



# OPEN-LOOP GROUND SOURCE HEAT PUMPS

FOR ALL YOUR **HEATING** AND **WATER** NEEDS



**HEATING** THAT WON'T COST THE EARTH

01494 792000  
[www.hdgeothermal.co.uk](http://www.hdgeothermal.co.uk)

# BACKGROUND

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## ABOUT US

H.D. Services became incorporated as a limited company in 1988. The company was formed by Frank Harris, a Civil Engineer experienced in soil mechanics and well drilling. The company initially focused on drilling water supply and soakaway boreholes and has developed their own range of sewage treatment systems, the HD-SM.

H.D. Services recognised the compatibility between the construction of water supply boreholes and the growing Renewable Energy market. Following attendance at a European Seminar on ground source heat pumps (GSHP), and after much research, H.D. Services decided to invest in the Open-Loop Ground Source Heat Pump market (also known as Water Source Heat Pumps).

We are a fully accredited MCS company and subscribe to the Renewable Energy Consumer Code (RECC), which means that customers can be assured of a high quality installation service by a registered installer. Use of an MCS registered installer means your installation may also be eligible for financial support via the domestic Renewable Heat Incentive (RHI) due to launch in Spring 2014.

The company works hard to ensure that the highest quality workmanship and service is delivered to our customers/clients and we take pride in our approach to our work. We do not employ external consultants to design, agents to sell or sub-contractor labour to install – all work is completed in-house.

## HOW WE WORK

We have a partnering agreement with a British manufacturer with whom we work closely to ensure the highest quality installation and service. As this type of renewable heating system is best suited to new homes with under-floor heating, we have focused our attention on the new-build market. Due, however, to the development of new under-floor heating technology, H.D. Services has expanded into the retrofit market.

We aim to provide the highest quality Open-Loop Ground Source Heat Pump service available in South East England. Our customers rely on our advice and flexibility to suit their individual requirements and we associate ourselves with like-minded suppliers. H.D. Services is committed to completing contracts on time.

## BACKGROUND

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### H.D. DRILLING LTD

H.D. Drilling is the sister company of H.D. Services and carries out all drilling works associated with the installation of our Open-Loop Ground Source Heat Pump systems. The company has been constructing water supply and soakaway boreholes throughout South East England since 1984. They have been members of the Well Drillers Association since 1988 and have a vast knowledge of the hydro-geology throughout South East England. The company can often confirm the feasibility of a proposed installation upon the receipt of a site postcode.

H.D. Drilling operate cable percussion drilling rigs only, the drilling method acknowledged by the Environment Agency as the most suitable way to drill the chalk aquifer. All drilling work associated with the installation of Open Loop Ground Source Heat Pumps is carried out by H.D. Drilling.

**Both H.D. Services and H.D. Drilling are BS EN ISO 9001 and 14001 registered companies.**



## HEAT PUMPS

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**For millions of years, the sun has provided sufficient energy to support life on Earth, most of which is not being harnessed and is just passing us by. If we can utilise just a fraction of this energy to heat our homes, we can move away from using fossil fuels and help put a stop to the destruction of our planet. One way in which we can do this is to use heat pumps to provide heating and hot water for our homes.**

### **GROUND SOURCE HEAT PUMPS**

After experimenting with a freezer, Robert C. Webber built the first direct exchange ground source heat pump in the late 1940s. The technology became popular in Sweden in the 1970s, and its acceptance has been growing slowly worldwide ever since. By 2004, there were over a million units installed worldwide, providing 12 GW of thermal energy. Each year roughly 80,000 units are installed in the United States and a further 27,000 in Sweden.

The earth is continually absorbing heat from the sun. Although the surface of the earth is subject to seasonal temperature fluctuations, once below a depth of 1.5 metres, the ground temperature is constant at between 8 and 14°C all year round. A ground source heat pump is designed to use this constantly renewed energy to supply your domestic heating and hot water requirements, reducing heating bills by upto 75%.

#### **The basic principles of a Ground Source Heat Pump:**

Ground source heat pumps upgrade low temperature heat extracted from the ground into higher temperature heat that can be used for space and water heating. They work on the same principal as a refrigerator cooling circuit but in reverse. A ground source heat pump takes low temperature heat from the ground or ground-water and 'upgrades' it to a higher temperature to provide space heating and/or hot water. In a typical system, for every unit of electrical energy used to drive the system, between 3 and 5 units of heat are produced.

There are two types of ground source heat pump installation – closed-loop and open-loop.

#### **Closed-Loop:**

Closed-Loop systems pump an anti-freeze solution through pipes buried in the ground. The loops can be installed either horizontally in trenches or vertically in a series of boreholes drilled into the ground. The overall length of these loops depends on the size of the heat pump and the thermal conductivity of the ground in which they are laid. Heat losses between the antifreeze solution and the loop-pipe, the loop-pipe and the grout surround and the grout surround and the ground itself reduces the efficiency of these systems in comparison with an open-loop system. Closed-loop systems, if poorly designed and installed, can result in freezing of the ground. A closed-loop system can, however, be installed anywhere in the country.

