

# SITE SURVEY WORKSHEET

Customer _____	Date _____
Address _____	Phone _____
Legal Description _____	
Performed By _____	Phone _____
Company Name _____	Signature _____

New Construction     Retrofit     Construction Permit and Number \_\_\_\_\_

Heat Loss and Energy Analysis By \_\_\_\_\_

Soil / Rock Types and Conditions \_\_\_\_\_

Drill Regulations \_\_\_\_\_

Special Requirements \_\_\_\_\_

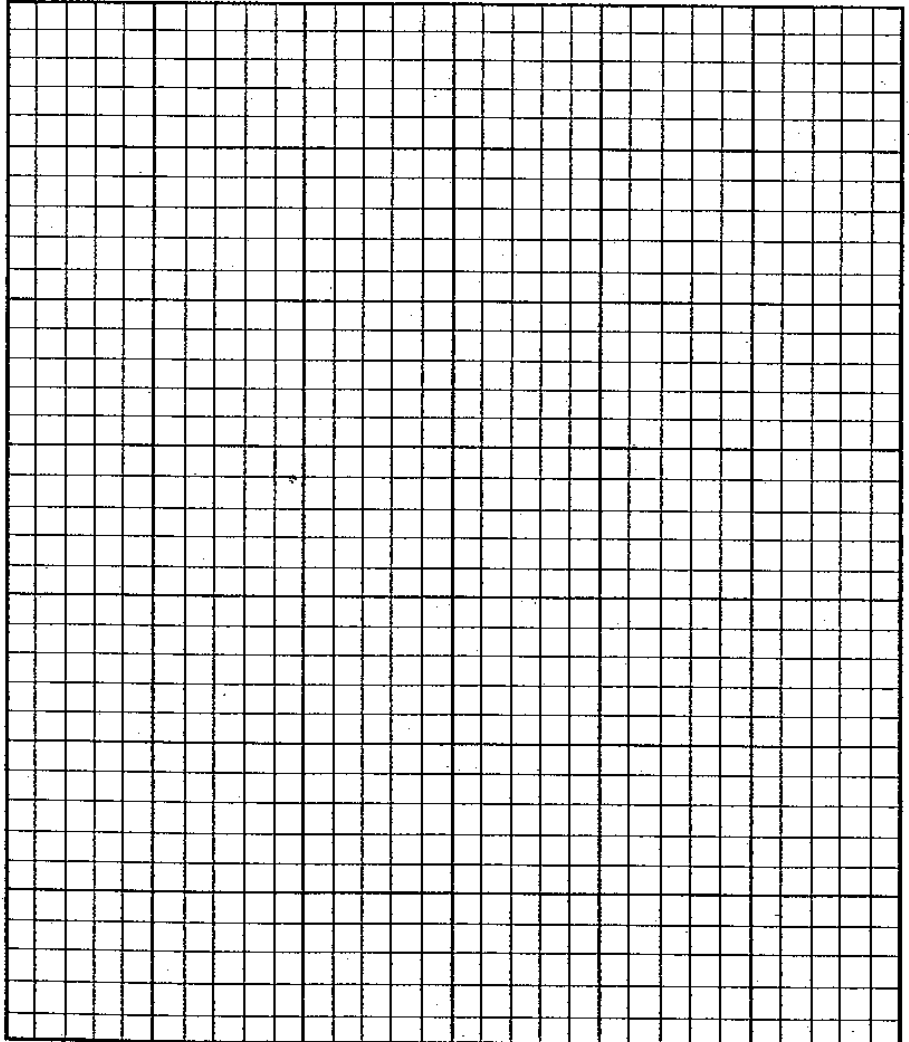
## SERVICE LOCATE CHECKLIST

- POWER LINES
  - Overhead \_\_\_\_\_
  - Underground \_\_\_\_\_
- NATURAL GAS
- PROPANE
- PUBLIC WATER
- WATER WEL
  - \_\_\_\_\_ Depth, m (ft)
- PUBLIC SEWER
- ON-SITE SEWER
- TELEPHONE LINE
  - Overhead \_\_\_\_\_
  - Underground \_\_\_\_\_
- TV CABLE
- FUEL LINES
- EASEMENTS
- SPRINKLER
- TILE DRAIN
- BUILDING ENTRANCE
- UNIT LOCATION
- POND
  - Size \_\_\_\_\_
  - Avg. Depth \_\_\_\_\_
  - Min. Depth \_\_\_\_\_
- OTHER \_\_\_\_\_
- ELEVATION
- POND/HOUSE
- FUTURE BUILDINGS  
(Buildings, pools, etc.)

