

## **Open Loop Earth Energy Systems**

### **Regulatory Background**

This document is intended to provide information to proponents who are installing open loop earth energy systems that require greater than 50 cubic metres of water per day ( $m^3/day$ ) to operate.

While water requirements will vary based on the size of the building, it is anticipated that the majority of residential and commercial buildings will require greater than  $50 m^3/day$  to operate the system and as such will require a review under the *Environmental Impact Assessment Regulation - Clean Environment Act*.

In order to facilitate the review of these systems, the Department of Environment and Local Government (DELG) will require proponents to adhere to certain requirements regarding the design, installation, testing and reporting for these types of systems. DELG will require proponents to follow the Canadian Standards Association document *C448 Series-13 Design and Installation of Earth Energy Systems*. Proponents should note that the *National Building Code* requires that these systems conform to this standard.

Proponents wishing to install open loop geothermal systems should inquire with the Environmental Assessment Section of DELG (see contact information below) to determine if the proposed system will require registration under the *Environmental Impact Assessment Regulation - Clean Environment Act*.

Proponents should note that open loop earth energy systems are not permitted in the following locations:

- a. Areas designated as a protected area under the *Wellfield Protected Area Designation Order - Clean Water Act*.
- b. Areas designated as a protected area under the *Watershed Protected Area Designation Order - Clean Water Act*. Applications for an Exemption to the regulation may be considered by the Minister.

Note that open loop systems requiring less than  $50 m^3$  of water/day do not require registration under the *Environmental Impact Assessment (EIA) Regulation – Clean Environment Act*.

### **Registration and evaluation process under the *Environmental Impact Assessment Regulation - Clean Environment Act***

1. Open loop systems requiring between 50 and 120 cubic metres of water per day. Proponents will be required to notify the Environmental Assessment (EA) Section of the project details (including contingency plan information – see Appendix A) prior to initiating any project construction, including well drilling. If appropriate, proponents will then receive a letter from the EA Section indicating that they will not be required to register the project under the EIA Regulation as long as they follow the requirements as outlined in Appendix A. A follow-up Installation Report with information outlined in Appendix A must be submitted to the EA Section within 30 days after the system has been installed. Contact information for submitting the project details and Installation Report is listed below.

2. Open loop systems requiring more than 120 cubic metres of water per day are required to register the project under the *EIA Regulation – Clean Environment Act*. The proponent should discuss the project with the EA Section prior to submitting an EIA Registration document. Along with EIA Registration, proponents must follow all the requirements as outlined in Appendix B.

Through the EIA process, the proponent will conduct a *Water Supply Source Assessment (WSSA)*, which includes submitting a WSSA Initial Application with their EIA registration document. A follow-up Installation Report with information outlined in Appendix B must be submitted to the EA Section after the system has been installed (see contact information for report submissions below).

**Contact Information:**

Environmental Assessment Section at (506) 444-5382

**Report Submissions:**

*E-mail:*

Environmental Assessment Section: EIA-EIE@gnb.ca

*Mail:*

Environment and Local Government  
P.O. Box 6000  
Fredericton, NB  
E3B 5H1

*Courier:*

Environment and Local Government  
20 McGloin St.  
Fredericton, NB,  
E3A 5T8

## **Appendix A – Requirements for Open Loop Earth Energy Systems that require between 50 and 120 cubic metres of water per day**

### **General**

The project details and the Contingency Plan must be reviewed by the Environmental Assessment (EA) Section prior to any site construction activities. If appropriate, the proponent will receive a letter from the EA Section indicating that EIA registration will not be required if the proponents follow the requirements outlined in this Appendix.

Systems shall be designed and installed in accordance with the requirements of *C448.2-13 Design and Installation of Earth Energy Systems for Residential and Other Small Buildings*. The following sections highlight additional specific requirements for design and installation of the system, qualification requirements for designers, installers and well drillers, testing and reporting requirements, and requirements for contingency and decommissioning plans.

### **Design and Installation**

1. Systems shall be designed taking into consideration the potential impact on existing systems in the area, and any domestic, communal or municipal wells in the area.
2. The system shall be designed with a return well capable of accepting all of the water from the source well without any overflow. The return well shall be designed such that the return water is re-injected back to the source aquifer. It is recommended that the return well be located down gradient of the supply well to reduce the potential effects of thermal breakthrough. If multiple supply and return wells are required, the wells should be placed as far apart as possible to limit the effects of groundwater drawdown or mounding.
3. A 25m setback shall be maintained between the system wells and any potable water well in the area.
4. The annular space between the well and the casing shall be grouted from bottom to top using a method approved by the Minister.
5. The wells shall be installed in accordance with the requirements of the *Water Well Regulation - Clean Water Act*, including maintaining setbacks from potential sources of contamination as detailed under Section 22(2).
6. There shall be no discharge to surface water bodies, septic systems, or municipal wastewater systems.
7. A flow meter shall be installed on the system to monitor the volume of water being extracted.
8. In the event that artesian conditions are encountered, the well driller shall control the flow of water using a method approved by DELG.
9. The heat exchange system coils shall be constructed of cupronickel.