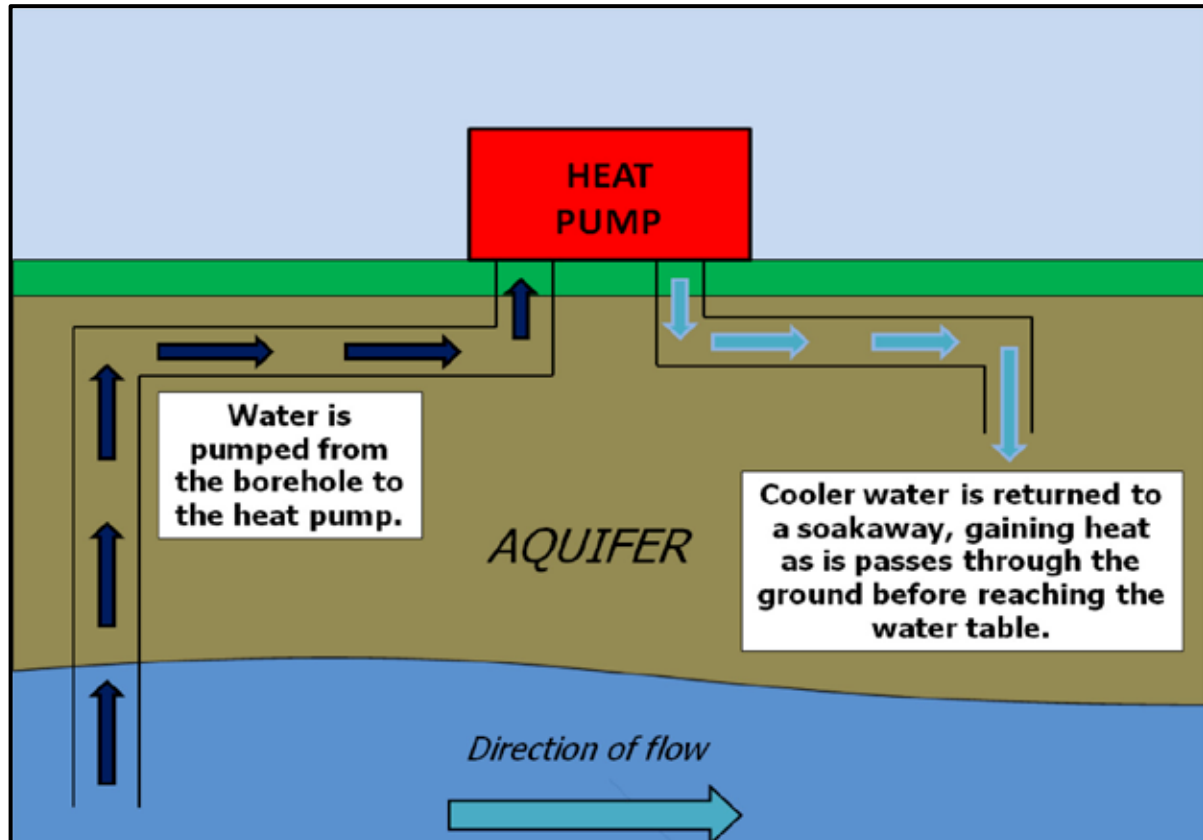
## HEAT PUMPS

### Open-Loop:

Open-Loop systems are the most efficient ground source heat pump option. They work by taking heat out of the ground water, usually abstracted from an aquifer (a body of saturated rock through which water can easily move). As the water is in direct contact with the ground there are no heat losses between surfaces. The water is extracted via a borehole and pumped through the heat pump, where heat is extracted from the water. The water is cooled by approximately 5°C before being returned to the ground, where it immediately begins to regain heat from the earth. The ground temperature in South-East England is constant at between 10 and 12°C all year round.

This type of system will only work in areas where there is sufficient ground water available. H.D. Services Ltd prefers to install Open Loop systems because:

- Open Loop systems require a water supply borehole and soakaway borehole; we have been drilling the chalk aquifers of South East England for over 30 years and have gained considerable experience and expertise in this area.
- An Open Loop system does not pump chemicals through the ground.
- The installation of an Open Loop system is less invasive compared to that of a Closed Loop system.
- An Open Loop system can also provide you with an independent water supply. This means you could save money on your water bills and you will not be subject to hosepipe bans!

