REGION 5

CHICAGO, IL 60604

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
UNDERGROUND INJECTION CONTROL PERMIT: CLASS I NON-HAZARDOUS

Permit Number: MI-133-1I-0009
Facility Name: MPC 8D

Pursuant to the provisions of the Safe Drinking Water Act, as amended 42 U.S.C. §§300f et seq., (commonly known as the SDWA) and implementing regulations promulgated by the U.S. Environmental Protection Agency (EPA) at Parts 124, 144, 146, and 147 of Title 40 of the Code of Federal Regulations (40 C.F.R.),

Michigan Potash Operating, LLC of Denver, Colorado

is hereby authorized to construct and operate a new Class I non-hazardous injection well located in Osceola County, Michigan, T17N, R8W, Section 31, SE Quarter Section, for injection into the Dundee Limestone at depths between 3945 and 4080 feet relative to ground level, upon the express condition that the permittee meet the restrictions set forth herein. The injection of any hazardous waste as identified in 40 C.F.R. Part 261 is prohibited. Injection shall not commence until the operator has received authorization in accordance with Part I(J) of this permit.

All references to Title 40 of the Code of Federal Regulations are to all regulations that are in effect on the date that this permit becomes effective. The following attachments are incorporated into this permit: A, B, C, D, E, F, G, and H.

This permit shall become effective on _____, and shall remain in full force and effect during the life of the permit, unless this permit is revoked and reissued, terminated, or modified pursuant to 40 C.F.R. §§144.39, 144.40, or 144.41. The permit will expire in one year if the permittee fails to commence construction, unless a written request for an extension of this one-year period has been approved by the Director. The permittee may request an expiration date sooner than the one-year period, provided no construction on the well has commenced. The permittee shall notify the Director at least 30 days before commencing construction of the injection well.

This permit and authorization to inject shall expire at midnight on _____, unless terminated prior to the expiration date.

Signed and Dated:_____

DRAFT

Tera L. Fong
Director, Water Division

PART I
GENERAL PERMIT COMPLIANCE

A. EFFECT OF PERMIT

The permittee is allowed to engage in underground injection in accordance with the conditions of this permit. Notwithstanding any other provisions of this permit, the permittee authorized by this permit shall not construct, operate, maintain, convert, plug, abandon, or conduct any other injection activity in a manner that allows the movement of injection, annulus or formation fluids into underground sources of drinking water (USDWs). The objective of this permit is to prevent the introduction of contaminants into USDWs if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 C.F.R. Part 141 or may otherwise adversely affect the health of persons. Any underground injection activity not specifically authorized in this permit is prohibited. For purposes of enforcement, compliance with this permit during its term constitutes compliance with Part C of the Safe Drinking Water Act (SDWA). Such compliance does not constitute a defense to any action brought under Section 1431 of the SDWA, or any other common or statutory law other than Part C of the SDWA. Issuance of this permit does not convey property rights of any sort or any exclusive privilege; nor does it authorize any injury to persons or property, any invasion of other private rights, or any infringement of State or local law or regulations. Nothing in this permit shall be construed to relieve the permittee of any duties under applicable regulations.

B. PERMIT ACTIONS

1. **Modification, Revocation and Reissuance, and Termination** - The Director of the Water Division of the United States Environmental Protection Agency (EPA), hereinafter, the Director, may modify, revoke and reissue, or terminate this permit in accordance with 40 C.F.R. §§ 144.12, 144.39, and 144.40. Also, the permit is subject to minor modifications as specified in 40 C.F.R. § 144.41. The filing of a request for a permit modification, revocation and reissuance, or termination, or the notification of planned changes, or anticipated noncompliance on the part of the permittee does not stay the applicability or enforceability of any permit condition.

2. **Transfer of Permits** - This permit is not transferable to any person except in accordance with 40 C.F.R. §144.38.

C. SEVERABILITY

The provisions of this permit are severable, and if any provision of this permit or the application of any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

D. CONFIDENTIALITY

In accordance with 40 C.F.R. Part 2, Subpart B and 40 C.F.R. § 144.5, any information submitted to the EPA pursuant to this permit may be claimed as confidential by the submitter. Any such claim must be asserted at the time of submission by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, the EPA may make the information available to the public without further notice. If a claim is asserted, the information covered by such a claim will be disclosed by EPA only to the extent, and by means of the procedures set forth in 40 C.F.R. Part 2, Subpart B. Claims of confidentiality for the following information will be denied:

1. The name and address of the permittee; and

2. Information which deals with the existence, absence or level of contaminants in drinking water.

E. DUTIES AND REQUIREMENTS

1. **Duty to Comply** - The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Safe Drinking Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application; except that the permittee need not comply with the provisions of this permit to the extent and for the duration such noncompliance is authorized by an emergency permit issued in accordance with 40 C.F.R. § 144.34.

2. **Penalties for Violations of Permit Conditions** - Any person who violates a permit requirement is subject to civil penalties, fines and other enforcement action under the SDWA. Any person who willfully violates permit conditions may be subject to criminal prosecution.

3. **Continuation of Expiring Permits**

   (a) **Duty to Reapply** - If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must submit a complete application for a new permit at least 180 calendar days before this permit expires.

   (b) **Permit Extensions** - The conditions of an expired permit may continue in force in accordance with 5 U.S.C. 558(c) and 40 C.F.R. § 144.37.

   (c) **Effect** - Permits continued under 5 U.S.C. 558(c) and 40 C.F.R. § 144.37 remain fully effective and enforceable.

   (d) **Enforcement** - When the permittee is not in compliance with the conditions of the expiring or expired permit, the Director may choose to do any or all of the following:

(1) Initiate enforcement action based upon the permit which has been continued;

(2) Issue a notice of intent to deny the new permit. If the permit is denied, the owner or operator would then be required to cease the activities authorized by the continued permit or be subject to enforcement action for operation without a permit;

(3) Issue a new permit under 40 C.F.R. Part 124 with appropriate conditions; or

(4) Take other actions authorized by the UIC regulations.

(e) **State Continuation** - An EPA-issued permit does not continue in force beyond its expiration date under Federal law if at that time a State has primary enforcement responsibility under the SDWA. A State authorized to administer the UIC program may continue either EPA or State-issued permits until the effective date of the new permits, if State law allows. Otherwise, the facility or activity is operating without a permit from the time of expiration of the old permit to the effective date of the State-issued new permit. Furthermore, if the State does not continue the EPA permit upon obtaining primary enforcement responsibility, the permittee must obtain a new State permit or be authorized to inject by State rule. Failure to do so while continuing to operate the well constitutes unauthorized injection and is a violation subject to enforcement action.

4. **Need to Halt or Reduce Activity Not a Defense** - It shall not be a defense for the permittee in an enforcement action to claim that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

5. **Duty to Mitigate** - The permittee shall take all timely and reasonable steps necessary to minimize or correct any adverse impact on the environment resulting from noncompliance with this permit.

6. **Proper Operation and Maintenance** - The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control and related appurtenances which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of this permit.

7. **Duty to Provide Information** - The permittee shall furnish to the Director, within a time specified, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine

compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

8. **Inspection and Entry** - The permittee shall allow the Director or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

(a) Enter, at reasonable times, upon the permittee's premises where a regulated facility or activity is located or conducted, or where records are kept under the conditions of this permit;

(b) Have access to and copy, at reasonable times, any records that are kept under the conditions of this permit;

(c) Inspect, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

(d) Sample or monitor, at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the SDWA, any substances or parameters at any facilities, equipment or operations regulated or required under this permit.

9. **Records**

(a) The permittee shall retain records and all monitoring information, including all calibration and maintenance records and all original chart recordings for continuous monitoring instrumentation and copies of all reports required by this permit for a period of at least three years from the date of the sample, measurement or report, unless these materials are submitted to the Director as part of reporting requirements under this permit.

(b) The permittee shall maintain records of all data required to complete the permit application form for this permit and any supplemental information submitted under 40 C.F.R. §§ 144.27, 144.28, and 144.31 for a period of at least three years from the date the permit application was signed.

(c) The permittee shall retain records concerning the nature and composition of all injected fluids until three years after the completion of plugging and abandonment of this injection well.

(d) The retention period specified in Part I(E)(9)(a) through (c) of this permit may be extended by request of the Director at any time. The permittee shall continue to retain records after the retention period specified in Part I(E)(9)(a) through (c) of this permit or any requested extension thereof expires unless the permittee delivers the records to the Director or obtains written approval from the Director to discard the records.

(e) Records of monitoring information shall include:

(1) The date, exact place, and time of sampling or measurements;

(2) The name(s) of individual(s) who performed the sampling or measurements;

(3) A precise description of both sampling methodology and the handling of samples;

(4) The date(s) analyses were performed;

(5) The name(s) of individual(s) who performed the analyses;

(6) The analytical techniques or methods used; and

(7) The results of such analyses.

10. **Monitoring** - Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. The permittee shall use the methods described in "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" (SW-846 available on EPA's website), or equivalent methods approved by the Director, to take representative samples. Monitoring results shall be reported at the intervals contained in Part II(D)(1) through (3) and Attachment A of this permit.

(a) Monitoring of the nature of injected fluids shall comply with applicable analytical methods cited and described in Table I of 40 C.F.R. § 136.3 or in certain circumstances by other methods that have been approved by the Director.

(b) Sampling and analysis shall comply with the specifications of the Waste Analysis Plan required in Part II(C)(3) of this permit.

11. **Signatory Requirements** - All reports or other information required to be submitted by this permit or requested by the Director shall be signed and certified in accordance with 40 C.F.R. § 144.32.

12. **Reporting Requirements**

(a) **Planned Changes** - The permittee shall give written notice to the Director, as soon as possible, of any planned physical alterations or additions to the permitted facility.

(b) **Anticipated Noncompliance** - The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

(c) **Compliance Schedules** - Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance

schedule of this permit shall be submitted by the permittee no later than 30 calendar days following each schedule date.

(d) **Twenty-four Hour Reporting**

(1) The permittee shall report to the Director any permit noncompliance which may endanger human health or the environment. See, e.g., Part I(G)(5) of this permit. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. Such reports shall include, but not be limited to the following information:

(i) Any monitoring or other information which indicates that any contaminant may cause an endangerment to a USDW; and

(ii) Any noncompliance with a permit condition, or malfunction of the injection system, which may cause fluid migration into or between USDWs; and

(iii) Any failure to maintain mechanical integrity.

(2) A written submission shall also be provided within five working days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and, if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate and prevent recurrence of the noncompliance.

(e) **Other Noncompliance** - The permittee shall report all other instances of noncompliance not otherwise reported at the time monitoring reports are submitted. The reports shall contain the information listed in Part I(E)(12)(d)(2) of this permit.

(f) **Other Information** - When the permittee becomes aware of failure to submit any relevant facts in the permit application or that incorrect information was submitted in a permit application or in any report to the Director, the permittee shall submit such facts or corrected information within 10 calendar days.

(g) **Report on Permit Review** - Within 30 calendar days of receipt of this permit, the permittee shall certify to the Director that he or she has read and is personally familiar with all terms and conditions of this permit.

F. **PLUGGING AND ABANDONMENT**

1. **Notice of Plugging and Abandonment** - The permittee shall notify the Director at least 60 calendar days before conversion or abandonment of the well. At the discretion of the Director, a shorter notice period may be allowed.

2. **Plugging and Abandonment** - The permittee must receive the approval of the Director before plugging the well and shall plug and abandon the well consistent with 40 C.F.R . §§ 144.52(a)(6) and 146.10, as provided for in the Plugging and Abandonment Plan contained in Attachment B of this permit. Within 60 calendar days after plugging a well, the permittee shall submit a Plugging and Abandonment report to the Director. The report shall be certified as accurate by the permittee and by the person who performed the plugging operation (if other than the permittee), and shall consist of either:

   (a) A statement that the well was plugged in accordance with the Plugging and Abandonment Plan previously approved by the Director; or

   (b) If the actual plugging differed from the approved plan, a statement defining the actual plugging and explaining the reason for the difference.

