

## APPENDIX 7 - BRINE DISPOSAL WELL PERMITTING GUIDELINES

Brine Disposal wells must meet all federal UIC specifications and obtain a federal Class IID UIC permit. In addition, a State Pollution Discharge Elimination Systems (SPDES) permit from the NYSDEC Division of Water is required to operate a disposal well. A permit to drill a well for disposal or convert a well for disposal is required from the Division of Mineral Resources. A drilling permit fee is required for a new disposal well, but no fee is required for a permit to convert an existing well to a disposal well. The operator must also provide a bond or other financial security to cover the operator's plugging responsibilities for such a well. In addition, a Mineral Resources permit is required for the plugging of any such fluid disposal well.

No SPDES permit is required for a well in which an operator injects brine exclusively for the purpose of enhanced oil recovery.

All brine disposal wells must be constructed to NYSDEC specifications. A geological and engineering report must be submitted for review and approval by the Bureau of Wastewater Facilities Design before the well is drilled or converted to disposal. Operating conditions will be specified in the SPDES permit and monitoring reports will be required.

The general guidelines that have been used for the disposal of approved fluids (production brines) are as follows:

1. No reinjection of well fluids will be allowed in, above, or below any primary groundwater aquifer as designated by the New York State Department of Environmental Conservation.
2. The fluids shall not be injected at pressures greater than 80 percent of the fracturing pressure. If the fracturing pressure for the injection

zone has not been determined, the bottom hole pressure shall not exceed a gradient of .6 psi per foot of depth. The weight of the column of fluid must be included in the calculation of bottom hole pressure.

3. All valves on a well shall be secured when the well is unattended either by chain and padlock or other approved method and suitable control of unauthorized access to the wellsite must be maintained.
4. The well operator must keep a record of the date and times of injection and the volumes and sources of injected fluids.
5. Should any unusual situations such as equipment failure, vandalism or other conditions occur causing a potential violation of surface or groundwater quality standards, or a potential hazardous condition, the permittee shall immediately notify the NYSDEC Regional Office when such conditions begin and when the conditions cease.

Many other factors must be considered before a disposal well can be approved. More specific guidelines, in addition to the existing guidelines, are proposed in order to streamline the NYSDEC disposal well permitting process.

Prior to preparation and submittal of a disposal well application, it is strongly recommended that the applicant and/or design engineer arrange a preliminary technical conference with the Region office of the Division of Water and the Division of Mineral Resources where the injection well will be located. The Division of Mineral Resources is to act as a technical advisor to the Division of Water with respect to the subsurface well construction and any required injectivity testing.

The data required by the DEC prior to approval of a disposal well should include the following where applicable.

- A. An engineering and geologic study including but not limited to:
  1. A brief statement outlining the purpose of the project, the well name,

the fluids to be injected, the name, description and the depth of the proposed injection zone.

2. The reservoir characteristics of the injection zone, such as porosity, permeability, average thickness, areal extent, fracture gradient, temperature, pressure and fluid saturations.
3. A description of the well construction of the existing or proposed disposal well. This should include the planned well drilling program, casing diagram, casing weights grades and lengths, volume and type of cement, records of all logs run and the proposed method of testing the well's integrity.
4. The regional and local freshwater flow systems must be briefly described and the deepest freshwater zone must be identified. A water quality baseline survey of surrounding freshwater supplies should be made. The report should delineate the number and location of potable water supplies in the area.
5. The area of review of the disposal well shall be a minimum one-fourth mile radius or a larger radius as determined by the DEC based on site specific conditions.
6. The location of all oil, gas or solution mining wells (active, inactive and abandoned) within the determined area of review or influence of the proposed injection well must be accurately shown on a neat legible plat drawn to scale. This plat must also identify the surface owners, offsetting leases and operators.
7. The written approval of the surface landowner where the injection well is located and offsetting operator notification are required. Copies of landowner approval and offset operator notification must be submitted at application.

8. Casing diagrams, including cement plugs, and actual or calculated cement fill behind casing of all active, inactive, abandoned or deeper-zone producing wells within the area of review or influence and evidence that abandoned wells in the area will not have an adverse effect or cause damage to life, health, property or natural resources must be submitted.
9. A chemical analysis of the liquid to be injected shall be filed with the DEC with the application. The minimum analysis shall consist of the following parameters, ph, chloride, sodium, calcium, magnesium, iron, specific conductivity, total dissolved solids, sulfates, hardness and oil or grease. Additional analyses must be submitted whenever the formation the injection fluid originated from is changed, or as requested.

