower most glacial till Unit D, is a clayly, silty, confining layer with minimal to no vertical permeability. Below Unit D, observed TDS is greater than 35,000 in the Jurassic Redbeds. This is likely due to the increasing concentration of anhydrite and gypsum deposition as depths are increased.

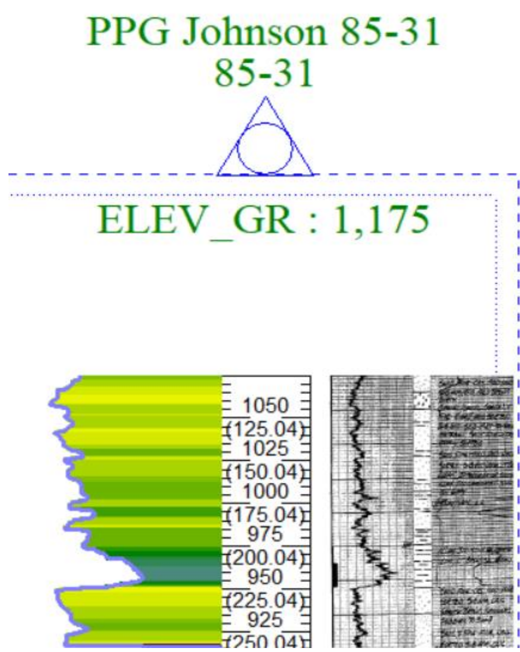
In fact, the E/1 unit, which is principally utilized for industrial purposes, is a calcium sulfate ($CaSO4$) base water as described by W.A. Menley. $CaSO4$ is the principle natural composition of gypsum and anhydrite.



- **Figure B6 is a type curve of the natural gamma ray radioactivity of the hydrological unit** in the AOR (RIGHT). This is from the PPG Parks 84-15, located in the NW/4SW/4 Section 31, Evart Township. This is in the immediate proximity to the proposed injection wells. The depth scale shows both measured depth and depth subsea.

The F/1 Unit which is described as a clay and silty clay, laminated to bedded, some interbeds of silt, massive silty sandy clay with pebbles common, serves as a hydrological barrier between confined and unconfined subsurface water systems.

The F/1 Unit confines the lower F Unit aquifer. It also serves as a vertical transmissibility barrier.



- **Figure B7 is Johnson 85-31,** at the Johnson 1-6D pad location. The F/1 and F Unit is observed at 225' below GL.

- **Figure B8 is a hydrological cross section** from the above referenced PPG Parks 84-15 hydrological well to the PPG Babcock 85-13 hydrological well located in the NE/4NE/4 Section 36. The cross section moves from South to Northerly. There are control wells in this cross section that penetrate the entire quaternary aquifer system and encounter the Jurassic Bedrock. Also in the cross section is a proposed injection location to give point of reference to the quaternary hydrological units that will be intersected by the proposed injection well.

- **Figure B9 is a hydrological cross section** extending across the entire AOR, spanning an approximate 3.5 mile length from South to North, crossing the reference wells utilized in Figure **B10**.

- **Figure B10 is a hydrological cross section** extending across the entire AOR, spanning an approximate 5.5 mile length from West to East, crossing the reference wells utilized in Figure D5. Also in the cross section is a proposed injection location to give point of reference to the quaternary hydrological units that will be intersected by the proposed injection well.

- **Figure B11 is a hydrological cross section** generated by W.A. Menley, spanning and approximate 4.0 mile length from Northwest to Southeast across the AOR.

The extensive geological understanding and well control of the hydrological units within the area, give extra assurance that all USDW or potential USDW or any freshwater sources of water of any kind, whatsoever, are thoroughly and adequately protected and monitored.

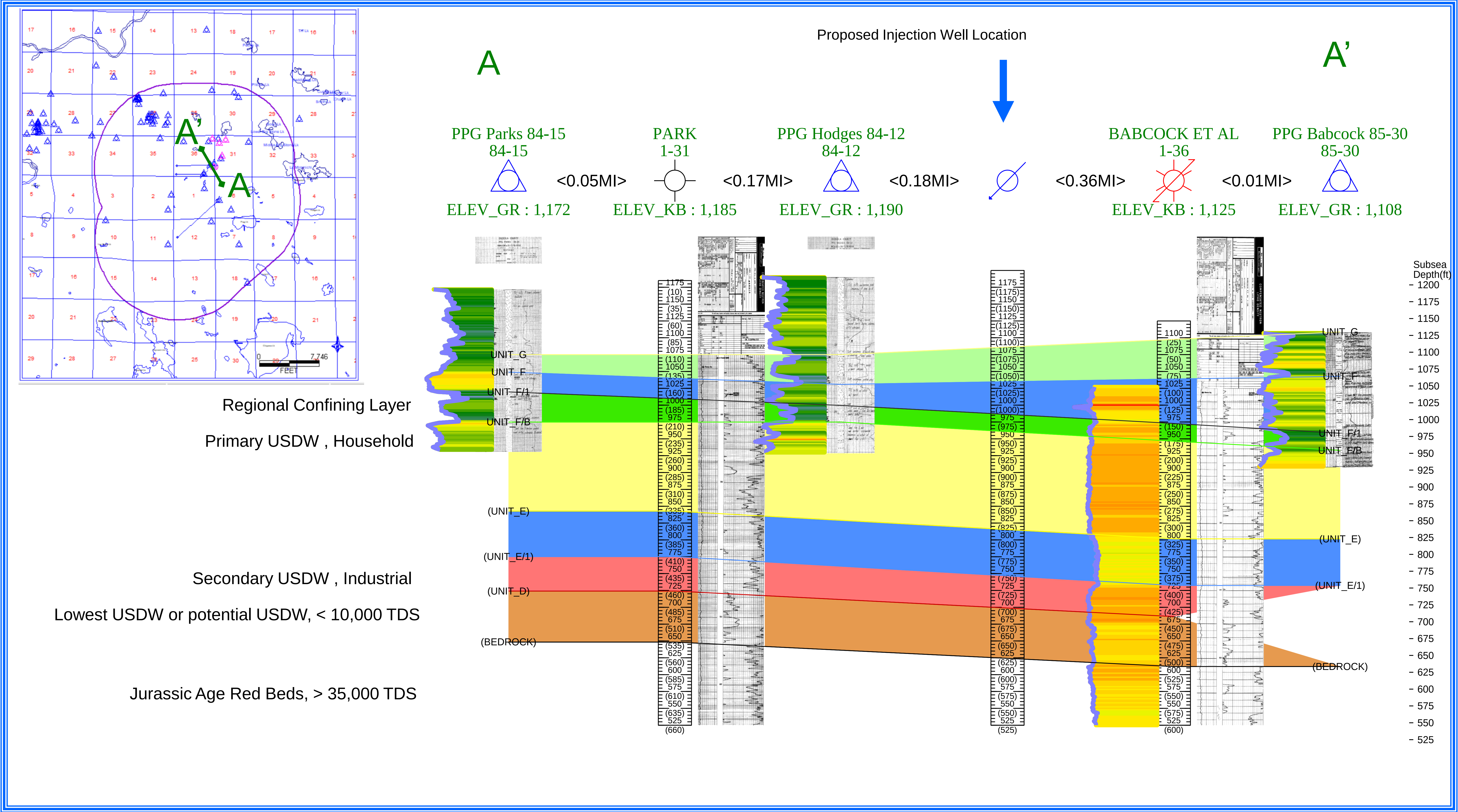


Figure B8. A cross section across in the immediate vicinity of the proposed injection wells. The cross Section A-A' and the path that it follows from South to Northerly, can be seen in the samll reference map in the upper left corner. This cross section included hydro-geological wells, mineral wells and gas wells.

Michigan Potash Operating, LLC

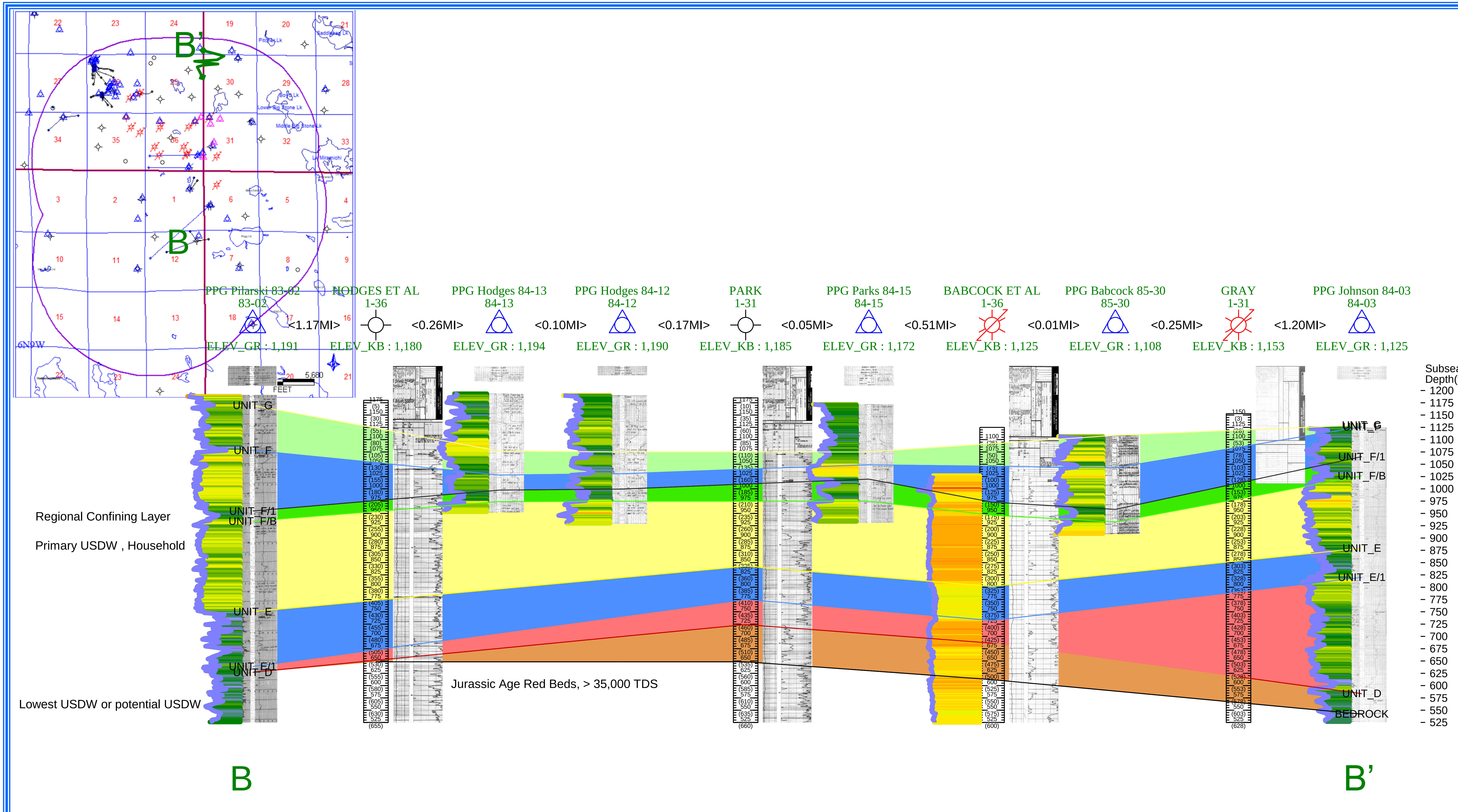


Figure B9 is a cross section extending across the entire AOR, spanning an approximate 3.5 mile length from South to North, crossing the reference wells utilized in Figure D5. The cross section path can be referenced by the small map in the upper left hand corner.

MICHIGAN POTASH OPERATING, LLC

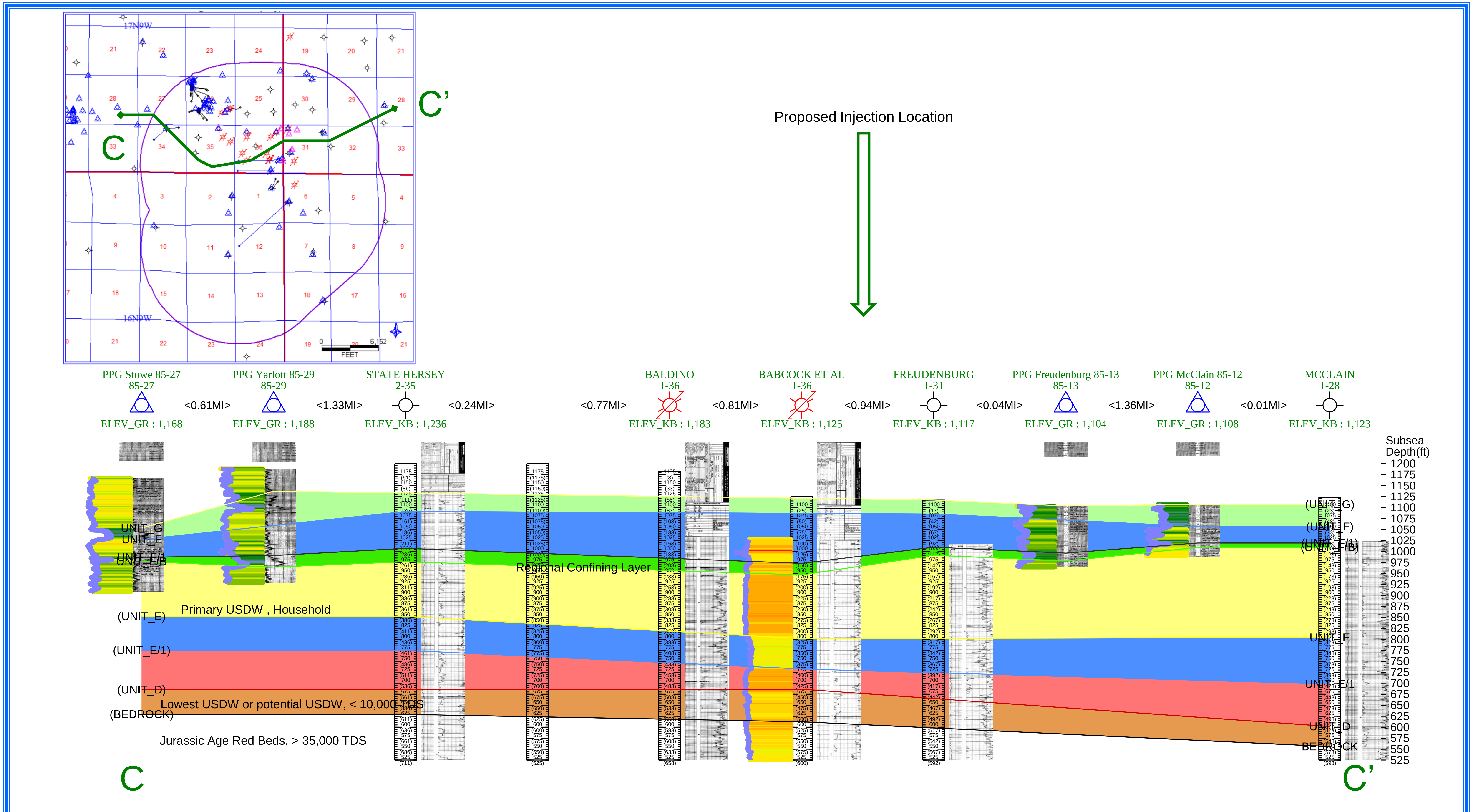
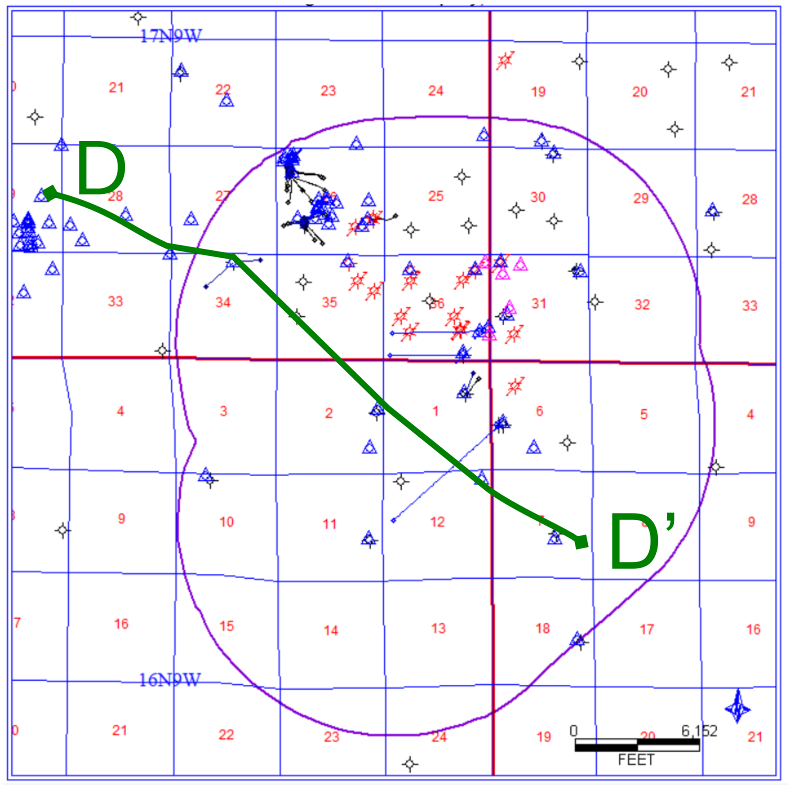


Figure B10. A cross section extending across the entire AOR, spanning an approximate 5.5 mile length from West to East, crossing the reference wells utilized in Figure D5. The cross section path can be referenced by the small map in the upper left hand corner.