3. **Temporary Abandonment** - If the permittee ceases injection into the well for more than 24 consecutive months, the well is considered to be in temporary abandoned status. The permittee shall plug and abandon the well in accordance with the approved plan and 40 C.F.R. § 144.52 (a)(6) unless the permittee:

   (a) Provides notice to the Director within 30 days of the end of the 24th consecutive month of temporary abandonment, and

   (b) Describes actions or procedures, satisfactory to the Director, that the owner or operator will take to ensure that the well will not endanger USDWs during the period of temporary abandonment. These actions and procedures shall include compliance with the technical requirements applicable to active injection wells unless waived by the Director.

4. **Revision of Plugging and Abandonment Plan** - If the permittee finds it necessary to change a Plugging and Abandonment Plan, a revised plan shall be submitted to the Director for approval at the time of the next monthly report.

5. **Standards for Well Closure** - Prior to plugging and abandoning the well:

   (a) The permittee shall observe and record the pressure decay for a time specified by the Director and shall report this information to the Director.

   (b) The permittee shall conduct appropriate mechanical integrity testing to ensure the integrity of that portion of the long string casing and cement that will be left in the ground after closure. Testing methods must include:

(1) Pressure tests with liquid;

(2) Noise, temperature, or oxygen activation logs; or

(3) Any other test required by the Director.

(c) Prior to well closure, the well shall be flushed with a buffer fluid.

G. **MECHANICAL INTEGRITY**

1. **Standards** - The injection well must have and maintain mechanical integrity consistent with 40 C.F.R. § 146.8(a)(1) and (2). Mechanical integrity demonstrations must be witnessed by an authorized representative of the Director unless an authorized representative informs the permittee that it is not possible to witness the test.

2. **Periodic Mechanical Integrity Testing** - The permittee shall conduct the mechanical integrity testing as follows:

(a) Long string casing, injection tubing and annular seal shall be tested by means of an approved pressure test in accordance with 40 C.F.R. § 146.8(b)(2). This test shall be performed upon completion of this well, and at least once every twelfth month beginning with the date of the last approved demonstration and whenever there has been a well workover in which tubing is removed from the well, the packer is reset, or when loss of mechanical integrity becomes suspected during operation;

(b) An approved temperature, noise, oxygen activation, or other approved log shall be run upon completion of this well and at least once every 60 months from the date of the last approved demonstration to test for movement of fluid along the bore hole. The Director may require such tests whenever the well is worked over.

(c) The permittee may request the Director to use any other test approved by the Director in accordance with the procedures in 40 C.F.R §146.8(d).

3. **Prior Notice and Reporting** - The permittee shall notify the Director of his or her intent to demonstrate mechanical integrity at least 30 calendar days prior to such demonstration. At the discretion of the Director a shorter time period may be allowed. Reports of mechanical integrity demonstrations which include logs must include an interpretation of results by a knowledgeable log analyst. The permittee shall report the results of a mechanical integrity demonstration within 45 calendar days after completion thereof.

4. **Gauges** - The permittee shall calibrate all gauges used in mechanical integrity demonstrations to an accuracy of not less than one-half percent of full scale, prior to each required test of mechanical integrity. A copy of the calibration certificate shall be submitted to the Director or his or her representative at the time of demonstration and

every time the gauge is calibrated. The gauge shall be marked in no greater than five psi increments.

5. **Loss of Mechanical Integrity** - If the permittee or the Director finds that the well fails to demonstrate mechanical integrity during a test, or fails to maintain mechanical integrity during operation, or that a loss of mechanical integrity as defined by 40 C.F.R. §§ 146.8(a)(1) and (2) is suspected during operation, the permittee shall halt the operation immediately and follow the reporting requirements as directed in Part I(E)(12) of this permit. The permittee shall not resume operation until mechanical integrity is demonstrated and the Director gives approval to recommence injection.

6. **Mechanical Integrity Testing on Request From Director** - The permittee shall demonstrate mechanical integrity at any time upon written notice from the Director.

H. **FINANCIAL RESPONSIBILITY**

1. **Financial Responsibility** - The permittee shall maintain financial responsibility and resources to close, plug, and abandon the underground injection operation in a manner consistent with 40 C.F.R. § 144.52(a)(7). The approved financial assurance mechanism is found in Attachment C of this permit.

   (a) The permittee must maintain a written cost estimate, in current dollars, for the Plugging and Abandonment Plan as specified in 40 C.F.R. § 146.10. The plugging and abandonment cost estimate at any point in the life of the facility operation must equal the maximum cost of plugging and abandonment at that time.

   (b) The permittee must adjust the cost estimate of plugging and abandonment for inflation within 30 calendar days after each anniversary of the first estimate. The inflation factor is the result of dividing the latest published annual Oil and Gas Field Equipment Cost Index by the index for the previous year.

   (c) The permittee must revise the plugging and abandonment cost estimate whenever a change in the Plugging and Abandonment Plan increases the cost of plugging and abandonment.

   (d) If the revised plugging and abandonment estimate exceeds the current amount of the financial assurance mechanism, the permittee shall submit a revised mechanism to cover the increased cost within 30 calendar days after the revision specified in Part I(H)(1)(b) and (c) of this permit.

   (e) The permittee must keep on file at the facility a copy of the latest plugging and abandonment cost estimate prepared in accordance with 40 C.F.R. §144.52(a)(7), during the operating life of the facility.

2. **Insolvency** - The permittee must notify the Director within 10 business days of any of the following events:

(a) The bankruptcy of the trustee or issuing institution of the financial mechanism; or

(b) Suspension or revocation of the authority of the trustee institution to act as trustee; or

(c) The institution issuing the financial mechanism losing its authority to issue such an instrument.

3. **Notification** - The permittee must notify the Director by certified mail of the commencement of voluntary or involuntary proceedings under Title 11 (Bankruptcy), U.S. Code naming the owner or operator as debtor, within 10 business days after the commencement of the proceeding. A guarantor of a corporate guarantee must make such a notification if he or she is named as debtor, as required under the terms of the guarantee.

4. **Establishing Other Coverage** - The owner or operator must establish other financial assurance or liability coverage acceptable to the Director, within 60 calendar days of the occurrence of the events in Part I(H)(2) or (3) of this permit.

I. CORRECTIVE ACTION

1. **Compliance** - The permittee shall comply with 40 C.F.R. §§ 144.55 and 146.7.

2. **Corrective Action Plan** - The permittee shall file a Corrective Action Plan for approval by the Director within 30 days of a written determination by the Director that improperly plugged, completed, or abandoned wells, or wells for which plugging or completion information is unavailable, are present in the area of review and penetrate the confining zone of the permitted well, as defined in the administrative record for this permit.

3. **Prohibition of Movement of Fluids into USDWs** Should upward migration of fluids through the confining zone of this permitted well be discovered within the two mile area of review due to injection activities at this facility, and should this migration of fluids cause the introduction of any contaminant into a USDW pursuant to 40 C.F.R. § 144.12, the permittee shall immediately cease injection into this well until the situation has been corrected and reauthorization to inject has been given by the Director.

J. **COMMENCING INJECTION**

The permittee may not commence injection until:

1. Results of the formation testing and logging program as specified in the administrative record of this permit are submitted to and approved by the Director; and

2. Mechanical integrity of the well has been demonstrated in accordance with 40 C.F.R. §146.8(a)(1) and (2) and in accordance with Part I(G)(1) through (3) of this permit; and

3. Results from ambient monitoring as required in Part II(C)(4) of this permit have been submitted and approved by the Director; and

4. All required corrective action has been taken in accordance with 40 C.F.R. § 144.55 (b)(2); and

5. Construction is complete and the permittee has submitted to the Director, by certified mail with return receipt requested, a notice of completion of construction using EPA Form 7520-9 and either:

   (i) The Director has inspected or otherwise reviewed the new injection well and finds it is in compliance with the conditions of the permit; or,

   (ii) The permittee has not received, within 13 days of the date of the Director's receipt of the report required above, notice from the Director of his or her intent to inspect or otherwise review the new injection well, in which case prior inspection or review is waived and the permittee may commence injection.

6. Written authorization to commence injection has been granted by the Director.

PART II
WELL SPECIFIC CONDITIONS FOR UIC PERMITS

A. **CONSTRUCTION**

1. **Siting** – All Class I wells shall be sited in such a fashion that they inject into a formation which is beneath the lowermost formation containing, within one quarter mile of the well bore, an underground source of drinking water.

2. **Casing and Cementing** - Notwithstanding any other provisions of this permit, the permittee shall case and cement the well in such a manner so as to prevent the movement of fluids into or between USDWs for the expected life of the well. The casing and cement used in the construction of this well are shown in Attachment E of this permit and in the administrative record for this permit. Any change shall be submitted for approval by the Director before installation.

3. **Tubing and Packer Specifications** - The permittee shall inject only through tubing with a packer set within the long string casing at a point within or below the confining zone. The tubing and packer used in the well are represented in engineering drawings contained in Attachment E of this permit. Any changes shall be submitted by the permittee for the approval of the Director before installation.

4. **Wellhead Specification** - The permittee shall install and maintain a female coupling and valve on the wellhead, to be used for independent injection pressure readings. Further, the permittee shall install a sampling port for waste sampling consistent with the permittee's waste sampling procedures, if applicable.

B. **OPERATIONS**

1. **Injection Pressure Limitation** - Except during stimulation, the permittee shall not cause or permit the injection pressure at the wellhead to exceed the maximum limitation which is specified in Attachment A of this permit. In no case shall injection pressure initiate fractures or propagate existing fractures in the confining zone or cause the movement of injection or formation fluids into a USDW. Prior to performing any stimulation and /or fracturing of the well**,** the permittee is required to submit procedures to the Permits Branch for review and approval**.** A list of all products to be used for the test along with their chemical composition must also be submitted.

2. **Additional Injection Limitation** - No waste streams other than those identified in Attachment F of this permit shall be injected. Every twelfth month the permittee shall submit a certified statement attesting to compliance with this requirement.

3. **Annulus Fluid and Pressure** - The permittee shall fill the annulus between the tubing and the long string casing with a fluid approved by the Director and identified in the administrative record of this permit. Any change in the annulus fluid, except during workovers or times of annulus maintenance, shall be submitted by the permittee for the approval of the Director before replacement. Except during workovers, the permittee shall maintain a positive pressure on the annulus as specified in Attachment A of this permit.

4. **Annulus/Tubing Pressure Differential** - Except during workovers or times of annulus maintenance, the permittee shall maintain, over the entire length of the tubing, a pressure differential between the tubing and annulus as specified in Attachment A of this permit.

5. **Automatic Warning and Automatic Shut-off System** - The permittee shall continuously operate and maintain an automatic warning and automatic shut-off system to stop injection in any of the following situations:

   (a) Pressure changes in the annulus or annulus/tubing differential signifying or identifying possible deficiencies in mechanical integrity; or

   (b) Injection pressure, annulus pressure, or annulus/tubing differential pressure reaches the pressure limits as specified in Attachment A of this permit.

   A trained operator must be on site and within perceptible distance of the alarm at all times when the well is operating. The permittee must test the automatic warning and automatic shut-off system at least every twelfth month. This test must involve subjecting the system to simulated failure conditions and must be witnessed by the Director or his or her representative unless the Director waives this requirement.

6. **Precautions to Prevent Well Blowouts** - In order to prevent the migration of fluids into underground sources of drinking water, the permittee shall maintain on the well at all times a pressure which will prevent the return of the injection fluid to the surface. The well bore must be filled with a high specific gravity fluid during workovers to maintain a positive (downward) gradient and/or a plug shall be installed which can resist the pressure differential. A blowout preventer must be kept in proper operational status during workovers. In cases where the injected wastes have the potential to react with the injection formation to generate gases, the permittee shall follow the procedures below to assure that a backflow or blowout does not occur:

   (1) Limit the temperature, pH or acidity of the injected waste; and

   (2) Develop procedures necessary to assure that pressure imbalances do not occur.

