Ohio Environmental Protection Agency

Fact Sheet For

National Pollutant Discharge Elimination System (NPDES)

General Permit for Discharges from Open-loop
Geothermal Heating and Cooling Systems

I. Background

The Federal Water Pollution Control Act [also referred to as the Clean Water Act (CWA)], the Ohio Water Pollution Control Act and the Ohio Revised Code (ORC Chapter 6111) provide that discharge of pollutants to waters of the state from any point source is unlawful, unless the discharge is in compliance with an effective NPDES permit.

The purpose of issuing NPDES permits to geothermal heating and cooling systems is to ensure that any wastewater discharges from these systems are in compliance with all applicable state and federal water pollution control laws.

Geothermal heating and cooling systems use the difference between groundwater and surface temperatures to extract heat during the winter (and discharge cooler water); during the summer the system adds heat to the discharge and cools the building. Some types of geothermal systems discharge to surface waters of the state. Most of these discharging systems (called open-loop systems) pump groundwater through a heat exchanger and out to a stream or lake. These systems add small amounts of heat, and possibly concentrated amounts of minerals or pollutants that do not exist in the surface water. As a result, these systems discharge pollutants to surface waters and are therefore subject to NPDES requirements.

Ohio EPA has elected to issue a statewide general permit to cover discharges from geothermal systems. While these systems add heat to the discharge, they are not expected to raise temperatures to a large degree. The eligibility requirements of the permit (Part I of the general permit) define which discharges can be covered, and sets conditions to prevent contaminated groundwater from being discharged untreated into waters of the state.

Discharge limitations are listed in Part VI of this fact sheet. The general permit is intended to cover any geothermal discharges that were designed to meet these limits and that would consequently have a minimal impact on the environment.

The conditions under the heading "eligibility" are very important because eligibility determining factors such as co-mingling of discharge streams, controlled discharge lagoon system discharges, single and multi-family dwellings and discharges from industrial facilities are addressed here.

II. Description of General Permit Coverage and Type of Discharge

The permit covers geothermal discharges to waters of the state. The permit does not cover any discharges that the Director of the Ohio EPA has determined to be contributing to a violation of a Water Quality Standard (WQS) as determined in Ohio Administrative Code, Chapter 3745-1.

Open-loop geothermal systems draw water from a ground water aquifer, pass the water through a heat exchanger to remove heat (winter) or add heat (summer) to the water. The water is then discharged to a surface water of the state. The draft permit covers only these 'non-contact' discharges; it does not cover discharges of antifreeze or other chemical discharges.

Discharges not eligible for coverage under this permit may still obtain an individual NPDES permit by submitting individual permit applications (Form 1, Form 2D or 2E, and an Antidegradation Addendum).

III. Description of Permit Conditions

Notice of Intent - Facilities that are designed to discharge 100,000 gallons per day or more must submit a Notice of Intent (NOI) application to apply for coverage under the general permit. The USEPA's regulations at 40 CFR 122.21 (a) exclude facilities covered by general permits from requirements to submit an application for an individual permit. Facilities that are designed to discharge less than 100,000 gallons per day are not required to submit an NOI, but are bound by the conditions of the permit. The cut-off of 100,000 gallons per day is based roughly on the cut-off set by the Ohio Department of Natural Resources for reporting well water withdrawals.

NOI requirements are intended to establish a mechanism that can be used to establish a clear accounting of the number of facilities covered by the general permit, their identities, locations, mailing addresses, and nature of discharge.

To apply for general permit coverage, all applicants will be required to complete and submit an NOI application form that is available from Ohio EPA, along with an application fee of $200. The NOI application form and appropriate fees shall be submitted to the following address:

Ohio Environmental Protection Agency
Office of Fiscal Administration
P.O. Box 1049
Columbus, Ohio 43216 - 1049

A copy of the NOI should also be sent to the appropriate district office of the Ohio EPA.

All applicants must submit the results of a volatile organic compound analysis done on a grab sample of the source ground water for the geothermal system to show that the discharge will meet the eligibility requirement in IV. B. 8. below. The analysis must be done using U. S. EPA methods in 40 CFR 136. A list of the volatile organic compounds to be analyzed is listed in Table A4 of this fact sheet. This is a list of the volatile organic pollutants listed in the draft permit.

Facilities who intend to obtain coverage under the general permit shall submit an NOI form within 45 days of the effective date of the permit. Dischargers who fail to obtain coverage under the general permit and are not otherwise covered by an NPDES permit are in violation of Ohio Revised Code (ORC) 6111.

