Attn: Lyndsey Hayes, Planning Department, Ribble Valley Borough Council
Email: planning@ribblevalley.gov.uk
Reference: 3/2024/0038
Planning Application Number: 3/2024/0038
Grid Reference: 361789 443533
Location: Land adjacent to 8 Old Hive, Chipping, PR3 2QQ
Proposal: Proposed drilling of borehole for ground source heating purposes and associated underground pipework.

[redacted]

Application Letter received: 10/02/24
Date: 28/02/24

SUMMARY - Key Points of Objection

Please note that, throughout this document, quotes from the Government / Planning Policy are highlighted in green.

1. INTRODUCTION

This application (3/2024/0038) is for planning permission to enable the drilling a borehole in the centre of a public highway, on the outskirts of Chipping, a rural 'Conservation' village situated within the 'Forest of Bowland', an Area of Outstanding Natural Beauty (AONB). The borehole is for the purposes of ground source heating (GSHP). The vertical closed loop system, plus associated underground pipework and surface ancillary equipment are to be sited, several metres outside the curtilage of the property at 8 Old Hive, Chipping, in the middle of a public highway.

The applicant, Chipping Community Energy (CCE), is a working group of Chipping Parish Council. The Group do not own either the property (8 Old Hive) or the adjacent roadway where the proposed borehole is to be sited - the ensuing extremely complicated landownership issues will be prohibitive and unlikely to be resolved in a timely manner, if at all.

CCE has a remit to develop a 'viable' low carbon heat option for residents of rural villages like Chipping, to enable their transition from fossil fuel-based heat sources. By developing this 'Pilot' project, the Working Group are hoping to demonstrate that: low carbon technology can effectively deliver lower cost heat to rural communities, including those harder to heat older stone properties at the very heart of villages like Chipping; and that the model that is developed is replicable in rural communities more widely.

CCE have carried out two 'extensive' feasibility studies over recent years. It is not clear from any of their literature why the 'model' for small clusters of vertical ground source heat pumps was chosen as 'optimum' from the various alternatives such as Wind, Solar, Air Pump, Hydro, and Biomass. The strategy being proposed is scientifically flawed, will be very expensive to implement and the benefits to the Community as a whole 'dubious' at best. In its current form the model is extremely unlikely to be 100% inclusive, due the dispersive nature of the village settlement and variety of building archetypes. These include a significant proportion of terraced properties, not suitable for this type of heating system, which requires a significant amount of outdoor space. It may work for individual detached properties but even that is unproven and highly questionable given the geological setting and age of most of the buildings within the village. The technology is generally recommended for 'New Developments', the costs of 'retrofitting' older poorly

insulated stone walled properties would be prohibitive and may not be possible in the many listed buildings at the village core, due to planning restraints.

2. NON-COMPLIANCE - GOVERNMENT POLICY

The proposal represents an inappropriate form of development within the Forest of Bowland, a rural area of 'Outstanding Natural Beauty (AONB)'. In the absence of 'any special circumstances', as defined in the NPPF, the proposed development would, by its inappropriateness, have a harmful impact on the character of the immediate area and local vicinity. The environmental constraints related to closed loop GSHPs are considerable – before drilling in 'protected' areas such as an AONB, permits are required.

The government do not permit the installation of closed loop GSHP boreholes for mid-terraced properties without adjacent outdoor space, such as No.8 Old Hive. The systems are not suitable due to the 'space' required for the borehole installation and ancillary equipment – which should be housed within the 'curtilage' of the property.

3. FEASIBILITY

The risks of the proposed 'energy strategy' by CCE are great and from the outside do not appear to have been either fully or accurately assessed, despite extensive 'feasibility studies'. There have to be cheaper more technically effective strategies available! The idea of dispersed networks of boreholes in this area is fundamentally 'flawed'– the costs will be enormous and the benefits are unproven! Possibly most worrying is the 'damage' that is likely to be caused, if the proposal is implemented, to the core infrastructure of this heritage 'Conservation Village'.

The proposed GSHP technology does not make any sense for terraced older properties with low EPC ratings. There has been slow uptake of this technology in the UK mainly due to the unsuitability of the majority housing stock but also the underlying Geology, both 'significant issues' in Chipping. There are very few examples of GSHP networks in the UK to use as precedents, and little regulation of the industry as a whole. CCE need to think very carefully before moving ahead with haste in to such a 'risky enterprise'.

The industry and government strongly recommend against the use of GSHPs in Old Properties where they are highly unlikely to provide an efficient source of heating, even when retrofitted with new radiators, insulation etc. Chipping has a myriad of different property archetypes, some of which will be impractical to retrofit. For houses like centuries' old terraced cottages, especially those that are listed, it is very difficult to understand how, under current planning rules, they would be able to achieve 'modern' standards of energy efficiency and comfort. For some households it will not be feasible to achieve such standards even if the rules are changed to permit adaptations, because the fabric of the buildings renders such changes infeasible.

4. GEOLOGY / GROUND STABILITY

The bedrock geology of Great Britain is mainly sedimentary in nature. At depths below ~ 15 m subsurface temperatures are affected by the heat conducted upwards from the underlying solid geology. Sedimentary rocks in general are poorer thermal conductors, than igneous or metamorphic rocks, which have been subject to heat and pressure during their formation.

Overlain on the bedrock or "solid" geology is a somewhat variable distribution of soils and fragmental material deposited by glaciers (boulder clay, and other forms of glacial drift) in the geologically recent past. "Drift" geology is important when considering building works, drainage, boreholes etc.

The area surrounding Chipping is covered by large amounts of Glacial Till – the depths vary considerably and tend not to be uniform in nature. A 'Test' borehole drilled in one location is unlikely to be representative of the subsurface conditions further afield, especially if there are topographic changes, which are a strong indicator of subsurface variation. The 'Test" borehole drilled in the centre of Chipping by the Village Hall cannot be assured to be representative of the conditions at Old Hive and beyond. Geological maps (from BGS) indicate that the bedrock is changing, but given the hilly nature of the local terrain it is likely the unconsolidated sediments at the surface are even more diverse in nature.

The results from the 'Test' borehole have not been released to the public but there were indications of significant amounts of mud and unconsolidated material, which are not generally very thermally conductive. CCE are recommending boreholes of ~200m, which is 'deep' and does seem to be indicative of a relatively poor thermal response. The objective of drilling the 'Pilot' borehole was to test the GSHP technology – it is unfathomable why a heat pump was never attached to a building and the response fully assessed for a 'typical' local home over the various seasons.

5. HIGHWAY - SAFETY / ACCESS

Chipping is a small rural settlement, with a poor road infrastructure. The main routes through the centre are very narrow with restricted pathways – they were constructed before the age of motorised transport. Particular bottlenecks for traffic are Windy Street, Church Raike and Talbot Street. The proposed strategy, by CCE, for several boreholes to be drilled at various locations throughout the village, some directly in the highway, will cause months of severe disruption to the traffic network.

The types of rigs required to drill 200 m boreholes are massive and likely to completely block local roads causing access problems for local residents as well as being a significant 'safety' hazard. Drilling is not an appropriate activity to undertake in narrow enclosed spaces, close to buildings.The inherent risks should not be underestimated. It will be impossible carry out work 'safely' at most of the CCE proposed locations, which are very close to nearby properties. The installation of vertical GSHPs is an activity, which by its nature requires considerable amounts of 'open space' such as a field or large isolated rural garden!

All drilling sites generate high levels of pollution, which can carry for large distances. Every single construction action has an impact on the environment, the effects are often severe and difficult to negate, they are detrimental to the health of employees, people living nearby and the local flora / fauna.

Section 50 permits are required before any work is carried out on public highways. There is no precedent in Lancashire for permits being given for this type of unnecessary construction.

1. INTRODUCTION

This application (3/2024/0038) relates to the drilling of a borehole and installation of Ground Source Heat Pump (GSHP) apparatus in the roadside, adjacent to number 8 Old Hive, Chipping, PR3 2QQ. This historic, mid terrace, worker's cottage, directly borders the road with only a narrow cobbled pathway outside. There is a single entrance to the front of the property, which does not have an immediately surrounding garden, driveway etc. within its residential curtilage. The proposed drill location for the vertical GSHP is outside the curtilage of the property, in the middle of a public highway. Direct land adjacent to a property is a specific requirement for the installation of ground source heat pumps.

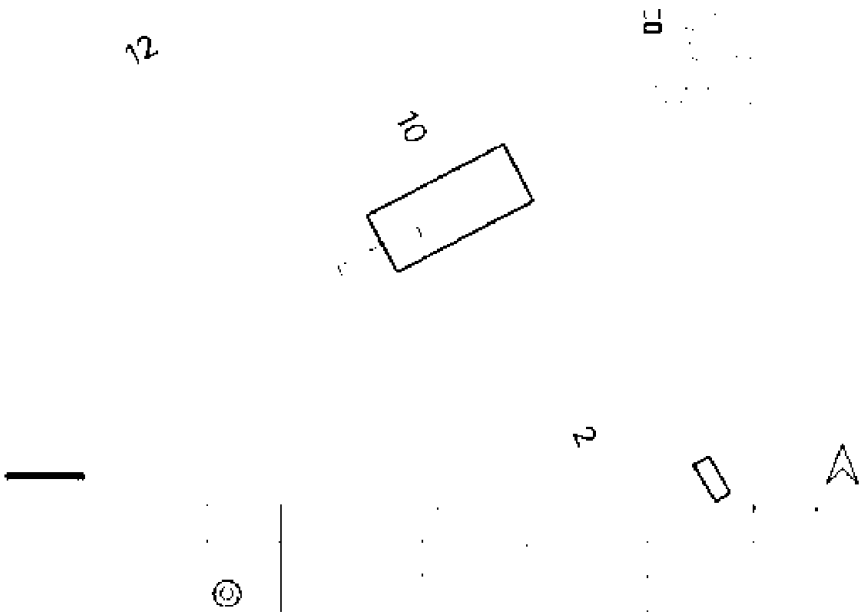
This proposal forms part of a larger, village wide scheme aiming to develop low carbon heat options, which is being managed by the Chipping Community Energy Group (CCE). The comments and objections made within this document do correlate directly to the proposed borehole in Old Hive, but may also have more widespread implications to rural community energy projects throughout the borough, for which this is very much a Pilot project. Ribble Valley should be commended for their impetus to move towards zero carbon but in this haste to push forward with new inventive schemes it is critically important that the technical details of such proposals are fully evaluated for credibility, hence the sections (3 and 4) relating to feasibility and geology later in this document.

2. NON-COMPLIANCE - GOVERNMENT POLICY

This application relates to the drilling of a closed loop borehole and installation of supporting pipework and ancillary equipment for a Ground Source Heat Pump (GSHP), to provide heat to No. 8 Old Hive, Chipping, PR3 2QQ. The technology captures heat, stored in soil and rock layers below the sub-surface. A specialist rig drills a vertical borehole to depths of up to 200m, following this a U-shaped straight pipe is inserted into the borehole, circulating a solution of water and antifreeze. The pipe captures the heat energy from the ground and passes it back to the heat pump where the temperature is raised and then used to provide heating and hot water.

Generally heat pumps are permitted developments, unless a property is listed or in a Conservation Area. As long as a borehole is situated within the land of your property and does not exceed 0.5 hectares, it is acceptable within current legislation.