C. **TESTING AND MONITORING**

1. **Sampling Point** - The injection fluid samples shall be taken at the sampling location as specified in Attachment A of this permit.

2. **Continuous Monitoring Devices** - The permittee shall maintain continuous monitoring devices and use them to monitor injection pressure, flow rate, and the pressure on the annulus between the tubing and the long string of casing. If the well is equipped with a fluid level indicator, the permittee shall monitor the fluid level daily. The monitoring results shall be submitted to the Director as specified in Part II(D) of this permit. The permittee shall maintain for EPA's inspection at the facility an appropriately scaled,

continuous record of these monitoring results as well as original copies of any digitally recorded information pertaining to these operations.

3. **Waste Analysis Plan** - The permittee shall comply with the written Waste Analysis Plan which describes the procedures used to monitor the nature of injected fluids and the procedures which will be carried out to comply with Part (I)(E)(10) of the permit. A copy of the approved plan shall also be kept at the facility.

4. **Prior Notice** - The permittee shall notify the Director of his or her intent to perform any tests required by this permit at least 30 calendar days prior to such activities. The permittee shall either follow the prescribed test procedures found in Attachment G of this permit or submit written procedures for approval at least 30 calendar days prior to the testing. If the submitted procedures are not appropriate for approval, EPA will require the permittee to submit new proposed test procedures for approval, or add appropriate conditions to the submitted procedures. At the discretion of the Director, a shorter time period may be allowed.

5. **Reporting** - All reports of well tests which include logs must include an interpretation of results by a knowledgeable log analyst. Reports on ambient reservoir pressure monitoring must include an interpretation of the results by a knowledgeable pressure transient test analyst. The reports should explain all anomalies in the data and variations in the procedures. The permittee shall report the results of any tests required by this permit within 45 calendar days after the tests are completed.

6. **Ambient Monitoring** - The permittee shall monitor the pressure buildup in the injection zone initially upon completion of the well, and at least once every twelfth month thereafter, including at a minimum, a shut down of the well for a time sufficient to conduct a valid observation of the pressure fall-off curve. From this observation, the permittee shall submit a report including at least a calculation of pressure build-up in the injection zone, injection zone transmissivity, and wellbore skin factor.

7. **Temperature Monitoring** – The permittee shall monitor injectate temperature at least once daily on each day during which injection occurs. If injection occurs during more than one eight-hour period in a day, temperature must be recorded at least once every six hours. The monitoring results shall be submitted to the Director as specified in Part II(D)(1)(f) of this permit.

D. **REPORTING REQUIREMENTS**

The permittee shall submit all required reports to the Director at:

U.S. Environmental Protection Agency – Region 5
Attn: Underground Injection Control Section (WP-16J)
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

1. **Monthly Reports** - The permittee shall submit monthly reports of the following information no later than the end of the month following the reporting period:

(a) A tabulation of maximum injection pressure, a daily measurement of annulus tank fluid level, and minimum differential between simultaneous measurements of injection pressure and annulus pressure for each day of the month;

(b) Appropriately scaled graphs showing injection pressure and flow rate and annulus tank fluid level. One graph must include, at a minimum, daily maximum injection pressure and daily average flow rate, on a single, monthly chart.

(c) A statement of the total volumes of the fluid injected to date, in the current calendar year, and the current month;

(d) A tabulation of the dates, amounts and types of liquid added to or removed from the annulus system during the month, and the cumulative additions and cumulative subtractions for the current month and each of the past 12 months;

(e) Any noncompliance with conditions of this permit, including but not limited to:

(1) Any event that exceeds operating parameters for annulus pressure or injection pressure or annulus/tubing differential as specified in the permit; or

(2) Any event which triggers an alarm or shutdown device required in Part II(B)(5) of this permit.

(f) The monthly average of the measured values of injectate temperature. If temperature measurements are recorded when the well is not injecting, those measurements will not be included in calculating the monthly average. Records of all temperature measurements must be maintained in accordance with Part I(E)(9)(a) of this permit.

2. **Quarterly Reports** – The permittee shall report at least every quarter the results of the injection fluid analyses specified in the Waste Analysis Plan attached to this permit. This report must include statements showing that the requirements of Part I(E)(10) and Part II(C)(3) have been met.

3. **Annual Reports** - The permittee shall report the following at least every twelfth month:

(a) Results of ambient monitoring required by 40 C.F.R. § 146.13(d)(1) and Part II(C)(4) of this permit; and

(b) A certified statement attesting that no waste streams other than those identified in Attachment F of this permit were injected into the well.

4. **Reports on Well Tests and Workovers** - Within 45 calendar days after the activity, the permittee shall report to the Director the results of demonstrations of mechanical integrity, any well workover, and/or results of other tests required by this permit.

PART III
ATTACHMENTS

These attachments include, but are not limited to, permit conditions and plans concerning operating procedures, monitoring and reporting, as required by 40 C.F.R. Parts 144 and 146. The permittee shall comply with these conditions and adhere to these plans as approved by the Director, as follows:

A. SUMMARY OF OPERATING, MONITORING AND REPORTING REQUIREMENTS (ATTACHED)

B. PLUGGING AND ABANDONMENT PLAN (ATTACHED)

C. FINANCIAL ASSURANCE MECHANISM (ATTACHED)

D. CONTINGENT CORRECTIVE ACTION (ATTACHED)

E. CONSTRUCTION DETAILS (ATTACHED)

F. SOURCE AND ANALYSIS OF WASTE (ATTACHED)

G. TESTING PROCEDURES (ATTACHED)

H. WASTE ANALYSIS PLAN (ATTACHED)

ATTACHMENT A

SUMMARY OF OPERATING, MONITORING AND REPORTING REQUIREMENTS

CHARACTERISTIC	LIMITATION	MINIMUM MONITORING FREQUENCY	MINIMUM REPORTING FREQUENCY
Injection Pressure	986 psig maximum*	Continuous	Monthly
Annulus Pressure	100 psig minimum	Continuous	Monthly
Annulus/Tubing Differential	100 psig minimum above operating injection pressure	Continuous	Monthly
Injection Rate		Continuous	Monthly
Cumulative Volume		Continuous	Monthly
Temperature**		Daily**	Monthly
Annulus Fluid Level		Daily	Monthly
pH, Eh, and Specific Gravity		Daily**	Monthly
Annulus Fluid Loss		Monthly	Monthly
Chemical Composition of Injected Fluids		Monthly	Quarterly
Physical Characteristics of Injected Fluids		Monthly	Quarterly

Sampling Location: The sample location is at the well head

* The maximum injection pressure was determined using the following formula:
[{fracture gradient - (0.433 psi/ft x specific gravity)} x depth] - 14.7 psi.

The maximum injection pressure is dependent upon depth, specific gravity of the injection fluid, and fracture gradient of the injection zone. The Dundee Limestone at 3945 feet was used as the depth and a specific gravity of 1.212 was used for the injection fluid plus a safety factor of 0.05. A fracture gradient of 0.80 psi/ft is used as a default value, unless a site-specific value is determined pursuant to Attachment A (1) and (2) of this permit, in which case the maximum injection pressure will be modified to reflect the specific value of the fracture gradient in this well. Such modification shall be considered a minor modification as allowed for at 40 C.F.R. § 144.41(f). The limitation on injection pressure will serve to prevent injection-formation fracturing.

** Frequency of temperature measurements will be in accordance with Section II(C)(5) of this permit. Reporting of injectate temperature will be in accordance with Section II(D)(1)(f) of this permit.

*** As specified in the Waste Analysis Plan attached to this permit, to include but not limited to the chemicals identified in 40 CFR part 261.24.

1. **Maximum Injection Pressure (146.13)**

During construction of this well, the permittee shall determine if the maximum injection pressure as specified at Attachment A of this permit allows sufficient operational flexibility. If the calculated maximum injection pressure allows for sufficient flexibility, the permittee may opt not to proceed with additional testing and the requirements of Attachment A (1) of this permit shall be met. If the maximum injection pressure calculated prior to direct testing proves insufficient, or another need is identified that requires modifying the maximum injection pressure, the permittee shall conduct one or more of the following tests to ensure that the maximum injection pressure exerted during operation will not propagate existing or open new fractures in any part of the injection zone. In all cases, the permittee shall submit a plan, for the Director's written approval, describing the detailed procedures to be followed during any test designed to determine the fracture gradient to calculate maximum injection pressure. Modification of the maximum permitted injection pressure following a test conducted under Attachment A (1) of this permit shall follow the procedures set forth for minor permit modifications, as specified at 40 C.F.R. §144.41(f).

(a) **In-Situ Stress Tests**

The permittee shall isolate zones for testing the fracturing pressure by means of a straddle packer assembly, or other comparable means. The zones chosen for testing shall be those predicted to have the lowest fracturing value. The permittee shall use either fresh water to conduct this test or a fluid that is permissible for injection into this well as allowed by this permit. At a minimum, the permittee shall measure the test fluid for its specific gravity and viscosity during the In-Situ Stress test. The results of this test shall be submitted to the EPA as specified at Attachment A (2) of this permit. Failure to report test results shall be considered grounds to deny a requested permit modification.

(b) **Step Rate Test**

The permittee shall isolate the entire injection zone by means of a packer assembly, or other comparable means. The permittee shall inject either fresh water for this test or a fluid that is permissible for injection into this well as allowed for in this permit. At a minimum, the permittee shall measure the test fluid for its specific gravity and viscosity during the Step Rate Test. The permittee shall inject into the well at increasing rates, holding each rate step constant. Each rate step shall span the same amount of time (at least 30 minutes per rate step is recommended). The permittee shall attempt to inject at three rates which result in a pressure higher than the injection zone fracture pressure during this test. A Cartesian plot of rate against the final stabilized pressure at each step shall be included as part of the data package submitted to the EPA. The results of this test shall be submitted to the EPA as specified at Attachment A (2) of this permit. Failure to report test results shall be considered grounds to deny a requested permit modification.

(c) **Other Test(s) Approvable by the Director**

The permittee may choose to conduct test(s) other than the two described in Parts III(A)(1)(a) and (b) of this permit. If so, the permittee shall submit a plan to conduct alternative test(s) to the Director for approval prior to conducting the test(s).

2. **Reporting Maximum Injection Pressure Determination**

The permittee shall report the results of the measurements, tests and determinations conducted in Attachment A (1) of this permit within 30 days of their completion.

OMB No. 2040-0042 Approval Expires 4/30/2022

United States Environmental Protection Agency

EPA

WELL REWORK RECORD, PLUGGING AND ABANDONMENT PLAN, OR PLUGGING AND ABANDONMENT AFFIDAVIT

Name and Address, Phone Number and/or Email of Permittee

Michigan Potash Company, LLC
C/O Steptoe Johnson
600 17th Street, Suite 2300
Denver, CO 80203

Permit or EPA ID Number	API Number	Full Well Name
		MPC 8D

State	County
Michigan	Osceola

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

Surface Location

SE 1/4 of NE 1/4 of Section 31 Township 17N Range 8W

Latitude 43.818506

Longitude -85.325927

ft. from (N/S) Line of quarter section

ft. from (E/W) Line of quarter section.

Well Class	Timing of Action (pick one)	Type of Action (pick one)
✓ Class I	✓ Notice Prior to Work	☐ Well Rework
☐ Class II	Date Expected to Commence N/A	✓ Plugging and Abandonment
☐ Class III	☐ Report After Work	☐ Conversion to a Non-Injection Well
☐ Class V	Date Work Ended	

Provide a narrative description of the work planned to be performed, or that was performed. Use additional pages as necessary. See instructions.