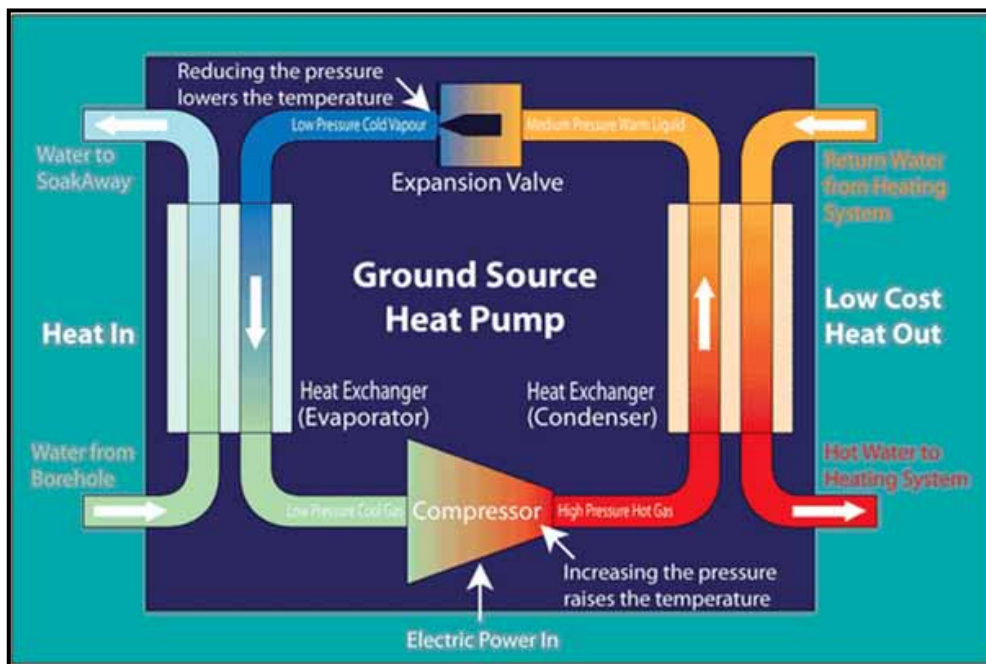


## HEAT PUMPS

### How an Open-Loop Ground Source Heat Pump works:

At the heart of a modern heat pump is a refrigeration system. The refrigeration cycle is an effective provider or remover of heat. An open loop ground source heat pump uses water pumped from the ground (typically via a borehole) and extracts heat from it. This heat is then raised in temperature and delivered to the domestic hot water system and the space heating system. The highest grade temperature is available to the hot water, enabling temperatures in excess of 60°C.

With coefficients of performance (COPs) of up to 5.0, open-loop ground source heat pumps offer an environmentally friendly source of heating with significantly lower running costs than a conventional heating system.





H.D. Services Ltd has a partnering agreement with the manufacturer of Soleco Open-Loop Ground Source Heat Pumps. (GSHP)

Soleco are specialists in the design and manufacture of Open-Loop GSHP and are based in the UK, where they have been designing heat pumps for more than 30 years.

Soleco Open-Loop GSHP use stored solar energy from underground water that remains at a constant year round temperature of around 11°C. The GSHP receives water from a borehole and transfers it to your heating system at temperatures up to 55°C.



The Soleco GSHP is most suitable with under-floor heating and modern low temperature radiators. With the constant temperature of underground water, coupled with the highly efficient design, back up heating is not normally required.



The Soleco Open-Loop GSHP has the added benefit of an independent domestic hot water circuit. Operating at the same time as the heating circuit, the Soleco Open-Loop GSHP can provide hot water up to 65°C.



Drinking water can be supplied via the water supply borehole, subject to analysis and suitable filtration.



By collecting the discharge water in a harvesting tank on route to the soakaway, not only will it begin to regain heat immediately, the grey water can also be used for garden irrigation, car washing and other everyday activities.

There are several benefits to choosing a Soleco Open-Loop GSHP:

## **FINANCIAL**

**Lower running costs** – better average coefficient of performance (COP) compared to air source or Closed Loop heat pumps.

**Eligible for Renewable Heat Incentive (RHI) Scheme** – financial support is available for those using renewable heat technologies.

**Independent Water Supply** – no mains water required, saving you money on water charges \*

## **GENERAL**

### **Hot water up to 65°C all year round**

**Greater water efficiency** – borehole water can be filtered for consumption, and discharge water can be used for grey water, to irrigate the garden or wash the car.

**Minimal visual impact** – only a manhole cover can be seen externally, unlike air source heat pumps, which have a large exterior unit.

**Compatible with low temperature radiators and under floor heating.**

**MCS accredited** – MCS HP0092 guarantees a high quality standard.

**Better Annual COP** – compared to either air source or closed-loop heat pumps.

### **National Support Network**

**High System efficiency** – as underground water temperatures remain constant throughout the year.

**Minimal installation disruption** – no need to dig up the garden to install the system, unlike a horizontal closed-loop system.

**Less space needed** – only a small plot is needed, unlike a horizontal closed-loop system.

**Reduced Carbon Footprint** – taking into account the CO<sub>2</sub> produced by electricity generation, a Soleco heat pump is responsible for less carbon dioxide than even the most efficient gas condensing boiler.