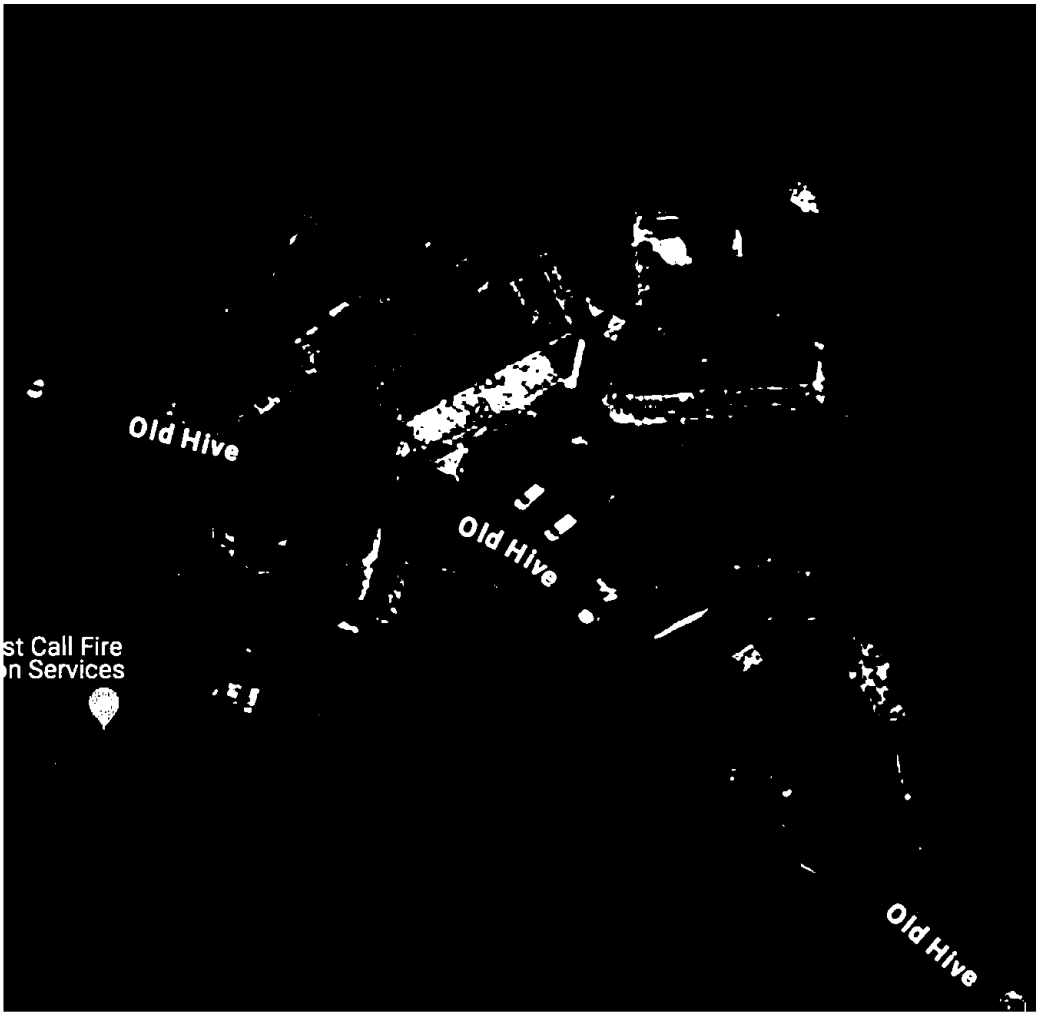
The proposed borehole installation would **NOT** be within the curtilage of the property in question (No. 8 Old Hive – PR3 2QQ), it would be situated in the middle of a public highway, within the Forest of Bowland Conservation area (AONB) - see proposed location map below. There is no provision within government policy for developments in the middle of a public highway, which will directly affect the passage of traffic and access to neighbouring properties.



This type of borehole installation requires the proposer to have sufficient external space within the curtilage of their land for the pipework and ancillary equipment. It is also critical that there is enough space for the drilling rig and accompanying vehicles to enter the proposed site. This would be very problematic within Old Hive, which is a narrow, rural road. Other drilling sites, proposed by the Community Energy Group as part of this village wide scheme, are more centrally located – here the problems manoeuvring large vehicles such as drilling rigs are likely to be even more severe. It is commonplace for trucks and lorries get stuck in the narrow streets within the centre of the village, occasionally causing damage to the heritage properties, which front them.

Old Hive is a single track, rural road with passing places. The picture included below, taken from google maps, shows an aerial view of the terraced houses. This small hamlet

of workers cottages was constructed before the age of motor vehicles, most of the residents do not have driveways, this means they have no alternative but to park on the roadside, which is also used as passing place for through traffic. The road is vitally important to the day-to-day livelihood of the residents of Old Hive. They rely on it not only for access to their properties but also as a stopping place for visiting vehicles – it is critical asset to the whole neighbourhood, a vital and fundamental part of all their lives.



Installing apparatus in a highway requires a Section 50 license NRSWA 1991. Utilities and other bodies have statutory powers to install apparatus in a public highway, any other company or individual who wants to install and maintain equipment needs to apply for a licence under Section 50 of the New Roads and Street Works Act 1991 (NRSWA).

Lancashire County Council Highways should to be involved in the decision making process for this proposal, since the installation and apparatus would be in the road. There is no precedent for Section 50 licenses related to GSHP installations in this county and no legislative support for them.

Chipping Community Energy Group have suggested there will be apparatus in the middle of the road but not given specific details how big this may be. In most planning applications, detailed and accurate plans of the development are required – this case should be no different. Prospus and the Energy Group in Chipping need to provide specific measurements for the equipment they are planning to install at the road surface once the borehole is drilled. The schematic illustration below is taken from the Chipping

Community Energy Website – how accurate is it in relation to their proposal for 8 Old Hive?

This picture is of a detached property with it's own driveway and land, so not directly pertinent here, nevertheless an assumption can be made there will be a permanent box in the middle of the highway to house apparatus related to the heat pump system. There is no room directly in the cottage for this type of equipment - No. 8 Old Hive is completely open plan downstairs - a single living area comprising lounge, kitchen and dining. GSHP installations require room to house the ancillary equipment, preferably an outbuilding. This would not be feasible in this small mid-terraced cottage - the apparatus would have to be sited in the road. This will cause significant problems in terms of ownership / responsibility, it would definitely be an eyesore in this Conservation Area (AONB), but more seriously due to its siting - a high-risk safety hazard.

Large vehicles commonly use the road adjacent to Old Hive, notably tractors and other farm related trucks, which transit through in order to access the village and surrounding land. The vibrational effects of heavy vehicular traffic have been known to cause structural damage to roads and surrounding properties. It is highly possible that the tremors caused by passing vehicles could lead to cracks in the subsurface pipes / casing of the borehole - the antifreeze contained within is toxic, if it leaks out and floods the surrounding subsurface it would cause significant environmental and structural damage. Generally ground source heat pump boreholes are situated beneath gardens or vacant land not under public highways, where implicitly they would be a much more significant safety hazard.

The Government do offer some advice to prospective heat pump installers. It is possible to check suitability, utilising the following website: https://www.gov.uk/check-heat-pump.

As an illustration the details for No.8 Old Hive were entered – they may not be totally accurate, since I do not live in the property, but should be for the most part relevant.

What type of home do you have?	Mid-Terrace	Change
Approximately when was your home built?	Before 1900	Change
What is the main type of external wall construction in your home?	Solid - uninsulated	Change
What is the approximate floor area of your home?	50m² – 70m²	Change
How many bedrooms does your home have?	2	Change
What type of roof does your property have?	Loft - insulated	Change
What is the main type of window glazing in your home?	Double	Change
Does your property have outdoor space on the ground floor (for example, a garden or communal car park)?	No	Change
What fuel does your current heating system use?	Electricity	Change
Does your home have a mains gas supply?	No	Change

When the above details were submitted the following response was given.

Ground Source Heat Pump

NOT SUITABLE FOR YOUR HOME

A Ground Source Heat Pump takes heat at a low temperature from the ground outside your house. It then uses an electric compressor system to increase the temperature of this heat, so it can be used to provide space heating and hot water for your home.

A Ground Source Heat Pump system installation will typically take 30-40 days though this period may vary. This period is inclusive of the groundworks required so your heating system will be operational for most of this time.

The feasibility of retrofitting a ground source heat pump system to an old mid – terrace property, such as No. 8 Old Hive, is discussed in more detail in Section 3. The illustration above is to show the governments current advice for this type of proposal, which is that it is NOT suitable.

ENVIRONMENTAL POLICY

The government provide environmental guidelines for closed loop ground source heating and cooling systems these are discussed in more detail below.

Overview
1. The system must be a closed loop system that does not discharge pollutants to the environment, other than heat transfer
2. The system must not cause pollution of surface water or groundwater
3. The system must not be in a groundwater source protection zone 1
4. The system must not be within 50 metres of a well, spring or borehole used to supply water for domestic or food production purposes
5. The system must not be in or near protected sites and ancient woodlands
6. The installation of your system must not mobilise any contamination that may be below the ground and cause groundwater pollution
7. The system must not be next to a septic tank or cesspit and its infiltration system
8. All of your system equipment must meet the relevant British Standards and Ground Source Heat Pump Association Standards
9. You must decommission your system properly when you stop using it

An environmental permit is required if the above conditions cannot be met.

1. The system must be a closed loop system that does not discharge pollutants to the environment, other than heat transfer

The system must be fully sealed and not discharge water or fluids into the environment.

The proposed system would be sealed, which should be OK so long as there are no leaks. Unfortunately these are difficult to assess and there is no regulation in the industry so no collated information regarding reliability in general or how common leaks are.

2. The system must not cause pollution of surface water or groundwater

- You must make sure your system: is not harmful to human health or the quality of water-dependent ecosystems

Drilling by its nature is a very messy business – during installation significant amounts of water, soil, mud, rocks etc. will be released which will no doubt end up in the local watercourse a few metres down hill from the proposed drilling location.

Heat pumps systems can also result in undesirable temperature changes in the water environment, with consequential impacts on water quality and aquatic ecology.

- does not result in damage to material property

The proposed installation would be so close to neighbouring properties that it would be almost impossible not to cause incidental damage to them.

- does not interfere with amenities or other legitimate uses of the environment

The proposed installation is in the middle of a public highway, which provides direct access to all the houses at Old Hive – the residents have a legal right to enter, occupy, and enjoy their property without undue interference.

3. The system must not be in a groundwater source protection zone 1

The map below shows the ground water protected zones around Chipping – the centre of the village is not within them but the surrounding countryside is.

Closed-loop systems transfer heat by circulating a refrigerant mixture (typically consisting of water, anti-freeze compounds and corrosion- inhibitors) around an array of closed-pipe

loops in the ground (borehole heat exchanger). Although these systems do not use groundwater directly, incorrectly installed or defective systems may adversely impact groundwater quality, for example through the release of anti-freeze components and other additives from leaking pipes that may be harmful. The extent to which such incidents occur in the UK is difficult to assess as closed-loop GSHP systems are not regulated or monitored, and the locations of these systems are largely unknown.

4. The system must not be within 50 metres of a well, spring or borehole used to supply water for domestic or food production purposes

This is difficult to check but this is a rural area and some of the more remote farms do use Springs / Boreholes for their water supply.