Michigan Potash Operating, LLC



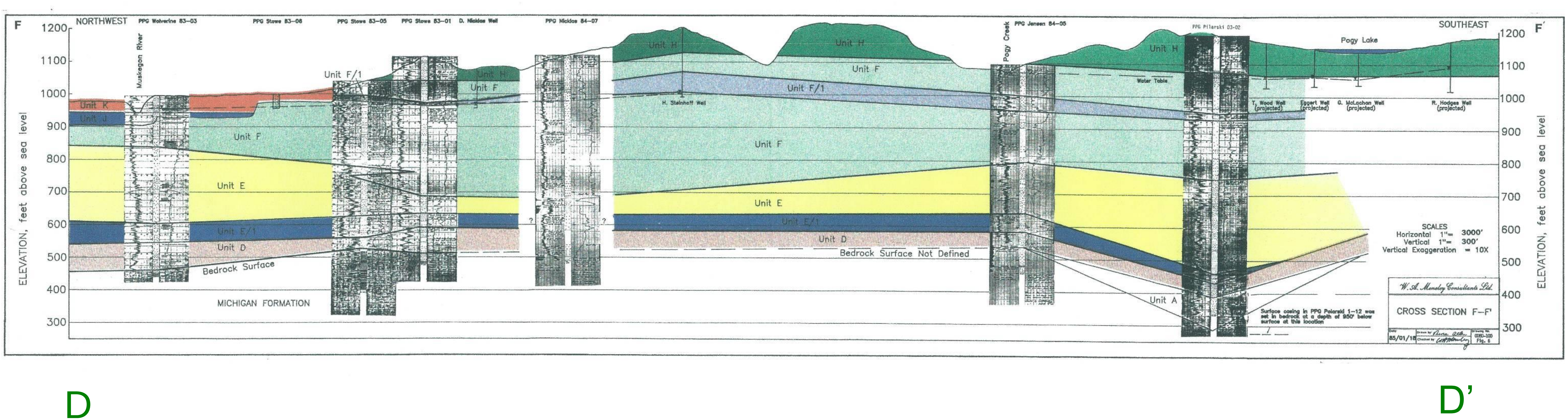


Figure B11. A cross section generated by W.A. Menley, spanning and approximate 4.0 mile length from Northwest to Southeast across the AOR.

MICHIGAN POTASH OPERATING, LLC

Lowermost USDW

As described above, the lowest USDW is the Sub Unit E/1, or clay/till in unit D before saline Jurassic age red-beds are encountered.

Within the entire AOR, the lowest occurrence of the glacial drift occurs at approximately 614 feet. This is considered to be the base of the lowermost USDW - an area defined by the USEPA as an aquifer containing less than 10,000 parts per million of total dissolved solids (TDS). Below the glacial till and into the Jurassic redbeds, TDS is typically in excess of 35,000.

The lowest producing USDW in the AOR is at 340'; however, by federal US EPA standards, glacial till qualifies as the lowermost USDW and at the Johnson 1-6D location, it was measured at 638'.

Quaternary Aquifers

All USDWs described in Section D.2 are from Quaternary glacial deposits. Quaternary deposits come in direct contact with Jurassic age, bedrock in the AOR, as previously described.

The cross sections and the data compiled by PPG has been incorporated into all regional studies performed over the AOR.

Restated, three main quaternary aquifers exist in the AOR:

Along Muskegon River - shallow wells (<50 feet) completed in valley fill deposits within the river valley - not a really extensive but can sustain high pumping volumes.

Unit H - shallow wells (<100 feet) completed in moraine deposits - not a really extensive but adequate for most domestic and agricultural potable water sources.

Unit F - wells completed from 150 to 250 ft in a really extensive prolific producing outwash deposits

Unit E/1 – 250 to 614 ft water wells completed principally for industrial use.

Bedrock Aquifers

There are NO Bedrock aquifers in the AOR supplying any water, whether fresh or saline for any purpose.

Within the AOR, which deep and basin centered, none the bedrock aquifers contain any water with less than 35,000 mg/L concentration of water (Hydrogeology of Part of Osceola and Mecosta Counties, Michigan, W.A. Menley 3/1985).

For clarification purposes, an aquifer is defined as a system that has the ability to transmit water with porosity and potential permeability. All of the below listed zones may have that ability, but are deep, confined, and saturated with extremely highly TDS and chloride content, and/or oil and natural gas and are not suitable for any use, industrial or otherwise.

Restated, the below systems do not constitute any source of potable or usable source of water for industrial or any other purpose. They are deep, confined, and highly saline. In fact, most of the below mentioned zones are either Oil and Gas bearing reservoirs, or have been used as disposal horizons throughout Michigan and in Osceola or Mecosta County.

Pennsylvanian Aquifer System

Chemical analysis data indicate TDS and chloride content in Palma Sandstone and other Pennsylvanian age systems contain of 234,000 mg/1 and 141,000 mg/1, respectively in Mecosta County.

This system includes the sandstones of the Saginaw and Grand River Formations. It overlies the Mississippian sandstones of the Marshall and Michigan Formations and is overlain by the "red beds" of Jurassic time. At no place is the Pennsylvanian System 1,000 feet below sea level in Michigan. No areas of subsidence or catastrophic collapse due to solution mining are known to occur in Pennsylvanian rocks.

Mississippian Aquifer System

Chemical analysis data indicates an average IDS and chloride content in the Marshall Sandstone are 254,880 mg/1 and 150,136 mg/l, respectively in Mecosta County and 267,000 mg/1 and 142,000 mg/1 in Osceola County.

This system includes the sandstones of the Marshall Sandstone and the Michigan Formation which includes the Bayport Limestone. It overlies the Mississippian Coldwater Shales and is overlain by the Pennsylvanian sandstone and shales. The Mississippian Berea Sandstone is an aquifer in the area of subcrop beneath the glacial drift in southeast Michigan. No areas of subsidence or catastrophic collapse due to solution mining are known to occur in Mississippian rocks.

Devonian Aquifer System

Chemical analysis data indicates an average TDS and chloride content in the Dundee are 305,000 mg/1 and 162,000 mg/1, respectively in Mecosta County and 270,000 mg/1 and 147,000 mg/1 in Osceola County.

This system includes the sandstones of the Sylvania Sandstone and the carbonate rocks of the Detroit River, Dundee Limestone and Traverse Groups. It overlies evaporate and carbonate rocks of Silurian age and is overlain by shale of Mississippian or Devonian age. No areas of subsidence or catastrophic collapse due to solution mining are known to occur in Devonian rocks.

Silurian Aquifer System

This system includes the carbonate and evaporate rocks of the Niagara Series, the Burnt Bluff and Manistique Groups and the Engadine Dolomite, the Cayugan Series, Salina and Bass Island Groups. It overlies the Silurian shades and carbonates of the Cataract Group and is overlain by Devonian carbonate rocks of the Garden Island Formation and Detroit River Group. Silurian formations are important hydrocarbon producing formations in Michigan. No areas of subsidence or catastrophic collapse due to solution mining are documented for Silurian rocks, though the Salina Group evaporate are the most important source formations for artificial brine production in Michigan.

Source of Information for the Geologic Data and Formation TDS

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http://www.dnr.state.mi.us/spatialdataiibrary/pdf_maps/mineral_lease_information/mecosta lease information.pdf
http://www. deq. state. mi.us/well-logs/

Comprehensive Freedom of Information Act Request for prior applications and reviews: Michigan Department of Environment, Great Lakes and Energy, EPA Region V, UIC Division Core and database reviews from the Michigan Geological Repository for Research and Education

7 Geologic maps and stratigraphic cross sections of the local and regional geology.

Regional Geologic Setting

The Michigan Basin is a sedimentary basin centered in the Lower Peninsula of the US State of Michigan. The feature is represented by a circular pattern of geologic sedimentary strata with a nearly uniform structural dip toward the center of the peninsula (Figure 1). The extent of evaporative deposits and other shallow water deposits suggest concurrent subsidence during basin filling. High evaporation rates during the Silurian and Devonian geologic periods resulted in massive and pure bedded halite (NaCl), and the possibility of potassium chloride (KCl) in select locations due to mineral rich sea water.

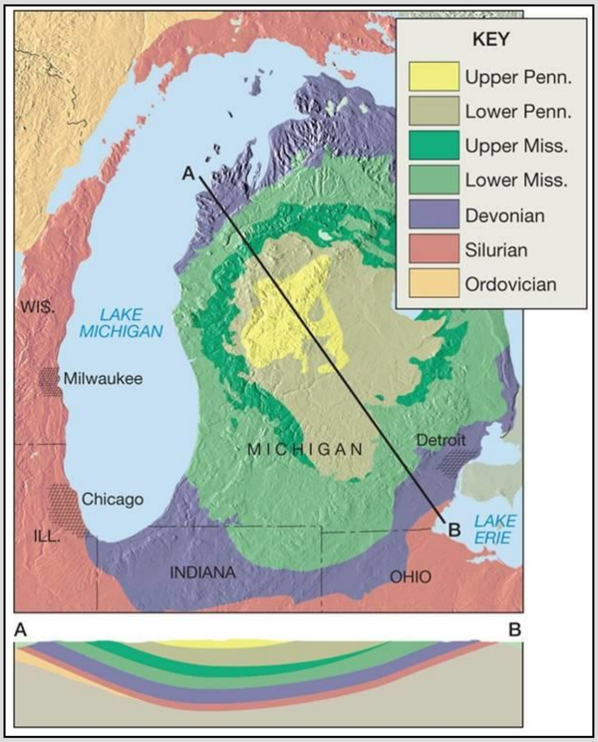

Figure C1. A geologic map of the sedimentary basin of Michigan, with a cross section shown from A to B. Salt occurs in Devonian Age (Blue). Salt and Potash occur in the Silurian Age (Red).

Massive bedded halite occurs in beds of the Silurian Salina Formation, and the Devonian Detroit River Group. Dow Chemical began mining Michigan's salt rich brines in 1897, creating a commercial source of potassium, calcium, and magnesium salts, bromine, and iodine. Dow Chemical remains headquartered in Midland, Michigan. Morton International, Martian Marietta Materials, and The Detroit Salt Company are other salt and mineral producers with an economic interest in salt and salt related deposits in Michigan.

The Michigan Basin is the dominant structural feature of the Michigan southern peninsula. It is a nearly circular and symmetrical structural and sedimentary basin. A maximum aggregate thickness of about 14,000 feet of Cambrian through Jurassic sedimentary strata was deposited in the basin. The basin first developed as a structural feature in late Silurian time during which approximately the middle one-third of the total sedimentary rock formation was deposited.

- **Figure C1** (Above and Right) is a generalized map of the sedimentary basin sedimentary basin of Michigan.

- **Figure C2** is the Michigan stratigraphic column illustrating the lithology of the sediments which fill the Michigan Basin and occur in the AOR.

The southern Osceola/northern Mecosta County area is covered by several hundred feet of Pleistocene glacial drift. The glacial deposits rests on Jurassic "red bed" sediments of Pennsylvanian shale and sandstone. The Paleozoic rock section, from Pennsylvanian downward, likely exceeds 10,000 feet in the area, and includes shale, limestone, dolomite, sandstone, anhydrite, and salt. The Precambrian basement beneath the Paleozoic deposits is not known to have been penetrated in the area but is thought to lie over 11,000 feet below the surface.

- **Figure C3** is a detailed reproduction of the northwest-southeast regional cross-section shown in Figure F1, drawn immediately through the AOR. The section utilizes the deepest well in the area (Freudenberg

1-31 - 10,858 feet), which is in the same section as the proposed injection locations (Section 31, Evart Township, Osceola County, Michigan). This cross section also utilizes the deepest reported well in the Michigan Basin (Sparks, Eckelberger, and Wrightsil 1-8 - 17,466 feet). Figure 22 shows the structural configuration of the injection and confining intervals, a bowl-shaped pattern which illustrates the shape of the Michigan Basin. This figure has a vertical exaggeration approximating 50 to 1.

- **Figure C4 is a zoomed in portion of Figure C2** showing the proposed injection horizon in relation to its stratigraphic column.

Local Geologic Setting

- **Figure C5 is a cross section through the AOR with geophysical well logs showing porosity, bulk density, natural gamma ray, caliper**. The cross section shows the geological units of interest and their immediate confining layers from West to East, with express illustrated consideration of the subsurface geological well logs to illustrate the regional geologic setting, showing the thickness and latral continuity of the confining zones (s) through the ara of review. The confining zone(s) is the Bell Shale. Above the Bell Shale is the Traverse lime, a low porosity limestone that will also serve as a confining zone. Above the Traverse lim is the antrim shale, which would also serve as a confining zone. At the top of the cross section is The AOR is in an a structurally undisturbed area, with regional dip less than 1 degree to the northeast. There are no observable faults in the AOR.

- **Figure C6 is a cross sectional trace of the path of the Johnson 1-6, from East to West, with geophysical well logs showing porosity, bulk density, natural gamma ray, caliper**. The cross section shows the geological units of interest and their immediate confining layers from East to West, immediately following the trace that the MPC 8D and Hodges 1-36 will follow in the Reed City Dolomite/Dundee. This expressly illustrates consideration of the subsurface geological well logs to illustrate the projected drilling path and continuity of the confining intervals.

- **Figure C7 is a cross sectional trace of the path of the MPC 8D and Hodges 1-36, from East to West, with geophysical well logs showing porosity, bulk density, natural gamma ray, caliper**. The cross section shows the geological units of interest and their immediate confining layers from East to West, immediately following the trace that the MPC 8D and Hodges 1-36 will follow in the Reed City Dolomite/Dundee. This expressly illustrates consideration of the subsurface geological well logs to illustrate the projected drilling path and continuity of the confining intervals.

- **Figure C8 is a structure map of the Dundee/Reed City Dolomite**.

The flat, undisturbed, geological character of the AOR can be observed in Figure C5 through C8. There is minor structure; no tectonics and no known faults in the AOR. The regional dip is less than 50’ per 1 mile.

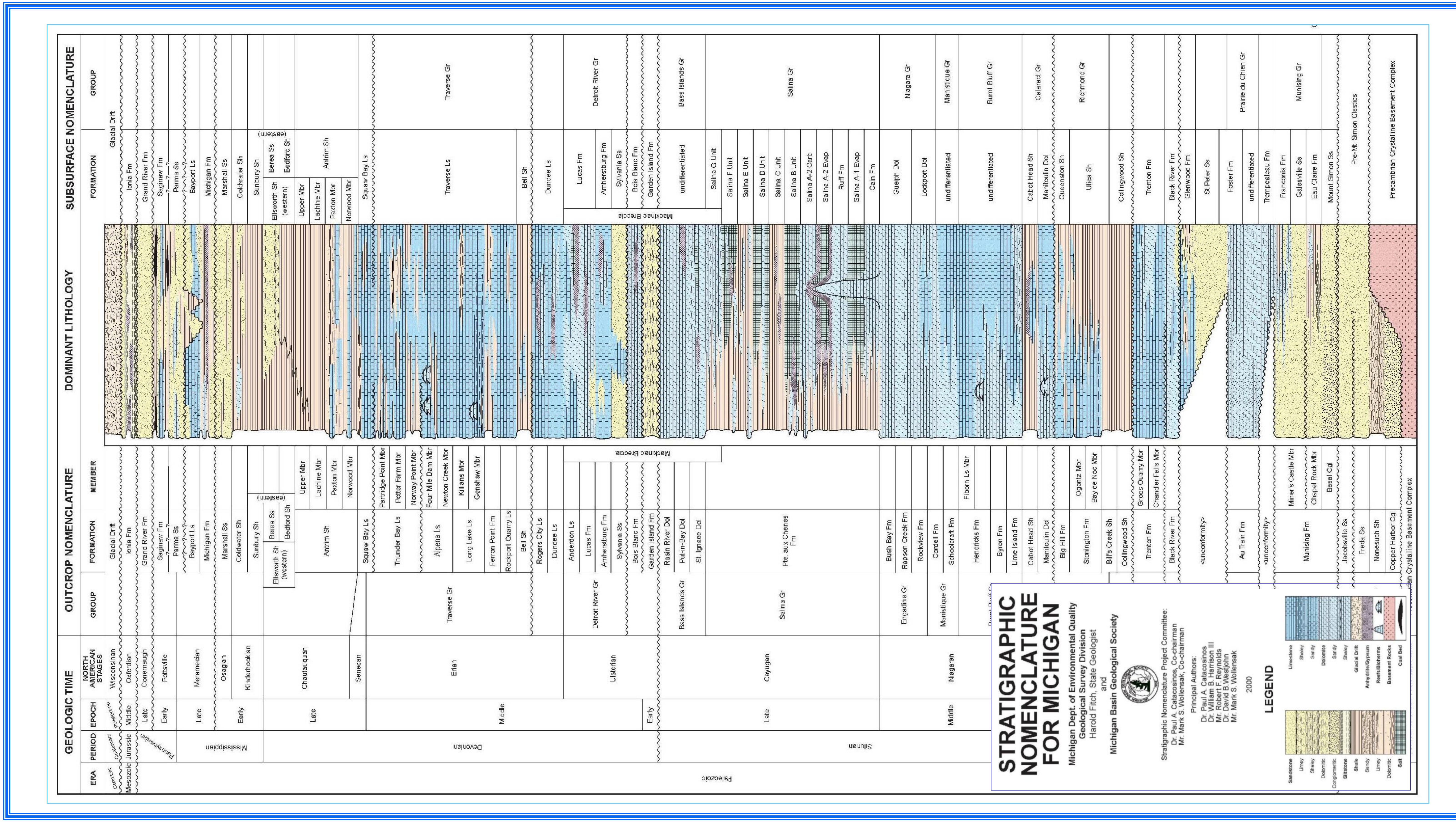

Figure C2 is the Michigan stratigraphic column illustrating the lithology of the sediments which fill the Michigan Basin and occur in the AOR.