\*The Water Act 2003 allows for the abstraction of water from the ground without charge, provided the daily abstraction rate is less than 20,000 litres. It is unlikely that a Soleco heat pump for domestic use will ever require more than 20,000 litres of water per day.



**SYSTEM COMPARISON**

	Available 24 hours	No fuel storage required	No planning permission restrictions	No visual Impact	Low maintenance cost	Independent water supply
SOLECO Open-Loop GSHP	✓	✓	✓	✓	✓	✓
Closed-Loop GSHP	✓	✓	✓	✓	✓	✗
ASHP	✓	✓	✗	✗	✓	✗
Solar	✗	✓	✗	✗	✓	✗
Biomass	✓	✗	✗	✗	✗	✗

GSHP – Ground Source Heat Pump

ASHP – Air Source Heat Pump

**TECHNICAL DETAILS**

GENERAL DESCRIPTION	SINGLE PHASE			THREE PHASE		
Model Designation	Sol 12-1	Sol 18-1	Sol 26-1	Sol 12-3	Sol 18-3	Sol 26-3
Power Supply	230v/1ph/50Hz			400v/3ph/50Hz		
Denomination	Water to Water					
Intended Use of Unit	Domestic Heating and Hot Water					
<b>DIMENSIONS</b>						
Height (mm)	1100					
Width (mm)	625					
Depth (mm)	725					
Weight (kg)	207	245	266	207	245	266
<b>PERFORMANCE FIGURES *</b>						
Heating Capacity (kW)	12.8	18.9	26.0	12.8	18.9	26.0
COP	3.95	4.28	4.12	3.95	4.28	4.12
<b>OPERATING RANGE</b>						
Min Operating Temperature (Building) °C	30					
Max operating Temperature (Building) °C	55					

\*Specified at BS EN 14511:2011 conditions. Source water in at 10°C, out at 7°C. Heating water in at 30°C, out at 35°C.

## H.D. SERVICES INSTALLATIONS

### WHY CHOOSE AN H.D. SERVICES INSTALLTION?

An H.D. Services Open-Loop GSHP installation could meet all your domestic heating requirements and your hot and cold water needs at a fraction of the running cost of a conventional gas boiler. The 'cooled' water can also provide a 'grey water' supply, ideal for car washing/garden watering/feeding cattle troughs etc.



**HEATING**



**HOT WATER**



**DRINKING  
WATER**



**GREY WATER**

Our service includes the supply, installation and commissioning of a complete water supply and open-loop heat pump system with the least disruption possible.

H.D. Services are a fully accredited Microgeneration Certification Scheme (MCS) company and subscribe to the Renewable Energy Consumer Code (RECC), which means that customers can be assured of a high quality installation service by a registered installer. Use of an MCS registered installer means your installation may also be eligible for financial support via the domestic Renewable Heat Incentive (RHI).

H.D. Services works hard to ensure that the highest quality workmanship and service is delivered to our customers/clients and we take pride in our approach to our work – if we do not think the site is suitable for an Open Loop heat pump system, we will tell you. We do not employ external consultants to design, agents to sell or sub-contractor labour to install – all work is completed in-house.

After commissioning an installation, H.D. Services will register it with the MCS, provide a 5 year workmanship warranty and offer an annual maintenance contract to ensure the heat pump is regularly maintained and working efficiently.