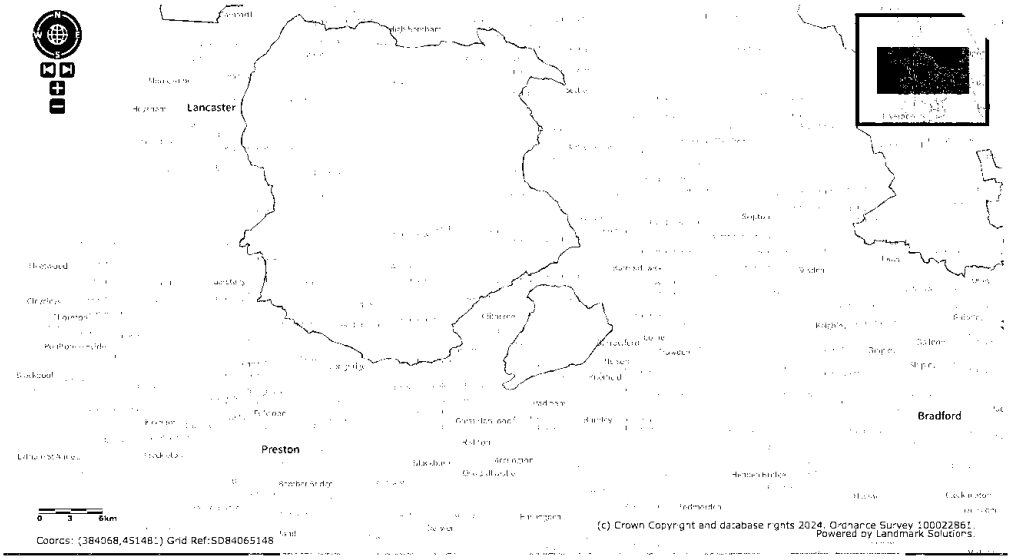
5. The system must not be in or near protected sites and ancient woodlands.

You will not meet the exemption conditions if the system is within certain distances of a protected site or ancient woodland. These distances are different depending on whether the system supplies residential property, a community building or commercial premises.

A protected site includes:

- special areas of conservation
- special protection areas
- Ramsar sites
- biological sites of special scientific interest (SSSIs)
- local nature reserves

Chipping is a village and civil parish in the borough of Ribble Valley, Lancashire, England, within the Forest of Bowland Area of Outstanding Natural Beauty (AONB) . The village is known to be at least 1,000 years old and is mentioned in Domesday. It lies on the south-western edge of the ancient Forest of Bowland – see map below.



The proposed development site in Chipping is part of the Forest of Bowland, an 'Area of Outstanding Natural Beauty'. The purpose of the AONB designation is to conserve and enhance natural beauty. Bowland is made up of a variety of terrains; an upland area of heather moorland with deep wooded river valleys is surrounded by a 'Fringe' which a

has a diverse landscape of undulating herb-rich hay meadows, lush pastures, broad-leaved woodlands, parkland and water bodies - all formulate an area of considerable conservation interest. The proposed site is part of Bowland fringe – the surrounding meadow and woodland areas are noted as haven for wildlife, part of a Local Biological Heritage zone (Clark House). Any development in this area would have a detrimental impact on local Biodiversity and Geodiversity, which should be preserved at all costs.

The significance of this area in terms of local landscape should not be underestimated, its credentials in terms of biodiversity and heritage have been recognised by various conservation schemes:

a) AONB - The proposed development is within the Forest of Bowland, which was formally designated an Area of Outstanding Natural Beauty (AONB) by the Government in 1964
b) BHS - Clark House Biological Heritage (DME3) site borders Old Hive.
c) WOODLAND GRANT SCHEME – Tree preservation area on land bordering Old Hive.
d) HERITAGE – The proposed site in this application is in Old Hive, which is a small historic hamlet, just outside the Chipping Village Conservation area. Some of the other drilling locations proposed, such as those in Windy Street (Application Number 3/2024/0037) are directly within it.

All of the above are discussed in more detail below and should be taken in to consideration when appraising this application - all development activity should be eco friendly and sustainable but also fit in with the local environs.

The proposed site / sites for drilling are in a strictly controlled, Conservation Area (AONB). It is my belief that the planning statements for this proposal do not give anywhere enough credence to this, the proposer's recognize the status but have not carried out a specific village wide environmental, geological or archeological surveys. They appear to believe, rather naively, that because the boreholes are underground they will have no direct effect at the surface. They have not given proper credence to ground stability in the area, the suggested borehole locations are too close to heritage properties for safety. The test borehole drilled was in a field, a little more sensible considering the amount of mud, which flooded out. The application does not contain accurate details pertaining to the nature of the apparatus to be installed in the middle of the highway, which makes it difficult to estimate the visual impact but it is liable to be significant. The drilling process is extremely messy, vast quantities of mud, rocks, water etc. are released, sometimes at pressure. As well as the mess, it is possible that the procedure may damage to nearby properties and possibly local instability in the subsurface and should definitely NOT be considered so close to any properties, never mind those of such historical significance.

Hopefully the text below will provide valuable additional contextual detail, which shows, without reservation, how important it is to preserve the integrity of the area, its heritage, biodiversity and geodiversity.

a) AONB

The proposed development is within the Forest of Bowland, which was formally designated an Area of Outstanding Natural Beauty (AONB) by the Government in 1964.The area was designated as a landscape of national significance due to a variety of factors, including:

- The grandeur and isolation of the upland core
- The steep escarpments of the Moorland Hills
- The undulating lowlands

- The serenity and tranquillity of the area
- The distinctive pattern of settlements, the wildlife of the area, the landscape's historic and cultural associations

The NPPF provides specific planning guidance for development planning and decision making in relation to AONBs. It confirms that great weight should be given to conserving landscape and scenic beauty. AONBs have the highest status of protection in relation to landscape and scenic beauty. The NPPF confirms that local planning authorities should set out the strategic priorities for their areas within Local Plans and accordingly deliver the conservation and enhancement of the natural environment, including landscape. The NPPF also confirms that allocations for development should prefer land of lesser environmental value (counting the AONB as high value), that local planning authorities should set evidence and criteria based policies against which proposals for any development on or affecting landscape areas will be judged (development affecting AONBs includes impact on their setting) and that planning should contribute to conserving and enhancing the natural environment.

The local Ribble Valley Core Strategy concurs with the sentiments of the NPPF and gives high protection to the Bowland AONB.

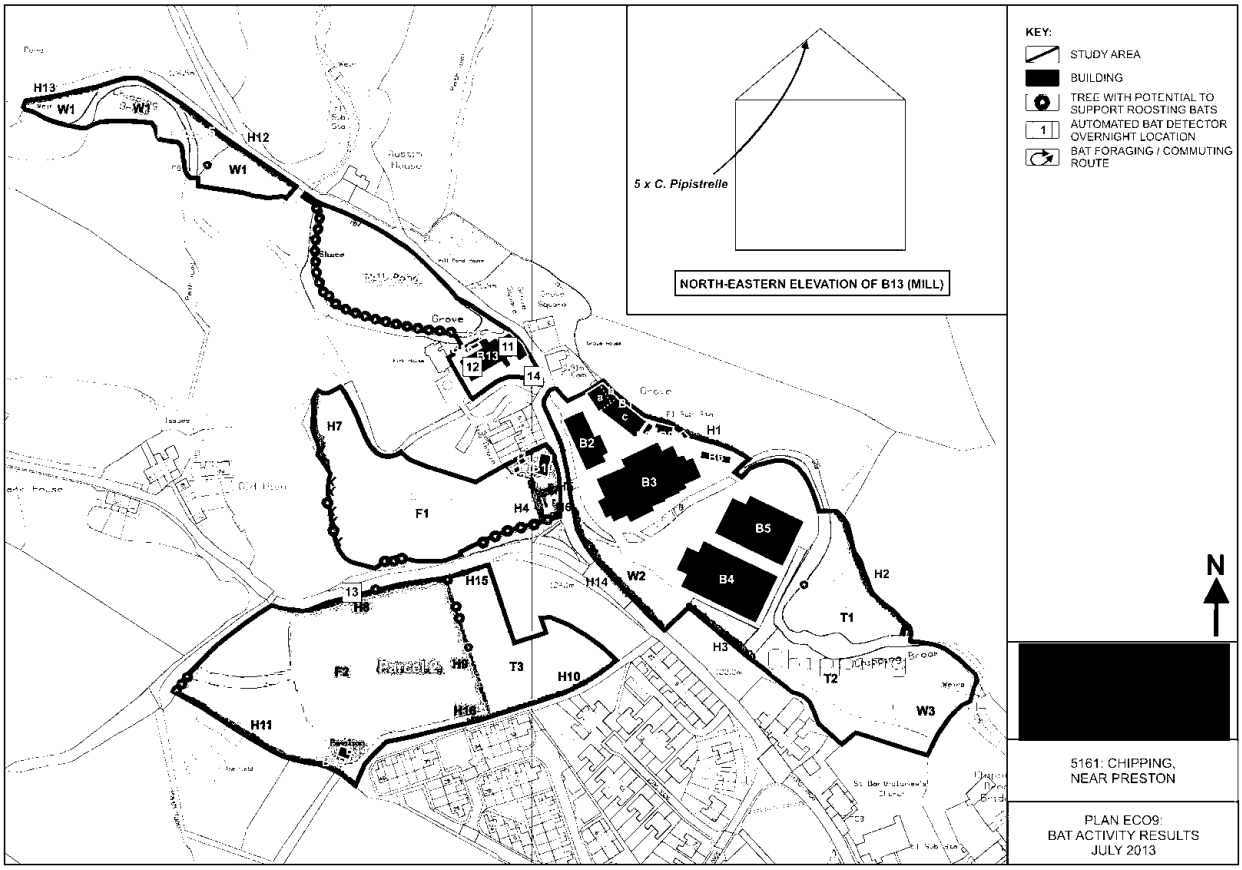
Biodiversity - Construction impacts animals. Loud machines have a significant impact especially during the initial groundwork stages. Noise and light pollution heavily impact wildlife, especially bats, badgers and birds, by disturbing their natural day cycle. However, it is only a part of a much more complex problem. Such changes significantly impact animals, forcing them to change their way of living and reducing their population. Consequences like these are often not noticed by decision-makers, as the problems may be visible only after a long time (usually long after the project has finished).

Obviously conservation is critical in designated areas such as AONB and Biological Heritage sites, but Wildlife is not restricted to these sites; it occurs throughout the countryside, no part of it is without some ecological interest.

The Government's Planning Practice Guidance on Renewable and low carbon energy (Paragraph 018) outlines that "Whilst there are generally a relatively low risk to the surrounding ecology in some situations, such as close proximity to important habitats used by birds or bats, the risk is greater and the impacts on birds and bats should be further assessed to allow for mitigation."

BATS are a protected species - their numbers have dwindled significantly over recent years. Fortunately they are relatively widespread throughout the Ribble Valley and are found within a variety of locations, due to the excellent habitat that the Forest of Bowland 'Area of Outstanding Natural Beauty' and surrounding countryside provide. [redacted] and can confirm, with some certainty, that the settlement is home to a thriving community of Bats. [redacted] and informed the bat conservation society, fortunately it managed [redacted]. This is not an isolated recording - [redacted] On summer evenings even the most inept observer can see bats in significant numbers foraging around the area.

All UK bats eat insects, so they need to find roosts near good foraging habitats such as pasture, woodlands or water. Various Ecological Surveys in the local area have shown significant numbers of bats. The map below shows local bat potential it was produced from survey data carried out in 2013.



The table below was also produced as part of the same survey in 2013.

9th July 2013	Number of registrations			
Species	Location 11	Location 12	Location 13	Location 14
Common Pipistrelle	0	18	96	473
Soprano Pipistrelle	0	2	11	23
Myotis sp.	0	0	0	20
Noctule	0	0	0	0

The chart shows how important this landscape is to bats, there are significant numbers (literally hundreds of recordings) in the local area, they roost in Kirk Mill, local trees and buildings. Any drilling works in the area would have a significant impact - the constant background humming noise emitted from the heat pump apparatus installed outside properties may also significantly affect these very sensitive creatures.