### **Qualifications for Designers and Installers**

The system designer shall be accredited by the Canadian Geo-Exchange Coalition (CGC), or shall be a Professional Engineer and/or Geoscientist registered in the Province of New Brunswick. The system installer shall be accredited by the CGC.

## **Qualifications for Well Drillers**

All wells shall be constructed by a Water Well Driller/Contractor licensed in the Province of New Brunswick.

## **Testing Requirements**

1. The system designer/installer/contractor/site professional shall determine the appropriate amount of testing required in order to verify that the water supply capacity is capable of supporting the earth energy system without causing any negative impacts to the aquifer or neighbouring water users. The capacity of the return well(s) must also be determined.
2. A water quality sample shall be collected from both the supply well and the return well(s) following completion. The sample should include analysis for general chemistry and trace metals. If poor water quality (such as saline groundwater) is encountered in any of the system wells, the proponent must notify the EA Section (prior to installation and completion of the system) to determine if additional requirements are needed. The potential for this to occur must be addressed in the Contingency Plan (see below for details).
3. Following start-up of the system, the initial and final temperature of the water in the supply and return wells must be recorded and reported to DELG.

## **Reporting Requirements**

Following completion of the installation of the system, a follow-up Installation Report must be submitted to DELG within 30 days. The report shall include the following information: system location (PID and coordinates); date installed; designers name and certification number (where required); installers name and certification number; well drillers name; type of system; type of refrigerant; copy of the water well record information for the source and return well (obtained from the well driller); pumping test information (if completed) and estimated yield of the water supply well; return well(s) capacity; copies of the water quality analyses for the supply and return wells; initial and final temperatures of the water in the supply and return wells following start-up of the system; setback distances from neighboring private, communal or municipal wells; copy of contingency plan (previously submitted to EA Section); and decommissioning plan (see below). For the purpose of reporting, the contractor can use the checklists in Annexes A and B of C448.2-13 and include the other requested information with these Annexes.

## **Contingency Plans**

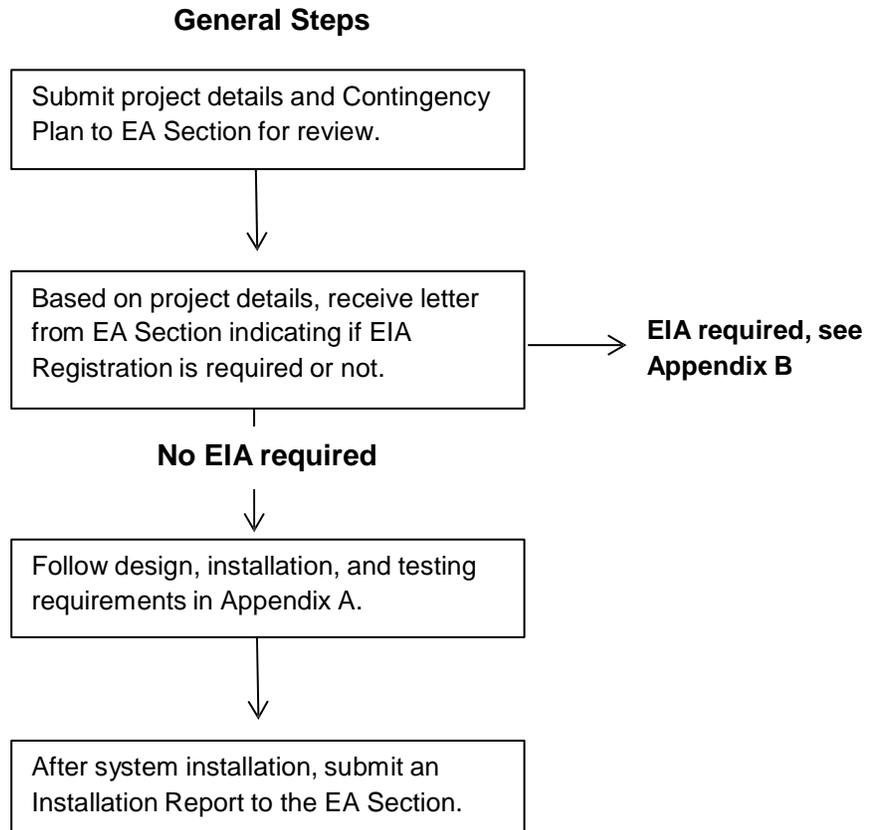
A contingency plan shall be developed to address, but not be limited to, such issues as artesian flowing wells, insufficient return well capacity, reduced return well(s) capacity due to biofouling, areas where poor water quality groundwater is known to occur (e.g. saline groundwater, elevated iron/manganese), and leakage of the refrigerant. If there is the potential for saltwater to be encountered during drilling activities, then the Contingency Plan must outline the mitigation measures that will be undertaken during well construction, aquifer testing and installation phases to ensure re-injection occurs in the same or similar quality aquifer and to minimize the risk of contaminating freshwater aquifers. The Contingency Plan must be prepared by a CGC certified industry professional in conjunction with either a New Brunswick licenced water well driller or a Professional Engineer and/or Geoscientist registered in New Brunswick and, shall be submitted to the EA Section before any project construction, including drilling and aquifer testing may take place.