The well will be plugged by pumping cement into the well bore. The well bore will be filled with cement to the first perforated liner at 4400'. The two cement calculations to fill the entire wellbore are below.
7" (3400 ft)*(0.2210 cuft/ft)/(1.47 cuft/sk)*(1.1 % ex) = 1209 sk
4.5" (1000 ft)*(0.0873 cuft/ft)/(1.47 cuft/sk)*(2.0 % ex) = 257 sk

Certification

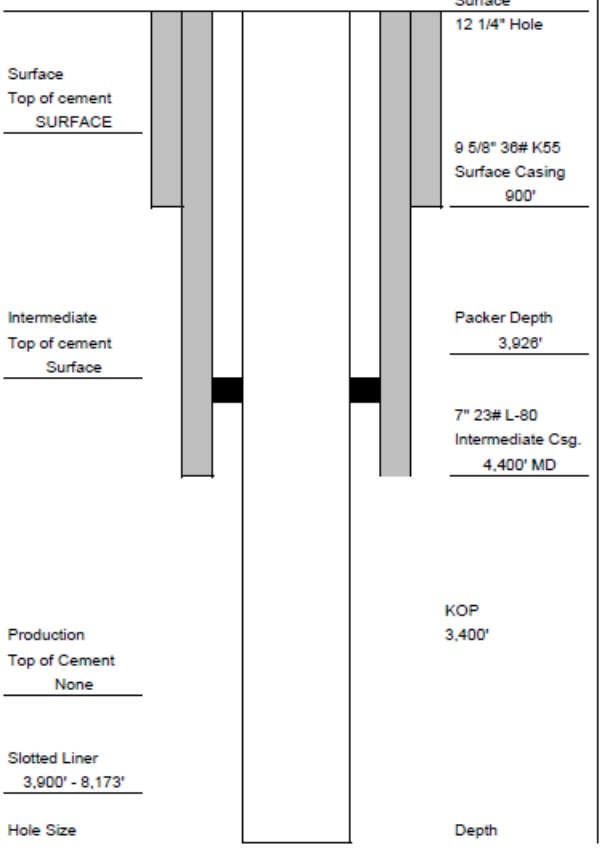
I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate,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

Name and Official Title *(Please type or print)*	Signature	Date Signed
Theodore Pagano, General Manager		02/15/2022

EPA Form 7520-19 (Rev. 4-19)

ORIGINAL WELL CONSTRUCTION DURING OPERATION

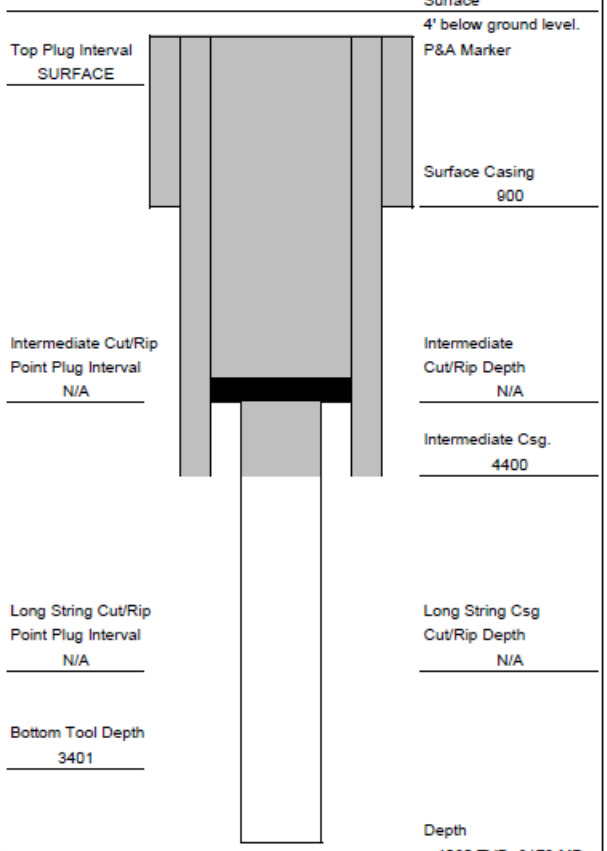
MICHIGAN POTASH INJECTION WELL
MPC 8D



** Add Any Additional Information
* May not Apply

PLUGGING AND ABANDONMENT CONSTRUCTION

MICHIGAN POTASH INJECTION WELL
MPC 8D



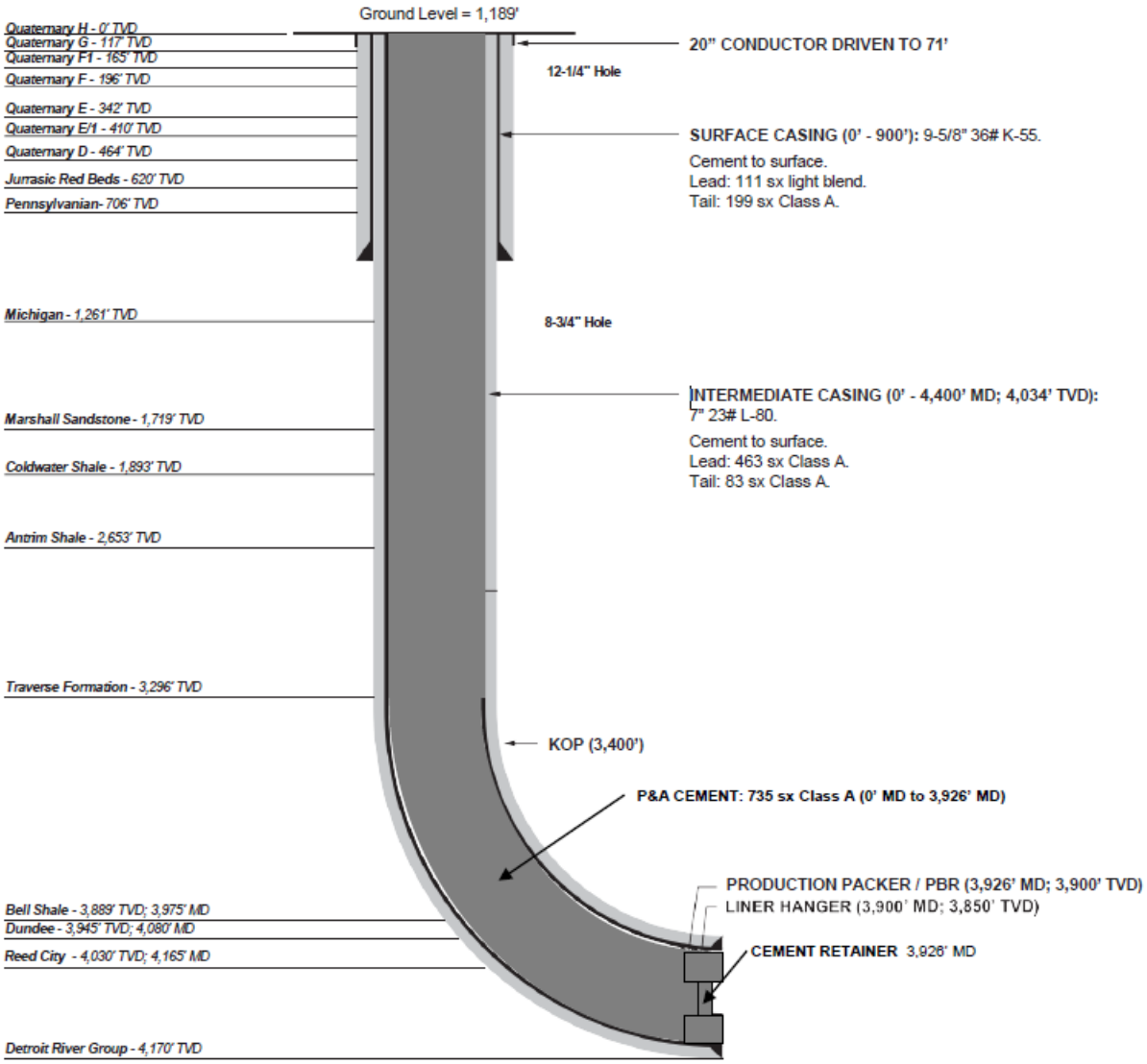
** Add Any Additional Information
* May not Apply

LIST OF ALL OPEN AND/OR PERFORATED INTERVALS AND INTERVALS WHERE CASING WILL BE VARIED

Specify Open Hole/ Perforations/ Varied Casing	From	To	Formation Name
Conductor Pipe - 20"	0	71'	
Surface Casing - 9 5/8" 36# K55	0	900'	Pennsylvanian
Intermediate Casing - 7" 23# L80	0	4,400'	Reed City
4 1/2" Liner	0	3,926'	Reed City
4 1/2" Slotted Liner	3,926'	8,173'	Reed City

FINAL WELLBORE DIAGRAM - P&A

MPC 8D
OSCEOLA COUNTY, MI
SE, NE, SE Sec. 36, T17N-R09W
SHL: 43.818506° / -85.325927° (N83)
BHL: 43.818342° / -85.342648° (N83)



February 15, 2022

Mr. Stephen Jann
Chief
Underground Injection Control Branch
U.S. Environmental Protection Agency
77 West Jackson Boulevard, WU-16J
Chicago, Illinois 60604-3590

Dear Mr. Jann:

This letter requests that the attached State Bond **# DEPNO114507721** in the amount of **$440,000.00** be considered an acceptable mechanism for meeting the Federal Underground Injection Control program financial responsibility requirement for the following well:

1. Well Name: MPC 8D
2. Well Location: Township 17N Range 8W
   Section 31 1/4 Section SE/4
   County Osceola
3. UIC Application # MI-133-3G-0028
4. Owner/Operator Name Michigan Potash Operating, LLC
5. Address 600 17th Street, Suite 2300
   Denver, CO 80202
6. Phone (231) 577-9616

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

Theodore A. Pagano, Manager		2/15/2022
Name and Official Title	Signature	Date Signed

cc: Jennifer Ferrigan, Michigan Department of Environment, Great Lakes, and Energy

ATTACHMENT D
CONTINGENT CORRECTIVE ACTION

Corrective Action Plan

The Area of review (AOR) for the MPC 8D injection well is a two-mile radius around the well borehole. Well records for all known wells drilled into the bedrock within the AOR have been reviewed. No wells appear to have been improperly completed or plugged and abandoned that might act to transmit fluids into the lowermost USDW. Therefore, no corrective action plan is required because there are no records indicating any artificial penetrations exist within the AOR that penetrate the confining or injection zones that have not been properly constructed or plugged and abandoned.

The following steps will be completed in the unlikely event that some unforeseen failure of the MPC 8D well occurs which might jeopardize the USDW:

• Immediately halt operation of the well.

• Notify appropriate regulatory authorities of the discovery and the nature of the well failure (telephone notification within 24 hours; written confirmation within 5 days).