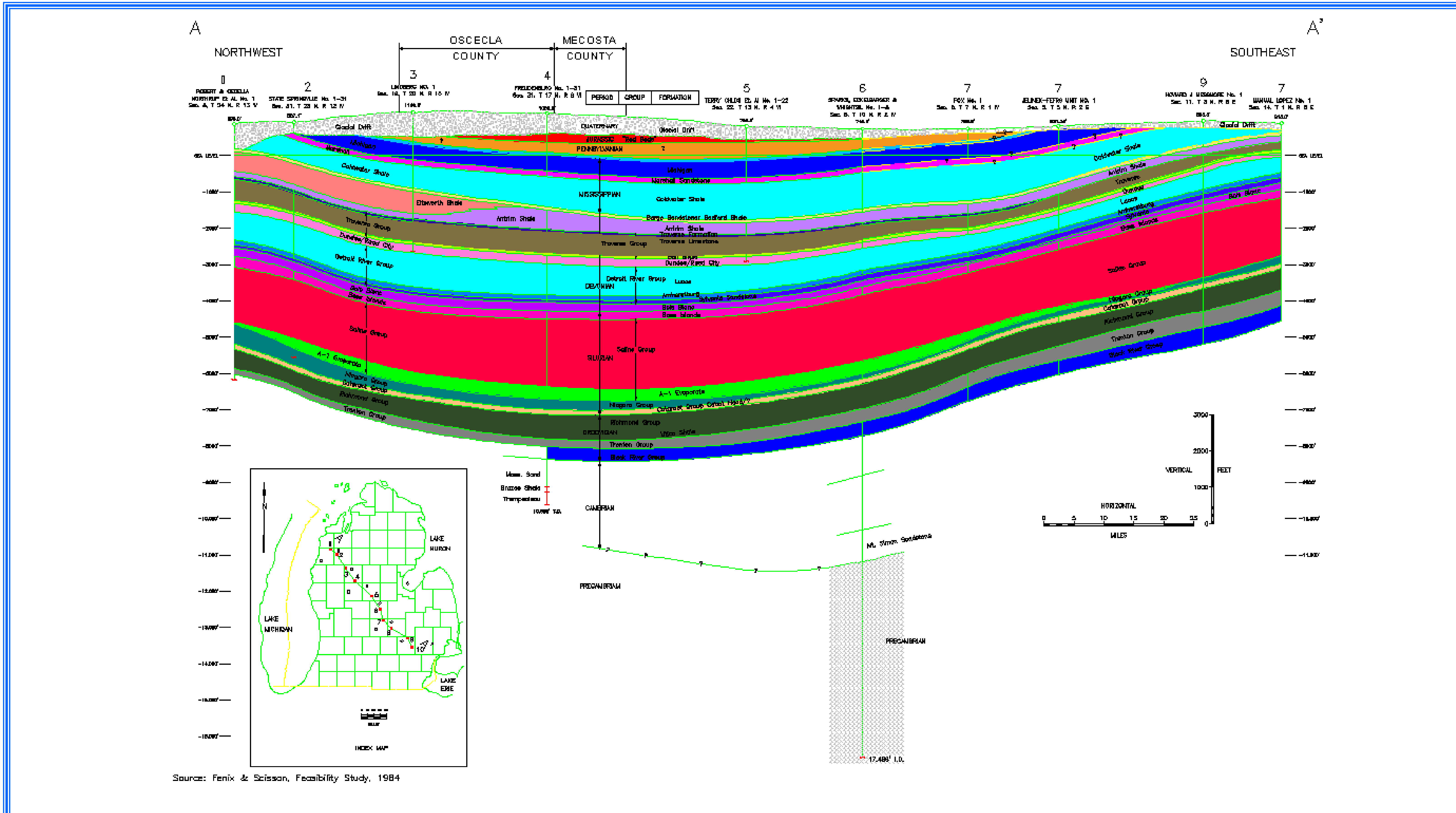

Figure C3. A detailed northwest-southeast regional cross-section through th estate of Michigan, drawn through the AOR, utilizing the deepest well in the AOR (Fruedenburg 1-31 - 10,858 feet), which is in the same section as the proposed injection location (Section 31, Evart Township, Osceola County, Michigan).

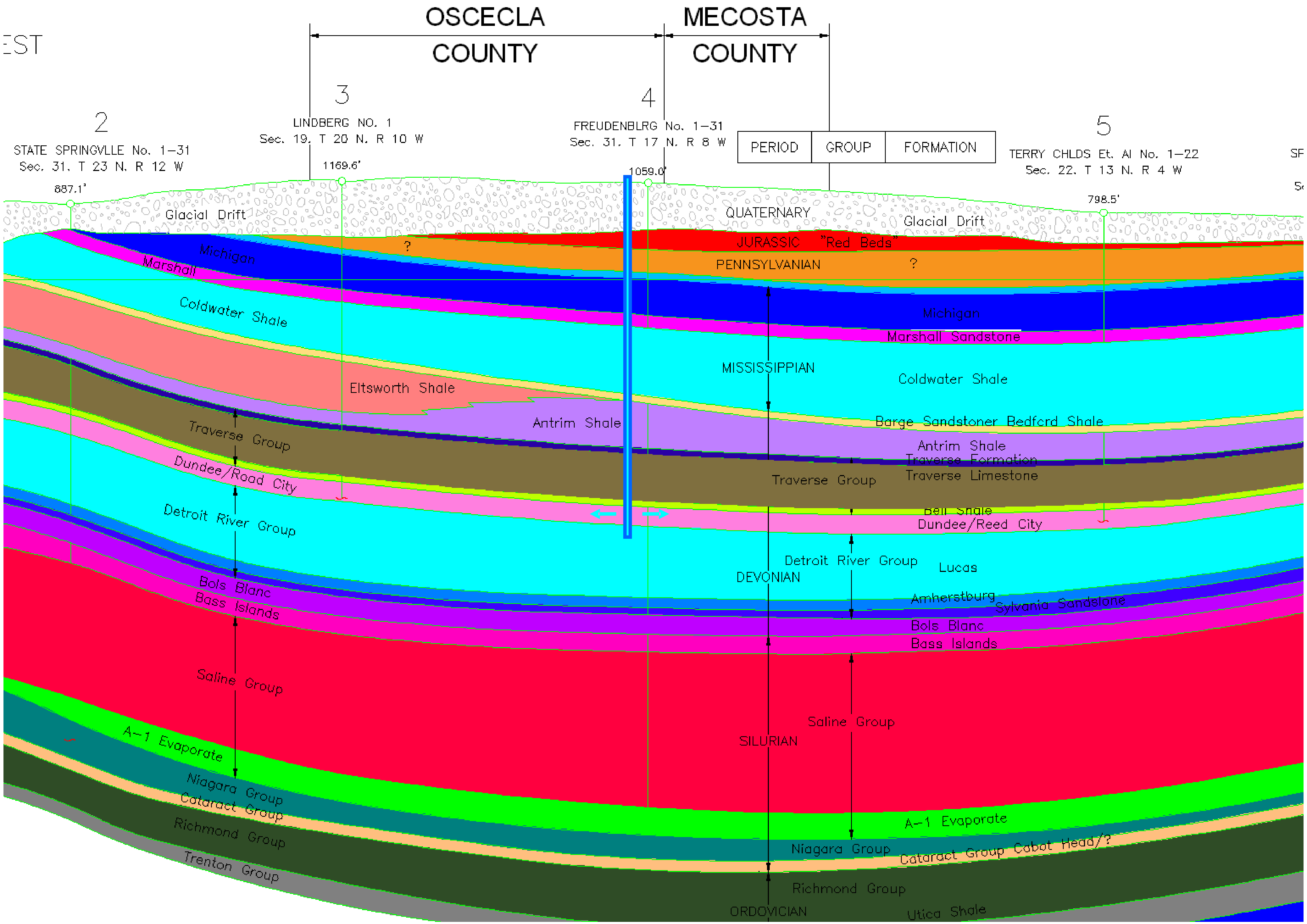

Figure C4 is a zoomed in portion of Figure B5 , showing the proposed injection horizon in relation to its stratigraphic column.

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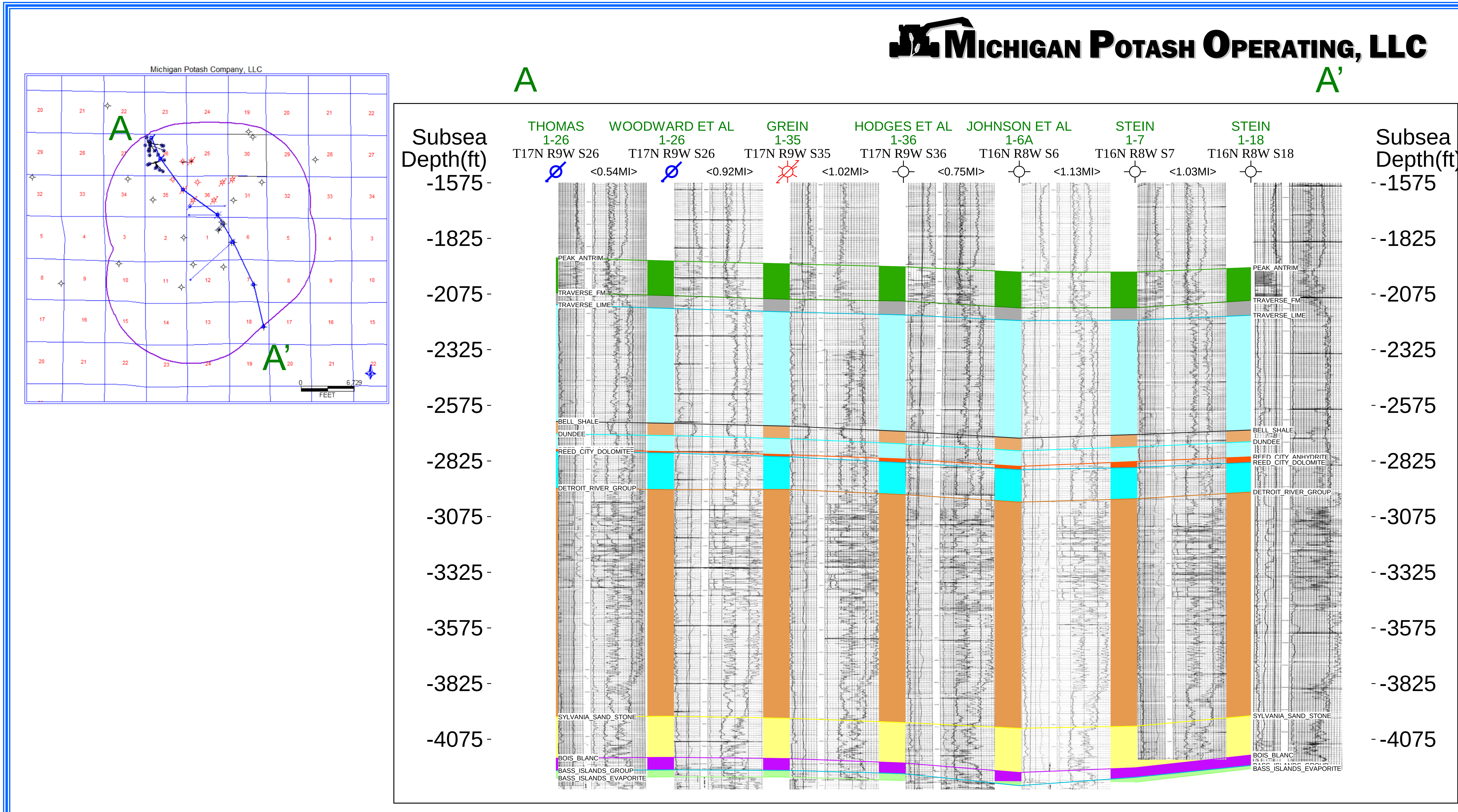


Figure C5 is a cross section through the AOR, showing the geological units of interest and their immediate confining layers from North West (A) o South East (A').

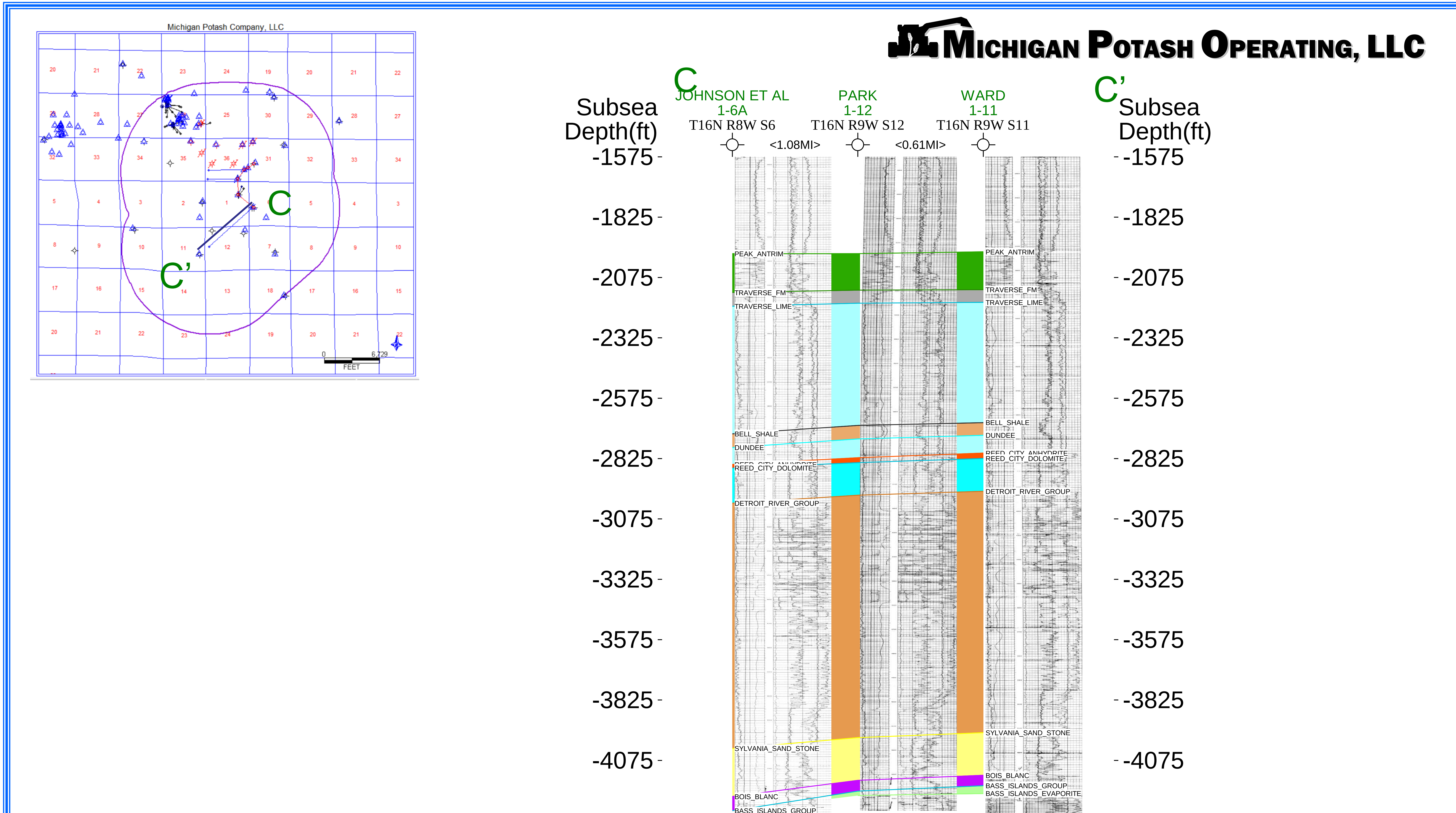


Figure C6 a cross section tracing the well path of the Johnson 1-6 from NE (C) to SW (C').

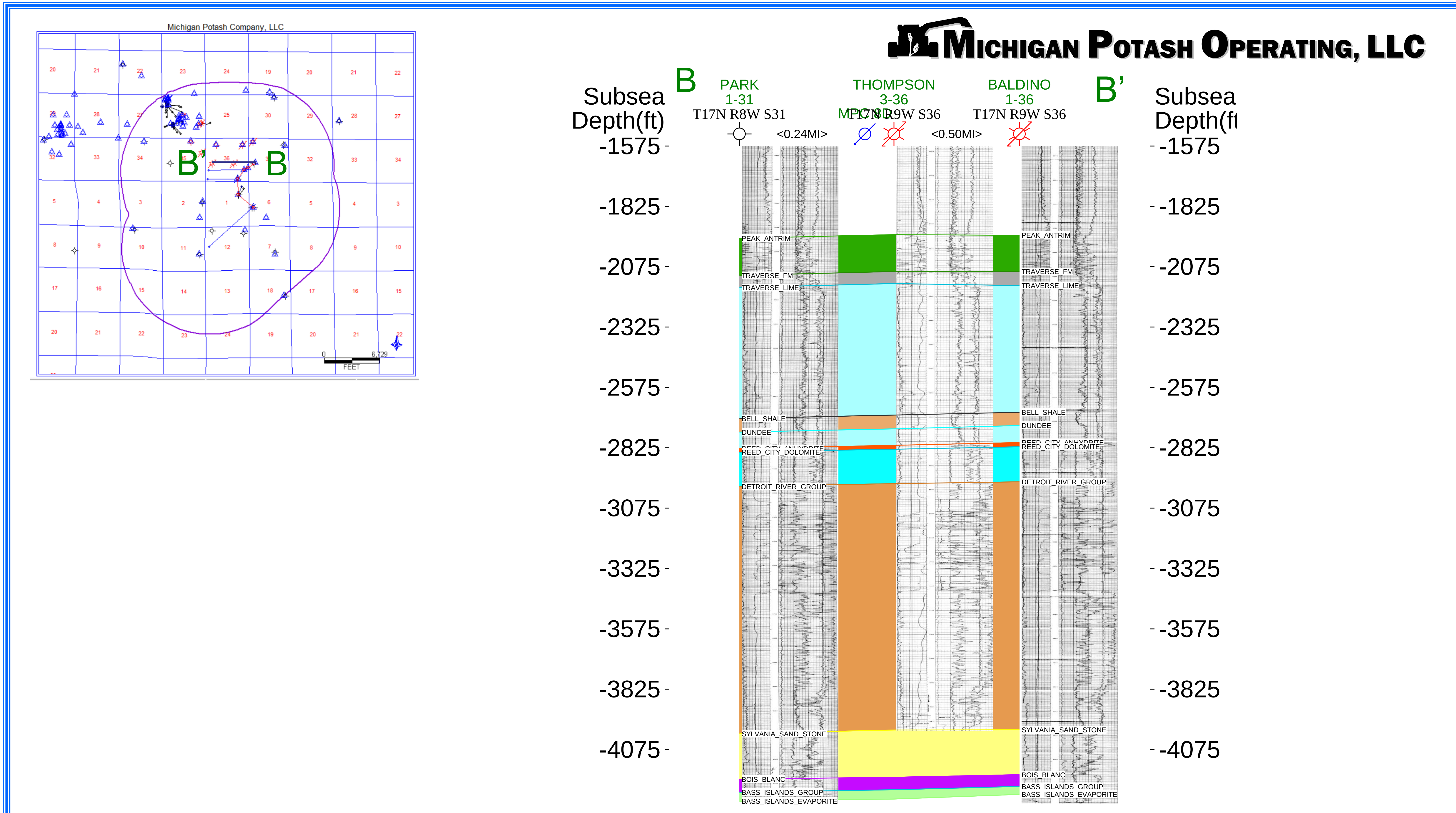


Figure C7 is a cross section tracing the MPC 8D and Hodges from East (B) to West (B')..

