Maine Underground Injection Control Program: Geothermal Regulations

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What is the UIC Program?

• The Underground Injection Control (UIC) Program is part of the Safe Drinking Water Act.

• Focus of UIC Program is protection of ground water, particularly for its use as drinking water supply.

• UIC regulates the subsurface disposal of a wide variety of liquid wastes.
Applicable Maine Laws and Rules

- Maine has had primacy over the UIC Program since 1983.

- No person may directly or indirectly discharge or cause to be discharged any pollutant to waters of the State without first obtaining a license from the Department. [38 M.R.S.A. § 413(1)]

- The term “pollutant” includes heat as defined in both Maine law and the federal Clean Water Act. [38 M.R.S.A. § 361-A(4-A)]

- The term “waters of the State” includes ground water. [38 M.R.S.A. § 361-A(7)]

- *Rules to Control the Subsurface Discharge of Pollutants* [06-096 CMR Chapter 543]
UIC Well Categories

• UIC wells are divided into 5 categories depending on their intended uses.

• Category V injection wells provide for the shallow disposal of wastewater with the potential to impact drinking water supplies.

• Examples include geothermal wells, floor drains in auto garages and catch basis in parking lots that discharge to dry wells or septic systems.
Prohibited Category V Wells

- Most Category V wells are licensed by rule.
- Some Category V wells are prohibited in Maine.
- Prohibited Category V wells include floor drains from motor vehicle repair and maintenance facilities and large-capacity cesspools.
Geothermal Wells and the UIC Rule

• Chapter 543, the “UIC Rule” classifies “fluid return wells that receive discharges of water that has been used for heating or cooling a heat pump or water extracted for the recovery of geothermal energy for heating, aquaculture, and the production of electrical power” as Class V wells.
Geothermal Wells and the UIC Rule

- Class V wells for fluid return associated with geothermal systems (*i.e.*, “geothermal well”) are licensed by rule pursuant to Chapter 543(5)(B).
- The owner or operator of a Class V geothermal well is required to register the well with DEP.
- Well installer should notify owner of need to register with DEP.
- The owner or operator may require assistance from the design engineer or well installer to properly complete DEP registration forms.
Geothermal Well Registration

State of Maine
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Land and Water Quality
17 State House Station, Augusta, ME 04333-0107
Telephone: (207)287-3901 Email: 1046k.bmex@state.me.us

CLASS V UNDERGROUND INJECTION CONTROL (UIC) WELL REGISTRATION

Facility Name or Well Identifying Information

Facility Name or Well identifier:

Town or City:

County:

Physical Location (street, road, etc. Please provide map, latitude/longitude or UTM coordinates, if available):

Owner/Operator Information

Owner/Operator Name:

Business/Agency:

Mailing Address:

Daytime Telephone Number:

Number and Type of Injection Well(s)

Motor Vehicle Waste Disposal Well

Industrial Well

Commercial Car Wash (engine and undercarriage washing)

Large-capacity Cesspool

Large-capacity Septic System

Septic Tank Effluent Well

Drainage Well

Agricultural Drainage Well

Stormwater Runoff Well

Geothermal Well (Supplemental Data Required)

Discharge Information

Indicate the type, characteristics of the discharge, average flow (gallons/day), and well construction information (drywell, septic tank, gravel pit, etc.) for each injection well listed above. Attach additional sheets or supplemental materials, as needed.

Well Identifier

Characteristics of Discharge

Average Flow
(gallons/day)

Well Construction Information
# Geothermal Well Registration

**Facility Name or Well Identifying Information**
- Well Owner / Address: 
- Facility Name or Well Identifier: 
- GPS Location of the Well(s): 
- Town or City: 
- County: 

**Professional Information**
- Drilling Contractor: 
  - Contact Name/Phone Number: 
- System Design Company: 
  - Address: 
  - Project Manager / Phone Number: 
- Geologist / Hydrogeologist: 
  - Phone Number: 

**Geothermal Well System Information**
- Is the well(s) located on a Mapped Significant Sand and Gravel Aquifer? Yes No Unknown
- Is the well(s) located on a Source Water Protection Area for a Public Water Supply? Yes No Unknown
- How many Geothermal Wells are going to be installed at the facility? Number: 
- What type of Geothermal System is going to be installed (Please Check One)?
  - Closed Loop
  - Closed Loop (Direct Exchange)
  - Open Hole
  - Other
  - If other is selected, please describe how the system works: 
- How many “Heat Pump” units are going to be installed at the facility? Number: 
- What is the maximum heating capacity of each individual “heat pump” unit in BTU’s? 
- What is the maximum cooling capacity of each individual “heat pump” in tons?