In the UK, bat populations have declined considerably over the last century. Bats are still under threat from building and development work that affects roosts, loss of habitat, the severing of commuting routes and specific threats around dwellings including cat attacks, flypaper, light, noise and some chemical treatments of building materials. Bats are dying by the millions, recent research suggests that; toxic chemicals emitted from urban

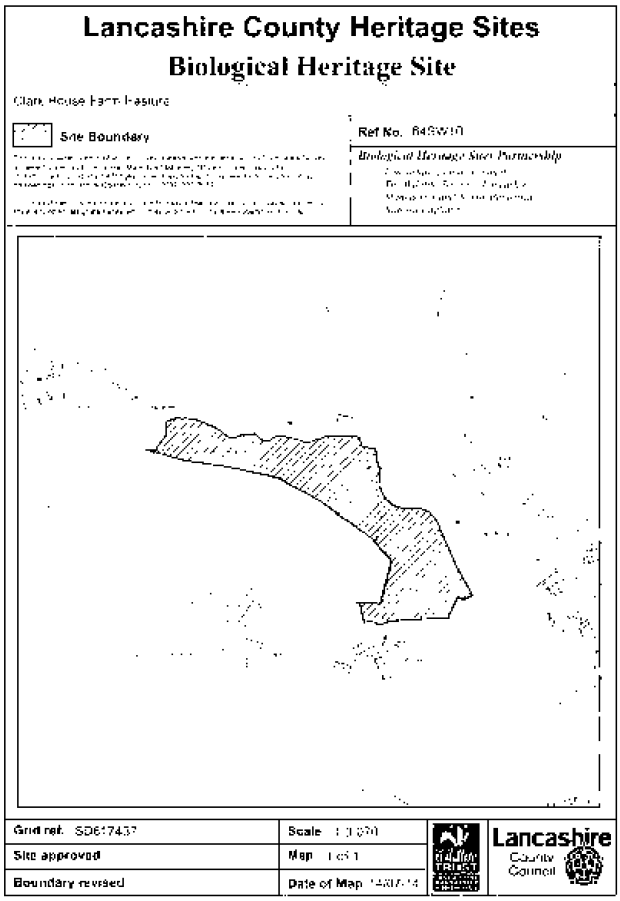
developments and pesticides used in agriculture are hormone disrupters and immune suppressants, which affect the 'normal' life cycle of bat colonies.

b) BIOLOGICAL HERITAGE SITE – CLARK HOUSE (DME3)

Biological Heritage Sites are areas of land rich in wildlife in Lancashire. Biological Heritage Sites support many of Lancashire's most important and threatened habitats and species. They are the most important places for wildlife outside of legally protected land such as Sites of Special Scientific Interest and form part of a national network of wildlife sites.

At the Rio Earth Summit, the world's nations planned to protect the variety of the planet's wildlife (biodiversity). Biological Heritage Sites provide a system whereby sites that are important for wildlife are highlighted. 'Awareness' is the key to site protection. Landowners and managers need to know where the sites are and why they are important to biodiversity.

The map below shows that Old Hive borders Clark House BHS (DME3), it is in fact very much a continuation of it.



Biological Heritage Sites are an established input into statutory development plans in Lancashire. They are an important factor of which due account is taken when decisions are made about planning applications. Just as important, they are the basis for increasing proactive conservation by public, private and voluntary sector interests - including landowners and land managers. Biodiversity is a key part of our environment, and its conservation is a key indicator of sustainable development.

Biological heritage sites have the potential to make a significant contribution to biodiversity and, although not directly protected by law, many of the species they harbour are. They include ancient woodland, species-rich grassland and bogs, as well as ancient hedges and grass verges, many of which provide a refuge for rare and threatened plants and animals..

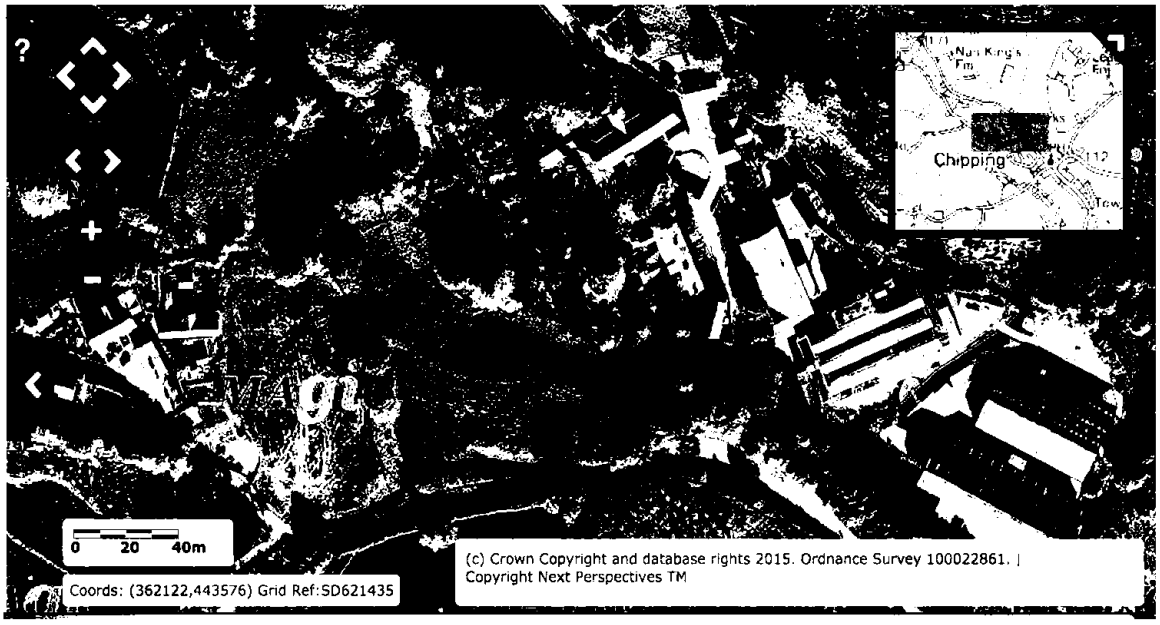
Biological Heritage Sites are components of the local ecological network, the preservation, restoration and re-creation of which should be promoted (NPPF paragraph 117). Government guidance emphasizes that such sites are of substantive nature conservation value and have a central role to play in helping to meet national biodiversity targets. The Clark House BHS borders the proposed site the biodiversity is bound to be affected by the polluting effects of any proposed drilling which may have a detrimental effect on the landscape in terms of noise, air and water quality and as such significantly affect biodiversity. Rare bird species nest in the area their habitats need to be protected at all cost.

The map below shows the connectivity of the proposed site to the Clark House Biological Heritage site (pink), Also the closeness to the wooded valley bordering Chipping Brook (dark green).

c) WOODLAND GRANT SCHEME

The Woodland Grant Scheme (WGS) provides incentives for people to create and manage woodlands on sites all over Great Britain. The Forestry Commission pays grants for establishing and looking after woodlands and forests because of the benefits that well managed woodlands give to society. Grants are paid to help with the creation of new woodlands and to encourage the good management and regeneration of existing woodlands.

The map below shows (green hash) the boundary of a local Woodland Grant Scheme.



Apologies for the colour scheme but essentially the boundaries of the hashed area are very close to the proposed borehole site at Old Hive. [redacted] from the 1840's until 2011, used wood in their furniture business and planted thousands of broadleaf trees locally, they aimed to plant thousands more, to preserve our natural heritage, but unfortunately went in to administration and the land was sold on. [redacted] also owned the neighbouring woodland (across Church Raike), a continuation of this Woodland Grant Scheme. Tragically many of the hazel trees were cut down to enable residential development at Fellside.

d) HERITAGE

Chipping is a picturesque village on the slopes above the River Loud, it is a designated Conservation area with stone-built cottages, a 17th century school and almshouses endowed by John Brabin, dyer and cloth merchant. A Conservation Area is defined as *"an area of special architectural or historic interest the character or appearance of which it is desirable to preserve or enhance"* (Section 69 of the Planning (Listed Buildings and Conservation Areas) Act 1990).

The special interest that justifies designation of the Chipping Conservation Area derives from the following features:

1. Historic layout and street pattern of Talbot Street and Windy Street;
2. Rural setting of the village in lowland farmland below Parlick Fell and Fairsnape Fell;
3. St Bartholomew's Church and churchyard, including sundial, stone boundary wall and steps;
4. St Mary's Church, churchyard, presbytery, former school and environs;
5. Chipping Brook;
6. Open areas in front of The Sun Inn and the Talbot Hotel;
7. Prevalent use of local stone as a building material;
8. Architectural and historic interest of the conservation area's buildings, including 24 listed buildings;
9. Trees, particularly beside Chipping Brook and in the churchyards of St
10. Bartholomew's and St Mary's Church;
11. Well tended roadside gardens;
12. Historical association with John Brabin: grade II listed house, school and almshouses;

13. Areas of historic stone floorscape;
14. Views of Pendle Hill and the distant Fells to the north.

Several of the above features are liable to be negatively impacted by the proposed drilling and ancillary apparatus in Windy Street. Within Chipping Conservation Area, all planning applications should be particularly carefully considered by the Council and only well detailed schemes, using the appropriate traditional materials, should be approved.

Drilling affects the stability of surrounding sediments – the proposed sites in the centre of the village are **too** close to listed buildings, they are highly likely to have a considerable detrimental affect on this heritage architecture. The boreholes and related pipework maybe subsurface but the ancillary equipment is not. Will the housing be in keeping with local architecture?

I maybe being overly dramatic but sincerely believe it is completely bonkers to consider drilling deep boreholes and placing related subsurface pipework so close buildings of such historical importance. The proposed locations: in the middle of the highway, very close to the nearby terrace cottages, is not a feasible siting for this type of technology. The government state that vertical GSHP should be located within the curtilage of the owner's property for a reason. It is totally unreasonable for neighbouring properties to have to put up with the destruction that will inevitably be caused. There has to be a more viable way of providing heating to these properties.

It is reckless to consider a network of boreholes in any urban area without detailed and accurate archeological / geological / geothermal / geophysical mapping. There are very few urban examples in the UK (the uptake here has been slow for a reason!), certainly nothing similar in nature to model being proposed here. They are more common in Europe - we need to learn from their experience. The following commentary is taken from a paper describing the disastrous effects of a network of boreholes in the centre of an historical (16th Century) town located in southern Germany.

A network of boreholes, in Staufen im Breisgau, caused significant damage to surrounding architecture. In September of 2007, seven geothermal borehole heat exchanger (BHE) drillings were performed in a small square directly adjacent to the 16th century town hall in the centre of the town. These led to enormous structural damage to buildings as a function of various geological parameters: artesian groundwater, two interacting karst formations, strong tectonisation, and a swellable anhydrite formation. Some weeks after termination of the well construction, uplift started, it reached (March 2010) a magnitude of approximately 26 cm. Actually, some 250 buildings (March 2010) were involved; showing cracks, tilting, and other effects of the differential swelling movements beneath the foundations. Surface uplifts with a rate up to 10 mm/month were determined using high-resolution spaceborne radar data and radar interferometric techniques. These amplitudes correlate with data from benchmarks of terrestrial geodetic surveying. Besides the uplift due to the swelling processes, future problems could arise from the fact that the gypsum formed from the swelled anhydrite is soluble in water. Thus, sinkholes and other karst related phenomena may occur.

The repair costs have been considerable, regrettably Staufen isn't the only town affected, there are eight other German urban centres with similar problems. Geothermal drilling became very popular but unfortunately was not massively regulated. Whilst the industry and the country have started to learn from those mistakes, for Staufen the knowledge came a little too late.

Hopefully it is not too late for Chipping! It is very important we pay heed to such examples when planning similar networks of boreholes in the UK. The costs of repairs would be enormous; in the case of heritage architecture once lost it is gone forever! The GSHP technology is relatively new, in the UK networks / clusters of boreholes are rare and usually for new buildings such as hospitals or blocks as flats, not retrofitted to historical properties in a dispersed rural village. It would be utterly crazy to test the technology in the middle of a Conservation area such as Chipping; there have to be more safe and viable alternative forms of energy!