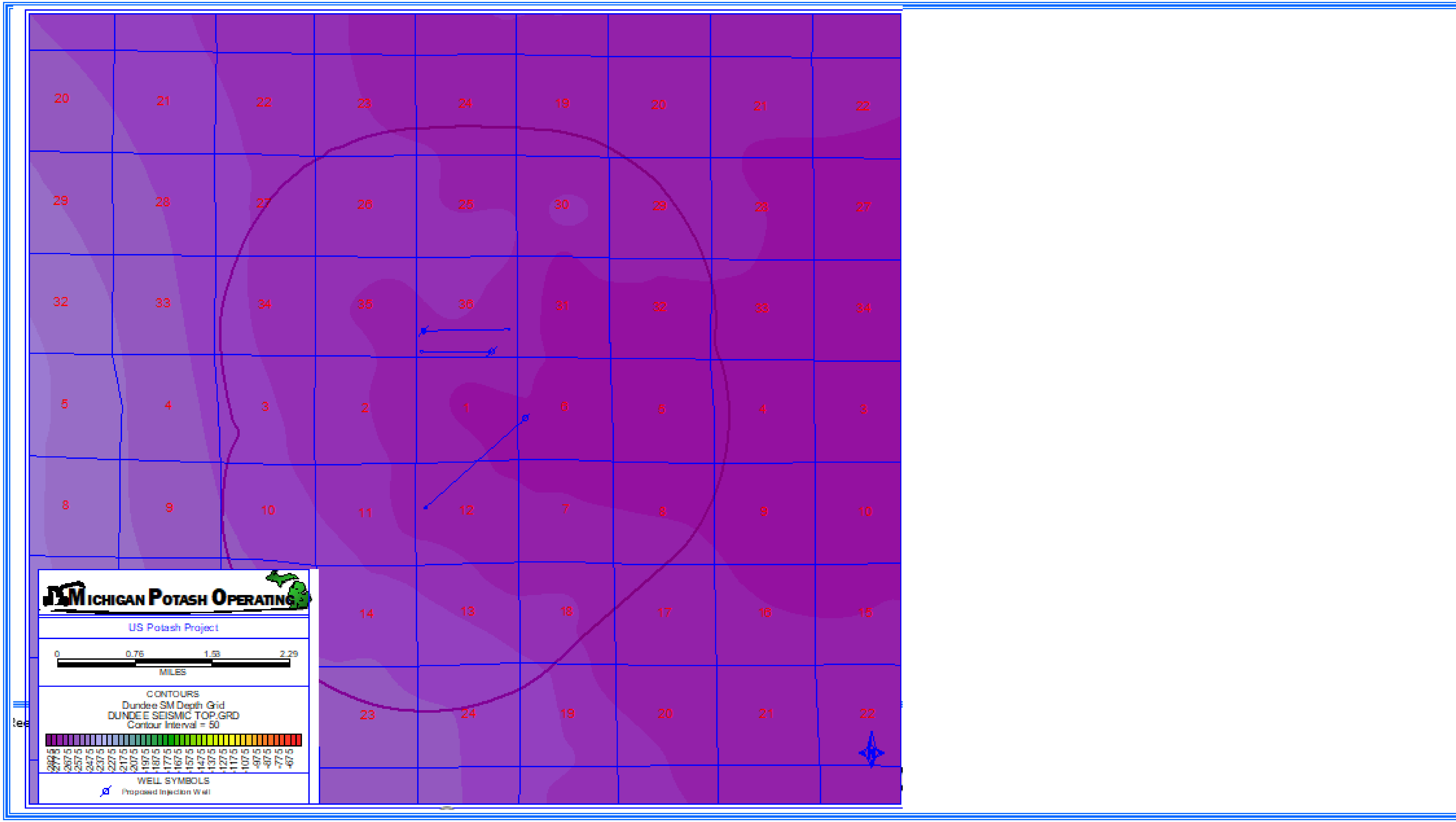


Figure C8. A structure map of the Dundee.

8 Chemical, physical and bacteriological characterizations of the waste stream before and after treatment and/or filtration. Include a characterization of the compatibility of the injectate with the injection zone and the fluid in the injection zone along with a characterization of the potential for multiple waste streams to react in the well bore or in the injection zone.

Chemical, physical and bacteriological characterizations of the waste stream before and after treatment and/or filtration:

The water stream injected into the proposed Class I Non Hazardous injection wells are non-hazardous brines (salt water) generated by the simple processing of food grade salt utilized on dinner tables across the world, Sodium Chloride (NaCl), i.e. table salt or “salt”, and potassium chloride (KCl) “potash”, which is a natural, food safe fertilizer, applied to staple crops for food generation and consumption, KCl may also be added to table salts, or baking sodas as a low sodium based substitute for salt for human consumption.

Salt and potash brine is sent to a natural gas fired evaporator, which concentrates the salt and potash water. The concentration of the water, crystallizes the salt from solution, and increases the concentration of the potash in the water. The water is then sent to potash crystallization processes, where temperature contrasts crystallize the potash from the water. The remaining water is recycled back for injection, or in the case of excess water that has been enriched in magnesium or calcium is sent to Class I wells.

The facility is a food grade facility, and therefore, no hazardous, or non-naturally occurring materials are introduced into the system.

There may be traces of sodium hydroxide, that is used in stripping naturally occurring H_2S from the brine that comes from the salt and potash bearing formation (Salina A1). These volumes, if any, would be trace (<1-2 ppm). The introduction of H2S by the A-1 Carbonate, has been prepared for, and will be treated. The proposed process monitors real time, H2S dissolved in brine. occurs as a result Pump packing seal water (<10gpm), and a bleed system (<10gpm) containing some sodium bisulfite may be added to the injection stream.

Concentrations of these predominant compounds vary during the course of operations. At times, the disposal fluid will be very dilute with respect to KC1 and NaC1; at other times the disposal fluid will contain higher concentrations of KC1 and NaC1. The following is a typical representation on the physical properties and chemical characteristics of the waste brine.

<u>Chemical Characteristics:</u>

Component	Weight Percent
H_2O	variable
NaC1	variable
KC1	variable
SO_4	<0.4
Br	<0.2
Ca	<0.2
Mg	<0.02

<u>Physical Characteristics:</u>

Specific Gravity	1.0 - 1.20 (1.25 with safety factor)
pH	5.5 - 8.0
Temperature	Ambient to 130 degrees F

Biological Characteristics:

The injection water from food grade salt and potash is mostly free of biological matter. However, groundwater used in the food grade salt and potash process will likely contain trace, naturally occurring biological matter, and the BODs will need occasional sampling and control. It is possible that the salinity of the disposal fluid would cause an overall decline in biological matter content.

Solid Waste:

The Part 625 Brine Disposal Wells include a means to handle solid waste generated from the KCl and food grade salt (Nacl) manufacturing process by dissolving excess, unmarketable, and off specification product (either KCl or NaCl) into a means of transport, handling, and disposal, which is by way of water, dissolving, and subsurface disposal and injection. The Part 625 Artificial Brine Wells are able to receive solid NaCl dissolved as a solute, while at the same time, recovering KCl product from the subsurface. As the KCl is preferentially dissolved subsurface, excess NaCl is precipitated below surface, thereby allowing the Part 625 Artficial Brine wells to also be a means of solid waste disposal and handling associated with the KCl and NaCL manufacturing process.

Radiological Characteristics:

The disposal fluid will contain trace amounts of the naturally occurring stable Cl 37 isotope and radiogenic K40 isotope associated with potassium chloride and sodium chloride. These are naturally occurring traces and not harmful to people, animals, or plant life. Potash is intentionally placed on crops to increase health and growth. Sodium chloride is intentionally placed in food sources.

Fluid disposed of in the wells, resulting from the solution processing of food grade salt and potash is comprised predominantly of only naturally occurring sodium chloride (NaC1) and naturally occurring potassium chloride (KC1).

As it concerns filtration:

Filtration is proposed via sand media filtration before injection into the postulated horizon to remove any potential suspended solids. Suspended solids are not a material concern provided before injection, much of the brine has been pretreated via a full clarification process, removing virtually all suspended solids.

As it concerns compatibility:

The brine produced by the manufacturing of food grade salt and potash is cleaner than the existing fluid in the injection horizons. There are fewer constituents in the injection fluid, and only ones that already exist in similar or greater concentrations in the resident injection horizons. Historical laboratory experiments have been conducted to evaluate the compatibility of the fluids which demonstrated no incompatibility. This is corroborated by long standing injection in analogous operations offset. Provided the injectate is a clean, controlled fluid, and the injected chemical composition contains only those constituents that already exists in the injection horizon as resident, naturally occurring ions; there is no incompatibility, and provided there are not multiple streams, there can be no potential for multiple stream reactions (See Section EGLE checklist 9 for detailed chemical and physical characteristics of the injection horizon's resident brine).

9 Information to characterize the proposed injection zone, including:

A. The geological name of the stratum or strata making up the injection zone and the top and bottom depths of the injection zone.

B. An isopach map showing thickness and areal extent of the injection zone

C. Lithology, grain mineralogy and matrix cementing of the injection zone.

D. Effective porosity of the injection zone including the method of determination.

E. Vertical and horizontal permeability of the injection zone and the method used to determine permeability. Horizontal and vertical variations in permeability expected within the area of influence.

F. The occurrence and extent of natural fractures and/or solution features within the area of influence.

G. Chemical and physical characteristics of the fluids contained in the injection zone and fluid saturations.

H. The anticipated bottom hole temperature and pressure of the injection zone and whether these quantities have been affected by past fluid injection or withdrawal.

I. Formation fracture pressure, the method used to determine fracture pressure and the expected direction of fracture propagation.

J. The vertical distance between the top of the injection zone from the base of the lowest fresh water strata.

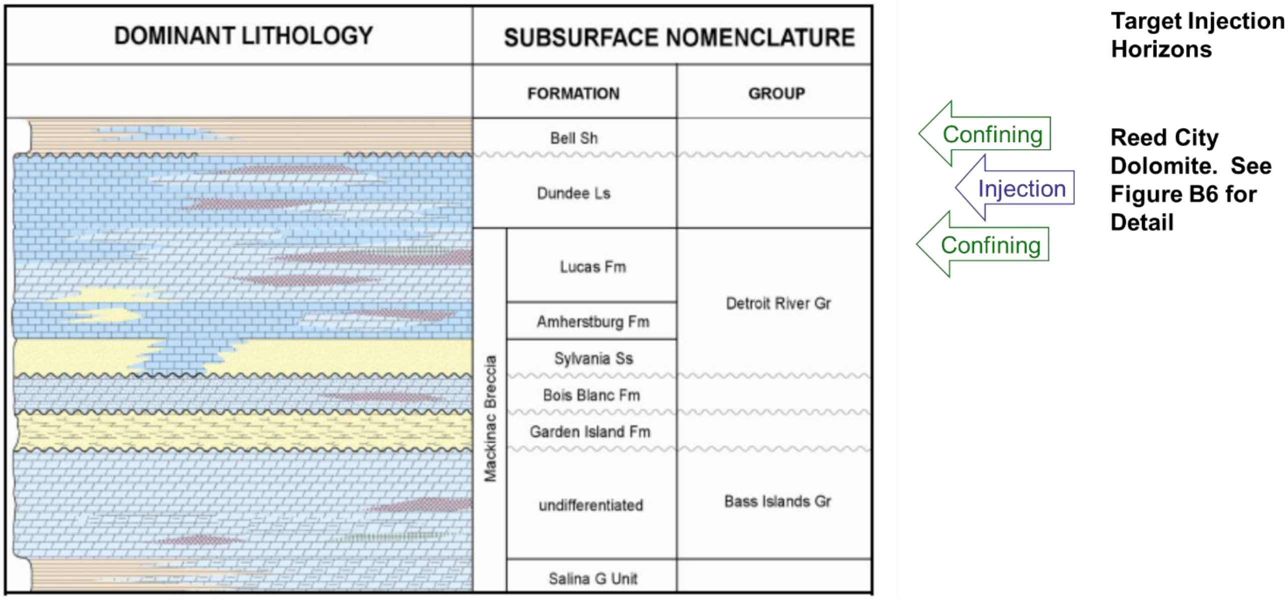
K. Other information the applicant believes will characterize the injection zone.

9.A The geological name of the stratum or strata making up the injection zone and the top and bottom depths of the injection zone.

Michigan Potash Operating proposes to inject into the Reed City Dolomite, which is at 3971' top, and 4200' bottom. The Reed City Dolomite an interval below an established anhydrite marker in this region, that lies within the "Dundee Limestone group". The Reed City Dolomite is the principle porosity target, the proposed formation group, including the Reed City Dolomite, Reed City Anhydrite, and Dundee Limestone are proposed, similar to the Thomas and Woodward wellbores. The Dundee Group serves as both the injection and confining interval.

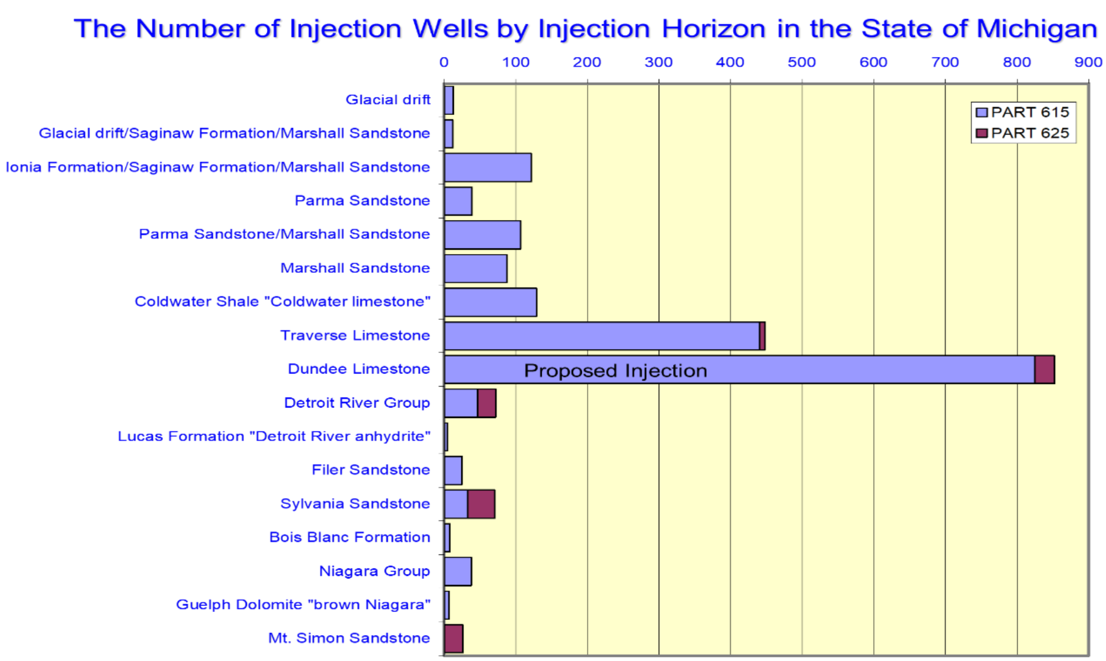
Both intervals have been the subject of extensive study in Michigan as injection horizons, and or have been injected into extensively. Michigan is a historical oil and gas province and rich brine producing province. As a result, there is well established data for injection and rock and fluid interaction with over +/- 2,070 established injection wells.

Figure C9 is an excerpt from Figure C2 with particular focus on the injection and confining zones closest to the proposed horizons **(below)**. The Reed City Dolomite occurs in the Dundee LS Formation group. The Reed City Dolomite occurs below an anhydrite layer within the Dundee LS. This figure is presented in great further detail, by horizon on Figures CXXX, for the proposed injection horizon. The confining interval is the Bell Shale.



Michigan is a historical oil and gas province and rich brine producing province. As a result, there is well established data for injection and rock and fluid interaction, with over 2,000 established injection wells.

Figure C10 is a graphical illustration of the stratigraphic horizons currently being utilized in the State of Michigan for fluid injection (below). This graph shows both Part 615 Oil and Gas Wells and Part 625 Mineral Wells. This graph can be easily cross referenced with **Figure C9 and Figure C2.**



In the State of Michigan most injection occurs in the Dundee Limestone or shallower due to the ease of access of shallow injection horizons and excellent confining intervals at shallow depths.

9.B An isopach map showing thickness and areal extent of the injection zone.

- **Figure C11** is an isopach map of the Reed City Dolomite group of the Dundee Formation, showing the area extent of the proposed injection zone.