## SITE PLAN

### COMPANY HEADING

Locate property lines, existing structure or obstructions, future consideration site, utilities and services, heat pump unit, circulating pump kit where it enters structure, slopes (% and direction), and equipment access routes.



Acknowledged By: \_\_\_\_\_

Owner/Agent: \_\_\_\_\_

Installation Date: \_\_\_\_\_

(Date): \_\_\_\_\_

Scale \_\_\_\_\_ = \_\_\_\_\_

# INSTALLATION CHECKLIST FOR OPEN-AND CLOSED-LOOP EARTH ENERGY HEAT PUMP SYSTEMS

(Two copies are to be provided to the owner)

Owner's Name \_\_\_\_\_ Date \_\_\_\_\_  
 Address \_\_\_\_\_  
 Province \_\_\_\_\_ Postal Code \_\_\_\_\_ Phone \_\_\_\_\_  
 System Type: Open-Loop  Closed-Loop  House Size \_\_\_\_\_  
 Design Heat Load (Building) \_\_\_\_\_  
 Design Cooling Load \_\_\_\_\_  
 Domestic Hot Water Load (Met by System) \_\_\_\_\_  
 Total Heating Load \_\_\_\_\_  
 Type of Distribution System: Forced-Air  Hydronic   
 Heat Pump Make \_\_\_\_\_ Model/Serial No. \_\_\_\_\_  
 Heating Capacity \_\_\_\_\_ Cooling Capacity \_\_\_\_\_

Check off appropriate entering water temperatures Heating EWT: 0°C (32°F)  10°C (50°F)   
 (EWT). (refer to CSA Standard CAN/CSA-C13256-1) Cooling EWT: 25°C (77°F)  10°C (50°F)

**If A Closed-Loop System:**

Heat Exchanger Length, if Horizontal \_\_\_\_\_  
 Heat Exchanger Type, if Horizontal Single-Pipe  Two-Pipe   
 Four-Pipe  Other   
 Borehole Depth and Number, if Vertical \_\_\_\_\_  
 Heat Exchanger Sized According to: Manufacturer

**If Software Program Used:**

Backfill Material, Horizontal Trenches \_\_\_\_\_  
 Borehole Fill Material, if Vertical \_\_\_\_\_  
 Type of Antifreeze/Inhibitors \_\_\_\_\_ Quantity \_\_\_\_\_  
 Antifreeze Protection Level \_\_\_\_\_ Loop Test Pressure \_\_\_\_\_  
 System Static Pressure \_\_\_\_\_

**If An Open-Loop System**

Attach copy of water well record or well pump test and include the number and specification of wells, intake, and pumps.

### Marking/Instructions Checklist

**If A Closed-Loop System:**

- Supply and Return Valves Marked Accordingly
- Submerged Heat Exchanger Position Marked at Shoreline
- Label at Loop Charging Valve Showing Antifreeze Type, Concentration, Contractor Information
- Owner Given Manufacturer Documentation and Warranty on System
- Owner Given Site Survey Worksheet of Installed System (Including Dimensions/ Locations of all Piping, Diameter, Depths and Lengths of Loops, Septic Systems, Water Inlet Lines, Lot Lines, etc.)
- If An Open-Loop

**If An Open-Loop System:**

- Supply and Return Lines to be Identified by Marker at Point of Entry to Water Wells
- Inform Owner of Possible Effects on Supply Water Well of Open-Loop System – Water Quality, Quantity, etc.
- Ensure Water Supply Well is Sealed in Accordance with Approved Well Construction Practices
- Ensure Water Well Yields Water to Supply Both Domestic and Heat Pump Requirements at Time of Installation

This installation was done in accordance with CSA Standard C448.2, *Design and Installation of Earth Energy Systems for Residential and Other Small Buildings*, and currently applicable regulations.

Name: (Please Print or Type) \_\_\_\_\_ Signature \_\_\_\_\_  
 Date: \_\_\_\_\_

## CERTIFICATION OF LICENSING

I, \_\_\_\_\_ do hereby certify that I am licensed to drill water wells in  
(name of Contractor/Company)  
the Province of Ontario

**AND FURTHERMORE THAT I** will supervise the drilling of a well on the property of

\_\_\_\_\_, located at \_\_\_\_\_ in the  
(Name of Landowner) (Municipal Address)  
the Geographic Township of Tay Valley.