### **How do we install an Open-Loop GSHP?**

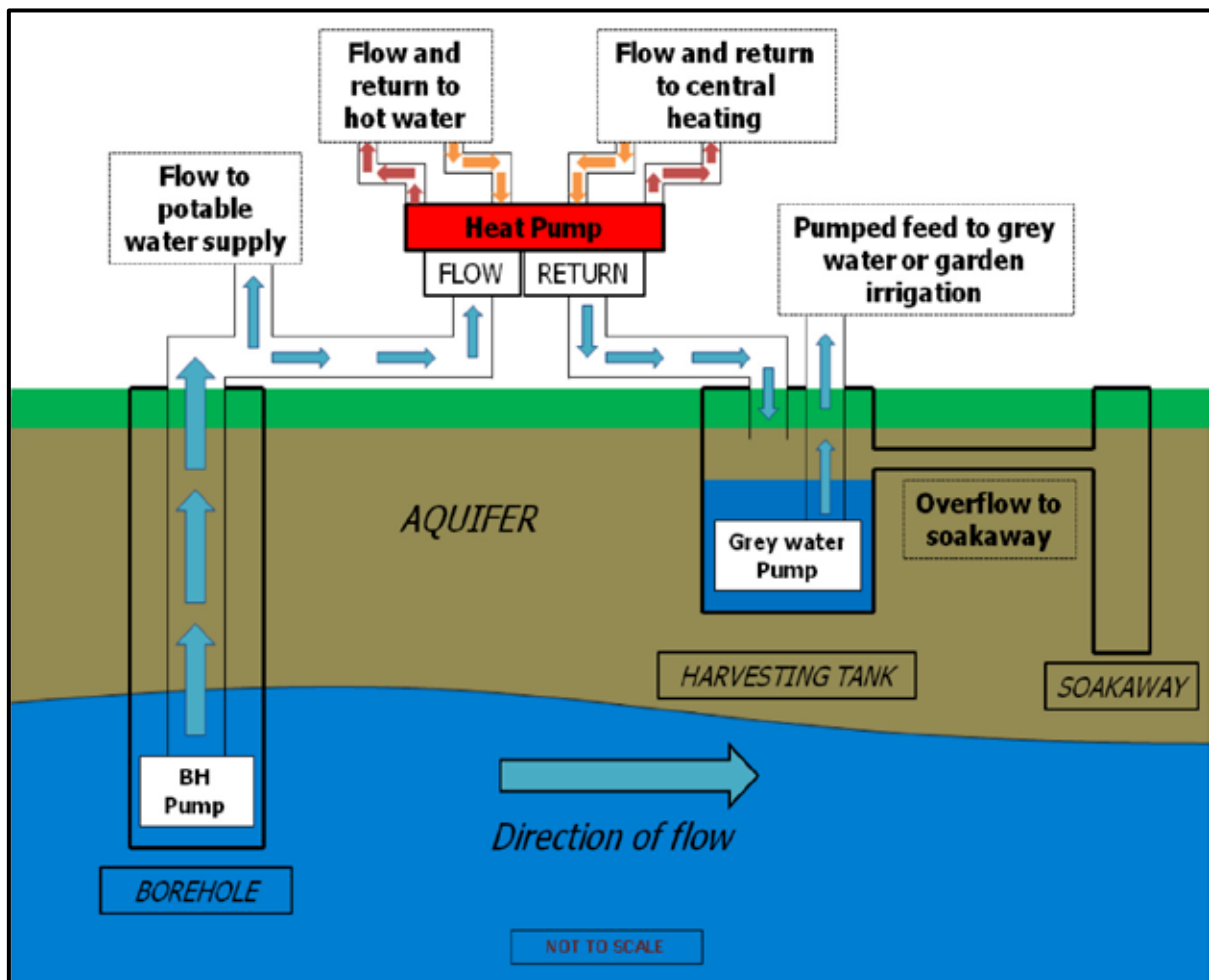
A water supply borehole would be drilled and a soakaway constructed, with the efficiency of both being proved by pumping continuously from one to the other. Ground water at a temperature of around 11°C would then be pumped into the building. Here, flow could be diverted to feed both a potable water supply (subject to analysis and via UV filtration) and an open-loop heat pump.

## H.D. SERVICES INSTALLATIONS

The heat pump extracts heat from the water and uses it to raise the temperature of water being circulated throughout the house. There are usually two separate water circuits, one for space heating up to 55 °C and another for domestic hot water up to 65°C.

Cooled water at around 6°C is directed from the heat pump back into the ground, where the ground temperature warms the water back up.

A harvesting tank can be installed to store the discharge from the heat pump, thereby providing a water supply for garden irrigation or other 'grey-water' use. Unlike rain water harvesting tanks that are only replenished when it rains, a heat pump harvesting tank is replenished whenever the heat pump is in operation. If the harvesting tank is buried in the ground, the water starts to reclaim heat immediately.



## H.D. SERVICES APPROACH

H.D Services Ltd. provides a one-stop solution throughout South East England for domestic and small commercial Open-loop Ground Source Heat Pump installations.

On all our Ground Source Heat Pump installations we offer:

- **FREE** feasibility study
- **COMPLETE** supply, installation and maintenance service
- **EXPERIENCED STAFF** who are directly employed
- **FULLY TRAINED AND ACCREDITED** personnel
- **ANNUAL** servicing/maintenance programme
- **ADVICE AND SUPPORT** in applying for the Renewable Heat Incentive (RHI) – which contributes to reimbursing the capital investment of qualifying installations.

H.D. Services is committed to providing the best heat pump installation we can. Consequently, we are members of and subscribe to the following:



H.D. Services also has long and positive working relationships with:



## H.D. SERVICES TRACK RECORD & CASE STUDIES

Since 2010 H.D. Services have installed numerous domestic and small scale commercial Open-Loop heat pump systems in various counties of South East England. We have on-going projects, where the water supply borehole has been drilled and the soakaway constructed. Water from the supply hole has been pumped into the soakaway for a number of hours to prove the efficiency of both and we are now waiting for the properties to be constructed before we install and commission the heat pumps.

H.D. Services work closely with their clients and contractors, architects and consultants to determine system requirements throughout the build process. A document outlining the plumbing and electrical requirements of the heat pump is provided.