IV. Eligibility Determining Factors

A. Except for discharges identified in paragraph B, this permit may cover discharges of wastewater from open-loop geothermal systems to waters of the state. **Note that geothermal systems that withdraw 100,000 gallons per day or more from an aquifer for more than 60 days per year must also file reports with the Ohio Department of Natural Resources, Division of Soil and Water Conservation.**

B. The following wastewater discharges associated with geothermal discharges are not eligible for coverage under this permit:

1. any discharge that is mixed with another type of discharge prior to reaching the receiving water. If the wastewater discharge does combine with another type of waste stream from the applicant prior to reaching the receiving stream, and it is possible to sample each waste stream separately, the wastewater discharge may be covered by this permit. The other waste stream(s) must be covered under a different NPDES permit,

2. any discharge that includes process wastewater or storm water from an industrial facility, unless the process or storm water discharges are monitored separate from the wastewater discharge and are covered under a different NPDES permit,

3. any discharge of heat transfer fluids other than water; any discharge of antifreeze chemicals.

4. any discharges that are subject to an existing NPDES permit with an effluent limitation, monitoring requirement, and/or other requirement that is not addressed by this permit, or is more stringent than contained in this permit,

5. any discharge to superior high quality waters, outstanding state waters, outstanding national resource waters, or category 3 wetlands as defined by rule 3745-1-05 of the Ohio Administrative Code,

6. any discharge to waters designated Coldwater Habitat or Exceptional Warmwater Habitat,

7. wastewater discharges geothermal systems that the Director has determined to be contributing to a potential violation of Ohio's surface water quality standards;

8. any discharge that contains volatile organic pollutants greater than 100 ug/l (total of all VOC compounds),

9. geothermal system discharges that are discharged to combined or sanitary sewer systems;

10. any facility that, in the judgment of the Director, is not likely to comply with the terms and conditions of this permit, and

11. any facility that discharges to ground water.

V. Antidegradation

Because this permit authorizes new discharges to waters classified as General High Quality Waters, certain provisions of Ohio's Antidegradation Rule apply [OAC Rule 3745-1-05]. These discharges add small amounts of heat and potentially low levels of pollutants from groundwater that may be greater than background levels in the receiving surface water. This general permit is going to public notice as a degradation under the public notice provisions of the Antidegradation Rule [OAC Rule 3745-1-05(C)(3)].

The Antidegradation Rule excludes general permits from the alternatives analysis and social/economic justification portions of the rule. The discharge alternative being considered for this permit is the pumping of groundwater through a heat exchanger and discharged to a surface water. While there are other types of geothermal systems that do not discharge, Ohio EPA is choosing to let the economics of installation, operation and discharge drive the alternative selected by the person installing the system.

Ohio EPA considered and rejected the alternative of central treatment of this water at a publicly-owned treatment works (POTW). These public treatment systems are designed to treat moderately concentrated amounts of biodegradable pollutants; the wastewater from geothermal systems contain almost no biodegradable material. Also, POTW operators do not routinely take this type of wastewater because it takes up plant capacity better used for sewage and other biodegradable wastewaters. Therefore central treatment at a POTW is not an appropriate disposal option for geothermal wastewater.

VI. Effluent Limitations and Monitoring Requirements

The main pollutant discharged from these facilities will be heat during the summer time. The permit contains a treatment technology limit for temperature. Ohio EPA is establishing a 10 degree Fahrenheit temperature change standard associated with this permit. Ohio EPA believes that most existing systems have been designed to meet standards this stringent.

Based on this treatment standard Ohio EPA has determined that temperature levels from these discharges will not have the reasonable potential to cause or contribute to exceedances of temperature standards. Groundwater sources in Ohio tend to be 55-65F. If a discharge adds 10 degrees to this, the resulting temperature (65-75F max.) would be well below the summer basin criteria that apply (82F avg., 85F max.). Based on this analysis, there is no reasonable potential for temperature standards to be exceeded.

Effluent monitoring requirements apply to permittees designed to discharge 100,000 gallons per day or more. Flow monitoring and summer temperature monitoring are required to track individual dischargers compliance with the temperature change limit.

VII. Notice of Termination

Each individual facility covered by the general permit must submit a Notice of Termination (NOT) form to terminate coverage under this permit. Permittees are to request permit coverage termination once the wastewater discharges are eliminated. Failure to submit an NOT form constitutes a violation of the permit and is a violation of ORC 6111.

VIII. Pollution Prevention

Ohio EPA strongly encourages pollution prevention as the preferred approach for waste management. The first priority of pollution prevention is to eliminate the generation of wastes and pollutants at the source (source reduction). For those wastes or pollutants that are generated, the second priority is to recycle or reuse them in an environmentally sound manner.