B. An Injection Plan including the following:

1. A flow schematic or map illustrating all aspects of the wellhead, pretreatment equipment, storage facilities, pumping equipment etc.
2. All equipment specifications including pipelines, pumps, filters, tank pressures, recorders, meters etc. The noise levels generated by the injection pumps should also be specified.
3. A monitoring system or method to ensure there are no leaks or other well malfunctions.
4. Specifications of any wastewater pre-treatment, filtration, and additives to be used.
5. The maximum anticipated surface injection pressure and daily rate of injection.

C. Operation and Maintenance Requirements are as follows:

1. The maximum bottom hole injection pressure shall not exceed .6 psi per foot of depth unless the operator can submit sufficient data on the

fracture gradient for the injection zone which is specific to the area where well is located, or runs a step-rate injectivity test to DEC specifications to determine the fracture pressure. These specifications are detailed below.

a. A step-rate test should be conducted prior to any sustained liquid injection or after a period of shut-in if stimulation is necessary. The results of this type of test are conclusive only if proper procedures are used. The proper procedures are as follows:

- 1) The fluid to be used in any injectivity test should be the same fluid the operator plans to inject for disposal.
- 2) The test well should be shut-in long enough after stimulation so that the bottom hole pressure is near the original shut-in pressure.
- 3) The step-rate test should be initiated from the shut-in static bottom hole pressure or hydrostatic pressure to the pressure required to fracture the injection zone formation or the desired injection pressure whichever is lower.
- 4) The test should be carried out by injecting fluid in a series of constant-rate injections with rates increasing step wise from low to high.
- 5) Ideally, the duration of each rate step should be equal. In relatively low permeability formations ( $K < 5\text{md}$ ) such as commonly found in New York State, each rate step should last one hour. For formations with greater permeabilities ( $K > 5\text{md}$ ), the duration of each rate step will be specified.
- 6) Surface pressure reading must be used to monitor during the test. Bottom hole pressure readings from an Amerada-type

pressure recording device is also strongly recommended. When smaller pressure increments occur for a unit rate change, fracturing has probably taken place.

- 7) Injection rates during the test should be controlled with a constant-flow-rate regulator and flow rates should be measured with a calibrated turbine flowmeter and rate meter.
2. An accurate operating pressure gauge and a pressure recording device shall be available at all times. All injection disposal wells shall be equipped for the installation and operation of such gauges on both tubing and annulus.
3. All injection piping, valves, and facilities shall be equal to or exceed design standards for the maximum anticipated injection pressure, and shall be maintained in a safe and leak-free condition.
4. In case of injection well shut down or malfunction, a back-up system or the capability of a minimum of 30 days retention of the wastewater must be available.
5. The disposal well site including off-loading pad, transfer pumps, and storage tanks must be in a diked area constructed of impermeable material and capable of holding 150% of the volume of the largest tank or 150% of the capacity of all tanks if they are gravity manifolded together. There shall be locking valves at all outlets from each tank and on the line to the injection well. Locks shall also be provided on tank access covers and facility access gates. Fencing to preclude unauthorized access shall be provided.
6. The trucks hauling waste brine to the wells shall be required to have a valid Part 364 permit. A log and manifest of all brine received for injection shall be kept.

7. A suitable fluid with appropriate inhibitors must be utilized between the injection tubing and casing.
8. Data from a continuous pressure recorder, shall be maintained to monitor the disposal well to ensure the disposal well operation is in conformance with the permitted operational limits and to insure that damage to life, health, property or natural resources does not occur. All injection wells shall be equipped with a pressure activated automatic shut-down system. Injection shall be terminated immediately if there are deviations from the permitted operational limits.
9. The charts from the pressure recorder, which will be considered a permanent record of the well operating pressure, shall be submitted to the state for review at intervals specified in the SPDES permit.
10. Additional requirements such as a monitoring well program and additional specialized injectivity tests, radioactive tracer and/or spinner surveys, temperature logs or modifications of the above requirements may be necessary to fit specific circumstances.