H.D. Services firmly believe in making the installation process of a Ground Source Heat Pump as stress-free as possible, which is why we provide a free consultancy service to all customers who request a quotation from us. The knowledge and expertise held within the company can provide the information necessary to allow a customer to make an informed decision regarding the type of Sewage Treatment system or Ground Source Heat Pump they require.



In 2010, H.D. Services installed a 20kW Open - Loop Ground Source Heat Pump at this barn conversion for holiday lets in Buckinghamshire. The water is used for consumption via filtration, heating and hot water via the heat pump and irrigation/cattle troughs via a harvesting tank.



This is a typical plant room.



In 2012, H.D. Services completed the installation of a 26kW Open-Loop Ground Source Heat Pump for this self build project in Hertfordshire, having initially quoted for the work in January 2011. We also designed and installed the sewage treatment system.

## H.D. SERVICES TRACK RECORD & CASE STUDIES



In 2012 H.D. Services completed the installation of a 26kW Open-Loop Ground Source Heat Pump at this self-build project in Buckinghamshire.



This is the Open-Loop Ground Source heat pump unit H.D. Services installed at the above site, and an example of the fittings.



In 2012 H.D. Services completed the installation of a 26kW three-phase Open-Loop Ground Source Heat Pump at this new build property in Buckinghamshire. A full case study follows.

We have ongoing domestic installations in Berkshire, Buckinghamshire, Hampshire, Hertfordshire, Oxfordshire and Sussex.

H.D. Services have also completed small commercial installations (<45kW) at two churches, one in Buckinghamshire and one in Hampshire.

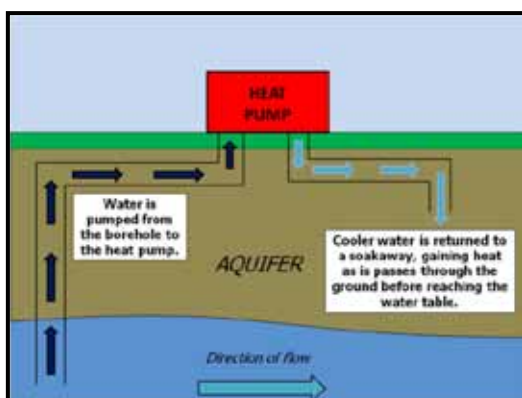
## H.D. SERVICES TRACK RECORD & CASE STUDIES

A site in South Buckinghamshire has received a 'Green Apple Award' in honour of its eco-credentials which include independent water supplies, heating and hot water - all from single water supply boreholes.

H.D. Services Ltd is an MCS accredited company that install, commission and service open-loop ground source heat pumps. We have installed and commissioned heat pumps for several self-builders, and on occasion for small developments. Each project has presented its own challenges – whether it is site access, drilling conditions or problems regarding access to a plant room. Each issue has been overcome to ensure that the client receives the best possible service with the minimal amount of disruption. We install Soleco open-loop heat pumps, which are manufactured in Devon.

In 2011, H.D. Services were approached by Acanthus Developments and asked to tender for the installation of three water supply boreholes to serve each of three prestige properties, one of which was to be retained by the owner of the development. Closed loop ground source heating was being considered; however the availability of a reliable ground water supply from the chalk aquifer combined with H.D. Services experience in working alongside other developers and self-builders across South East England, resulted in the installation of three open-loop heat pumps.

H.D. Services were able to assess the feasibility of a water supply borehole upon receipt of a



site postcode. Utilising the experience of our sister company, H. D. Drilling, who have been members of the Well Drillers Association since 1988, it was a simple process to confirm the hydro-geology at the site and submit a quotation for the construction of both a water supply borehole and soakaway for each property. The agreement H.D Services made with the client was that we construct both the water supply borehole and soakaway and pump from one to the other to prove the efficiency of both before taking any

payment whatsoever.

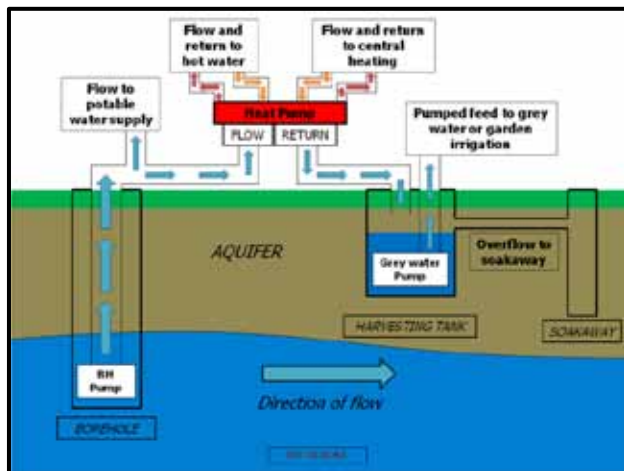
Having proved the efficiency of the water supply and soakaway at all three properties, we waited several months for the construction to be completed before installing and commissioning the open-loop heat pumps. Each property has been offered its own maintenance contract.