**AND FURTHERMORE THAT I** am aware of the well drilling requirements of the Township of Tay Valley and the regulations of the Ministry of Environment as they govern well installation in the Province of Ontario.

**AND FURTHERMORE THAT I** acknowledge that each registered plan of subdivision may have different well drilling requirements.

**AND I DO HEREBY CERTIFY THAT** the said well shall be drilled, cased and grouted to the standards as specified in the applicable Well Construction Agreement.

Signed this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

\_\_\_\_\_  
Well Contractor

\_\_\_\_\_  
Licence No.

\_\_\_\_\_  
Well Technician

\_\_\_\_\_  
Licence No.

\_\_\_\_\_  
Pump Installer

\_\_\_\_\_  
Licence No.

## WELL CONSTRUCTION AGREEMENT

Re: Part Lot \_\_\_\_ Concession \_\_\_\_  
Geographic Township of \_\_\_\_\_  
Municipality of Tay Valley Township  
Part \_\_\_\_\_ on R-Plan 27R \_\_\_\_\_

In consideration of the Municipality waiving the requirement of a hydro-geological report in respect of the above noted property; I \_\_\_\_\_ (being the owner/agent of the owner), hereby agree to construct any water wells on this property in accordance with the attached specifications or those specifications as provided for in the subdivision agreement.

Dated at \_\_\_\_\_, this \_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_.

Signed \_\_\_\_\_

Witness \_\_\_\_\_

**SCHEDULE  
TO WELL CONSTRUCTION AGREEMENT  
BETWEEN**

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**and  
THE CORPORATION OF TAY VALLEY TOWNSHIP**

Part Lot: \_\_\_\_\_ Concession: \_\_\_\_\_ Being Part \_\_\_\_\_ On R-Plan 27R- \_\_\_\_\_

**WELL DESIGN SPECIFICATIONS**

All wells shall be located and constructed in accordance with the following specifications:

The well shall be completed into a bedrock aquifer to ensure that the water supply can be adequately protected from surface contaminants. Completed wells shall be a minimum of 150 mm (6 inch) diameter. The annular space shall be 50 mm (2 inches) in diameter larger than the outside diameter of the casing, for the entire length of the casing. The well shall be drilled for a depth of 6 m from surface or for 2 m into competent bedrock, whichever is deeper, using standard well drilling equipment.

A 150 mm (6 inches) interior diameter steel casing with a drive shoe shall be seated into the bedrock. The remainder of the well shall be completed as a 150 mm diameter open hole to whatever depth is required in order to obtain an adequate supply of potable water. Wells shall be constructed by a properly licensed water well contractor and in accordance with Ontario Regulation 903 and as per the attached sketch.

The casing shall be pressure grouted with cement, for the entire length of casing. Neat cement grout shall be a mixture of 100 lbs. of cement to 5 or 6 gallons of clean water. Hydrated lime may be added to a maximum of 10% of the volume of cement. Not more than 2 parts (by weight) of sand to one part of cement may be used. Cement grout shall be allowed to set a minimum of 24 hours (high early cement) or 72 hours (normal cement) before drilling continues.

The final depth of the wells will be dependent on the yield. Well drilling and construction operations shall be inspected, and the Township shall be notified for inspection 24 hours prior to the following stages;