Businesses can benefit economically, help preserve the environment, and improve your public image by implementing pollution prevention programs. For more information about pollution prevention, including fact sheets and the ***Ohio Pollution Prevention and Waste Minimization Planning Guidance Manual****, please contact the Ohio EPA, Office of Pollution Prevention at (614) 644-3949.*

Water Quality Standards for Common Pollutants

Table A1. Standards in milligrams per liter (parts per million)

Pollutant	30-day average	Daily Maximum
Dissolved Solids, Total	1500	--
Strontium, Total Recoverable	21	40

Table A2. Standards in micrograms per liter (parts per billion)

Pollutant	30-day average	Daily Maximum
Arsenic, Total Recoverable	100	340
Barium, Total Recoverable	220	2000
Chlorine, Total Residual	11	19
Selenium, Total Recoverable	5	--

The next table includes water quality standards for hardness-related metal parameters. These standards will vary by watershed. For the purposes of this table, we have grouped together watersheds that have similar hardness values. The hardness values were set by taking a sample-number weighted average of the median hardness values for each watershed within a group. The hardness value for each watershed was determined using Ohio's background water quality report – "Analysis of Unimpacted Stream Data for the State of Ohio", June 1988.

The purpose of showing these standards is to provide some basic guidance on chemical levels expected in surface water discharges. These are not necessarily limits. If the geothermal discharge goes to a larger stream, there will likely be dilution available to meet these instream standards. You may be able to get permit coverage under this permit, or an individual permit. If you have questions about whether your proposed discharge could meet water quality standards, please contact your Division of Surface Water permits contact in your district office. Water quality criteria can also be found on the Ohio EPA web site:

http://www.epa.state.oh.us/dsw/wqs/criteria.aspx

Table A3. 30-day average standards in micrograms per liter (hardness dependent metals)

	Grp. 1	Grp. 2	Grp. 3	Grp. 4	Grp. 5	Grp. 6	Grp. 7	Grp. 8	Grp. 9
Metal/Hardness	100	125	177	229	250	281	300	320	356
Cadmium	12	15	23	30	34	38	41	44	50
Copper	9.3	11	15	19	20	23	24	25	28
Lead	6.4	8.5	13	18	21	24	26	28	32
Nickel	52	63	85	105	113	125	132	140	153
Zinc	120	145	194	242	260	288	304	321	351

Group 1 watersheds – Conneaut Creek, Ashtabula River, Lake Erie tributaries between the PA state line and the Grand River.

Group 2 watersheds – Grand River, Chagrin River, Lake Erie tributaries between the Grand and Chagrin Rivers, Ohio River tributaries between the Scioto and Muskingum Rivers, excluding the Hocking River.

Group 3 watersheds – Mahoning River, Ohio River tributaries between Little Beaver Creek and the Muskingum River, Ohio River tributaries between the Scioto River and the Little Miami River.

Group 4 watersheds – Cuyahoga River, Lake Erie tributaries between the Chagrin River and the Rocky River.

Group 5 watersheds – Muskingum River, Rocky River, Black River, Lake Erie tributaries between the Rocky and Black Rivers.

Group 6 watersheds – Little Beaver Creek (Columbiana/Mahoning Co.), Vermilion River, Huron River, Lake Erie tributaries between the Black River and Old Woman Creek (including Old Woman Creek).

Group 7 watersheds – Hocking River, Scioto River, Little Miami River.

Group 8 watersheds – Maumee River, Lake Erie tributaries between the Maumee River and the MI state line, Wabash River, Mississinewa River.

Group 9 watersheds – Sandusky River, Portage River, Lake Erie tributaries between Old Woman Creek and the Maumee River, Great Miami River, Mill Creek (Cincinnati), Ohio River tributaries between the Little Miami River and the Great Miami River.

Table A4. Volatile Organic Compounds

Acrolein	1,3-Dichloropropylene
Acrylonitrile	Ethylbenzene
Benzene	n-Hexane
Bromoform	Methyl Bromide
Carbon Disulfide	Methyl Chloride
Carbon Tetrachloride	Methylene Chloride
Chlorobenzene	Styrene
Chlorodibromomethane	1,1,1,2-Tetrachloroethane
Chloroethane	1,1,2,2-Tetrachloroethane
2-Chloroethylvinylether	Tetrachloroethylene
Chloroform	Toluene
1,2-cis-Dichloroethylene	1,2-trans-Dichloroethylene
Dichlorobromomethane	1,1,1-Trichloroethane
Dichlorodifluoromethane	1,1,2-Trichloroethane
1,1-Dichloroethane	Trichloroethylene
1,2-Dichloroethane	Trichlorofluoromethane
1,1-Dichloroethylene	1,2,3-Trichloropropane
1,2-Dichloropropane	Vinyl Chloride
	Xylenes