Working from building plans and SAP reports, the quotation allowed for the supply and installation of Soleco three-phase heat pumps; two 18-kW and one 26-kW. The boreholes were drilled using a cable-percussion rig. This is the preferred method when drilling into the chalk aquifer as it does not allow sediment to pollute the aquifer or fissures. Borehole logs were submitted to both the British Geological Survey and Environment Agency to protect the abstractions from derogation by a third party.



## H.D. SERVICES TRACK RECORD & CASE STUDIES

It was suggested to the client that the water being extracted from the aquifer could not only provide space heating and hot water via the heat pump, but could also be used as a potable supply subject to analysis and suitable filtration. Furthermore, having passed through the



heat pump, the water could be re-used via a harvesting tank from where the water would be pumped for a garden irrigation system or other 'grey-water' use. This proves to be a very efficient option as unlike a rainwater harvesting tank, which will quickly empty during a prolonged dry spell, a harvesting tank fed from a heat pump will be replenished whenever the heat pump is in operation. It also means that hose-pipe bans will not apply to the property.

Work commenced in 2011 and the water supply boreholes for each property were drilled as the original buildings were being demolished. The borehole pumps were left in-situ to provide build-water until the houses had been erected, after which H.D Services Ltd returned to site to install and commission the heat pumps themselves, including inter-connecting pipe work from the water supply borehole to the heat pump and from the heat pump to the soakaway.

From the experience gained on the above contract, we now produce plumbing and electrical documents, which are handed to the client for distribution to their plumbers and electricians. Written by our qualified plumber and electrician in conjunction with the heat pump manufacturer, they provide the installers of the heating distribution system with both the plumbing and electrical requirements of the heat pump. This ensures that those on site have the necessary information to hand regarding system requirements.

The installations were completed in late 2012 and all three of the heat pumps were commissioned successfully and received their MCS certification and a 5 year workmanship warranty. Although the whole job, from quotation to commissioning, took over a year we worked closely with the client, his architect and the builder to ensure that all needs were met and any issues addressed.



**The development of the site won a Green Apple Award in recognition of its Sustainable Nature and the Architectural Design Excellence of the properties.**



## KEY PERSONNEL

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### **Mr. F. J. Harris – DIRECTOR**

Since founding the company in 1984, Frank has twice served as Vice-Chairman of the Well Drillers Association. He is a qualified Civil Engineer and Mechanical Engineer, a Member of the Institute of Civil Engineers and a Fellow of the Geological Society.



### **Mrs. C. I Harris – COMPANY SECRETARY & DIRECTOR**

Previously an I.T. Project Manager, Cheryl has been joint director of H.D. Services since the company was founded in 1984 and has served as company secretary since then. She takes responsibility for the financial side of the business.



### **Mr. P. Harris – CONTRACTS MANAGER – (GSHP)**

Paul has worked for H.D. Services since 2004. Initially as a site technician and contracts engineer, he is now the Contracts Manager for the Ground Source Heat Pump department. Qualified as both a plumber and electrician, Paul is our heat pump expert and works closely with the manufacturer in furthering the development of Soleco Open Loop Heat Pumps.

### **Miss. V. Harris – HYDRO-GEOLOGICAL REPORTS/ESTIMATING**

Victoria has been working for H.D. Drilling on a full-time basis since 2011. A graduate in Further Education, she completes all our hydro-geological reports and she assists in the development of our marketing strategy.

### **Mrs. R. Taylor – P.A. TO CONTRACTS MANAGER/GSHP BUSINESS DEVELOPMENT OFFICER**

Rebecca has been working full time for the company since 2012. She hails from a public sector background and has taken responsibility for managing the business development of the Ground Source Heat Pump division. She liaises with the industry associations (GSHPA/REA) and government offices (DECC/DEFRA) and manages the H.D. Services compliance with the Microgeneration Certification Scheme and the Renewable Energy Consumer Code. Rebecca leads our Ground Source Heat Pump marketing and publicity campaign.

### **Mrs. J. Stevens – P.A. TO DIRECTOR**

Jill has been with the company for more than 10 years as Frank's P.A. She works closely with both directors and takes responsibility for the servicing schedule of our sewage treatment systems.

## KEY PERSONNEL

### **Mrs. S Willens – ACCOUNTS**

Sue has been running the accounts department for both H.D. Drilling and H.D. Services since 1989.