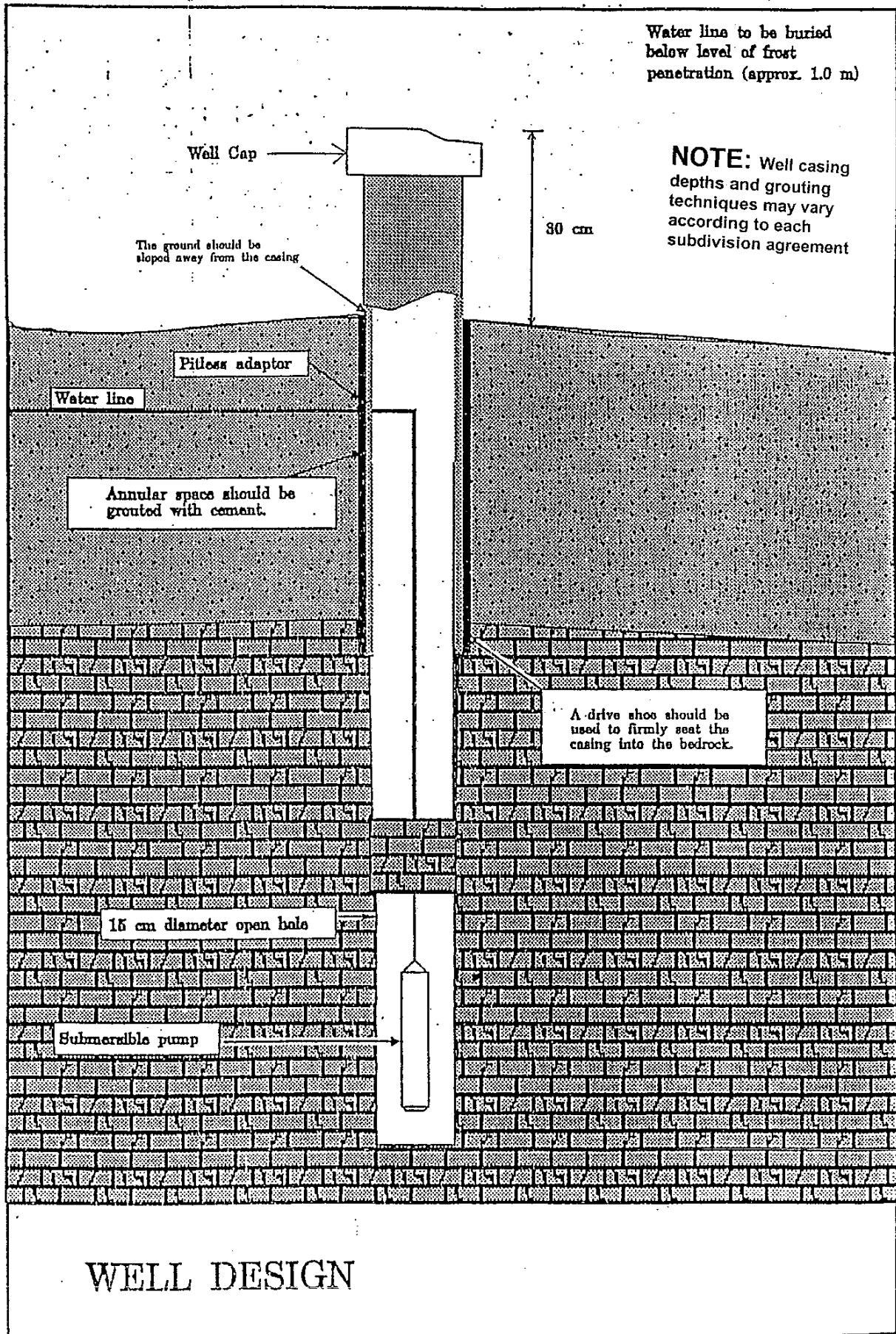
- Prior to commencement of pressure grouting
- Prior to backfilling of service trench

MOE recommended cement grouting methods No. 3, 4 or 5 shall be followed, in order to ensure that all void spaces are filled. Wells shall be completed with a pitless adaptor to ensure ease of maintenance of well pumps and equipment. Holes in the well casing shall be cut with a hole saw, not a torch. Tiles and other drainage collecting structures are not permitted around the well head.

Since current Municipal By-Laws do not permit flowing wells or ground-source heat pumps to be discharged into road ditches or Municipal Drains; Therefore when flowing artesian conditions exist (i.e. the static water level is above the ground surface), it will be required that the well casing be extended above grade to a height above the highest static water elevation.

Finishing casing shall extend a minimum of 0.3 meters above finished grade.

Water line to be buried below level of frost penetration (approx. 1.0 m)



**NOTE:** Well casing depths and grouting techniques may vary according to each subdivision agreement

## WELL DESIGN

## Overview of Ground Source Heat Pumps & the OBC

**[NOTE: These notes represent an overview of the requirements for ground source heat pumps (“earth energy systems”) for residential and other small buildings, and do not cover all of the design and installation provisions. Reference should be made to the CSA Standards for a complete understanding of the provisions.]**