## **Decommissioning Plans**

A Decommissioning Plan shall be developed for the system that conforms to the *Guidelines for the Decommissioning (Abandonment) of Water Wells*. The Guideline may be obtained from the EA Section or found on-line at:

<http://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/Water-Eau/GuidelinesWaterWells.pdf>

### **See Flowchart of General Steps Below**



## **Appendix B – Requirements for Open Loop Earth Energy Systems that require more than 120 cubic metres of water per day**

### **General**

Projects must be registered for review under the *EIA Regulation* and follow the requirements in this Appendix. Through the EIA process, proponents will be required to conduct a Water Supply Source Assessment (WSSA) in order to evaluate the project. The WSSA process has two components, an Initial Application with a Contingency Plan, followed by the Hydrogeological Assessment. The Initial Application and Contingency Plan must be submitted for review and approval before any project construction activities, such as well drilling and aquifer testing, take place. Also, public consultation will be required as part of the EIA review process.

Systems shall be designed and installed in accordance with the requirements of *C448.1-13 Design and Installation of Earth Energy Systems for Commercial and Institutional Buildings*. The following sections highlight additional specific requirements for design and installation of the system, qualification requirements for designers, installers and well drillers, testing and reporting requirements, and requirements for contingency and decommissioning plans.

### **Design and Installation**

1. Systems shall be designed taking into consideration the potential impact on existing systems in the area, and any domestic, communal or municipal wells in the area.
2. The system shall be designed with a return well capable of accepting all of the water from the source well without any overflow. The return well shall be designed such that the return water is re-injected back to the source aquifer. It is recommended that the return well be located down gradient of the supply well to reduce the potential effects of thermal breakthrough. If multiple supply and return wells are required, the wells should be placed as far apart as possible to limit the effects of groundwater drawdown or mounding.
3. A 25m setback shall be maintained between the system wells and any potable water well in the area.
4. The annular space between the well and the casing shall be grouted from bottom to top using a method approved by the Minister.
5. The wells shall be installed in accordance with the requirements of the *Water Well Regulation - Clean Water Act*, including maintaining setbacks from potential sources of contamination as detailed under Section 22(2).
6. There shall be no discharge to surface water bodies, septic systems, or municipal waste water systems.
7. A flow meter shall be installed on the system to monitor the volume of water being extracted.
8. In the event that artesian conditions are encountered, the well driller shall control the flow of water using a method approved by DELG.
9. The heat exchange system coils shall be constructed of cupronickel.

### **Qualifications for Designers and Installers**

The system shall be designed by a Professional Engineer and/or Geoscientist registered in the Province of New Brunswick. Installers shall be certified by the Canadian Geo-Exchange Coalition (CGC).

### **Qualifications for Well Drillers**

All wells shall be constructed by a Water Well Driller/Contractor licensed in the Province of New Brunswick.

### **Testing and Reporting Requirements**

Through the EIA process, proponents must conduct a Water Supply Source Assessment (WSSA) in order to evaluate the potential water supply for the proposed open loop earth energy system. All requirements are outlined in the WSSA Guidelines, including the requirement to submit a WSSA Initial Application with a Contingency Plan (see Section 2.3 of the WSSA guidelines for details) for review and approval before any project construction activities start, including drilling and aquifer testing.

The WSSA Guidelines may be obtained from the EA Section or on-line at: [http://www2.gnb.ca/content/gnb/en/departments/elg/environment/content/environmental\\_impactassessment.html](http://www2.gnb.ca/content/gnb/en/departments/elg/environment/content/environmental_impactassessment.html) .

After the WSSA Initial Application is reviewed and approved, the proponent may proceed to the Hydrogeological Assessment. Once the Hydrogeological Assessment has been completed it must be submitted to the EA Section for review and approval. At the end of this process the Minister of the DELG may approve the project, and typically, the proponent will receive an EIA Determination which means the open loop earth energy system can then be installed.

Following completion of the installation of the system, a follow-up Installation Report must be submitted to DELG within 30 days. The report shall include the following information: EIA project reference number, system location (PID and coordinates); date installed; designers name; installers name and certification number (where required); well drillers name; type of system; type of refrigerant; initial and final temperatures of the water in the supply and return well(s) following start-up of the system; and setback distances from neighboring private, communal or municipal wells.

**See Flowchart of General steps below**

**General Steps**