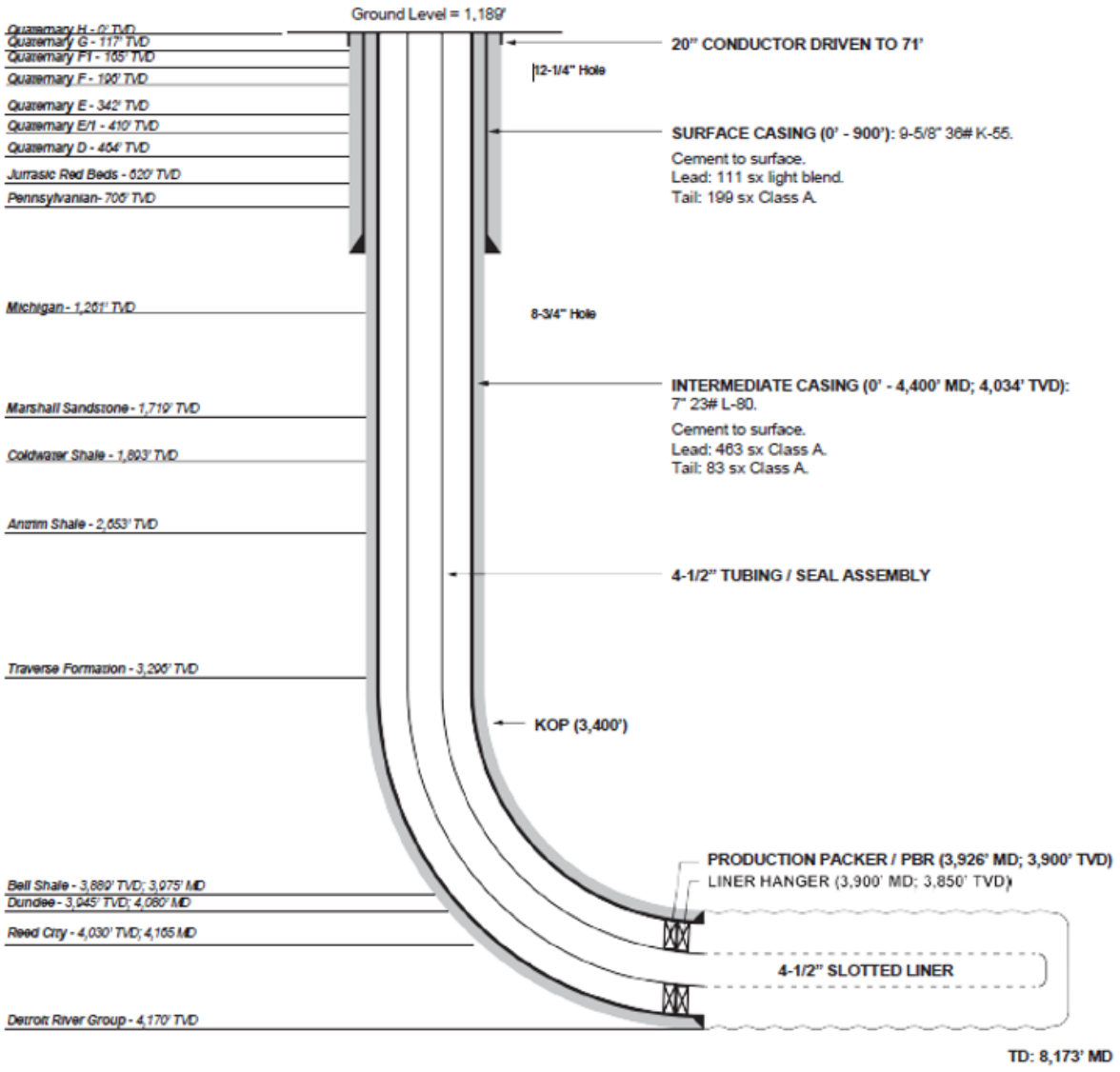
• Conduct an investigation into the cause of the well failure; develop corrective action plan to eliminate the problem.

• Perform remedial work.

ATTACHMENT E
CONSTRUCTION DETAILS

MPC 8D

OSCEOLA COUNTY, MI
SE, NE, SE Sec. 36, T17N-R09W
SHL: 43.818506° / -85.325927° (N83)
BHL: 43.818342° / -85.342648° (N83)



ATTACHMENT F
SOURCE AND ANALYSIS OF WASTE

Fluid disposed of into the MPC-1D injection well, results from the solution mining of salt and potash, and is comprised predominantly of sodium chloride (NaCl) and potassium chloride (KCl). 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 excess water is disposed of by injection into Class I wells. The following is a typical representation of the physical properties and chemical characteristics of the waste brine:

Physical Properties	Range	Typical
Specific Gravity	1.0 – 1.2	1.10
pH	5.5 – 8.0	7.0

Chemical Characteristics

Component	Weight Percent
H2O	Variable
NaCl	Variable
KCl	Variable
SO4	<0.4
Br	<0.2
Ca	<0.2
Mg	<0.02

There may be traces of sodium hydroxide that is used in stripping naturally occurring H2S from the brine that comes from the salt and potash bearing formation. Pump packing seal water (<10gpm), and a bleed system (<10gpm) containing some sodium bisulfite may be added to the injection stream.

Biological Characteristics:

The injection water from salt and potash is essentially free of biological matter. Groundwater used in the salt and potash process may contain trace, naturally occurring biological matter; however, the high salinity of the disposal fluid would cause an overall decline in biological matter content.

Radiological Characteristics:

The disposal fluid will contain trace amounts of the naturally occurring stable C137 isotope and radiogenic K40 isotope associated with potassium chloride and sodium chloride.

ATTACHMENT G
MECHANICAL INTEGRITY TESTING

Standard Annulus Pressure Test

1. Ensure the packer is set within 100 feet of the top of the injection zone. Packers not set within 100 feet of the top of the injection zone will be evaluated by EPA on a case-by-case basis. Note any approved deviations from previously reported well construction.
2. Document the test using a mechanical or digital device or a service company job record which records the value of the parameters of interest as measured during the test.
    a. Submit along with the test results a gauge calibration certificate for the mechanical or digital device used to record test parameters. All calibration (for new or recalibrated gauges) must have been performed within a year prior to the test.
    b. Place a gauge on the wellhead to measure pressure. If a recording device is used, the recording device serves to verify the data witnessed on the wellhead gauge.
    c. Use an appropriately scaled mechanical gauge which has a measurement range that is 1.2 – 2 times the maximum pressure measured or a 1 psi resolution digital gauge with sufficient full scale.
    d. Measure and document pressure using a gauge and/or a digital record and/or a chart record that can be read with sufficient accuracy to identify pressure change which would result in a failure of the test and to record accurate values during the test interval. For example, if the test pressure is 300 psig, the gauge and/or chart record should be marked in increments of 5 psi or less.
3. Verify that the tubing/casing annulus is full of liquid. No unapproved fluid or substance that may affect test outcomes are allowed. Measure and report the volume of liquid added to the annulus during pressurization (if any). If an annulus tank is pressurized with nitrogen to pressurize the well, record the liquid displaced from the tank into the well annulus.
4. Stabilize the temperature of the well and the annulus liquid, either by ceasing injection or injecting at a constant fixed rate. Ensure that the wellhead injection tubing pressure is at least 100 psi different from the annulus test pressure.
5. Pressurize the annulus to the greater of 300 psig or the maximum permitted injection pressure plus 100 psi. A positive pressure differential of greater than 100 psi should be maintained between the annulus and the injection tubing. If EPA does not approve any deviations from this criteria prior to testing, the test results might not be considered a sufficient demonstration of mechanical integrity and a new test would then be needed. A net gain or loss of more than 3% during the test indicates the well does not have mechanical integrity. Following pressurization, isolate the annular system from its pressure source and, if present, the sealpot or surge tank being sure to prevent any leaking across the shut-off valves.
6. Test for at least 60 minutes. Note the time, the annulus pressure, and the injection/tubing pressure at the start of the test and measure and note these same parameters at least every 10 minutes thereafter up to the end of the required test duration.

7. Send a report of the testing including any other data or documents available at the conclusion of the test which support the test results, such as gauge calibration certification, third-party service ticket, and/or original chart/digital recordings, to EPA per the reporting requirements of the permit.
8. If the tested well was reworked in association with the test, submit a rework record.
9. Include the certification statement and signature on the transmittal letter or on the individual MIT results form and, if submitted, the rework record to comply with the requirements of 40 CFR § 144.32(b).

Fall-Off Test

1. Injection of normal injectate at the normal rate is preferred.
2. The injection period should be at least 50% longer than the planned shut-in time, or at minimum as long as operationally possible. During this time injection at a constant rate (+/- 10%) should be attempted.
3. The pressure gauge utilized for the pressure transient test shall have been calibrated no more than one year prior to the test date.
4. Place the pressure gauge downhole at approximately the top of the permitted injection zone at least one hour prior to ceasing injection.
5. Following at least one hour of pressure data collection during injection, shut-in the well as quickly as possible.
6. Collect data at a frequency of at least one data point every 10 seconds for at least the first five minutes after shut-in; between five and 30 minutes at no less than one reading every 30 seconds; and the operator can reduce frequency as required after 30 minutes.
7. End pressure measurements when pressure is relatively stable, when operational necessity dictates, when sufficient radial flow dominated data has been collected to allow evaluation of kh and extrapolation of pressure to infinite shut-in time is possible, or if boundary effects are observed.
8. The test shall include a written report by a knowledgeable well test analyst. Such report must explain any anomalies shown in the results.
9. The test report shall include an up-to-date well schematic, a copy of the dated calibration certificate for the gauge utilized, and digital pressure data on CD/flash drive/email in a spreadsheet format.
10. The test report shall include a tabulation of values for the following background parameters: EPA permit number, porosity, net thickness (ft), viscosity (cp), formation compressibility (per psi), long string casing inner diameter (in), open hole diameter (in), and Kelly bushing elevation (ft). The test report shall also include a tabulation of values for the following test specific parameters: test start date/time, test end date/time, test length (hr), depth reference (Kelly bushing or ground level), specific gravity of test fluid, test fluid compressibility (per psi), gauge depth (ft), gauge calibration date, pressure required to maintain tubing fluid to the surface (psi), final tubing fluid level (ft), final flow rate immediately prior to shut-in (gpm), cumulative volume injected since last pressure equalization (gal), permeability-thickness (md-ft), skin factor, radius of investigation (ft),

final measured flowing pressure (psi), final measured shut-in pressure (psi), and p* pressure (psi). Pressure gauge units (psia or psig) shall be specified.

11. The test must conclusively demonstrate its objectives and satisfy the Director to be considered a completed test.

Radioactive Tracer Survey

1. The tool shall be calibrated by recording the tool response to rock formations of lithology known to produce a low reading, and to lithology known to produce a high reading.
2. Set the scaling at the same level for all phases. 40 counts per second per inch is usually effective.
3. Record a base log before any radioactive material is released in the well.
4. Use slugs large enough to ensure the maximum height of deflection caused by the slug is 50 times higher than the background.
5. Inject at the highest practicable rate during the slug tracking test, but at low enough velocity to allow the slug to be followed effectively.
6. If the slug moves upward outside of the tubing or splits during the tracking test, follow the slug upward to determine the limit of its upward movement.
7. Inject at the highest practicable rate during the stationary test.
8. Set the tool with the bottom detector within five feet above the end of the tail pipe, the casing shoe or the top perforation (whichever is deeper) during the stationary test; or if the slug moved upward during the tracking test, place the top detector above and the bottom detector below the highest level of upward movement detected during the tracking test. If the slug passes both detectors during the stationary test, move the tool up in steps to find the shallowest extent of movement.
9. The stationary test must be run for a minimum of 30 minutes and must be run long enough to be able to detect upward flow of 2 feet per minute.
10. Run a final base log after testing.
11. The test shall include a written report by a knowledgeable analyst. Such report must explain any anomalies shown in the results.
12. The test report shall include an up-to-date well schematic; digital logging data on CD/flash drive/email in a spreadsheet format; description or illustration of the logging tool with measurements of detector and ejector placement relative to the tool bottom; and plots of the logging activity including merged and unmerged slug tracking records, stationary test plot, initial base log, final base log, and superimposed initial and final base logs.
13. The test report shall include a tabulation of values for the following background parameters: EPA permit number, long string casing inner diameter (in), long string casing length (ft),tubing inner diameter (in), tubing length (ft), depth to top of packer (ft), depth to bottom of packer (ft), tail pipe inner diameter (in), tail pipe length (ft), tail pipe lowermost depth (ft),top of open hole or uppermost perforation (ft), open hole diameter

(in), well total depth (ft),plugged back total depth or top of fill depth (ft), Kelly bushing elevation (ft), and as applicable depth to top of confining zone (ft), depth to top of permitted injection zone (ft),and depth to top of injection interval (ft). The test report shall also include a tabulation of values for the following test specific parameters: test date, depth reference (Kelly bushing or ground level), and injection rate for each test (gpm).