1. The generic term “*ground source heat pumps*” includes both “*open loop*” and “*closed loop*” types of systems:
  - a) “*open loop*” systems extract heat from ground water taken from a well
  - b) “*closed loop*” systems consist of buried piping, laid either horizontally or vertically in bore-holes, which is charged with a heat transfer medium (antifreeze), to extract heat from the surrounding ground.
2. Heat pumps are a building service system, and are captured in the definition of a “*building*” in the Building Code Act as “...*service systems appurtenant thereto.*” This interpretation has been confirmed by the Courts. Therefore, all heat pump systems require a building permit.
3. The Building Code Regulation provides design criteria for heat pump systems (“earth energy systems”) in **Articles 6.2.1.4 (3) and (4)**. Those Articles reference the **CSA-C448.1** (Commercial and Institutional Buildings) and **CSA-448.2** (Residential and Small Buildings) Standards.
4. Ground source heat pump systems must be designed and constructed in accordance with the CSA-C448 Standards referenced above. Consequently, in order to be deemed complete, the building permit application should have supporting documentation, which addresses the various design and installation provisions of those Standards. In order to determine compliance with the referenced Standards, it is suggested that documentation such as listed below, should be filed in support of any application:

### a) Open Loop Systems

- i) A hydrogeology report prepared by a qualified hydrogeologist, which addresses the following issues:
  - Review of any associated hydrogeology report (i.e. provided as part of a privately-serviced subdivision);
  - Assessment of water supply aquifer for water quantity, and possible impact on local potable water supply;
  - Assessment of water supply aquifer for water quality (i.e. water chemistry which could affect the system design or operation);
  - Recommendation for system discharge (i.e. into roadside ditch, natural watercourse or rejection (“dump”) well and possible impacts;
  - Construction details for supply and rejection wells.



- ii) A site plan which identifies the following:
  - Location of existing / proposed buildings, structures, well and septic system
  - Property lines and location of any easements or right-of-ways;
  - Location of proposed supply and rejection (dump) wells;
  - Distance of all wells from septic systems on adjacent properties;
  - Location of existing buried services (i.e. gas, hydro, etc);
  - Proposed location of service trenches to new supply and rejection wells.
  
- iii) Heat pump system design and specifications, including:
  - Heat loss / gain calculations;
  - Heat exchanger manufacturer's specifications;
  - Depth of trench excavation;
  - Backfill material.
  
- iv) Specific (as-built) documentation to be provided upon completion of the installation:
  - Water well records of the new supply and rejection wells;
  - Fully dimensioned site survey and worksheet for the installed system in accordance with Annex 'B' of the CSA Standard.
  
- v) Inspections should pay particular attention to the following:
  - Grout around the well casing (although this is governed by Regulation 903 under the Ontario Water Resources Act, there is no mandated inspection of well construction by any public agency);
  - Pitless adaptor installation at piping connection to the well casing;
  - Piping entrance at foundation wall;
  - Piping material and jointing;
  - Pipe bedding and backfill material;
  - Pump and heat exchanger unit installation;
  - Interior ductwork sizing and connections.

**b) Closed Loop Systems**

- i) A hydrogeology report prepared by a qualified hydrogeologist, which addresses the following issues:
  - Review of any associated hydrogeology report (i.e. provided as part of a privately-serviced subdivision);
  - Assessment of water supply aquifer for any potential impact on the local potable water supply;

- Assessment of water supply aquifer for water quality (i.e. water chemistry which could affect the system design or operation);
  - Geotechnical analysis and projected depth of frost penetration;
  - Depth of all aquifers and water table below grade.
- ii) A site plan which identifies the following:
- Location of existing / proposed buildings, structures, well and septic system;
  - Property lines and location of any easements of right-of-ways; location of proposed distribution piping trenches / bore-holes;
  - Distance to all wells on adjacent properties;
  - Location of existing buried services (i.e. gas, hydro, etc.);
- iii) Heat pump system design and specifications, including:
- Water well records of the bore-holes;
  - Results of distribution piping pressure test
  - Fully dimensioned site survey and worksheet for the installed system in accordance with Annex 'B' of the CSA Standard.
- iv) Specific (as-built) documentation to be provided upon completion of the installation:
- Water well records of the bore-holes;
  - Results of the distribution piping pressure test
  - Fully dimensioned site survey and worksheet for the installed system in accordance with Annex 'B' of the CSA Standard.
- v) Inspections should pay particular attention to the following:
- System verification and testing in accordance with protocol in CSA Standards;
  - Grout around the piping in the vertical bore-holes;
  - Length of distribution piping;
  - Piping material and jointing;
  - Pipe bedding and backfill material
  - Piping entrance at foundation wall;
  - Pump and heat exchanger unit installation;
  - Interior ductwork sizing and connections.