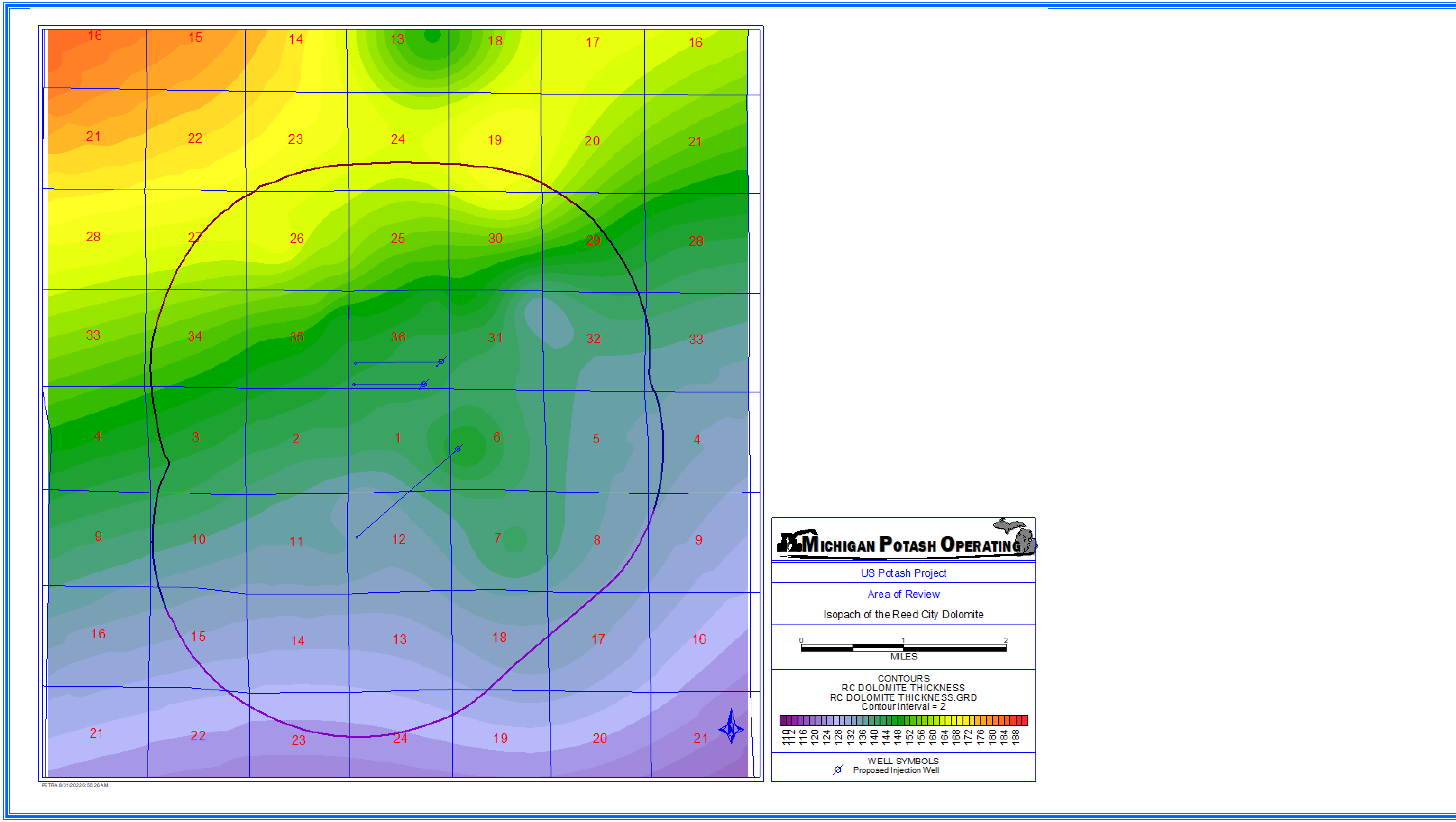


Figure C11. An isopach map of the Reed City Dolomite Group of the Dundee Formation

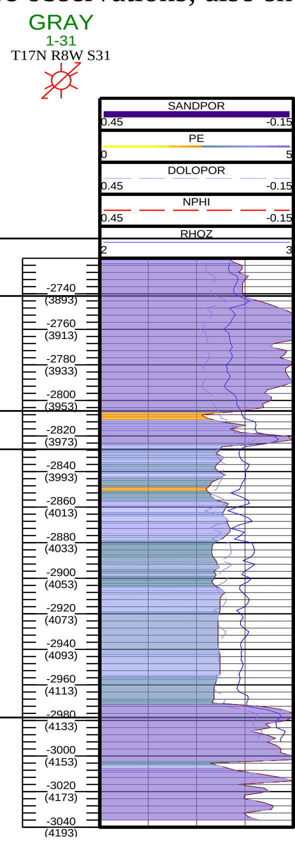
9.C. Lithology, grain mineralogy and matrix cementing of the injection zone.

Figure C12 shows

(1) A regional map of Michigan, showing the net thickness of the Dundee Group in the entire state, with a reference to the AOR; and

(2) A geophysical type curve of the injection and confining horizon(s) from the Bell Shale to the Detroit River Anyhydrite in the Grey 1-31, located in the NW/4NW/4 Section 31, which is in the AOR; and The Reed City Dolomite is the target injection horizon.

(3) The porosity of both the injection and confining intervals as determined from well log analysis and core observations; also shown below for ease of refence; and



	Zone	Footage	Porosity	Permeability	Description
Confining	Bell Shale		0	0	Limestone, buff grey brown, f-micro crystaalin, argolicous, dololithic with grey shale
Confining	Dundee Limestone	60'	0-2%	<.1 md	Limestone, buff grey-brown, fine microcrystaline.
Confining	Reed City Anhydrite	10'	0	0	Anhydrite
Injection	Reed City Dolomite	150'	5-7%	50-100 md	Dolomite, brown, hard, medium to fine crystaline, succroustic, small sl argilicous, good inter crystaline porosity
Confining	Detroit River Anhydrite	60'	0	0	Minor dolomite, brown dark brown anhydrite with small brown limestone and grey-black shale. Anhydrite, white grey.

(4) The permeability-porosity relationship as determined from extensive core and lithologic studies as performed throughout Michigan's development history in the Dundee and Reed City formation, demonstrating real data, test results, and observations; and

(5) Real lithologic descriptions as observed by the wellsite geologist when drilling through the Freudenberg 1-31, located in the NE/4NE/4 Section 31, which is in the AOR, and re-referenced here, provided its appearance in Figure C3 and Figure C4.

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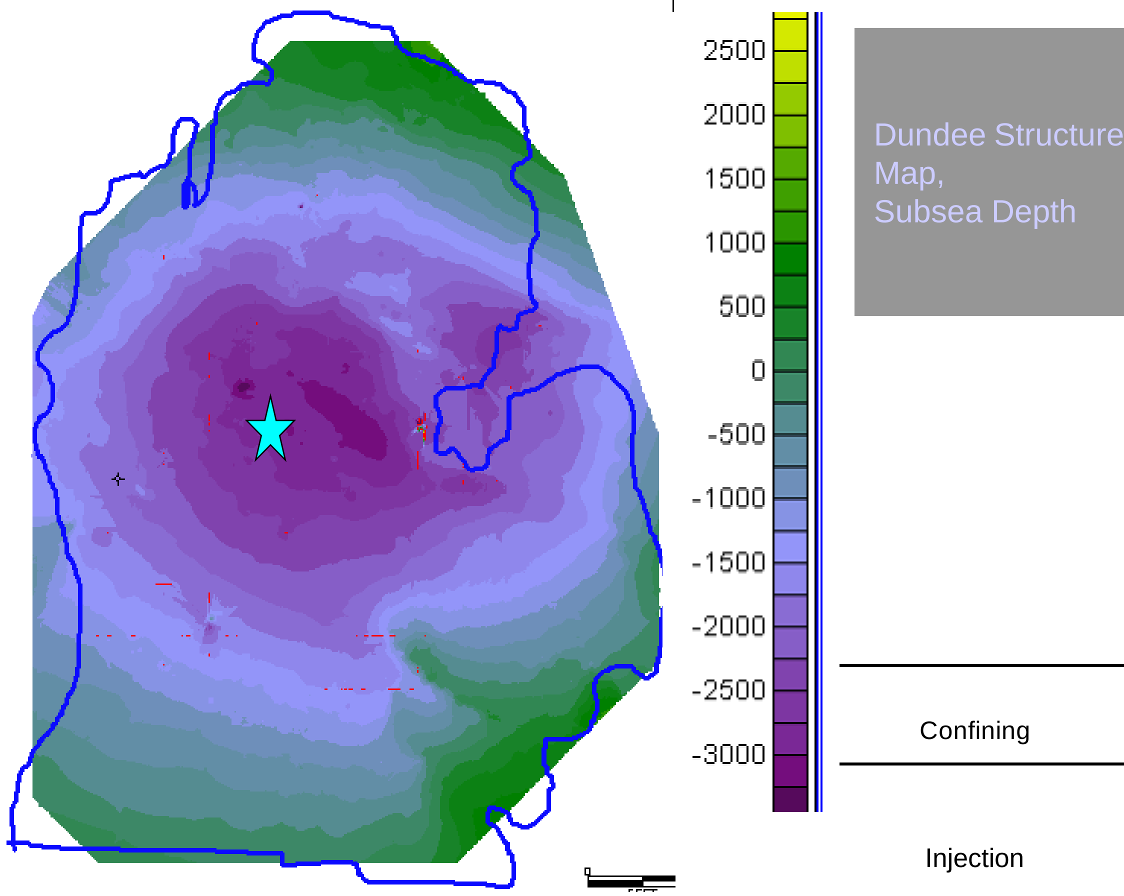
Reed City Dolomite Injection and Confining Interval Detail

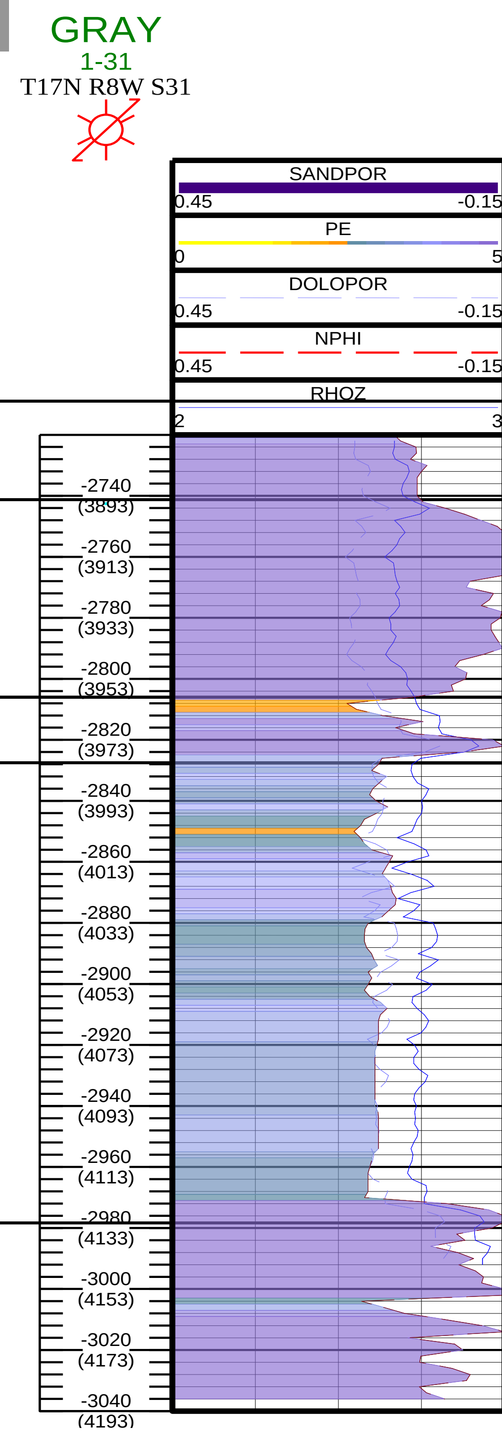


Measured Permeability In AOR

REED CITY DOLOMITE POROSITY AND PERMEABILITY

WELL	THICKNESS POROSITY	UNCORRECTED LIMESTONE POROSITY (%)	MEASURED PERMEABILITY (MILLIDARCIES)
Johnson 1-1	147	3.69	< 1
McClain 1-28	140	.4.365	7 *
Pilarski 1-12	140	5.6425	166
Ward 1-11	154.5	7.0925	250 **
Grein 2-36	156	8.64	- ***
Compton 1-13	156	10.0325	244 ****
Woodward 1-26	150	5.65	86.5*****
Thomas 1-26	164	5.65	86.5*****

*/ Drill stem test included 2 feet of porous Dundee Formation above the Reed City Dolomite.
**/ Calculated 362 md. Plots do not permit high precision, reduced to 250 md to be conservative.
***/ Drill stem test unreliable due to tool leakage.
****/ Drill stem test included 14 feet of porous Dundee Formation above the Reed City Dolomite.
*****/As reported on Class I Non Hazardous Re-applicaton from Step Rate Tests



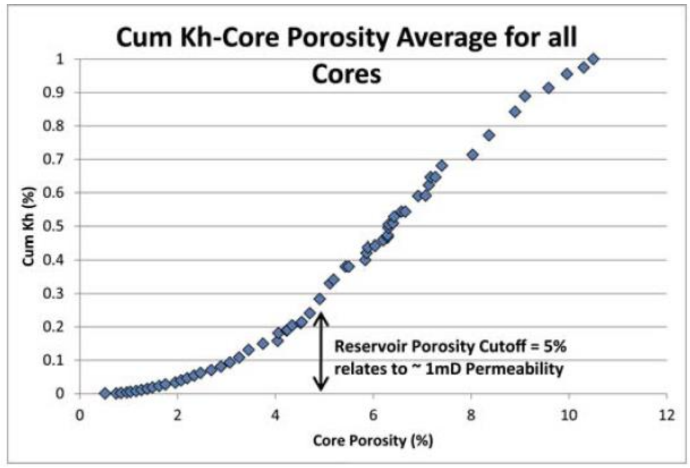
	Zone	Footage	Porosity	Permeability	Description
Confining	Bell Shale		0	0	Limestone, buff grey brown, f-micro crystaalin, argolicous, dololithic with grey shale
Injection	Dundee Limestone	60'	0-2%	<.1 md	Limestone, buff grey-brown, fine microcrystaline.
Injection	Reed City Anhydrite	10'	0	0	Anhydrite
Injection	Reed City Dolomite	150'	5-7%	50-100 md	Dolomite, brown, hard, medium to fine crystaline, succroustic, small sl argilicous, good inter crystaline porosity
Confining	Detroit River Anhydrite	60'	0	0	Minor dolomite, brown dark brown anhydrite with small brown limestone and grey-black shale. Anhydrite, white grey.

Figure C12. Showing (1) a geophysical type curve of the injection and confining horizons in the Reed City Doloimite from the Grey 1-31, located in the NW/4NW/4 Section 31 (2) the calculated porosity (3) the real observed and determined permeability from extensive drill stem analsyis and step fall-off tests as performed and reported immediately in the AOR (4) a structure map of the top of the Dundee Limestone in the entire state, as it relates to the AOR (5) real lithologic descriptions as observed by the wellsite geologist when drilling through the Fruendenberg 1-31, located in the NE/4NE/4 Section 31.

The Reed City Anhydrite, the micro-crystalline limestone of the Dundee Formation, and the Bell Shale, all above the proposed injection zone have virtually no porosity or permeability and serve as additional confining layers. Above the Belle Shale are multiple, tight, dense limestones, shales, and anhydrites, including the Antrim Shale, Ellsworth Shale, Sunbury Shale, and the Coldwater Shale for another approximate 3,000 before any USDW is encountered.

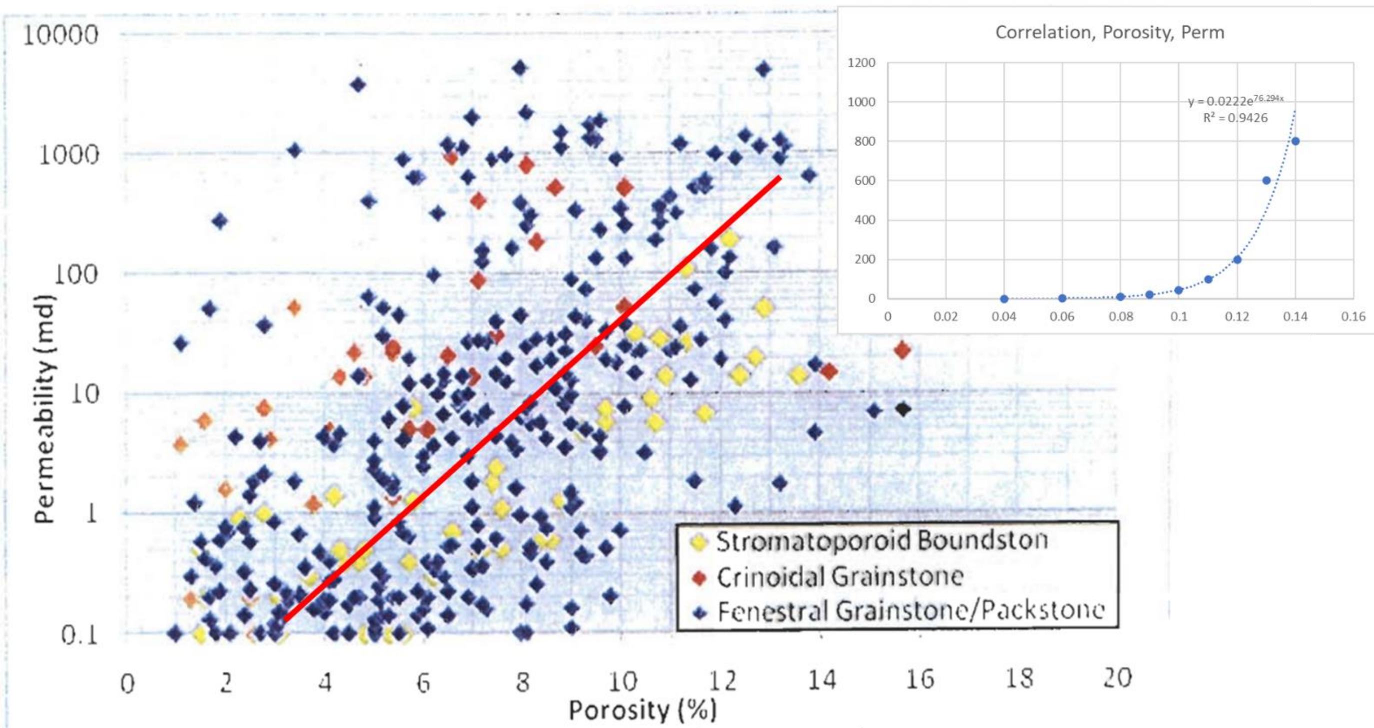
9.D Effective porosity of the injection zone including the method of determination.