14. The test must conclusively demonstrate its objectives and satisfy the Director to be considered a completed test.

Temperature Log

1. To conduct a static temperature log, the well must be shut in for at least 36 hours, or longer if temperature stabilization based on previous logs requires more time.
2. If the well cannot be shut in for 36 hours, shut in for as long as possible and run two logs at least six hours apart.
3. Calibrate the temperature tool in a bucket of ambient temperature water and a bucket of ice water immediately prior to conducting the test.
4. Log from the top of the well to the bottom, recording both temperature and natural gamma ray activity.
5. Record log data at least once per foot.
6. Logging speed shall not exceed 30 feet per minute. Reduce speed to 20 feet per minute in air-filled well bores.
7. The test shall include a written report by a knowledgeable log analyst. Such report must explain any anomalies shown in the results.
8. The test report shall include an up-to-date well schematic, digital logging data on CD/flash drive/email in a spreadsheet format, and a plot of the logging activity.
9. The test report shall include a tabulation of values for the following background parameters: EPA permit number, long string casing length (ft), tubing and/or tail pipe lowermost depth (ft), top of open hole or uppermost perforation (ft), well total depth (ft), plugged back total depth or top of fill depth (ft), Kelly bushing elevation (ft), depth to top of confining zone (ft), and depth to top of permitted injection zone (ft). The test report shall also include a tabulation of values for the following test specific parameters: test date, depth reference (Kelly bushing or ground level), date of last injection, temperature of last injected fluid (F), elapsed time since last injection (hr), volume injected into the well in the past year (gal), names and depths of any other injection formations used at the site, temperatures logged by the tool and thermometer during calibration (F), depth to fluid level in the tubing (ft), depth to top of receptive strata (ft), and depth to bottom of receptive strata (ft).

NON HAZARDOUS CLASS I INJECTION WELL APPLICATION

APPENDIX 1

WASTE MANGEMENT PLAN
OSCEOLA AND MECOSTA COUNTY, MICHIGAN

Michigan Potash Operating, LLC

WASTE MANGEMENT PLAN
OSCEOLA AND MECOSTA COUNTY, MICHIGAN

THE UNITED STATES POTASH PROJECT
DECEMBER 2021

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The U.S. Potash Project, Waste Management Plan

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The U.S. Potash Project, Waste Management Plan

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TABLE OF CONTENTS (CONTINUED)

The U.S. Potash Project, Waste Management Plan

APPENDICES

Theodore A. Pagano
General Manager
Michigan Potash Company, LLC
Telephone: (970) 590-3944
Fax: (303) 395-1530
E-mail: tpagano@mipotash.com

1.0 INTRODUCTION

1.1 Purpose

Michigan Potash Operating, LLC is applying for a permit to operate Class I NON-HAZARDOUS injection wells for the disposal of salt water, that is, brine created from the processing of food grade sodium chloride, “NaCl” and potassium chloride “KCl.”

The proposed wells are to be operated under the United States Environmental Protection Agency (USEPA) Underground Injection Control program and follow federal rules and regulations as defined in Title 40 of the Code of Federal Regulations.

The requirements of 40 CPR Section 146.13(b)(1) specify that any operator of a Class I underground injection well monitor and analyze the fluids injected into the well such that,

"The analysis of the injected fluids (shall be monitored) with sufficient frequency to yield representative data of their characteristics."

Additionally, 40 CFR Section 146.68(a)(1) specifies that:

"The owner or operator shall develop and follow an approved written waste analysis plan that describes the procedures to be carried out to obtain a detailed chemical and physical analysis of a representative sample of the waste, including the quality assurance procedures used."

This Waste Analysis Plan (WAP) fulfills the applicable requirements of the permit application process as stated in various 40 CPR sections. This document was prepared following guidance as illustrated in the *USEPA Region V Underground Injection Control (UIC) Section Regional Guidance #8* issued January 21, 1994 entitled Preparing a Waste Analysis Plan at Class I Injection Well Facilities.

1.2 Waste Description and Generation

Wastewater consists of an aqueous solution of predominantly composed of water and naturally occurring salt, or sodium chloride and naturally occurring potassium salt, potassium chloride. Both principle constituents are utilized in food and agriculture. Analytical results do not indicate any hazardous constituents.

A typical waste analysis is as follows:

Physical Properties:

	Range	Typical
Specific Gravity	1.0 - 1.2	1.1
pH	5.5 - 8.0	7.0

CONTINUED ON NEXT PAGE

Chemical Characteristics:

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

Sodium hydroxide is used in the stripping of the H_2S from the production brine. As processes change, scale and/or corrosion inhibitors may be used. There is a slight chance that minute amounts of these chemicals may enter the waste stream.

Biological Characteristics:

Disposal fluid originates primarily from the solution mining of potash and salt and is essentially free of biological matter. Well water used to dissolve the potash may possibly contain biological matter; however, the high salinity of the disposal fluid would cause an overall decline in biological matter content.

Radiological Characteristics:

The disposal fluid will contain trace amounts of the naturally occurring stable C137 isotope and radiogenic K^{40} isotope associated with potassium chloride and sodium chloride.

1.3 Waste Storage Transportation and Disposal

The wastewater generated by the brine production process will be piped to a holding tank then pumped through a dual media (anthracite and sand) filter prior to disposal in the injection well.

1.4 Operating Data

Average injection rate while in operation: 90 - 600 gallons per minute (gpm)

Average injection pressures while in operation: 600 - 1500 pounds per square inch (psig)

1.5 External Transport and Disposal Procedures

Michigan Potash Operating will not allow any fluids or brine to leave Michigan Potash Operating Property. In the event of multiple well failures, the production process will either be halted or the wastewater will be shipped off-site for disposal.

1.6 Project Responsibility

The General Manager, Operations Manager and Production Manager will have the primary responsibility to ensure all WAP conditions are met. The collective management team is also

responsible for coordination and selection of the subcontracted laboratory used to support the analyses associated with this WAP.

TriMatrix Laboratories, Inc. of Grand Rapids, Michigan will be performing the analytical requirements of the WAP. It is the primary responsibility of TriMatrix to ensure that all of the laboratory QA functions are fulfilled.

2.0 SAMPLING ACTIVITIES

The following parameters will be analyzed for one or more of the following reasons:

- required by permit
- required to show that the waste is characteristically non-hazardous per 40 CFR 261
- required per the USEPA Region V guidance document
- required by Michigan Potash Operating for optimal injection well system performance

2.1 Sample Parameters/ Analytical Method/ Sampling Frequently

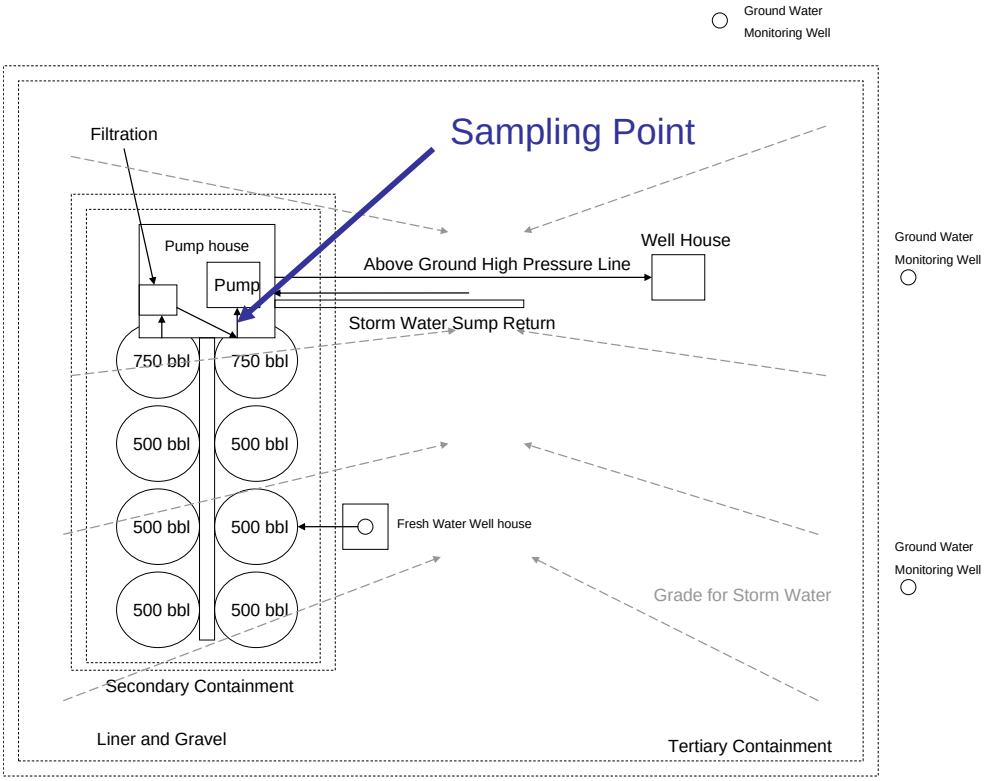
PARAMETER	ANALYTICAL METHOD	SAMPLING FREQUENCY
Barium	USEPA 6010B	Quarterly
Calcium	USEPA 6010B	Quarterly
Cobalt	USEPA 6010B	Quarterly
Copper	USEPA 6010B	Quarterly
Iron	USEPA 6010B	Quarterly
Lead	USEPA 6010B	Quarterly
Magnesium	USEPA 6010B	Quarterly
Manganese	USEPA 6010B	Quarterly
Selenium	USEPA 6020	Quarterly
Sodium	USEPA 6010B	Quarterly
Zinc	USEPA 6010B	Quarterly
Alkalinity, Bicarbonate	USEPA 310.1	Quarterly
Alkalinity, Carbonate	USEPA 310.1	Quarterly
Alkalinity, Total	ASTM D 1246-88	Quarterly
Bromide	USEPA 325.2	Quarterly
Chloride	USEPA 120.1	Quarterly
Conductivity @ 25 C	USEPA 120.1	Quarterly
pH	USEPA 150.1	Quarterly
Oxid/Reduct Potential	ASTM D 1498-76	Quarterly
Residue, Dissolved @ 180 C	USEPA 160.1	Quarterly
Specific Gravity	ASTM D 1429-79	Quarterly
Sulfate	USEPA 375.4	Quarterly
Sulfide	USEPA 376.1	Quarterly
Carbon, Total Organic	USEPA 415.1	Quarterly

2.2 Sampling Frequency Justification

The sampling frequency presented in this WAP is based on permit requirements. As historical data and process knowledge has indicated, the waste stream is consistent relative to analytical test results. As such, the frequency specified will provide the necessary monitoring to insure identification of any potential fluctuations in the stream. Additionally, this WAP allows for supplemental, or modified, sampling when system anomalies are suspected.

2.3 Sampling Location

Michigan Potash Operating has identified a primary sampling location from which injected brine will be collected. The primary sampling point, a manual spigot located at the discharge point of the final filtration unit and the suction of the injection pumps, will be used for all specified sampling events. This spigot is located on the wastewater main discharge line, such that no other piping is connected to the main prior to the wellhead. The sampling location is illustrated below on the site security diagram.



2.4 Sampling Protocol

The sampling protocols include the collection of operational data at the wellhead and the collection of samples at the appropriate sample point.

2.4.1 Sampling Protocol (Analytical)

Sampling will be performed quarterly. The sample will be obtained at the primary sample point by carefully opening the spigot valve to allow the sample to flush to the local sump drain for one minute. After the flush period, appropriate sample containers will be filled with the final filtered wastewater (annually a second set of containers will be filled as a field duplicate.)

Each sample container is labeled with the:

- date of collection
- time of collection
- sampler initials
- sample ID

A Chain-of-Custody will be initiated that includes:

- date of collection
- time of collection
- sampler signature
- sample ID
- analyses to be performed
- pertinent sampling notes

2.5 Sampling Personnel

Only those Michigan Potash Operating individuals who are thoroughly familiar with the safety and operational characteristics of the injection well system and the requirements of this document will perform or assist in sampling.

The Michigan Potash Operating sampling staff will possess site familiar training in the proper sampling protocols specified in this WAP. Additionally, they will possess the required training and site knowledge to perform the sampling tasks safely.

Michigan Potash Operating personnel will be primarily responsible for the operation, maintenance and corrective action documentation of the injection well system.