5.1 If your system supplies a single residential property and the maximum output is 45 kilowatts (kW) or less

You will not meet the exemption conditions if the system is within 20 metres of a protected site or ancient woodland.

Please refer to the above discussion in 5.0, which details the importance of Old Hive in relation to Conservation and Heritage.

6. The system must not be next to a septic tank or cesspit and its infiltration system

This is a rural community many of the properties have septic tanks.

The government state 'If you cannot meet all of the exemption conditions, you must **get an environmental permit** to run your new closed loop ground source heating and cooling system.'

Has this been obtained?

In summary the proposed network of GSHP in Chipping does not adhere to the government's environmental objectives to: protect and enhance our natural, built and historic environment. The NPPF states that local planning authorities should set out the strategic priorities for their areas within their Local Plans and accordingly deliver the conservation and enhancement of the natural environment, including landscape. It also provides specific planning guidance for development planning and decision-making in relation to AONBs: 'Great weight should be given to conserving and enhancing landscape and scenic beauty in National Parks, the Broads and Areas of Outstanding Natural Beauty, which have the highest status of protection in relation to these issues. In Ribble Valley there are limitations for siting renewables within designated areas. With two thirds of the borough being an Area of Outstanding Natural Beauty, sites for renewables need to be investigated comprehensively. The borough can contribute to the renewable energy targets through small-scale renewable energy installations, for example hydro-power.

3. FEASIBILITY

The main objective of the Chipping Community Energy Group (CCE) is to find a collective zero carbon energy solution that is affordable, replicable and scalable. This is a credible objective but have the group chosen the best strategy available in terms of technology, practicality, funding etc. to achieve their aim? The current model is for a dispersed group of vertical GSHP – at this stage it appears highly unlikely that this will be a practical village wide solution, there are many pitfalls, these are discussed in more detail below. Has the CCE fully evaluated all the alternatives such as: Solar, Air Source Heat Pumps, Hydro, Biomass and Wind? Maybe a combined option would be a more effective strategy?

Community energy is all about a group of people coming together, taking action and using local resources to reduce, manage or generate their own energy. Practically for a project to work effectively the whole neighbourhood needs to be fully invested, at minimum of 80% uptake. To date the interest shown by the Chipping Community has been below 20% (a significant proportion of these reside in Fellside and are disillusioned with their Air Source Heat Pumps!), an indication of the underlying lack of confidence! Even though the population are being crippled by the high Energy prices they have been reticent to engage with the CCE. The villagers not only need to feel confident about the proposed methodology but also that the management team involved have the skills necessary to implement and manage it. They group are no doubt enthusiastic but do not have any 'track record' in this field of operation; in fact there is very little expertise in the UK as a whole. The 'Sales Pitch' is slick but lacks real substance, the facts just do not add up, this technology is NOT suitable for a 19th Century, mid terraced stone walled property, lacking insulation with a very low EPC rating and no direct outdoor space. There are significant safety issues drilling so close to nearby properties (recommended distance from nearby properties >10m – most in this application <5m) and in the middle of a road. Environmental and heritage concerns related to the location in an AONB and Conservation area. Ownership is 'unclear' and likely to be a problem if a borehole is located on land owned by a third party or the public highway. What happens if the system malfunctions, who is responsible? Who will pay for possible environmental issues if leaks occur and who will come out and fix it? There is a severe shortage skilled labour in this field, limited supply chains mean it will be hard for people to access a heat pump or spare parts without delay, if a heat pump stops working, it is highly unlikely to be fixed straight away. A GSHP system of the type being proposed has not been installed in a building of any type in the village, never mind one of this ilk. There is very little guarantee that the technology will be effective, given the local Geological setting (Section 4) even if retrofitted to a high standard with new radiators, insulation etc. The ideal property for a heat pump is very well insulated, and has large radiators or under floor heating. The upfront costs for the suggested scheme are ginormous (retrofitting, drilling, installation etc.), the risks even greater and the benefits unproven!

The CCE scheme comprises a series of boreholes and pipe connections into a variety of buildings within the village and in the surrounding countryside. During the initial phase of the project the group plan to drill 15 boreholes, with associated pipework and install related ancillary equipment. It does seem madness to dive straight in head-first and start drilling so many boreholes en mass when the technology has not actually been fully proven at one residence. Yes a 'Test' borehole has been drilled but no heat pump was attached. It is crazy to go to all the effort and expense of drilling a 'Test' borehole but not fully assessing its effectiveness and feasibility over the various seasons, in a 'typical' local family home.

CCE state that more efficient technology can be achieved by developing a 'shared solution'. This sounds great ideologically but in practice would be totally unfeasible in a dispersed settlement, with various building archetypes. Shared solutions maybe useful for new housing developments or community buildings, such as hospitals, but to date none have been successfully implemented (using a GSHP based network) where the housing types vary in character and size and are dispersed. In Swaffham Prior, Cambridgeshire, a multi technology solution is being implemented, which does include GSHP but the boreholes are situated in a field outside the village, not attached to individual houses within an urban area. See map below.

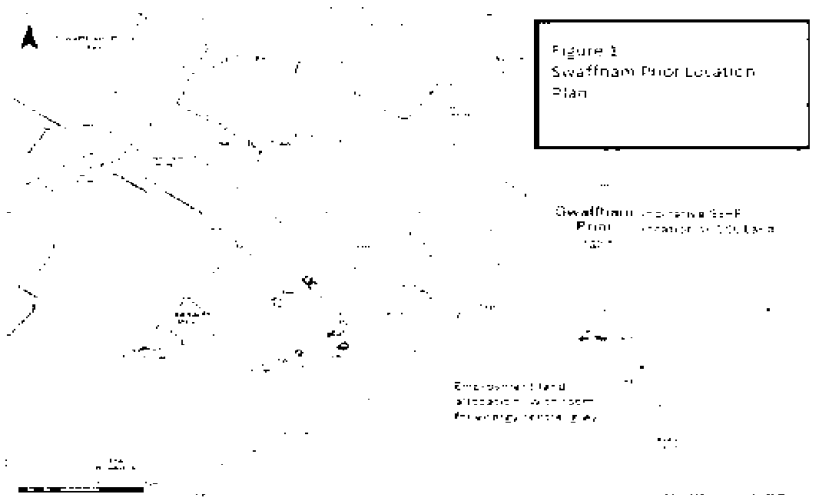


Figure 3: Map of Swaffham Prior

Swaffham Prior is a similar size to Chipping ~300 houses, all are fairly centrally located – see above. The Council donated a field outside the village (highlighted in yellow on the above map) and barn to house equipment. The boreholes were NOT dispersed around the area (see map below of the proposed strategy for Chipping), they were all drilled in the same field, with a uniform geology / topology away from buildings, in flat rural Cambridgeshire.

The Location map (fig.1) sets out all of the applications in the village and surrounding area.

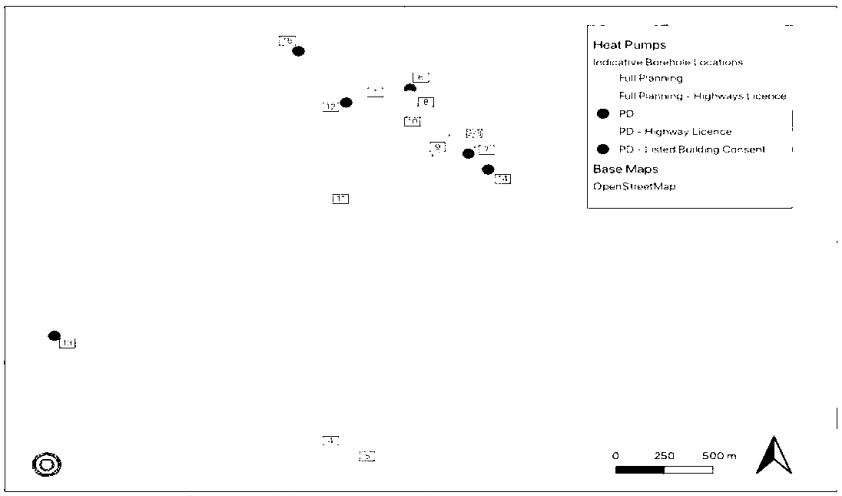


Figure 1 A Location Map of all the boreholes participating in the Community Energy Scheme

The costs of the Swaffham Prior project were enormous >12 Million Pounds – to heat ~300 houses. The Cambridgeshire scheme was backed by the Council. Who is going to fund this hare-brained scheme for Chipping? Will Ribble Valley contribute?

CCE have suggested that the second phase of development in Chipping will be dispersed clusters of boreholes servicing small groups of homes – typically 5 – 12. According to modelling carried out by Martin Crane for Community Energy (England) the minimum number of properties required for viability is >20. Modelling carried out by the group in Rossendale, indicated it is likely to be at least 25.

In older properties with limited indoor and outdoor space, heat pumps are not a viable option. The government recognise this and offer advice regarding alternative solutions on their website. For more specific details regarding the suitability at No. 8 Old Hive – please refer to Section 2. Most of the properties in the village are old and not well insulated, they are recognised by the government (and industry specialists) as being unsuitable for the type of heating system being recommended in this proposal. There are a high percentage of listed buildings in the centre of the village which have very stringent rules and regulations concerning changes which can be made – a heat pump is unlikely to meet those set aesthetic standards. Homeowners in listed buildings aren't allowed to alter the foundations of the property, which will prove problematic when trying to install the necessary pipework. Considering a 'pump cover' for the outside apparatus is also not an acceptable solution within a 'Conservation Village'.

Britain's homes are draughty and leaky, with less than half having cavity or solid-wall insulation. The UK's housing stock is some of the worst-insulated, in Western Europe, losing heat three times faster many of our neighbouring countries. Heat pumps produce a more efficient ratio of electricity used to heat generated when they're operating at temperatures, lower than the usual operating temperature of a gas boiler. That lower temperature of operation is at its best with an effectively insulated home. Proper insulation means a heat pump working at that lower temperature can be just as effective as a gas boiler. The Energy & Utilities Alliance (EUA) said half of UK housing wasn't suitable for heat pumps in their 2021 report. They argued heat pumps could only replace a gas boiler in around 18% of UK properties. The EUA analysed 22.7 million properties, and found that between 37% and 54% of them wouldn't be suitable for a heat pump. This was because of a combination of factors, such as poor insulation, small radiators, and a lack of indoor or outdoor space for storing the heat pump. They concluded that retrofitting the properties with measures to make them suitable to heat pumps, such as improved insulation, would be too disruptive and costly for the residents.

Before installing a heat pump it is imperative that EPC details are properly assessed. The EPC rating for 8 Old Hive (F) and many similar properties in the village is very low. The Chipping Community Energy Working group will require detailed energy surveys for individual properties in order to understand heat loss and therefore the heat load required to maintain a warm, comfortable home. The cost and time required for a detailed audit of each home is prohibitive but very necessary before any work starts. The covering letter included with this application outlines plans for boreholes at various homes throughout the village. The properties vary in size and archetype, yet with the exception on one very large property, are all only outlined as requiring a single solitary borehole. How can this be feasible? The sums just don't add up – if 1 borehole is adequate for a small terrace cottage (8 Old Hive – 564 square feet) how can it also be suitable for a large detached property such as Clarke House (1,787 square feet) nearly 4 times bigger. Either the terraced cottage will be over powered (unlikely) or Clarke House underpowered – the latter does seem to be more relevant, given estimates available online. Most detached properties appear to require several boreholes.