Effective porosity has been identified by both direct and indirect methods. The Dundee formation (Reed City and Roger City Groups Included) has been extensively analyzed by direct porosity-permeability measurements throughout the Michigan Basin. While a direct correlation between the more limestone based Dundee and the more Dolomitezed Character of the Reed City Group may differ slightly, the effective porosity relationships provide reasonable rule of thumbs for the site specific Reed City Member at the proposed project location. The chart to the right is an excerpt from McClosky and Grammar (2018) that shows the cumulative Permeability-Porosity relationship from 26 cored wells through the Dundee formation in Gladwin County. The effective cutoff porosity was determined to be approximately 5.0%.

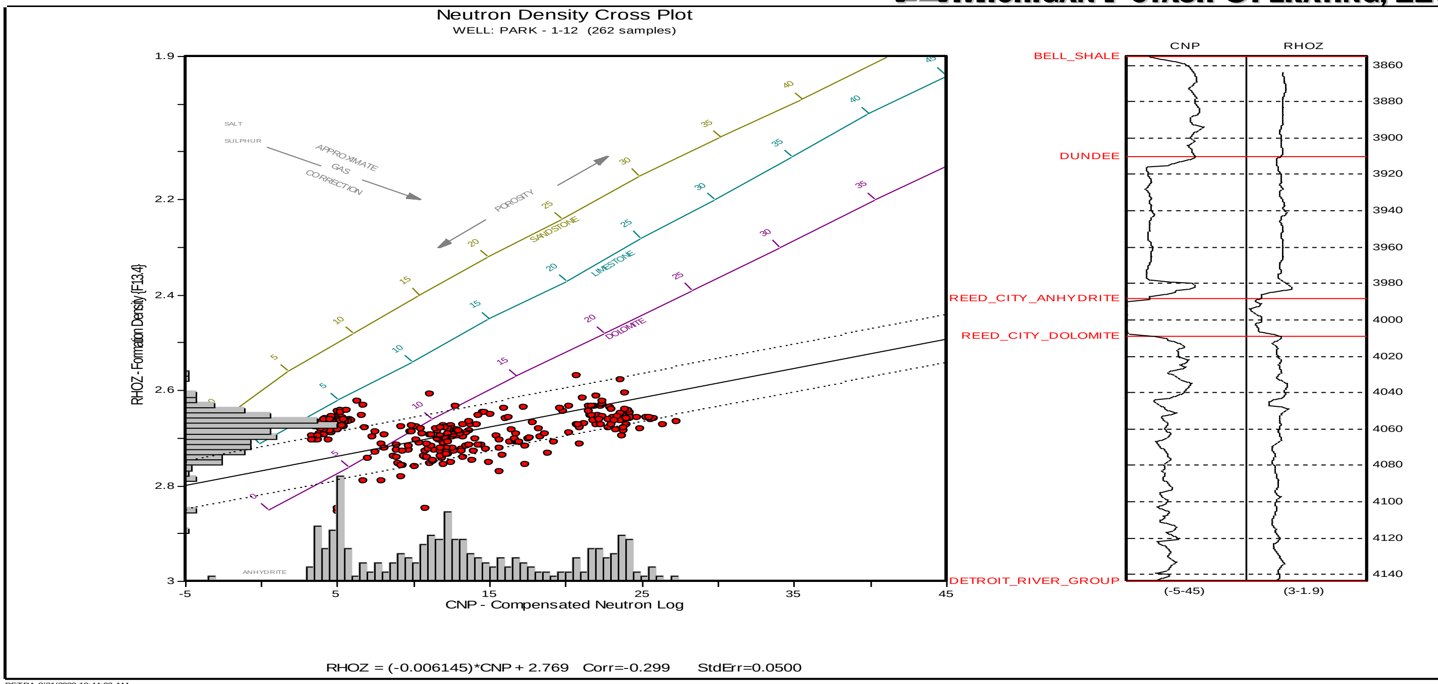


Cumulative permeability-feet percent (Cum Kh) versus core porosity average for all 26 wells with whole-core analysis reports. Average core porosity 0%–12% is located on x axis, and cumulative permeability-feet (decimal percent) 0–1 is on y axis. The inflection point occurs at 5% porosity and was used as a reservoir cutoff. This reservoir cutoff value may define economically producible hydrocarbons from noneconomical hydrocarbons.

This conclusion is similar to that of Abduslam (2012) where a similar analysis was performed on extensive direct measure Dundee cores throughout numerous location in the Michigan Basin. His correlation is shown below, and MPO has put a porosity-permeability relationship to the numerous analysis and has determine that the proper cuttoff also approximates 5.0% porosity, where permeability drops below 1 md.



A site specific porosity crossplot of the Netron Density and Bulk Density over the Park 1-12, which is the target toe locaiton of the Johnson 1-6D directional plan, demonstrates fully dolotimized Dundee in the Reed City Member, and high effective porosity. This would be indicative and corroborative of the high measured permeability via DST testing in the offset Ward 1-11 (>350 md), and the injection step rate testing in the Woodward and Thomas (>900 md).



The porosity permeability relationships demonstrate an increase in effective porosity and potential cutoffs of effective porosity. Net injection thicknesses have been determined provided the Reed City appears mostly ineffective below 5% porosity. These direct measurements of core have been utilized and applied to the indirect geophysical well log data. The effective porosity then, above the cutoffs, most likely approximates the true porosity, which has been calculated from the density log, as follows:

DPHI = (RHOMA - RHOB)/(RHOMA - RHOF).

A density of 2.87 is used in the calculation of true porosity from the bulk density log.

Effective porosity is net readily associated with the permeability increases; whereby the Porosity, Permeability relationship has been used similar to Abduslam, as follows:

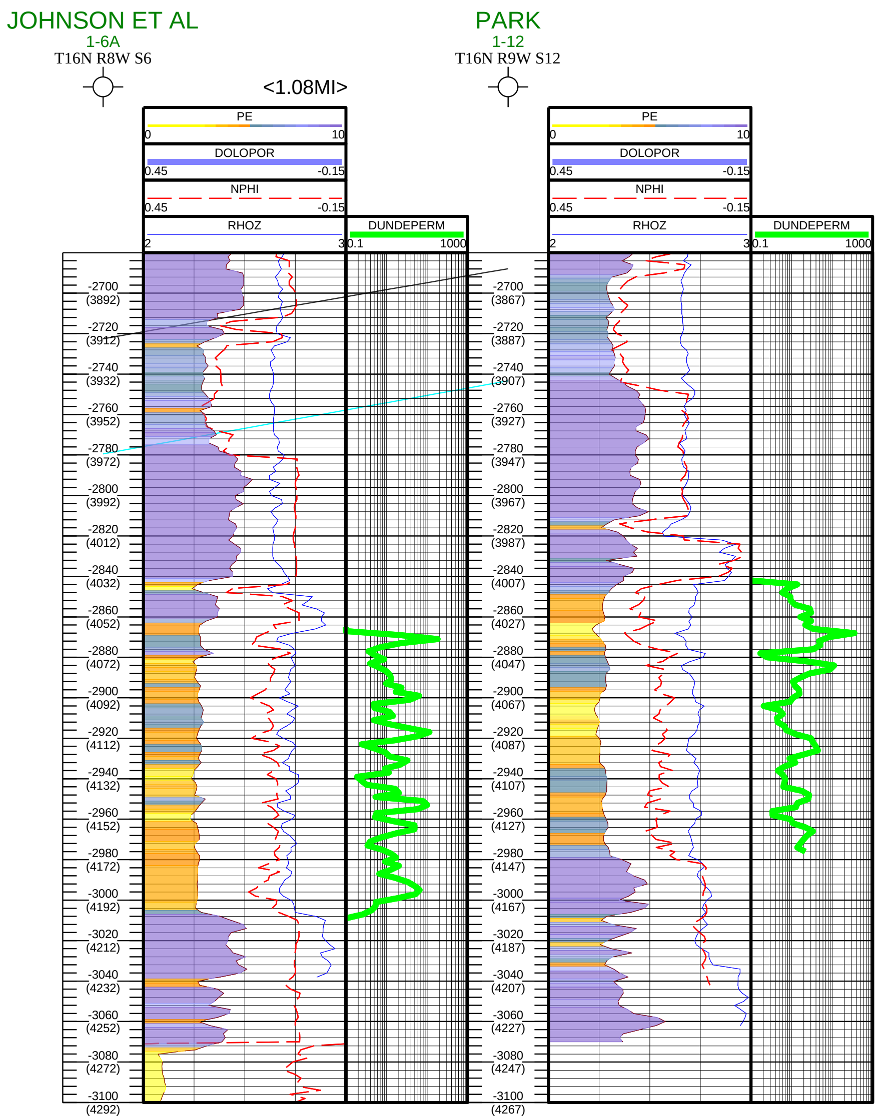
PERM=0.00222*EXP(76.294*DOLO TRUE POROSITY)

9.E Vertical and horizontal permeability of the injection zone and the method used to determine permeability. Horizontal and vertical variations in permeability expected within the area of influence.

Permeability has been identified by direct method via Klinkinberg permeability analysis on core throughout the Michigan Basin. These analysis have then been applied to the porosity permeability relationship of Abduslam (2012) as shown above via the following observed relationship expressed as follows:

The direct porosity permeability relationship in the Dundee/Reed City Member is expressed as follows:
Permeability = 0.00222* e^(76.294*porosity), (provided a 5% porosity cutoff).

Vertical permeability tends to be 1/10 of Horizontal permeability in most sedimentological applications. The direct core measurements of porosity permeability relationships applied to the calculated true porosity are shown below along the trace of the Johnson 1-6 lateral (from the Johnson 1-6 wellbore to the Park 1-12). The permeability correlations are verified by resistivity log separation and Caliper log indications of filter cake.



9.F The occurrence and extent of natural fractures and/or solution features within the area of influence.

The Reed City Dolomite is a dolotomized limestone, which maybe considered a solution feature. Its porosity is developed due to ancient migratory brines from deeper sandstone aquifers. There are otherwise, no known natural fractures or other solutions features that control injectivity performance, that the applicant is aware of.

9.G Chemical and physical characteristics of the fluids contained in the injection zone and fluid saturations.

The physical and chemical characteristics of the formation fluids have been gathered from the Ward 1-11 in the AOR is summarized as follows:

Property	Result
pH	5.5
Color	light brown
Specific gravity	1,2118
Specific conductance	94,000 microohms/crn @ 25°C
Viscosity	18 centipoise @ 23°C

Constituent	Concentration
Dissolved CO2	132 mg/1
Dissolved Oxygen	0.1 mg/l
Sulfide as H2S	<30 mg/1
Calcium	3,9%
Magnesium	0.59%
Potassium	1.6%
Sodium	5.9%
Barium	8 mg/1
Boron	57.5 mg/1
Cadmium	0.2 mg/1
Iron	<10 mg/1
Manganese	2.7 mg/I
Silica	2.4 mg/1
Strontium	0.14%
Bicarbonate	220 mg/l
Carbonate	<1 mg/1
Bromide	0.16%
Chloride	19%
Fluoride	0.4 mg/1
Iodide	28 mg/1
Nitrate	<0.1 mg/1
Sulfate	210 mg/1
Oil content	74 mg/1
Suspended solids	0.6%
Total dissolved solids	27%

The Reed City Dolomite porosity is saturated with a very briny formation fluid having over 320,000 mg/ liter total dissolved solids.

Fluid saturations would be 100% of porosity.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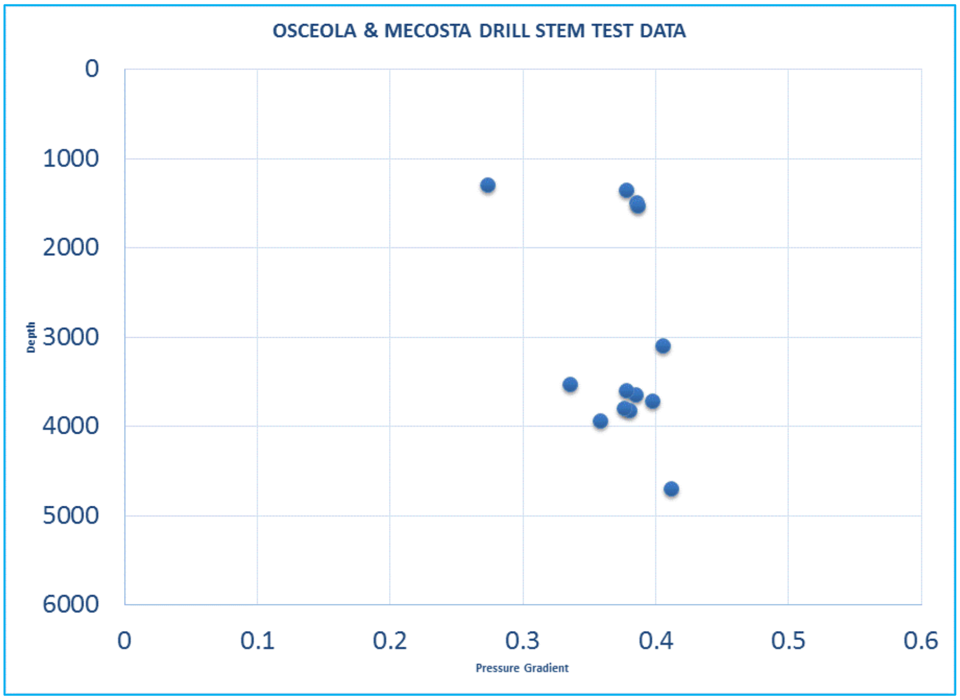
9.H The anticipated bottom hole temperature and pressure of the injection zone and whether these quantities have been affected by past fluid injection or withdrawal.

The following chart is actual well data pressure gradients experienced via drill stem testing in Osceola and Mecosta County Michigan between 0 and 6000' KB as compiled from AASG Geothermal Data. Pressure gradients are determined via the greater of initial shut in pressure or final shut in pressure divided by the top point of the test depth. Tabular data is also provided.



WellName	ZONE	GREATER OF ISIP/FSIP	Pressure Gradient	At Depth
Golupski, Cleo M Mrs1-22	Traverse Limestone	1253	**0.405764249**	3088.0
Lindell, Carl1	Dundee Limestone "Reed City zone"	1455	**0.380790369**	3821.0
Mott, Charles Stewart Foundation1	Michigan Formation "Stray sandstone"	575	**0.386165212**	1489.0
Leach1	Dundee Limestone	1401	**0.384995878**	3639.0
Johnson & State Rose Lake1-27	Traverse Limestone	1183.7	**0.335325779**	3530.0
HAMPLE, LAWRENCE & JANE ET AL	Stray	355	**0.273708558**	1297.0
HAMPLE, LAWRENCE & JANE ET AL	Reed city	1430	**0.376811594**	3795.0
HAMPLE, LAWRENCE & JANE ET AL	Richfield	1935	**0.411789742**	4699.0
PEDERSEN, PATTY ANN	Stray	511	**0.378238342**	1351.0
PEDERSEN, PATTY ANN	Dundee	1479	**0.39768755**	3719.0
BURRETT, LILA	Dundee	1360.4	**0.378309232**	3596.0
Seger	Dundee	1409	**0.358250699**	3933.0
Mott Foundation	Stray	590	**0.38637852**	1527.0

For injection pressure calculations, a conservative, normal pressure gradient of 0.433 psi/ft is adequate and has been reported on Form 7200-14. Additional injection pressure data will be obtained by site specific step rate injection testing.

A DST in the Grey 1-31 in the Richfield Detroit River Group from 4,700 to 5,030 opened with no blow a recovered only 480' of drilling fluid, corroborating a weakly, under pressured gradient just below the propositioned injection horizons. It is not anticipated that the Dundee has been affected by past fluid injection. There has been no historical withdrawal.

Measured bottom hole temperature is catalogued by numerous drilling logs in the area, and is 115 degrees F.

Historical pressure injection fall off tests performed between 2005 and 2016 on behalf of, or by the U.S. EPA and on the Thomas 1-26 and Woodward 1-26 has been compiled and surrendered to the regulatory authorities, and is shown below. These tests are specific to the Reed City Dolomite member of the Dundee Group.