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Geothermal Well Registration Exemptions and Exceptions

• The owner or operator of a Class V geothermal well at a single-family, detached, residential house is exempt from the registration requirements of Chapter 543.

• DEP may require additional information to characterize the discharges to geothermal wells and require a Waste Discharge License if necessary to control pollutants.
Geothermal Wells and P.E. Requirements

• All commercial geothermal wells must be designed by a certified professional engineer unless exempted pursuant to 32 M.R.S.A. § 1255.

• Notable exemptions: 1) detached one-family or 2-family residences; and 2) revisions to existing or new HVAC systems with a maximum cooling capacity of 5 tons or heating capacity of 200,000 BTUs.
Geothermal Wells
Installation and Types

• Although not required, the DEP recommends consultation with a State Certified Geologist to ensure proper well design.

• Three most common types in Maine are:
  – Closed Loop
  – Direct Exchange
  – Open Hole
Closed Loop Geothermal

• Underground loop of pipes that typically contains an antifreeze solution. The subsurface loop acts as a heat exchanger, transferring thermal energy to the ground and subsequently circulating to an indoor heat pump where it releases thermal energy to the building via the heat pump refrigerant.

• The risk of ground water contamination from closed-loop geothermal systems is relatively low. However, the potential exists for a leak or rupture to occur that would allow the antifreeze to discharge.

• DEP recommends using biodegradable heat exchange fluid mixtures, such as food grade propylene glycol. All other thermal exchange fluids must be approved in writing by the DEP prior to use. Additionally, the DEP recommends grouting the wells to help prevent a direct release of heat exchange fluid to ground water if pipes fail.
Direct Exchange Geothermal

• DX systems are more common for smaller residential applications where a large thermal exchange system is not needed as in a commercial application.

• Typical DX systems utilize copper piping placed in a series of vertical wells. The copper piping is subsequently charged with refrigerant and carrier oil that is circulated to the compressor in the building.

• DX systems require more refrigerate and carrier oil than closed loop systems. Thus, the risk of ground water contamination from DX systems is higher than closed loop.

• DEP recommends using biodegradable heat exchange fluid mixtures, grouting the wells, and installation of a cathodic protection system to protect the integrity of the copper piping.
Open Hole Geothermal

- Open hole systems generally consist of a series of deep (400 – 1,000 feet) 6-8” diameter vertical standing column wells fitted with a PVC sleeve and a lower Porter Shroud.
- Water is pumped from the well and circulated through a heat pump then subsequently discharged back into the well on the exterior of the Porter Shroud.
- Open Hole systems are also a potential source of ground water pollution from refrigerants and carrier oils.
- DEP recommends that a heat exchange system be installed to separate the well water loop from the building loop to significantly reduce the potential of a release.
- Discharges, such as bleed water, from deep aquifer wells to shallow ground water may require treatment to reduce natural pollutants.
Response to System Failures

A release of pollutants from a geothermal system is in violation of the following State statutes:

- 38 M.R.S.A. § 413: prohibits the unlicensed discharge of pollutants to waters of the State
- 38 M.S.R.A. § 543: prohibits the discharge of oil into or upon waters of the State

In accordance with 38 M.S.R.A. § 548:

- All oil releases must be remediated to the Department’s satisfaction.

In accordance with 38 M.S.R.A. § 550:

- If an oil spill or release is reported to the Department within 2 hours, the responsible party IS NOT subject to fines or civil penalties.
UIC and Geothermal Summary

- Geothermal technology can provide a clean and sustainable method of heating and cooling when installed and operated correctly.

- Maine’s UIC Program provides a simple License By Rule provision for most wells through well registration.

- Some Open Hole wells may require treatment and a separate Waste Discharge License.

- Consulting with a certified geologist/hydrologist on well design and installation is recommended.
UIC and Geothermal Summary

• The biggest risk associated with geothermal wells is the accidental release of oil and refrigerant from piping and equipment failures.

• Measures can be taken to minimize the environmental risk, such as using less toxic fluids and grouting the wells.

• If an accidental release of fluids is discovered, it is important to report the event to DEP to minimize contamination and clean-up requirements.
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