This 'reckless' promotion of ground source heat pumps needs to be challenged, not just economically, but also on availability, reliability and functionality issues. The model being proposed here has not been tried and tested in any other UK community and is not

backed by science. Several members of the UK Community Energy Group (one of the few organisations with any direct experience of such technologies) have expressed concern that the model being proposed is not feasible, we need to head their advice - if not the repercussions will be considerable. Instead of rushing 'like a bull in a china shop' into expensive and unproven technologies, maybe the group should consider improved insulation measures (more likely to save carbon and keep bills down), alongside cheaper and safer power options such as Solar.

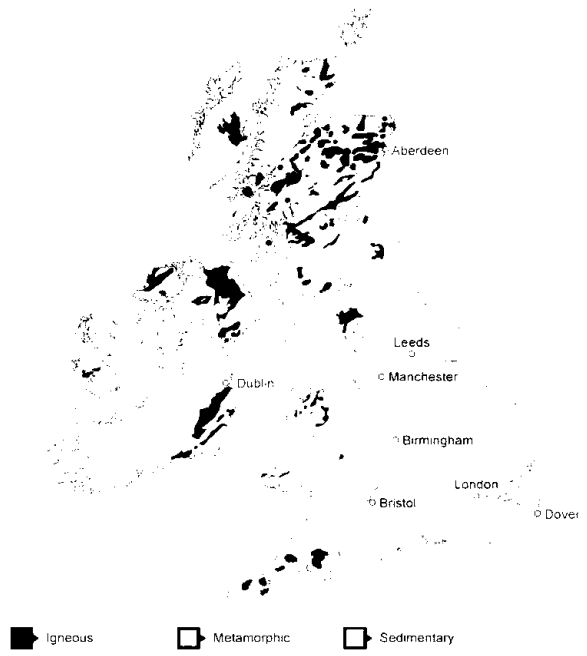
4. GEOLOGY / GROUND STABILITY

One of the most critical aspects in assessing the viability and sustainability of a network of Ground Source Heat pumps, such as that being proposed by Chipping Community Energy Group and Prospus, is the underlying geology of the area to be drilled. The performance of a closed loop ground source heat pump system depends on direct local conditions. It is important these are determined as precisely as possible especially when modelling a network of systems across a broad area. Factors that need to be considered are: surface temperature, sub-surface temperatures down to 100 – 200 m, thermal conductivities, diffusivities of the soil / rock layers, groundwater levels / flows and aquifer properties. In addition rock strength is a critical factor in determining the excavation or drilling method required at a site and the associated costs.

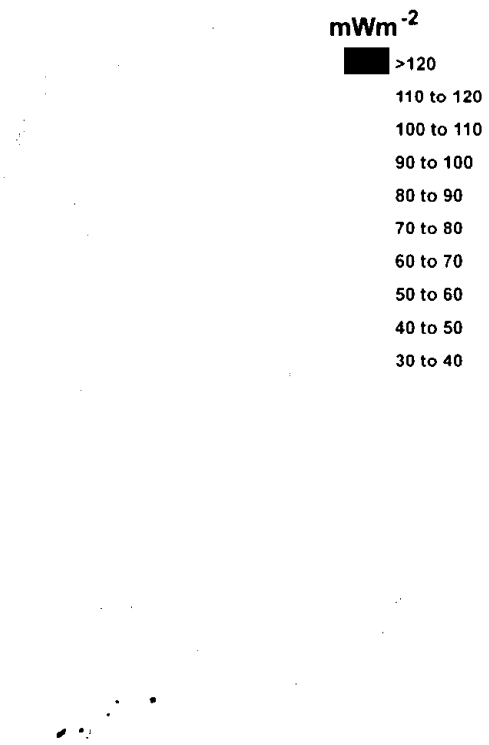
Ground source heat pump boreholes are vertical ground arrays or collectors used to extract heat energy from rock to a heat pump. A borehole's performance is dependent on the location's geology and its thermal conductivity, the efficiency of the heating distribution system and the building's heat demand. Different geological settings have different heat transfer characteristics. For example, a borehole in loose stones has an energy extraction rate of approximately 20 watt per metre (W/m), while granite has an extraction rate of 55 to 70W/m.

The UK has been slow to develop this technology – one of the main reasons for this is the unsuitable geology. The thermal conductivity of rocks varies considerably with rock composition, hardness, porosity etc. There are three main types of rock: igneous, sedimentary, and metamorphic. Igneous rocks form when molten rock (magma or lava) cools and solidifies. Sedimentary rocks originate when particles settle out of water or air, or by precipitation of minerals from water, they accumulate in layers. Metamorphic rocks are formed when existing sediments are altered by heat, pressure, or reactive fluids, such as hot, mineral-laden water. As indicated by the map below - the majority of bedrock in England is 'sedimentary' in nature, there are exceptions but these rocks inherently exhibit lower thermal conductivity.

The various rock types are distributed across the British Isles.



Below a depth of around 15 m, temperatures are affected by the amount of heat that is conducted upwards from the interior of the earth. This component is the heatflow - the heatflow map below shows how much of the UK is covered by poorly conductive bedrock i.e. <80m W m-2



Areas of increased heat flow are associated with the radiogenic granites of the SW of England and the buried granites of northern England. Values are also above the regional background over the batholith (intrusive igneous rocks) in the Eastern Highlands of Scotland.

Please note - the heatflow estimates for Chipping (part of the Forest of Bowland AONB) and surrounding area are generally very low, due to the underlying geology.

The geology of the Forest of Bowland has followed a complex and chequered history involving a series of major events throughout the past 340 million years. The latter has included periods when deep seas covered the area, as well as shallow tropical lagoons - with coral reefs, in addition to large deltas and swamps and finally glaciers and large sheets of ice. Such events throughout geological time created the diverse range of sedimentary rocks that can be found throughout the area today. Collectively these are known as the "Bowland Series" consisting of a variety of sedimentary deposits including: millstone grits, sandstones, limestones and shales, as described in further detail below.

These were' laid' down as deposits in various formations over time before being uplifted by numerous earth movements and then scoured and ground down by large ice sheets and glaciers during the last Ice Age. The resulting boulder clays were left behind as superficial 'drift' deposits over large areas as the ice sheets and glaciers retreated towards the end of the last ice age. As the climate ameliorated and became much warmer and wetter, large deposits of peat then began to form on the tops of the Fells, whilst fast flowing rivers, running off the fells, continued to erode underlying deposits of

rock and bring down vast quantities of sediment from the hills to form alluvial soils in the valley bottoms, a process which still continues.

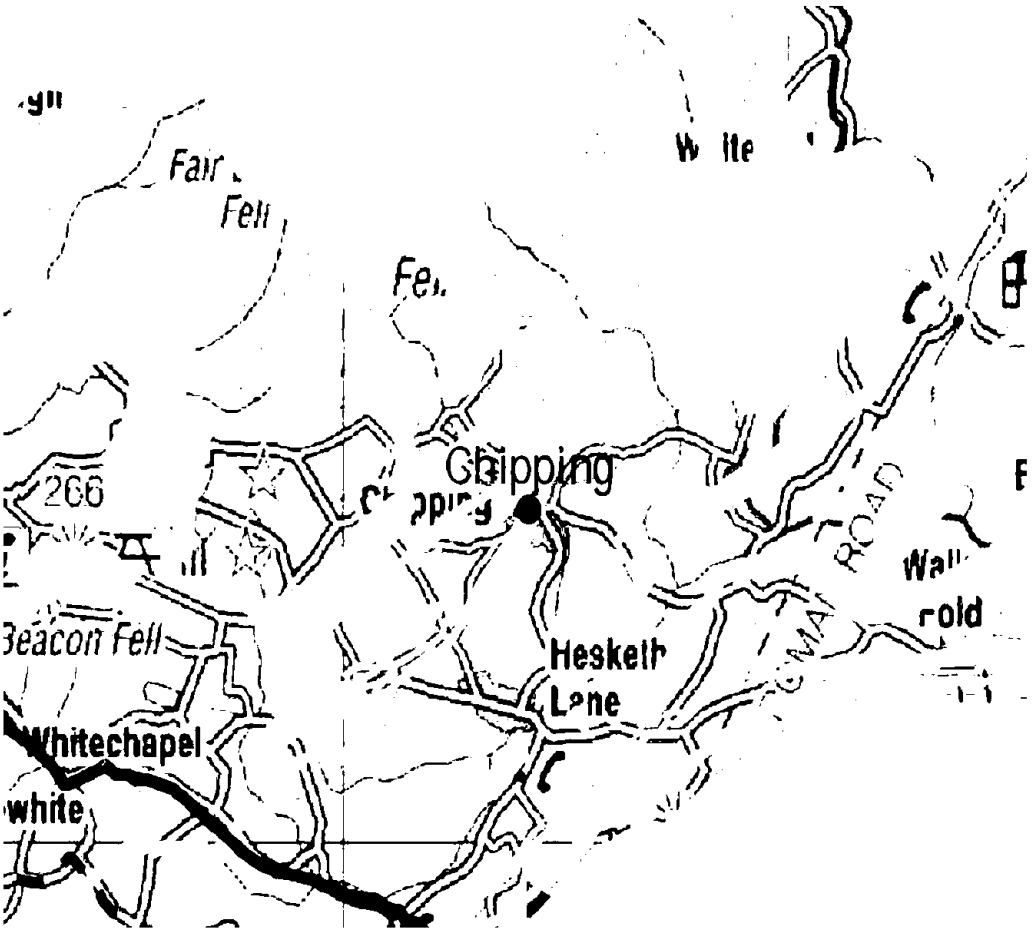
The sedimentary rock formations that are present throughout the Forest of Bowland were laid down during the Carboniferous period. Their formations consist of inter-bedded limestones, shales and sandstones which were laid down beneath water of an ocean before being raised up by earth movements some million years later. The most resistant of these, the Millstone Grits, form higher areas of ground on the Bowland Fells.

The oldest of these form the Dinantian series and consist of basal conglomerates, which may be found in the far north east of the county, just outside the Forest of Bowland. These underlay carboniferous 'Great Scar' limestones which were deposited in shallow tropical seas in the northern most parts of the Forest of Bowland, whilst inter-bedded limestones, sandstones, calcareous shales and reef forming limestones were deposited during the same period of time in layers further south throughout the current day areas of Forest of Bowland and Ribble valley.

Millstone grits from the Namurian series were then deposited in the present day area of the Ribble valley and also in a slowly subsiding delta to the north, now the Forest of Bowland, whose rocks were subsequently uplifted to form the Bowland fells during more recent times. Today such rocks outcrop in Bowland form the high water gathering grounds of the area. Different sequences of rocks were laid according to the physical conditions of the day. In Bowland alternating beds of limestones, sandstones and shales predominate.

During glacial and inter-glacial times of the Last Ice Age drift deposits from both the Pleistocene and Holocene (or recent) periods, consisting largely of unconsolidated clays, sands and gravels, were left by retreating glaciers and ice sheets as the climate ameliorated. These deposits are spread across the area on the Bowland Fringe as hummocky ground. More recently deep peat has formed on the Fells of the Forest of Bowland giving rise to areas of 'blanket' bog, as mosses and other peat forming plants thrived in the prevailing damp south westerly winds and climatic conditions of the time. Streams and rivers, whose drainage patterns were changed by glaciers and ice sheets during the last Ice Age also continued to transport large amounts of sediment, including sand and silt, from upland areas during flood spate conditions. This process continues today.

The map below is copied from the British Geological Survey and shows the varied terrain of sedimentary strata in the Chipping area. Please note the underlying bedrock is not uniform it changes quite significantly across the village and surrounding areas – these subsurface changes are often reflected in the surface geography. This variation is of critical importance when planning any sort of drilling activity. The assumption that a test borehole in the village is indicative of the subsurface across whole area is very naïve – it shows a lack of understanding of the whole process and does not add any credibility to the overall scheme of which this proposal is part. I strongly recommend that the Community Energy Group in Chipping revisit the technical feasibility of their proposed project, this work should involve a more detailed geology survey.