Michigan Potash Operating sampling personnel will be primarily responsible for coordinating sampling activities with the lab, performing sampling as outlined in Section 2.4, preparing and completing all required sample labels and chain-of-custody (COC) and for assuring transportation of samples to the laboratory for analysis.

2.6 Chain-of-Custody

The following COC procedures have been developed to insure that all samples collected remain intact and representative, until all analytical procedures are conducted. These procedures include both field and laboratory custody requirements.

2.6.1 Field Custody Procedures

Sample containers are labeled as indicated in Section 2.4 immediately after collection. A COC is initiated in the field at the time of collection. The samples and COC are sent by the field sampling technician to the laboratory.

Upon receipt of the sample at the laboratory, the COC is signed as received by the sample custodian, the sample information is recorded in a log and the sample is released to the laboratory for testing.

2.6.2 Laboratory Custody Procedures

TriMatrix Laboratories, Inc. has incorporated strict procedures for sample custody. The entire TriMatrix QA/QC manual is attached as Appendix A. These guidelines were established to maintain the custody of samples in the laboratory and the legal validity of results generated.

The sample custody procedure outlines the general procedures utilized in the processing of all samples received. The following, where applicable, are to be considered minimum requirements. Appendix A contains specific details utilized by TriMatrix for sample receipt, login, storage, internal sample transfer, storage, analysis, and disposal.

2.6.3 Sample Custody Procedure

This procedure is designed to outline the general processes used to initiate and maintain sample custody for samples received at the laboratory. These procedures have been instituted to insure that proper sample custody has been established upon receipt and that this custody is maintained during the entire analytical process. Detailed procedures are specified in Appendix A.

General Procedure:

When a sample cooler is received, a sample login is immediately initiated. The cooler is inspected externally to determine if any obvious leakage has occurred. The cooler seals are broken and the COC is removed. The cooler contents are inspected for obvious damage or leaks. A thermometer is used to measure the temperature of the samples, and the receipt temperature is recorded on the COC. Upon completion of inspection, the COC is checked against the bottles received. The COC is reviewed and signed.

All samples received at the laboratory are logged into a laboratory data management system, which assigns a unique laboratory sample number to each sample. Each container for a given sample is issued a unique container identification number.

Login personnel determine which analysis is required for a given sample from the information provided on the COC. The COC information is entered into the laboratory data management system.

The sample COC, check list, and any other shipping paperwork are placed into a project file, which is then given to the applicable laboratory project manager who verifies the receipt of the sample, COC information, and analyses logged into the database system.

Labels are generated for each sample container. These labels are durable, water resistant, and printed with indelible ink. The labels include the following information:

- sample number
- client name
- client sample ID
- date received
- date collected
- preservative (if any)
- required tests from that container

The sample number serves as the container identification number. Where multiple containers are received for a given container type, they are further identified with a container identification in the format of "1 of 3". This sample number and container number format provides a link between sample analysis and the container used.

Samples are placed in a cooler (maintained at (C). Access to the cooler and samples are limited to the technical staff of the laboratory. Sample security is maintained through secured limited access areas.

2.7 Bottles and Preservatives

All samples will be collected in appropriate sample containers supplied by the laboratory. Depending on the analysis involved, chemical preservatives may or may not be necessary. Samples will be transported on ice and stored refrigerated at 4 +/- 2 deg C.

2.8 Sample Transport

All samples will be packaged in a cooler with sufficient ice and packing material. Caution will be taken during handling and transport of the samples to ensure that the sample containers are not damaged.

3.0 ANALYSIS INFORMATION

3.1 Analytical Procedures

Analytical methods are listed in Section 2.1 of the WAP. It is understood that these are the base parameters, and circumstances may necessitate the need for additional testing.

Appendix A details aspects of the analytical parameters, including typical lower quantization limits, analytical method references, units of reporting, and holding times.

3.2 Parameter and Quantization Limit Justification

The parameters selected for analysis under the WAP are representative of those necessary to monitor and characterize the injected brine. These parameters are analyzed to determine compliance with the UIC permit, and to insure that the injected brine characteristics are consistent.

The parameters selected for analysis under this WAP are consistent with the requirements of the UIC permit. The provision for waste re-characterization, provided in this WAP, eliminates the need for additional routine analyses.

The quantization limits as outlined in Appendix A, reflect realistic levels of detection that can be reasonably reproduced to insure permit compliance, and to allow for the obvious effects of the sample matrix. These limits should be achievable for the analysis indicated, however, when not obtainable, adequate documentation for matrix interference will be provided.

3.3 Waste Re-characterization

In the event that a significant change is suspected or detected in the injected brine, a provision for waste re-characterization will be implemented. An immediate sampling/resampling of the waste stream will be performed and analyzed for all parameters specified in Section 2.1. This sample will be drawn from the primary sampling point as described in Section 2.3.

Waste re-characterization will be used to determine that the waste being injected into the injection well system is stable, and that any injected brine variation will not impact the underground injection process.

4.0 QUALITY ASSURANCE/QUALITY CONTROL

4.1 Field QA/QC

The following general procedures will be followed by sampling personnel: 4.1.1 Equipment Blanks

Samples for this WAP are drawn from a free flowing spigot, therefore all sampling equipment and containers are dedicated. Equipment Blanks will not be required.

4.1.2 Trip Blanks

A trip blank will be prepared by the laboratory using preserved containers (as applicable) and filled with reagent grade water. The trip blank will follow the sample containers to the site and through the entire collection and transportation process.

4.1.3 Field Duplicates

Field duplicates are representative samples taken at the same time of normal sampling using similar sampling techniques. The field duplicates are identified in a generic fashion to limit laboratory knowledge of the sample source. Field duplicates will be analyzed for all parameters. Field duplicates will be analyzed at a frequency equivalent to at least one (1) per calendar year. Additional field duplicates may be required to investigate specific parameters or analytical processes.

4.2 Laboratory QA/QC

This section presents the general QA/QC requirements applicable to the analysis of environmental samples, as well as the methods for assessing data quality. The purpose of the QA/QC program is to produce data of known quality that is legally defensible, satisfies applicable data quality objectives (DQOs), and meet or exceed the requirements of the WAP.

Performance of all analytical methods is monitored to assess the accuracy and precision of the procedure. Specific quality control checks are designed to provide the necessary information for method assessment.

The following general elements apply to the chemical analyses performed in the laboratory.
TriMatrix Laboratories, Inc., a third party firm, has provided a lengthy, detailed QA/QC program for their specific operations that is attached to this WAP as Appendix A.

4.2.1 Elements of Quality Control - Chemical

A preparation batch is a group of samples that are carried through an applicable preparation technique (e.g. digestion, distillation, or extraction) at the same time using the same reagents and conditions. An analytical batch is a batch of samples that are analyzed using the same instrument and conditions within the same time period. The identity of each batch is unambiguously recorded as a unique "Batch ID" so that a reviewer can identify the QC samples associated with a group of samples.

The type of QC samples that may be utilized and their use are identified below. The specifics regarding frequency, acceptance criteria, and corrective action are included Appendix A. Specifics regarding the requirements of these QC samples are detailed in the individual standard operating procedures.

4.2.2 Calibration

Instruments and support equipment are calibrated in accordance with the referenced analytical methods. Details of calibration procedures are contained in the laboratory SOPs. For the analyses selected, all target analytes are included in initial and continuing calibrations regardless of their need in a given environmental sample.

If the calibration acceptance criteria are not met, the operating curve may be narrowed either by eliminating the low point or high point of the curve (providing all project criteria are still met.) For multi-analyze calibrations, specific analysts may be eliminated from the low or high points. Otherwise, the entire calibration curve is repeated. Elimination of any of the inner levels of the calibration in order to meet QC acceptance criteria is allowed provided that all analytes are eliminated in that level and the required minimum number of calibrated levels remain.

4.2.3 Surrogates (SURR)

Surrogates are used to evaluate accuracy, method performance, and extraction efficiency in organic procedures. Surrogates shall be added to environmental samples, quality control samples, and blanks.

4.2.4 Initial Calibration Verification (ICY)

A second source standard containing all target analytes is analyzed after each initial curve, to verify the validity of the calibration. This standard must be from a separate source or lot number from that used for calibration. Unless specified in the reference method, the ICV is at a concentration near the midpoint of the calibration range.

If the acceptance criteria are not met for the ICV, corrective action steps will include the following. When deemed appropriate, the analyst may take lesser corrective action.

- Perform corrective action (e.g. prepare new standard, rinse system, etc.) analyze another calibration verification. If acceptance criteria are not met in this second consecutive (immediate) calibration verification, then perform one of the following. Either,
- demonstrate performance after corrective action with two consecutive successful calibration verifications, or
- A new initial instrument calibration must be performed.

The acceptance criteria must be met before samples can be analyzed. However, sample data associated with unacceptable calibration verification may be reported if the verification indicates high bias and the samples indicate non-detectable concentration, or if the project DQOs are met and an appropriate qualifier is reported.

4.2.5 Initial Calibration Blank (ICB)

A reagent blank is analyzed after the ICY and prior to the analysis of environmental samples. A blank may also be analyzed after high concentration samples to demonstrate that carryover contamination does not exist.

Samples associated with an ICB indicating high bias may be reported if the samples indicate non-detectable concentration, or if the project DQOs are met and an appropriate qualifier is reported.

4.2.6 Interference Check Sample (ICS)

Interference check samples are used in inductively coupled plasma analyses to verify background and inter-element correction factors.

Samples associated with an ICS indicating high bias may be reported if the samples indicate non-detectable concentration, or if the project DQOs are met and an appropriate qualifier is reported.

4.2.7 Method Blank (MB)

The method blank goes through all applicable preparation steps and is used to document non-contamination of the entire analytical process.

The MB is considered a batch control parameter. Samples associated with a MB indicating high bias are re-prepared and analyzed. The only exceptions are samples that indicate a non-detectable concentration despite the MB result, or where the project DQOs are met and an appropriate qualifier is reported.

4.2.8 Laboratory Control Sample (LCS)

The LCS is prepared with analyte-free water or, where available, a purchased solid matrix spiked with representative analytes. The LCS shall be spiked with a second source standard at a level near or below the midpoint of the calibration curve for each analyte. This QC sample shall be carried through the entire preparatory and analytical procedure to document the accuracy of the entire analytical process.

The LCS is considered a batch control parameter. Samples associated with aLCS that fails to meet the acceptance criteria for recovery are re-prepared and analyzed. The only exceptions are samples that indicate a non-detectable concentration when the LCS indicates high bias, or where the project DQOs are met and an appropriate qualifier is reported.

4.2.9 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

A matrix spike and matrix spike duplicate are separate aliquots of sample spiked with known concentrations of analyte using a second source standard. The spiking occurs prior to sample preparation and analysis. Samples used for the MS/MSD are chosen at random. This allows for the evaluation of all sample matrices over time. The MS and MSD shall be spiked at a level less than or equal to the midpoint of the calibration curve.

The MS/MSD are matrix-specific quality control samples and are used to assess the bias for accuracy and precision of a method in a given sample matrix. The MS/MSD accuracy recovery is not solely used to assess batch control.

Samples having an indigenous concentration greater than or equal to 4 times the spiked amount are considered not applicable for spike analysis at that level. Where the sample chosen for MS/MSD analysis is one of a group of samples submitted from a site with homogeneous character and the MS/MSD require that the sample is re-prepared and analyzed, all samples from that Sample Delivery Group should be re-analyzed under similar conditions. If the acceptance criteria are not met in two separately prepared analyses, the failure is considered matrix specific for that sample and the results yielding better recovery are reported with an appropriate qualifier.

4.2.10 Duplicate (DUP)

Applicable to analyses where MS/MSD are not, duplicate samples are analyzed using identical recovery techniques and treated in an identical manner. Duplicate sample results are used to assess the precision of the entire analytical process. Samples used for the DUP are chosen at random. This allows for the evaluation of all sample matrices over time.