### **Mr. P. Coleman – DRILLING ADVISER**

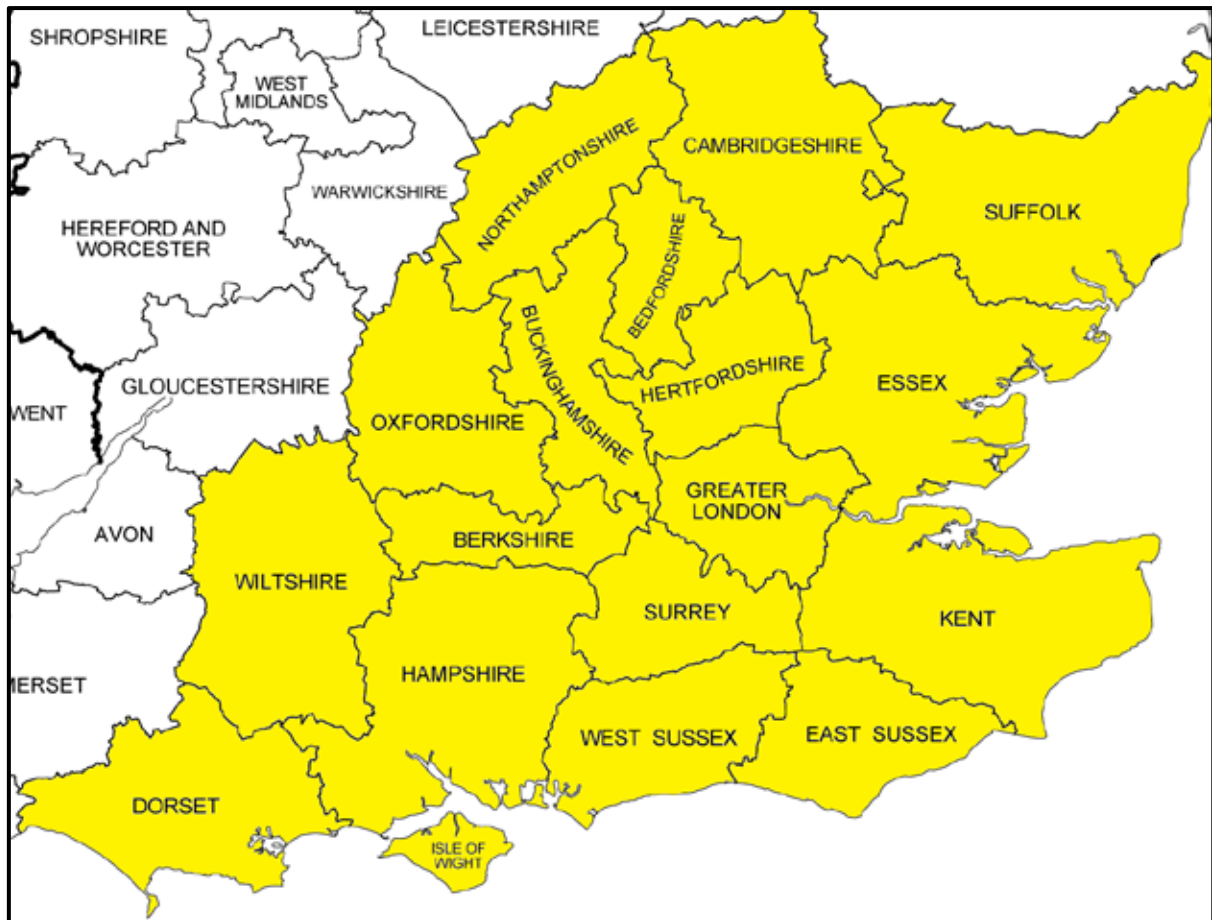
Peter has worked for the company since 1985. He and Frank worked together at Le Grand Well Drilling in the 1970's, one of the largest Well Drilling companies in the country at that time. Peter has remained loyal to the company for over 25 years and is one of the most experienced percussion drillers in the UK. He semi-retired in 2008 and is now retained by H.D. Services as a drilling adviser and rig & plant maintenance engineer.


### **SITE PERSONNEL**

Our site staff are all qualified in their various fields of expertise and include the following:

<b>Name</b>	<b>Role</b>	<b>Training</b>	<b>Length of service</b>
Mr. P. Harding	Site Engineer / Foreman	Land Driller	23 years
Mr. L. Jarrold	Foreman Driller	Land Driller	13 years
Mr. K. Spencer	Foreman Driller	Land Driller	13 years
Mr. B. Clayden	Foreman Driller	Land Driller	7 years
Mr. D. Halsey	Construction Site Operative	Electrician	9 years
Mr. D. Jarvis	Construction Site Operative	Plumber	3 years
Mr. R. Conway	Construction Site Operative	Trainee Plumber	2 years
Mr. A. Collins	Construction Site Operative	Trainee Electrician	2 years
Mr. E. Leigh	Construction Site Operative	Trainee Electrician	1 year

## AREAS OF OPERATION



 Denotes areas H.D. Services work in.



**H.D. SERVICES LTD.**

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For more information on heat pumps, please visit: [www.hdgeothermal.co.uk](http://www.hdgeothermal.co.uk)

**H.D. DRILLING LTD.**

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