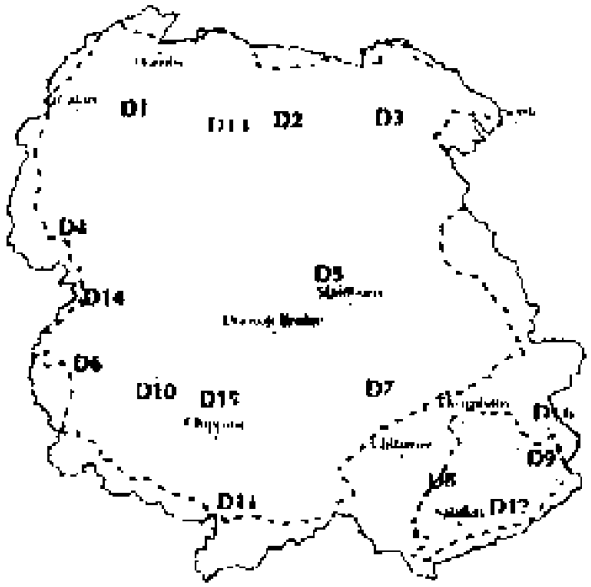


Geology

Shale	Coal Measures
Gritstone	Chert
Mudstone	Mudstone, Siltstone and Sandstone
Limestone	Sandstone and Mudstone
Sandstone	Mudstone and Siltstone
Siltstone	Siltstone and Sandstone
Tuff	

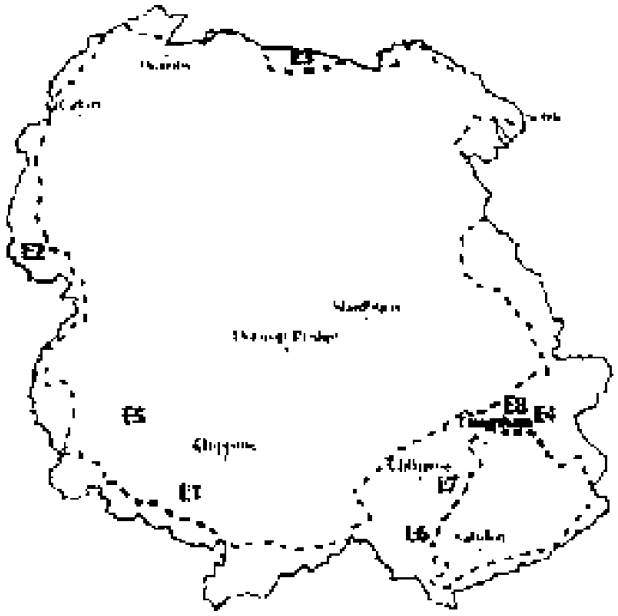
The Moorland Hills (for example Wolf Fell) are formed by the Millstone Grit series. These rocks were laid down in alternating thick bands of coarse, cemented sand and gritstone separated by weaker shales (very vulnerable for proposed drilling). The gritstones form the fell tops, while the softer rocks form lower areas. The area tends to have a soft rounded topography, the slopes having been smoothed by ice and further softened by the boulder clay mantle of glacial deposition.

The transitional rolling enclosed landscape of the Moorland Fringe (see map below) skirts the edges of the Moorland Hills, and links the upland to the lowland landscape.

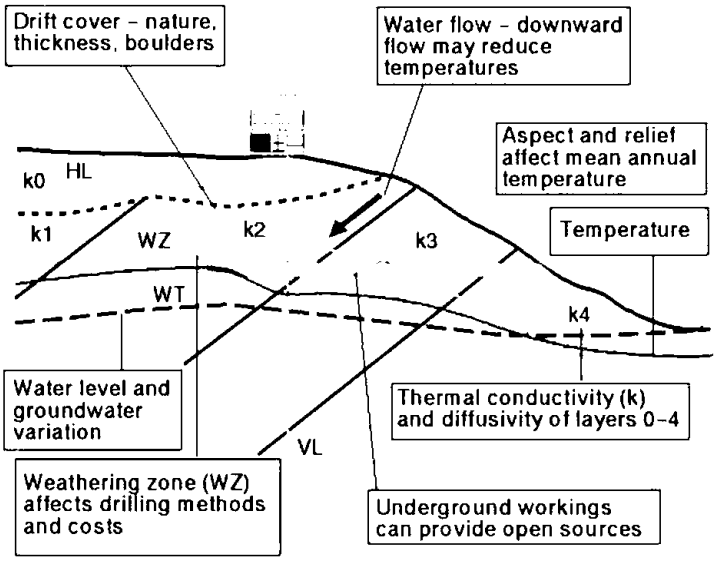


The Moorland Fringes are underlain by a combination of rocks of the Millstone Grit Series and limestone. The solid geology is overlain by soils whose thickness varies according to elevation and topography; the gentler, more sheltered slopes and broad terraces above the valleys have a thicker covering of soils than the moorland summits.

The Lowland Landscape (see map below) has its underlying geology masked by heavy boulder clays deposited by glacial activity.



The geology of the local Chipping area is varied in nature. This diversity has critical implications when designing a village wide network of boreholes for heating purposes. The complexity of the subsurface is illustrated by the hypothetical example below.



The above sketch shows the main factors that impact on the design of the ground component of a GSHP system. Superficial deposits (drift cover) overlie dipping solid geology indicated by their thermal conductivities k0-k4. The depth extent of the weathered zone is indicated by the dotted line WZ and the water level by the dotted line WT. The solid line labelled temperature is an isotherm. HL and VL are horizontal and vertical collector loops respectively.

It shows a hypothetical situation where the bedrock geology is dipping and is exposed on the flanks of a hill. At the top of the hill, the underlying bedrock is overlain by superficial deposits. The location of ground collector loops for a:- horizontal closed loop system and a vertical closed loop system are indicated by HL and VL respectively. The temperature of the ground in the vicinity of the loops determines the temperature gradient between the ground and the loops that drives the heat transfer. Hence, ground temperature impacts directly on the heating or cooling efficiency of the system. The rock strength, thickness of superficial deposits and depth of weathered bedrock all affect the ground conditions and hence the trenching or drilling methods used and their associated costs. When drilling to depths of 200 m as outlined in this proposal - several formations with different physical properties are likely to be encountered. Each of the formations around the ground collector loop may have different thermal properties and these will affect the heat exchange performance.

The above illustration shows how diverse the subsurface can be in areas of varying topology such as Chipping. A borehole drilled at the bottom of the hill would not be representative for the top of the hill and vice versa. Hence the 'Test" borehole drilled in the centre of the village is unlikely to represent the geology in Old Hive. The results from the core are not publically available but there were some comments made that a lot of mud was released during drilling, which is to be expected in this area of thick glacial deposits. The geology map produced by BGS (which may not be totally accurate) does indicate a change of bedrock in the Old Hive area Limestone / Shale, which maybe represented at the surface but probably not, especially if there is a very thick layer of soil or Glacial Till. As discussed earlier in this section – areas of loosely consolidated material such as glacial deposits are generally the least thermally conductive and therefore less suited to GSHP technology. Unconsolidated sediments tend to be inconsistent in nature, not 'ideal' for any type of construction activity. If there are deep shales, as indicated by the map, then this is a further cause for concern since they are notoriously unstable – please refer to the section below regarding Fracking.

When drilling to depths of 200 m, several geological formations with different physical properties might be encountered. Each of the formations around the ground collector loop may have different thermal properties and these will affect the heat exchange performance. This will vary from location to location – for example a property at the top of a hill (Old Hive) would be very different to the bottom (Chipping Village Hall where the borehole was drilled). This is just an illustration - the best way to map the subsurface in detail would be to incorporate a variety of data sets including borehole and high-resolution seismic surveys. This is the methodology implemented in Oil Industry, where they have many years of experience drilling boreholes.

In the UK there are only a couple of examples of village wide networks for vertical GSHPs (Cambridgeshire / Cornwall), both are very different in design to the dispersed clusters being proposed here, they also have very different Geology settings. There is currently a drilling project underway in Stithians, Cornwall - as discussed above this is ideally located in a very thermally conductive area (Granite Batholith). It is being run by Kensa, who are the only UK company with any real experience in the technology and are based 3 miles from Stithians so should understand the underlying geology very well. Apparently the boreholes being drilled there are very 'Pristine' compare to the test carried out in Chipping which released significant quantities of mud, these results are to be expected given the underlying geology in both areas.

GROUND STABILITY

Working with the ground always has risks, there are many examples of subsidence causing damage to properties, some related to subsurface workings such as coal mining, fracking and drilling but others just natural geological phenomena such as quakes, tremors and sink-holes. There can also be ground stability issues related to water movement and ground saturation such as landslip and flooding. The impacts should not be underestimated we mess with nature at our peril! The costs of improper planning are considerable - as in the German example in Staufen discussed earlier, they can run in to millions of pounds.

NPPF - To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location.

The main aims at the 'planning stage' of any proposal should be to minimise the risks and effects of land instability on property, infrastructure and the public. I have serious concerns about the impact of the drilling boreholes on the surrounding properties in terms of drainage as well as ground stability. The proposed site is on a hill, water runs down the road and drains in to local waterways near the bottom of the slope. There are subsurface soak-aways sited under the road for run off etc. In periods of heavy rain they have overflowed – causing many episodes of subsidence / structural damage for the properties in Old Hive situated close to the road. Drilling vertical boreholes, such as the one outlined in this proposal, is highly likely to worsen the problem and cause even further instability.

The road and wall bordering the stream a few metres downhill has suffered from subsidence in recent years, significant groundwork has been undertaken to reinforce them. In the eighties, after a long period of heavy rain, there was a massive landslide, close to the proposed drilling site, behind the terraced cottages in the Grove. The subsurface in this area is made up of unconsolidated material (Glacial Till, Mud, Silt etc.) – it is not stable and should NOT be considered for drilling.

A little further afield near Blackpool there has been test drilling at a 'Fracking Site'– earth tremors were recorded locally, directly related to the drilling and in consequence the project has now been halted. The borehole was to ~1200 m, which is deeper than being proposed here but the geology similar, they were drilling in to Bowland Shales. The cumulative subsurface effects of a network of boreholes in Chipping, is to a certain extent unknown but likely to cause more instability in the subsurface than a solitary vertical GSHP. The Blackpool earth movements are not isolated cases, in the United States, Fracking' has come under similar controversy.

Ground temperature may also be a cause of instability, especially during the extremes of winter or summer where ground dries out or freezes. The operation of geothermal schemes will result in temperature changes in the subsurface. Heat exchange between GSHP systems and the subsurface can lead to local temperature changes of ±4–10°C in the surrounding area. This thermally affected zone (TAZ) can reduce the system's own efficiency and that of other nearby GSHP systems but may also have significant effects on the stability of the subsurface, especially in freezing temperatures due to the cooling effects of the system.

The overall scheme being proposed by the Chipping Community Energy Group is for a dispersed network of clustered boreholes. The scheme is unlikely to be feasible in practical terms, since modelling indicates a minimum of 25 houses are required per cluster (please refer to studies carried out by the UK Community Energy Group in the Rossendale Area – available online). The effects of drilling so many boreholes, spread out across a geologically unstable area do not appear to have been given enough forethought and consideration, by the team involved – the repercussions of their actions could be catastrophic! The idea is 'novel' but the model is fundamentally flawed and the knock on effects in terms of ground stability maybe devastating! Are the group prepared to take responsibility for damage caused by their actions? Repairing roads and properties will be a very costly business!