The DUP is a matrix-specific quality control sample and is used to assess the bias of a method due to a given sample matrix. The DUP is not used to solely assess batch control. If the acceptance criteria (%RPD) are not met, the sample and its duplicate must be re-prepared and analyzed. Relative Percent Difference is calculated only where the two values are greater than or equal to 5 times the PQL. If the values are below 5 times the PQL, the acceptance criteria are ± 1 PQL of each other.

Where the sample chosen for duplicate analysis is one of a group of samples submitted from a site with homogeneous character and the DUP requires that the sample is re-prepared and analyzed, all samples from that Sample Delivery Group should be re-analyzed under similar conditions. If the acceptance criteria are not met in two separately prepared analyses, the failure is considered matrix specific for that sample and the results yielding better recovery are reported with an appropriate qualifier.

4.2.11 Post-digestion Spikes (PDS)

A PDS is applicable only to digested metals analyses and those general chemistry (wet chemistry) analyses that include a preparation step (e.g. cyanide, nitrogen - ammonia, and phenolics). A post-digestion spike may be analyzed to assist in the assessment of matrix interference when the MS and MSD fail to meet the accuracy acceptance criteria. In addition, a PDS can be used as a troubleshooting tool. The spiking solution is added to a sample aliquot just prior to analysis thereby evaluating the matrix effect on the analysis process only and not the preparation portion. Samples having an indigenous concentration greater than or equal to 4 times the spiked amount are considered not applicable for spike analysis at that level.

If the MS/MDS fail to meet the accuracy acceptance criteria and the PDS is within the acceptance criteria, matrix interference should be suspected. If the MS/MSD and PDS fail to meet the accuracy acceptance criteria, matrix interference is probable and the sample, MS/MSD, and PDS should be prepared and analyzed. A smaller sample size should be considered as means to negate the apparent matrix interference.

4.2.12 Serial Dilution (SD)

As a troubleshooting tool, it may be necessary to analyze a serial dilution of a sample. The results of a 1:5 serial dilution should agree with each other within 5% (unless stated otherwise in the reference method). These criteria are for evaluating the matrix effect in a new or unusual matrix and not for comparing results for a sample diluted because it was above the calibration range of the instrument.

4.2.13 Continuing Calibration Verification (CCV)

A second source standard containing all target analytes is analyzed to verify that the calibration curve remains valid. This standard must be from a separate source or lot number from that used for calibration. Unless specified in the reference method, the ICV is at a concentration equivalent to the midpoint of the calibration range.

If the acceptance criteria are not met for the CCV corrective action steps include the following. When deemed appropriate, the analyst may take lesser corrective action.

- Perform corrective action (e.g. prepare new standard, rinse system, etc.)
- Analyze another calibration verification. If acceptance criteria are not met in this second consecutive (immediate) calibration verification, then perform one of the following. Either,
- demonstrate performance after corrective action with two consecutive successful calibration verifications, or
- A new initial instrument calibration must be performed.

Sample data associated with unacceptable calibration verification may be reported if the verification indicates high bias and the samples indicate non-detectable concentration, or if the project DQOs are met and an appropriate qualifier is reported.

4.2.14 Continuing Calibration Blank (CCB)

A reagent blank is analyzed after the CCV. A blank may also be analyzed after high concentration samples to demonstrate that carryover contamination does not exist.

Samples associated with a CCB indicating high bias may be reported if the samples indicate non-detectable concentration, or if the project DQOs are met and an appropriate qualifier is reported.

4.2.15 Control Charts/Tabulations

Control chart-type data are retained by the laboratory for all quality control sample types. Where allowed by the reference method, laboratory generated acceptance limits may be statistically prepared for Surrogate recovery, LCS recovery, MS recovery for accuracy, and MSD/DUP recovery for precision. Statistical outliers are removed and a minimum of the 50 most recent data points is used to update the limits. When used, lab generated acceptance limits are updated on a minimum annual basis. Control limits are established at the average plus-and-minus three standard deviations (X ± 30 n_1) unless otherwise required in the reference method.

4.2.16 Subsampling

When removing a portion of an environmental sample, appropriate care and technique is used in order to obtain a representative sub-sample. For water samples this includes thoroughly shaking the sample container in order to mix any solids. It is appropriate to shake filtered groundwater samples as any particulate in the filtrate is from the original sample. For solid and semi-solid samples this includes stirring the sample in order to homogenize any stratified layers within the sample container. These techniques do not apply to removing an aliquot for the analysis of total organic halides (TOX), or total organic carbon (TOC).

4.2.17 Sample Containers

Most containers are purchased certified clean from a commercial vendor. These containers are ready for use and require no additional monitoring prior to use. Containers that are purchased without certification will be verified clean prior to shipment.

4.3 Calibration Procedures - Laboratory Analyses

All analytical calibration procedures utilized at TriMatrix have been developed to meet or exceed the requirements specified in SW-846, (current) edition, and EPA 600/4-79/020. These procedures are strictly adhered to at all times.

4.3.1 Accuracy and Traceability of Calibration Standards

All standards and reagents are tracked from their initial preparation through their use in the preparation and analytical batches. Standards purchased from an outside vendor are, where available, traceable to the National Institute of Standards Technology (NIST). A Certificate of Analysis, or similar document of traceability, is kept in the appropriate standards preparation log. Purchased standards may be used at their prepared and labeled concentration without further verification.

Standards preparation and reagent preparation logbooks are maintained throughout the laboratory. Each logbook is labeled with the laboratory name, unique name/purpose of the logbook, logbook number, the "start date" and the "end date".

Each stock standard, subsequent dilution, and prepared reagent is given a unique tracking number. When preparing dilutions of a standard the following information is included in the standards log:

- standard source lot number
- standard name
- expiration date
- initials of the preparer
- date prepared
- detailed information of the volume/mass used
- final volume prepared
- diluent
- prepared concentration

The expiration date of a prepared standard is that date on which the stock solution expires. In mixes where there is more than one expiration date for the stock solutions, the earliest date is chosen as the expiration date for the entire mix. Each container is labeled with standard or reagent name, concentration, tracing number, and the expiration date. Containers too small for a label with the required information are labeled with a minimum of the logbook reference number and expiration date. Expired standards are discarded and are not used for the generation of analytical data. Standards are prepared using glassware and delivering devices of known and acceptable accuracy.

4.4 Data Reduction, Review, Reporting - Field Analyses

Data reduction for field analyses involves the direct recording of values from various meters and instruments. All results generated from field analyses consist of values read directly from continuous monitoring meters. Therefore, no calculations are required in producing the final reported results.

Where it may be applicable, field analysis raw data is reviewed by Mosaic personnel for accuracy and completeness. Particular attention is paid to the maximum and minimum values recorded, as these

values are compared to permit limits for compliance purposes.

4.5 Data Reduction, Review, Reporting - Laboratory Data

Data reduction involves the handling of raw sample data including, but not limited to, detector response, electrode potential readings, titrant volumes, and gravimetric measurements to achieve final sample concentrations. Automated systems are used for calculation and reduction wherever feasible.

4.5.1 Data Review

A two-tier technical review of all data is performed and documented. 4.5.1.1 1' Level Technical Review

The laboratory technician performing an analysis reviews all of their own data and is responsible for ensuring that the calculations were properly performed and the quality control requirements were met. A data review checklist is initiated by the technician to document this review. The data review checklist is then given to a peer knowledgeable with the current requirements of that analytical procedure, a senior technician, unit supervisor, or the QA/QC director.

4.5.1.2 2nd Level Technical Review

A peer, senior technician, unit supervisor, or the QA/QC director reviews the data by repeating the verification performed by the laboratory technician. This step is documented through use of the data review checklist.

Acceptable data is then available for review in the laboratory data management system. This is performed through the "QA Validation" function of the database. Anyone able to perform the 1st Level or 2nd Level Technical review can "validate" the data in the database. This step approves the data for release.

4.5.2 Project Manager Review

Before the data is released, a project manager will review all final reports for consistency and completeness to ensure that the data meet the overall data quality objectives of the project. This review is intended to verify that those analyses requested on the COC have been performed, the sample information is accurate, and the appropriate data qualifiers have been added.

4.5.3 Quality Assurance Review

In addition to the tiered review process, the quality assurance department will periodically perform data audits. These audits, required as part of the laboratory quality systems audit program, can be performed for the generation of reports that include quality control data, and as a troubleshooting measure. Batches that are reviewed are chosen on random basis and recreate the calculations of all samples in a given batch.

4.5.4 Reporting

For each sampling event/sample delivery group, TriMatrix will prepare an analytical report. The analytical report, accompanied by a cover letter will generally contain the following elements.

- Laboratory name, address, and phone number

- Title of "Analytical Results"
- Date reported
- Client name (with address on the cover letter)
- Client project ID
- Work Order and Sample Number
- Client sample identification and description
- Client defined matrix
- Collection date and received date
- Analyze
- Result (at client requested reporting limits and units)
- Reporting limit
- Units
- Applicable data qualifiers and dilution factor
- Date of analysis
- Analytical method reference
- Date of sample preparation
- Analyst initials
- Page numbering

The original chain-of-custody form and the login checklist will be returned with each report. Any deviations from the requirements of the laboratory sample acceptance policy will be noted in the final report on either the cover letter or the login checklist.

4.5.4.1 Report Archive

Analytical reports generated as part of the injection well waste analysis sampling will be archived by TriMatrix. Individual reports will be maintained in the work order file organized by work order number.

4.6 Internal Laboratory Audits

The purpose of auditing is to identify whether the lab is generating scientifically sound and defensible data, and that daily operating systems meet the requirements of this quality assurance plan. It is the responsibility of the laboratory QA Director to perform periodic performance audits and system audits.

4.6.1 Performance Audits

Performance audits are conducted periodically throughout the year. Performance audits include proficiency testing samples and detailed data reviews. Findings from these audits are used to evaluate the defensibility and data quality produced by the analytical system, randomly selected samples from various test methods are evaluated in this process. Deficiencies from these audits are discussed with the analyst. Copies of the reports from these audits are forwarded to the unit supervisors and summarized for upper management in the annual system audit report.

4.6.2 System Audits

A systems audit is performed on a minimum annual basis. The systems audit is a comprehensive review of the overall quality and measurement system. The purpose of these audits is to confirm compliance with the requirements of the Quality Assurance Plan, and to assess the applicability of the quality system

to other certification and regulatory programs. Systems audits identify the presence of the necessary organization, facility, and quality systems needed to provide evidence of the laboratory's capability and competence. Copies of the reports from these audits are forwarded to upper management.

4.7 Laboratory Corrective Action Procedures

Corrective action is necessary whenever deviations from requirements of the quality system occur. System corrective action is described in this section.

4.7.1 System Corrective Action

The QA department typically initiates corrective action. This type of action is usually initiated due to poor performance audit results, poor system audit results, or unacceptable results on performance testing samples. Either the unit supervisor or their designee is responsible for investigating the problem and determining the corrective action needed. When the source of the problem has been identified and corrective action suggested, a written record is completed, evaluated and, if appropriate, approved by the unit supervisor and QA department. Documentation of each corrective action is kept on file. The forms used are numbered and monitored by the QA department to ensure that out of control events and actions are documented, and that the corrective actions are appropriate, effective, and complete.

Regardless of the source or projected impact on the system failure, the following systematic approach is used in developing a suitable corrective action. The emphasis of the corrective action is to prevent the problem from reoccurring.

- Define the problem
- Establish the root cause of the problem
- Determine the needed action to resolve the problem and eliminate the root cause
- Assign responsibility for implementing corrective action
- Verify the corrective action has been implemented and has eliminated the problem
-

5.0 SAFETY

5.1 Safety Guidelines

Sampling activities at Mosaic will be conducted with the proper personal protective equipment (PPE). Sampling activity will generally be conducted using Level D PPE. The following is a list of specific items to be used by field personnel as defined by Safety Level D:

- Hard Hat
- Safety Glasses with side shields
- Safety shoes
- Heavy work clothes covering legs, shoulders and arms
- Safety gloves

Caution must be exercised at all times when performing sampling activities. In and around the area of the injection well system various mechanical hazards exist.