Comparison of Prior Tests and Evaluations								
Thomas 1-26 and Woodward 1-26								
Date of Test	Well Name	Analyst	Inj. Rate, gpm	P_{final}, psi	P*, psi	k, md	S	Bound Dist, ft
3/19/2005	Thomas 1-26	Subsurface	337.1		2275.6	1315	-1.74	892?
3/19/2005	Thomas 1-26	USEPA, Steve Roy	337.1	2227		1232.3	-2	525
3/21/2006	Thomas 1-26	Subsurface	324.2		2294.4	1521	-1.5	918
3/21/2006	Thomas 1-26	USEPA, Gerrish	324.2	2205	2284	1394	-1.1	88
3/24/2007	Thomas 1-26	Subsurface	288.54		2250.6	1403	-2.09	920
3/24/2007	Thomas 1-26	USEPA, Patterson	288.54	2173		1567.6	4	386
8/12/2008	Thomas 1-26	Subsurface	128		2177.1	1510	-1.72	351-456?
8/12/2008	Thomas 1-26	USEPA, Simmons	128	2115		674.5	-2.6	248
8/3/2010	Thomas 1-26	Petrotek	n/a		2177.8	1291.9	-3.5	n/a
7/31/2012	Thomas 1-26	Brock Engineering	422		1974	383	-6.9	n/a
7/31/2012	Thomas 1-26	USEPA, Bill Bates	421.7	2165	2220	3954	-3	
7/24/2014	Thomas 1-26	Brock Engineering	255		2008	295	-6.7	n/a
7/24/2014	Thomas 1-26	USEPA, Steve Roy	255	2077.9	n/a	n/a	n/a	n/a
3/19/2005	Woodward 1-26	Subsurface	122		2126.8	410	16.4	774?
3/19/2005	Woodward 1-26	USEPA, Steve Roy	122	2250	2314.1	355.4	13.5	420
3/21/2006	Woodward 1-26	Subsurface	205		2316.4	516.7	2.27	692
3/21/2006	Woodward 1-26	USEPA, Patterson	205	2257		497.8	2	351
8/22/2007	Woodward 1-26	Subsurface	140		2191.4	491.6	4.14	n/a
8/22/2007	Woodward 1-26	USEPA, Gerrish	140	2144		n/a	n/a	n/a
8/5/2009	Woodward 1-26	Petrotek	105		2138.5	337	7.94	n/a
8/5/2009	Woodward 1-26	USEPA, J. Wawczak	105	2142	2176	290.8	4.9	n/a
8/3/2011	Woodward 1-26	Brock Engineering	124		2176	163	-8.7	n/a
8/3/2011	Woodward 1-26	USEPA, Greenhagen	124	2224.1	2254	428.4	5.3	
7/31/2013	Woodward 1-26	Brock Engineering	96.45		2136	118	-8.5	n/a
7/21/2015	Woodward 1-26	Brock Engineering	128.99		2105.2	691	-14.3	n/a

Historical pressure injection tests performed between 2005 and 2016 on behalf of, or by the U.S. EPA and on the Thomas 1-26 and Woodward 1-26 has been compiled and surrendered to the regulatory authorities, and is shown below. These tests are specific to the Reed City Dolomite member of the Dundee Group.

Average Measured Permeability (k) was measured as (k) 907 md. Pressure rise between 2005 and 2016 was not observed.

9.I Formation fracture pressure, the method used to determine fracture pressure and the expected direction of fracture propagation.

Historical injection tests have been made in the AOR by pumping treated water into the Reed City Dolomite at rates to 28 bbls (1,176 gallons) per minute at a surface pressure of 2,960 psi. After deduction of calculated friction losses of 38 psi within the well, the pressure at the top of the Reed City Dolomite, while injecting treated fresh water, was 4,647 psi. No parting or fracturing of the formation was noted, indicating the fracture pressure must be greater than 4,647 psi, with a top perf is at 3985'. For ease of reference, the offset data has been incorporated below. This observed data is similar to that data collected state wide by Region V EPA for the Dundee Formation where the average Formation Fracture Gradient is above 1.10. Site Specific information will be obtained via injection step rate testing.

Woodward 1-26:

II.2 Average and Maximum Injection Pressures

The maximum injection pressure has been set by permit at 2,576 psig for the Woodward 1-26 well.

Injection fluid may be water (specific gravity of 1.0) or a partially saturated sodium chloride/potassium chloride brine solution with a specific gravity as high as 1.2.

Previous documents submitted to the USEPA (*1995 Re-Permit Application (Attachment H-2 and Appendix A); 1984 Permit Application)* indicated a maximum injection pressure for water of 2,928 psi and for brine of 2,589 psi. This information was based upon previously conducted fracture testing at the top perforation of the injection zone (4,647 psi). A pressure gradient of 1.18 psi per foot was calculated.

Upon review of the previous ten years of operation records, the average injection pressure remains between 600 to 900 psi as stated in the previous *1995 Permit Re-Application.*

The Thomas 1-26:

H.2 Average and Maximum Injection Pressures

The maximum injection pressure has been set by permit at 2,533 psig for the Thomas 1-26 well.

Injection fluid may be water (specific gravity of 1.0) or a partially saturated sodium chloride/potassium chloride brine solution with a specific gravity as high as 1.2.

Previous documents submitted to the USEPA (*1995 Re-Permit Application (Attachment H-2 and Appendix A); 1984 Fenix & Scisson Permit Application)* indicated a maximum injection pressure for water of 2,928 psi and for brine of 2,589 psi. This information was based upon previously conducted fracture testing at the top perforation of the Reed City Dolomite injection interval (4,647 psi). A pressure gradient of 1.18 psi per foot was calculated.

Upon review of the previous ten years of operation records, the average injection pressure remains between 600 to 900 psi as stated in the previous *1995 Permit Re-Application.*

Utilizing this data, an estimate fracture pressure for the proposed well can be determined as follows:

Surface Pressure = 2,960

Final Fracture Pressure Gradient Values

In 1992 and 1993, the Region 5 Underground Injection Control Program public noticed draft and final values for fracture pressure gradients for specific oil fields in Michigan. These values were published in the *Federal Register* in three groups. The column headed "FRN" indicates in which *Federal Register* Notice the final fracture pressure gradient (FPG) value for each field was published. (Internet-accessible copies of the *Federal Register* do not go back this far, so these notices are not viewable over the Internet at this time.)

County	Field	Formation	Township/Range/Section	FPG (psi/ft)	FRN*
Bay	Kawkawlin	Dundee	T15N, R4E, S27, 28, 33, 34 and T14N, R4E, S3	1.23	3
Calhoun	Pennfield 35	Niagaran Reef	T1S, R7W, S35	0.60	1
Clare	Cranberry Lake	Richfield	T20N, R6W, S1, 2, 11, 12	1.10	1
	Hamilton	Richfield	T19N, R3W, S5-8 and T19N, R4W, S1, 2 and T20N, R4W, S35,36	1.06	2
Crawford/Kalkaska	Beaver Creek	Richfield	T25N, R5W, S12, 13, 24 and T25N, R4W, S7, 8, 16-21, 28, 29	1.07	1
Gladwin	Beaverton	Dundee	T17N, R2W, S19	1.11	3
	Bentley-Dundee	Dundee	T17N, R2E, S18, 19, 20	1.15	1
	Billings:				
	Billings 2 Unit	Dundee	T17N, R1E, S2, 3, 10, 11	1.12	1
	Billings-Bentley Unit		T17N, R1E, S12, 13 and T17N, R2E, S18		
	Grout	Richfield	T18N, R2W, S10, 11, 14, 15	1.05	3
Ingham	Aurelius 35	Niagaran Reef	T2N, R2W, S26, 35, 36	0.65	1
	Ingham 13	Salina-Niagaran	T2N, R1E, S13	0.76	1
	Onondaga 10	Salina-Niagaran	T1N, R2W, S2-4, 10, 11, 14	0.61	1
	Onondaga 21A	A-1 Carbonate (Salina)	T1N, R2W, S15-17, 21, 22	0.81	3
Isabella	North Wise	Dundee	T16N, R3W, S17	1.12	3
Kalkaska	Kalkaska "21"	Salina-Niagaran	T27N, R8W, S22	0.92	1
Lapeer	Richfield	Richfield	T10N, R10E, S21-23, 26-28, 33-35	1.09	3
Manistee	Manistee	Niagaran	T22N, R17W, S36	0.82	2
	Bear Lake	Niagaran	T23N, R15W, S12	0.58	3
Missaukee	Enterprise	Richfield	T23N, R4W, S18 and T23N, R5W, S10-14	1.10	2
	East Norwich	Richfield	T24N, R5W, S1-3, 9-16, 21, 22	1.14	2
	Falmouth	Richfield	T22N, R6W, S30, 31 and T22N, R7W, S25, 36	1.10	3
Ogemaw	Rose City:				
	Rose City Unit	Richfield	T23, 24N, R2E, S3, 19-21, 27-30, 32-35	1.07	1
	Rose City Central Unit		T24N, R1E, 2E, S25		
	Rose City West Unit		T24N, R1E, S21		
	West Branch:				
	West Branch Unit (excluding West Branch 28: see below)	Dundee	T21N, R2E, S2 and T22N, R2E, S21, 26, 27, 33-36 and all of S28 except the S/2 of the NW/4	1.15	2
	Country Club Unit		T22N, R1E, S13, 24 and T22N, R2E, S18-21, 29		
	West Branch 28	Dundee	T22N, R2E, S28, S/2 of NW/4	1.25	3
Otsego	Chester:				
	Chester 18 Unit	A1 Carbonate & Niagaran	T30N, R2W, S7, 8, 17, 18, 19, 20	0.99	1
	Chester 21 Unit		T30N, R2W, S21, 22	0.78	1
	Hayes:				
	Hayes 15 Unit	Salina-Niagaran	T29N, R4W, S15	0.67	1
	Hayes 21A Unit		T29N, R4W, S21, 28		
Roscommon	Headquarters:				
	Headquarters Unit	Richfield	T21N, R3W, S19, 29, 30	1.22	1
	Headquarters-Sour Unit		T21N, R3W, S29, 30, 32, 33		
	St. Helen	Richfield	T24N, R1W, S16, 19-21, 27-30	1.16	2
St. Clair	Columbus 3	Niagaran	T5N, R15E, S3, 10 and T6N, R15E, S34	0.79	1

*FRN = *Federal Register* Notice:

Ref. No.	Page	Date
1	*FR* 57 (247): 61084	12/23/92
2	*FR* 58 (224): 61910	11/23/93
3	*FR* 58 (240): 65711	12/16/93

Treated fresh water gradient = 0.433 psi/ft, where SG = 1.0
Top perf at 3985 ft

Surface Pressure + 0.433 psi/ft x depth – 14.7 = Bottom Hole Pressure

4,647 +0.433 psi/ft x 3985 – 14.7 = 4,685 psi

Fracture Gradient = 4,685psi/3985ft = 1.18 psi/ft

The current fracture gradient utilized on the permitted Thomas and Woodward is 1.17 psi/ft, and has been incorporated into EQP 7200-14. Site specific data will be obtained during step rate injection testing.

The expected direction of fracture propagation would be in the direction perpendicular to maximum stress. In the Michigan basin, maximum stress is North-Northeast to South-southwest, approximating 45 degrees. The direction of minimum stress then would be at 135 degrees, if any fracture propagation at all were to occur. It is highly unlikely.

***Form EQP 7400-14,** has been filed with a default 0.8 psi/ft fracture gradient as directed by regulatory direction from the U.S. EPA despite substantial offset data available. Upon completion of the wells, step rate injection testing will be performed to obtain site specific data that will match the offsets and expected operating parameters listed in this section are anticipated; with 1.17 psi/ft FRACTURE GRADIENT.*

9.J The vertical distance between the top of the injection zone from the base of the lowest fresh water strata.

The base of the glacial till is 638’ in the subject well. The top of the injection zone (Dundee Lime) is 4,050’. The top of the Belle Shale is 3917.

The distance between the top of the injection zone and the base of the lowest fresh water strata is 3,427’.

Please reference **Figure B1** for a graphical illustration and cross section through the area visually representing the above statement.

10 Information to characterize the proposed confining zone, including

A. The geological name of the stratum or strata making up the confining zone and the top and bottom depths of the confining zone.

B. An isopach map showing thickness and areal extent of the confining zone

C. Lithology, grain mineralogy and matrix cementing of the confining zone.

D. Effective porosity of the confining zone including the method of determination.

E. Vertical and horizontal permeability of the confining zone and the method used to determine permeability. Horizontal and vertical variations in permeability expected within the area of influence.

F. The occurrence and extent of natural fractures and/or solution features within the area of influence.

G. Chemical and physical characteristics of the fluids contained in the confining zone and fluid saturations.

H. Formation fracture pressure, the method used to determine fracture pressure and the expected direction of fracture propagation.

I. The vertical distance between the top of the confining zone from the base of the lowest fresh water strata.

J. Other information the applicant believes will characterize the confining zone.

A. The geological name of the stratum or strata making up the confining zone and the top and bottom depths of the confining zone.

Although the Bell Shale serves as first 'technically' names confining interval, the Dundee Limestone exhibit 50-60' of zero porosity above the Reed City Anhydrite, which also is a confining interval, and the targeted porosity intervals in the Reed City Group.

The Bell Shale top is 3915 and the Base is 3971 in the subject well.

B. An isopach map showing thickness and areal extent of the confining zone

Figure C13 is an isopach map of the Bell Shale showing the areal extent.

C. Lithology, grain mineralogy and matrix cementing of the confining zone.

The Belle shale is was described in the subject well as a shale, grey, blue, non-calcareous interval.

D. Effective porosity of the confining zone including the method of determination.

There is no effective porosity in the confining interval given it is a shale. This has been verified via well logs.

E. Vertical and horizontal permeability of the confining zone and the method used to determine. Horizontal and vertical variations in permeability expected within the area of influence.

Provided the Bell Shale is a shale, there is no to little permeability or porosity in the confining interval. There is no anticipated variation then, in the area of influence.

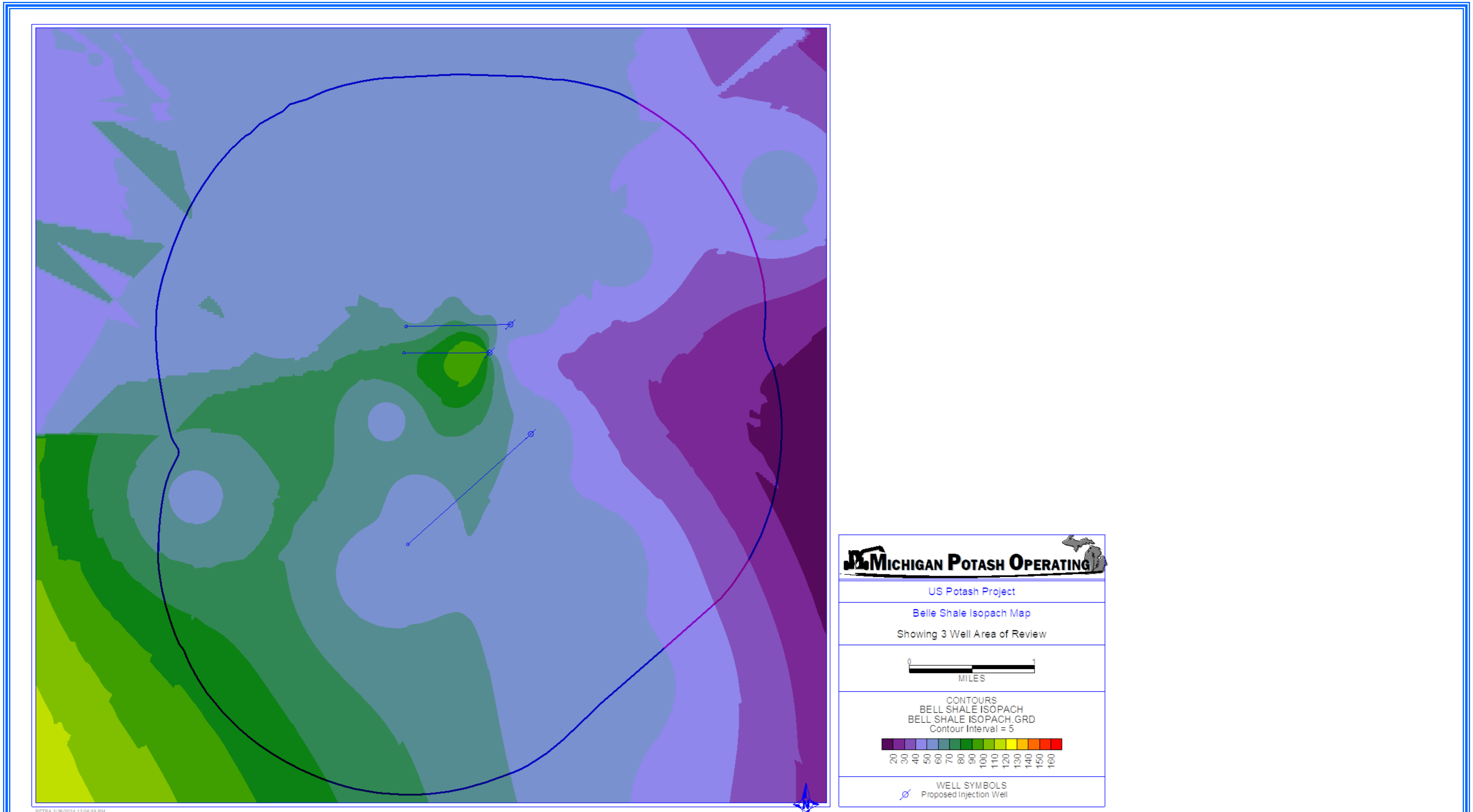


Figure C13. An isopach map of the Belle Shale.

F. The occurrence and extent of natural fractures and/or solution features within the area of influence.

There are no known natural fractures or solution features within the confining zone, either observed via indirect or direct methods.

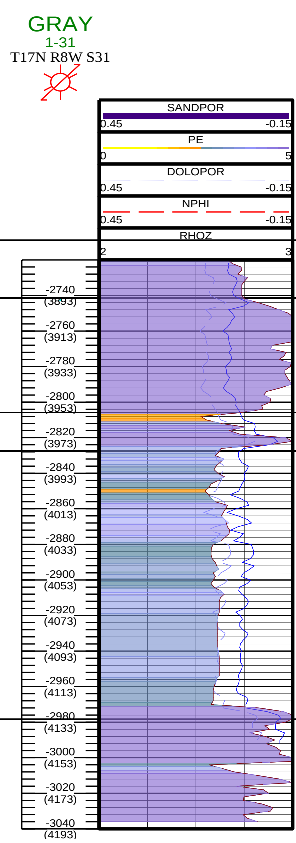
G. Chemical and physical characteristics of the fluids contained in the confining zone and fluid saturations.