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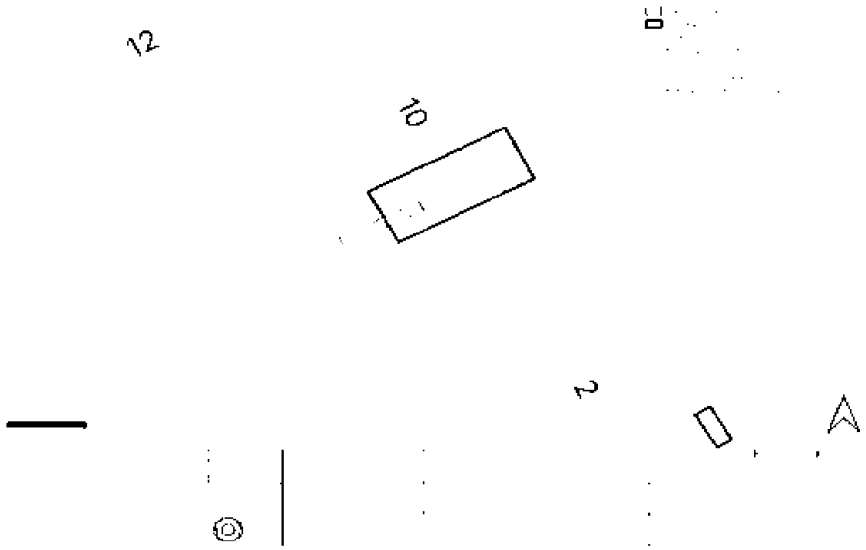
4. HIGHWAY - SAFETY / ACCESS

The government do not permit the drilling of boreholes for heat pumps in the middle of public highways. The current legislation states Closed Loop Vertical GSHP systems should be located within a property's curtilage. The proposed location for the borehole at No. 8 Old Hive is outside the curtilage, in the middle of the road – see location map below.

Before any drilling activity takes place CCE will need to obtain permission from the highways department (Section 50). Please refer to Section 2 for more detail concerning this procedure.

The map below (24_0038_Statement) shows a blocked area (highlighted in orange) that requires a Section 50 licence.



The picture below is from google maps and shows the terraces of cottages at Old Hive. No.8 has a Green door and white window frames.

Please note the road highlighted with a blue arrow on the picture and map – this is the access route for several properties at Old Hive (18 – 24). If a drilling rig is placed at this location it will

block the only entrance to all of those cottages. CCE have not taken this in to account when planning the borehole location, the residents have a legal right to access their own properties. Many are elderly and infirm – this is the only available route, if impassable they could be imprisoned for the duration of the work, which is likely to take several days, possibly weeks.

The space required for a rig of this type plus ancillary equipment is large, probably far greater than indicated by the orange block (Section 50 licence area) on the map. The planned borehole of 200m is deep and will require a massive rig. It is very likely that all the equipment need for the operation will block the highway as well as the access to the surrounding cottages in Old Hive. Why is the borehole location on the map outside the orange block? Surely it should be central! The proposer's need to check the accuracy of the plans submitted, this is not a field or someone's private garden - it is a public highway. The residents at Old Hive have the right to enter, occupy, and enjoy their property without undue interference.

ATTACHMENT 1 OF 1

The blue arrow denotes the approximate drilling location (8 Old Hive). Note the closeness to surrounding cottages, also the main roadway. There is a manhole ~ 1m from the borehole location has this been taken in to account? Drilling in to the local sewers is not advisable, a significant environmental risk. According to the Application Statement ancillary equipment (details NOT specified) will be placed on the roadside (See section 2 for more detail), presumably at the borehole location. This would be a significant hazard to traffic and an eyesore in this Conservation Area. As discussed previously there will also be ownership issues if a borehole is not within the curtilage of a property. In the case of No. 8 Old Hive above this would mean on the cobbled area in front of the white window.

The above example is indicative of 'poor and inappropriate planning' – similar issues occur with most of the 15 locations identified in the covering letter. The orange blocks (highway license zones) in all of them are unlikely to be either accurate or fit for purpose.

The picture below is of drilling rigs in a field just outside Swaffham Prior - equipment of this type / size is very likely block all of the roads in Chipping whether in transit or in situ.

The borehole field in Swaffham Prior. Picture: Ian Miles www.flashpointpictures.co.uk

Drilling is a notoriously messy activity it causes significant pollution: noise, vibration, air, mud, water etc. It is a very grimy business – with gravel, water and mud flying everywhere, sometimes under pressure. The residents at Old Hive not only have a right to access their properties but also to peace, quiet and a clean environment. Considering undertaking this type of activity so close to houses is insane, very likely to cause damage. Industry recommendations are for > 10m from existing buildings (3m from boundaries with neighbouring properties), if this were the case in Old Hive the borehole would be across the highway very close to the hedge. The government requirement for a Vertical GSHP to be within the curtilage of a property is 'Sound'! Significant space is necessary for access, installation and operation!

Drilling related activity has a significant impact upon all local road networks. The rigs are large – transporting them around the narrow roads in Chipping will be very difficult and place considerable pressure on the already congested roads in the centre. Chipping is a heritage village with a significant number of listed buildings. The historical nature of the buildings and related access routes, is preclusive to traffic flow – the highways and houses (along Talbot and Windy Street) were built centuries ago, way before the evolution of motorised transport. Serious considerations should be given to road networks and access issues for a proposal of this type in the village. Also to the pollution levels inherent with increased traffic, which are not in keeping with environmental policies for this Area of Outstanding Natural Beauty.

Tourism is prolific across the area, especially in the summer months when the village becomes a hotspot for walkers, cyclists etc. The main streets are narrow, some single track, there are few

designated paths for walkers or cyclists – it is rare to pass through unhindered and at peak times waiting times increase considerably. Even at current levels the village is already a significant bottleneck, especially at peak times. Car ownership has increased exponentially over the last 50 years and is expected to continue to increase. It is inevitable that road networks will become more and more congested in the future. The historical road network in Chipping was not built to support significant throughput of large construction type vehicles.

This section relates to the construction of the housing development at Fellside (very close to the proposed drilling site at Old Hive), it has been included to show in practice how disruptive and unsafe the proposed drilling site at 8 Old Hive is likely to be. Our concerns about safety are not without foundation - at the time they were compounded by the lack of due attention from the Highways Agency. During the Fellside development most of the residents at Old Hive made repeated requests for precautions such as notification, signage, gritting etc, these fell on deaf ears. The department's response can only be described as totally inadequate - they did not even have the courtesy to reply to our emails. As a direct result of their ineptitude there were 2 serious accidents, which I am aware of: one involved a resident of Old Hive, whose car was completely written off after she was forced, by the road closures, to drive down very steep, icy, untreated country lanes.

I am sure the council is fully aware of the types of problems caused by ground-works and road closures in relation to safety, but the above examples are specific to Chipping / Old Hive and are pertinent to the current application. They show how dangerous the narrow country roads around Chipping can be - especially in winter and when congested by unusually large, heavy vehicles. The residents of Old Hive and for that matter Fellside have a right to safe access to their homes via Church Raike. If the road is closed for any reason it will cause havoc for the residents at Old Hive and beyond. Drilling is a very hazardous activity – it is NOT safe to locate the activity in the middle of a highway, close to residential properties.

The village wide 'Energy Model' being proposed by CCE is for a network of boreholes. The effects of multiple vertical GSHPs on the subsurface will be cumulative, causing significant cooling of the surrounding area. In winter this is likely to cause increased freezing below ground, leading to instability, especially in an area of soft sediments such as Chipping. These types of effects maybe somewhat muted in an isolated field or garden but the proposals here are in a built up residential area – the safety implications are enormous! It really would be 'a disaster just waiting to happen'!

5. CONCLUSION

The main premise that Prospus and CCE have put forward to support this application is that because they plan to construct 'zero carbon' heat systems it is OK to ignore the site constraints in terms of conservation and biodiversity. The Forest of Bowland, Area of Outstanding Natural Beauty (AONB), is a nationally protected landscape and internationally important for its heather moorland, blanket bog and rare birds. It was designated as a landscape of national significance due to a variety of factors: the grandeur and isolation of the upland core; the steep escarpments of the Moorland Hills; the undulating lowlands; the visual contrasts between each element of the overall landscape; the serenity and tranquillity of the area; the distinctive pattern of settlements; the wildlife of the area; and the landscape's historic and cultural associations. CCE and Prospus have failed to adequately address any of the requirements regarding Conservation, set out in local and national legislation, for drilling and construction in AONB. Government 'Environmental Policy' clearly precludes the drilling of GSHP boreholes in such areas without proper permitting. The group have not submitted detailed and accurate environmental, geological or archeological surveys – their plans are haphazard at best and will inevitably destroy the unique character, foundation and infrastructure of the village, which has high preservation status.

All Drilling sites generate high levels of pollution - it is not an appropriate form of activity in a Conservation Village such as Chipping with a dense network of heritage properties. It is unsafe to consider carrying out such activities, within an urban environment, so close to people's homes, the knock on effects could be disastrous. Closed-loop boreholes for GSHP are not permitted outside a property's curtilage - they require a significant amount of open space for installation and application. They are not recommended for older mid-terrace properties such as those in this application and definitely not appropriate in the middle of a public highway! Yes we do need to move to lower carbon technologies but there has to be a more feasible option than vertical Ground Source Heat Pumps.

There are no precedents available for the type of energy model proposed - dispersed small clusters of vertical GSHPs. According to modelling carried out by some of the most respected UK experts in this field, a minimum of 25 clustered units is required for a network to work efficiently, this would not be possible in Old Hive or Chipping as a whole. According to the government and industry experts GSHPs are not suitable for older properties of the type found in Chipping. A borehole has been drilled to test the premise but no heat pump was attached or linked to a property, hence the technology is still essentially 'unproven'.

The safety implications of drilling multiple deep boreholes across an urbanized area should not be underestimated, we mess with nature at our peril. This would be the first network of its type in the UK. We need to tread very carefully with the implementation any 'new' technology, whenever local energy sources are extracted, there's usually some sort of trade-off. It could be something serious like air quality, or something relatively minor like an altered view. Nobody starts an energy project with a plan to destroy a town, but that is exactly what happened in Germany, when in 2007 a drilling operation caused subsurface movements and cracks throughout the town architecture. This is not an isolated example - several other towns in Germany were also affected. We need to pay head and learn from their mistakes it is imperative to be extremely cautious when planning any drilling activity, the risks are enormous.

The majority of rural and urban properties in the Chipping and the UK are not ready for heat pump installation until: windows, radiators etc. have been upgraded to their maximum level. Effective insulation is crucial for heat pumps to function optimally because the devices operate at lower temperatures than gas or oil boilers. As a nation we are used to instant heat at the touch of a button – GSHPs produce ambient, background heat. Due to the effect of the Gulf Stream, our weather patterns aren't as stable as they are in continental Europe. We've

historically built houses to cope with this fluctuation of temperature. Our habit is to interact with the weather far more than in other parts of Europe. A heat pump runs at a constant temperature 24/7 but in our climate, being able to turn a boiler on if it gets cold makes more sense.

A sensible approach to net zero carbon involves allowing competition to provide alternative green solutions that people actually want to buy because they work, rather than forcing upon them poor and expensive products that don't. Chipping's unique geology, weather and heritage architecture are fundamentally unsuitable for the type of 'energy strategy' being proposed by CCE. All those who sign up are liable to end up paying through the nose to live in chillier homes.

Drilling closed loop boreholes for GSHPs is only permitted within the curtilage of a property. There is no justification or requirement within planning policy for a development of the type proposed in this application.

Most local residents strenuously object to planning proposals for a reason. It goes without saying that they are the ones who will be affected by the severe disruption they inevitably cause. I would be grateful if the council would take my objections into consideration when deciding this application and would welcome the opportunity to meet with a representative of the planning department to illustrate my objections at first hand.

28/02/2024