Any porosity encountered above the injection horizons is sporadic, thin, and immediately interlayered with confining anhydrites, dolomites, cherts, or limestones, which will render data collection near impossible, impractical, or dangerous. Provided this is a shale, fluids will not flow and they can not be recovered.

H. Formation fracture pressure, the method used to determine fracture pressure and the expected direction of fracture propagation.

The high differential rock properties, (young modulus, Poisson's ratio and fracture toughness) associated with the Bell Shale, but also the dense limestone just below it in the Upper Dundee Lime, which actually serves as the principle confining interval, and just above it in the lower Traverse lime; there should be reasonable assurance that the confining interval will not be inadvertently fractured, provided the substantially greater permeable character of the Reed City Dolomite member of the Dundee. In the event fracture were to occur, theoretically, it would occur under the same conditions and directions as those described for the injection horizon.

At the direction of regulatory, a very conservative fracture gradient of 0.8 psi/foot has been applied to the Bell Shale. It should be well noted and understood that the confining interval actually the Dundee Lime, in the Dundee Group; which is above the Reed City Anhydrite, which also serves as a confining interval. Measured fracture gradients of the injection interval (Reed City Dolomite) are substantially above the recommended 0.80 psi/foot gradient suggested by regulatory default (at measured 1.17 in the AOR).



	Zone	Footage	Porosity	Permeability	Description
Confining	Bell Shale		0	0	Limestone, buff grey brown, f-micro crystaalin, argolicous, dololithic with grey shale
Confining	Dundee Limestone	60'	0-2%	<.1 md	Limestone, buff grey-brown, fine microcrystaline.
Confining	Reed City Anhydrite	10'	0	0	Anhydrite
Injection	Reed City Dolomite	150'	5-7%	50-100 md	Dolomite, brown, hard, medium to fine crystaline, succroustic, small sl argilicous, good inter crystaline porosity
Confining	Detroit River Anhydrite	60'	0	0	Minor dolomite, brown dark brown anhydrite with small brown limestone and grey-black shale. Anhydrite, white grey.

I. The vertical distance between the top of the confining zone from the base of the lowest fresh water strata.

The top of the Bell Shale is at 3915. The base of the lowermost fresh water source is 638.

The vertical distance between the top of the confining zone from the base of the lowest fresh water strata is 3,277.

Please see Figure B1 for a graphical representation of this statement.

11 Information demonstrating injection of liquids into the proposed zone will not exceed the fracture pressure gradient and information showing injection into the proposed geological strata will not initiate fractures through the confining zone. Information showing the anticipated dispersion, diffusion and/or displacement of injected fluids and behavior of transient pressure gradients in the injection zone during and following injection.

Please see Section EGLE BRINE DISPOSAL WELL CHECKLIST ITEM 2, where pressure wave data based on the laws of transient pressure and fluid dispersion given real observed subsurface rock parameters was provided.

Pressure transient and injectivity, step rate data will be performed, while being witnessed by the US EPA and/or EGLE in the step rate analysis.

There is also legacy data available within the AOR for Non-Hazardous Class I wells currently injecting in the into the Reed City Dolomite, which is summarized below, in expectation that measurements at the proposed locations may be similar. The following is a summary of data from historical reports, also for reference.

	Woodward 1-26	
Parameter	2005	2006
Permeability (k)	410 md	516.7 md
Perm-thick product (kb)	61,090 md-ft	76,988 md-ft
Skin factor (s)	16.4	2.27
Pressure change due to skin (Δp_{skin})	158.9 psi	29.22 psi
Flow efficiency (E)	0.36	0.80

Results of the pressure transient testing indicated the Woodward 1-26 well is positioned between parallel no-flow boundaries. A radial flow model with the Woodward 1-26 well positioned between parallel no-flow boundaries was utilized to evaluate the pressure transient data.

Please also see Section EGLE BRINE DISPOSAL WELL CHECKLIST ITEM 9.I which utilizes real injection step rate testing that was initiated in the offset Class I Disposal wells, the Thomas and the Woodward, where actual data was deployed to demonstrate that the injection rates did not, and still do not, initiate fractures under current regulatory observation. Also, please see ELGE BRINE DISPOSAL WELL CHEKCLIST ITEM 9.H. for transient fall off testing results.

The proximity of multiple wells enables the possibility of observation and interference testing. Therefore, while one well is undergoing a step rate injection test, or injection volume, the offset well will be utilized as an observation well, allowing additional information as it concerns the proposed injection horizons and injectivity. This can be done for all injection horizons provided proper planning once injection is established. The procedures for estimating reservoir reaction to injected fluid are made by determination of the porosity, permeability, thickness, extent, and pressure of the reservoir. Formation samples and cores, geophysical logs, and drill stem tests, and observation of pressures between two points enables a analysis of reservoir extent by comparing and deducing this data.

12 Proposed operating data including all of the following data

A. The anticipated daily injection rates and pressures.

B. The types of fluids to be injected.

C. A plan for conducting mechanical integrity tests.

12.A The anticipated daily injection rates and pressures.

At any given time, disposal may occur to a single well or to all applicant wells simultaneously, thereby reducing or changing the injected rate and volume per well. Maximum total project rates are not expected to exceed the following rates. It is more likely than not, that injection pressures, or injection volumes will be the limiting threshold. The horizontal character of the proposed wellbore designs should enable high injection rates due to high reservoir surface area exposure.

Maximum, instantaneous injection rates have been incorporated into Form EQP 7200-14 as though all volumes would be sent to a singular well. Step rate injection data must suggest this singular wellbore is able to accommodate such volume.

Anticipated Injection rates:

Average Rate	Maximum Rate	Average Volume	Maximum Volume
Bpm	bpd	Bpd	bpd
9.5	27.85	13,680	40,104

All proposed injection zones are under-pressured in the area, with an anticipated pore pressure gradient of 0.41 psi/ft or less, but maybe as high as 0.55 psi/ft based on offset falloff data. Open hole logs suggest good injectivity within the horizontal leg of the proposed Dundee.

Reed City Dolomite injection in the AOR over the previous ten years of operation demonstrates an average injection pressure into the Reed City Dolomite of 900 psi. This is reported regularly and summarized in re-application permits by the owner and operator of MI-133-1I-0002 and MI-133-1I-0001. These wells are injecting into the same Reed City Dolomite horizon as is proposed by Michigan Potash Operating. It is logical and expected that similar rates and pressures will be observed. MI-133-1I-0002 and MI-133-1I-0001 have under gone fracture testing in the AOR in the Reed City Dolomite. Injection tests were made by pumping treated water in the Reed City Dolomite at rates up to 1,176 gallons per minute at a surface pressure of 2,960 psi. After deduction of calculated friction loses of 38 psi within the well, the pressure at the top of the Reed City Dolomite, while injected treating fresh water was 4,647 psi. No parting or fracturing of the formation was noted, indicated the fracture pressure must be greater than 4,647 psi. A pressure gradient of 1.18 psi per foot was calculated. No further attempts were made to facture the injection zone (Please see section 9.I).

This is typical of the Dundee, which has fracture gradients in typically in excess of 1.10 (EPA Michigan Field Fracture Gradients by County), included below for ease of reference.

The permitted maximum injection pressure for the Thomas 1-26 well and Woodward 1-26 well is 2,393 psi and 2,453 psig respectively. Both are in the immediate vicinity of the applicant wells, into the same horizon, and up structure.

If capable, MPO proposes operating the disposal wells at higher pressure to obtain greater, more efficient disposal capacity than that currently sought at the offset operation operating at 900 psi. Based on available data, the following operating pressures are expected.

The applicant will seek step rate injection testing to increase and establish its operating parameters to match those experienced by precident disposal wells operating in the Area of Review.

Average Pressure psi	Maximum Pressure psi
1,700	2,490

Injection fluid may be water (specific gravity of 1.05) or a partially saturated sodium chloride/potassium chloride brine solution with a specific gravity of up to 1.20, with a safety factor of 0.05 applied to operating conditions.

[{1.17 psi/ft - (0.433 psi/ft x specific gravity)} x depth] - 14.7 psi =

[{1.17 psi/ft - (0.433 psi/ft x 1.25)} x 3985 ft] - 14.7 psi =

2490 psi.

Form EQP 7400-14, *has been filed with a default 0.8 psi/ft fracture gradient as directed by regulatory direction from the U.S. EPA despite substantial offset data available. Upon completion of the wells, step rate injection testing will be performed to obtain site specific data that will match the offsets and expected operating parameters listed in this section are anticipated; with 1.17 psi/ft FRACTURE GRADIENT.*

12.B The types of fluids to be injected

The waste stream injected into the proposed Class I Non Hazardous injection wells are non-hazardous brines (salt water) generated by the simple processing of food grade salt utilized on dinner tables across the world, Sodium Chloride (NaCl), i.e. table salt or “salt”, and potassium chloride (KCl) “potash”, which is a natural, food safe fertilizer, applied to staple crops for food generation and consumption.

Salt and potash brine is sent to a natural gas fired evaporator, which concentrates the salt and potash water. The concentration of the water, crystallizes the salt from solution, and increases the concentration of the potash in the water. The water is then sent to potash crystallization processes, where temperature contrasts crystallize the potash from the water. The remaining water is recycled back for injection, or in the case of excess water, is sent to Class I wells.

The facility is a food grade facility, and therefore, no hazardous, or non-naturally occurring materials are introduced into the system.

There may be traces of sodium hydroxide, that is used in stripping naturally occurring H_2S from the brine that comes from the salt and potash bearing formation (Salina A1). Pump packing seal water (<10gpm), and a bleed system (<10gpm) containing some sodium bisulfite may be added to the injection stream.

Class III wells under Area Permit MI-133-3G-0028, is the source of non-commerical, non-hazardous feed brine to the facility, and at times, to the proposed disposal wells. The field name has been dubbed the US Potash Project, Evart, MI.

Please also see Section EGLE Brine Disposal Checklist Item 8.

12.C A Plan for Mechanical Integrity Tests

All required logs will be run at before any perforations are added to the casing and before fluid injection commences.

The mechanical integrity of all the proposed injection wells will be tested according to the requirements of 40 CPR 146.8 to demonstrate that (1) there are no significant leaks in the casing, tubing, or packer and (2) there is no significant fluid movement into a USDW through vertical channels adjacent to the injection wellbores. As required by permit, mechanical integrity tests shall be conducted at the required frequency, and especially before any injection commences. The timing of these test shall be dictated according to pro-active best practice.

Required tests include:

1) an approved pressure test in accordance with 40 CFR 146.8(b)(1) [annually];

2) an approved radioactive tracer survey [every five years]; and

3) an approved temperature, noise, oxygen activation or other approved log [every five years];

or 1,2, & 3 above as otherwise directed by permit.

Gauges used in performance of the MIT will be calibrated to an accuracy of not less than 0.5 percent of fullscale prior to field use. A copy of the calibration certificate will be submitted to USEPA each time the gauge is calibrated.

Notice will be made to the EGLE at least thirty days prior to the date of the schedule MIT. Tests must be witnessed by a representative of the USEPA and/or EGLE. A written report of the results of the MIT will be made to the EGLE within 45 days following completion of the MIT.

Brine is transmitted through the wells in tubing suspended from the wellhead and extending to a point near the top of the receiving formation. At or near the bottom of the tubing, the annulus between the tubing and the cemented casing is sealed with a packer; thus, the entire annulus from the wellhead to the packer is sealed off from the injected brine. The annulus is filled with an inhibited brine to a point slightly below the freeze line where the remainder of space is filled with oil. The annulus pressure is maintained to hold 20 psi at all times at surface and is monitored with a continuously recording pressure gauge.

If mechanical integrity was compromised the annulus fluid pressure would change and any change would be immediately detected by a change in the annulus pressure. If the injection tubing or packer developed a leak, a change in the annulus pressure would develop and would also be immediately detected by the continuously recording pressure gauge. In either case, investigative and remedial action would be promptly taken to replace or repair the part damaged following immediate notification and contingent operating procedures.

The multiple well application allows for an excess of disposal capacity and optionally to allow for system upsets, emergency shut-in, and contingent disposal capacity.

If failure were to occur to one well, that well would be shut-in immediately, and the entire disposal flow would be directed to the other well(s). If necessary , flow rates would be reduced as needed to remain below permitted injection pressure limits.

13 For a proposed disposal well to dispose of waste products into a zone that would likely constitute a producing oil or gas pool or natural brine pool, a list of all offset operators and certification that the person making application for a well has notified all offset operators of the person's intention by certified mail. If within 21 days after the mailing date an offset operator files a substantive objection with the supervisor, then the application shall not be granted without a hearing pursuant to part 12 of these rules. A hearing may also be scheduled by the supervisor to determine the need or desirability of granting permission for the proposed well.

The proposed injection horizons are not in a producing oil or gas pool or natural brine pool.

14 A proposed plugging and abandonment plan

The Plug and Abandonment has been proposed as follows:

1. POOH with 4 ½" packer and injection string.
2. Unsting from 7" stinger and POOH with 7" string.
3. PU and RIH with Cement Retainer. Set at 2250', just above stinger.
4. MIRU cement and pump SX Cement (calc 50 SX past shoe).
5. Leave 30' over cement retainer.
6. Perforate 9 5/8" casing at 2120 with 1' squeeze guns.
7. RIH with cement retainer. Establsih circulation and cement 9 5/8" to surface.
8. Pull off retainer. And Cement 9 5/8" to surface.
9. Place 10 SX at surface.
10. Cut and cap.

Proposed Plugged Wellbore Diagram.

JOHNSON ET AL 1-6

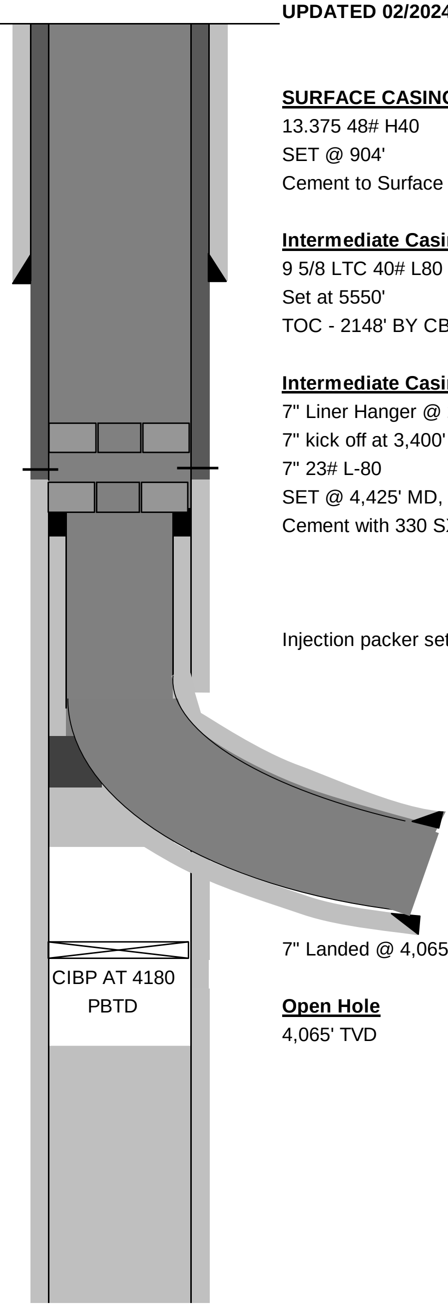
SURFACE: 43.805767, -85.321836
BOTTOM: 43.792777, -85.341280
MECOSTA COUNTY, MI

PROPOSED P&A WELLBORE DIAGRAM

GL @ +/-1,175'

UPDATED 02/2024 BY TAP

Geological Zone	TVD	MD
Quaternary H	0	0
Quaternary G	93	93
Quaternary F1	154	154
Quaternary F	182	182
Quaternary E	346	346
Quaternary E/1	432	432
Quaternary D	509	509
Jurrasic Red Beds	638	638
Michigan	1318	1318
Marshall Sandstone	1762	1762
Coldwater Shale	1938	1938
Antrim Shale	2681	2681
Traverse Formation	3329	3329
Bell Shale	3913	3913
Dundee	3971	3971
Reed City Dolomite	**4050**	**4050**
Detroit River Group	4202	
Amherstburg	4797	
Sylvania Sand Stone	**5218**	



SURFACE CASING
13.375 48# H40
SET @ 904'
Cement to Surface

Intermediate Casing
9 5/8 LTC 40# L80
Set at 5550'
TOC - 2148' BY CBL

Intermediate Casing 2
7" Liner Hanger @ 2300' with seal assembly
7" kick off at 3,400' with whipstock
7" 23# L-80
SET @ 4,425' MD, 4,065' TVD
Cement with 330 SX Class A, 1.18 ppg

Injection packer set in Bell shale 3915' TVD, ~4003' MD

7" Landed @ 4,065'

Open Hole
4,065' TVD

15 Identify the source or sources of proposed injected fluids. Identify if injected fluids will be considered hazardous or non-hazardous as defined by Part 111, Hazardous Waste Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA)

Please see EGLE Brine Disposal well Checklist Item 8.

The waste stream injected into the proposed Class I Non Hazardous injection wells are non-hazardous brines (salt water) generated by the simple processing of food grade salt utilized on dinner tables across the world, Sodium Chloride (NaCl), i.e. table salt or "salt", and potassium chloride (KCl) "potash", which is a natural, food safe fertilizer, applied to staple crops for food generation and consumption.

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The facility is a food grade facility. No hazardous materials as defined by Part 111 of Act 451 are anticipated.

16 Whether the well is to be a multisource commercial hazardous waste disposal well.

The well is expressly NOT a multisource commercial well and is expressly not a hazardous waste disposal well.