High Peak Borough Council

Code of Practice
Excavations in the Vicinity of Buxton Thermal Springs

1. General

1.1 Scope

This Code of Practice provides a source of advice on how to protect Buxton Thermal Springs from the effects of excavations (defined as any excavation greater than 600 mm below ground level) that might (or might conceivably) damage, contaminate, pollute, disrupt, interrupt or otherwise interfere with the thermal spring. It should be used whenever excavations are planned within the Core Protection Area shown on Figure 1.

The Code of Practice is provided for intrusive works that may be termed shallow excavations: for example trenching for laying cables or excavations for shallow foundations. More substantial excavations in the vicinity of Buxton Thermal Springs are likely to have greater impact on ground conditions and will therefore require additional measures beyond this Code of Practice to ensure the springs are protected. Such excavations will require planning permission hence the potential risks to Buxton Thermal Springs and additional measures required will be assessed as part of that process.

A separate Code of Practice is available from High Peak Borough Council that describes the recommended approach for borehole drilling within the Core Protection Area. Deep borehole drilling has the potential to influence Buxton Thermal Springs from a greater distance than shallow excavations. Therefore, the Code of Practice for borehole drilling applies in both the Core Protection Area and the Extended Protection Area, both of which are shown on Figure 1.

1.2 Background

Thermal springs are rare in Britain. The Buxton Thermal Springs have been used since Roman times and have a long history of use as a mineral water and spa. They consist of a series of springs that discharge at temperatures up to 27.5 degrees Celsius through Carboniferous Limestone in the vicinity of The Crescent in Buxton. The location of the springs suggests that the thermal water is capped beneath Namurian strata (shales and sandstones, “Millstone Grit”) that exist to the north of The Crescent, with the thermal water emerging at the ground surface at the feather edge of the Namurian strata. The thermal water is unpolluted and has unique chemical properties that distinguish it from the non-thermal groundwater. The thermal springs are understood to originate from the percolation of rainfall into a network of micro-fractures in the Carboniferous Limestone to reach a depth greater than 900 m. The heated water then returns to the surface, probably following faults in the limestone strata.

The thermal water is bottled as Buxton Water, which is one of the best known Natural Mineral Water brands in UK. The Crescent buildings have been regenerated as a Spa Hotel, which also uses the thermal water, in this case for bathing and spa treatments.

Although the thermal water has a greater hydraulic head than the cold groundwater system, there is a delicate balance between the cold and thermal groundwater systems and the precise route of the waters though the limestone is not entirely known. There is therefore a need to avoid disturbing established flow pathways within the limestone in and around the Crescent. Excavations, borehole drilling and piling have the potential to disturb groundwater flow pathways. The construction works associated with creating an excavation or borehole also have the potential to cause contamination of the groundwater, reducing groundwater quality and affecting their unique chemical characteristics.

1.3 Who the code is aimed at?

This Code of Practice is aimed at utility companies, landowners and occupiers, contractors, and supervising personnel who are planning to create shallow excavations within the Core Protection Area as shown on Figure 1. There is a risk that such activities within the Core Protection Area may affect the Buxton Thermal Springs.

1.4 How were the protection areas defined?

The protections area were defined by considering the pathways for thermal groundwater emerging at Buxton Thermal Springs and the hydrogeological factors that affect the vulnerability of those pathways.

The Core Protection Area corresponds to the area where the Namurian strata are expected to be less than 50 m thick, the ground level is below 300 m AOD and the location is within 250 m of known thermal groundwater associated with Buxton Thermal Springs. The northern limit of the Core Protection Area follows the boundary of the Environment Agency's Inner Source Protection Zone (SPZ1) for Buxton Thermal Springs.

The Extended Protection Area is defined by being within 500 m of known thermal groundwater associated with Buxton Thermal Springs and where the Namurian strata are estimated to be less than 100 m thick. The northern and eastern limit of the Extended Protection Area follows the boundary of the Environment Agency's Confined Inner Source Protection Zone (SPZ1c) for Buxton Thermal Springs.

1.5 Further Information

This document should be read in conjunction with other codes of practice, health and safety guides and British Standards in relation to excavations, drilling, installation and decommissioning of these schemes. These include the *BS 5930:2015 (Code of practice for ground investigations)*.

High Peak Borough Council's Code of Practice *Borehole Drilling in the Vicinity of Buxton Thermal Springs* provides information, guidance and a list of requirements for managing potential effects from drilling boreholes on Buxton Thermal Springs.

The Core Protection Area is wholly within the Inner Groundwater Source Protection Zone (SPZ1) for Buxton Thermal Springs. The Environment Agency uses Source Protection Zones as an initial screening tool to identify areas in which some activities or developments have the potential to adversely affect groundwater intended for human consumption. Environment Agency position statements relevant to potentially polluting activities and development within SPZ1 can be found in *The Environment Agency's approach to groundwater protection*[1]. Source Protection Zones are not statutory designations and the Environment Agency may not be required to permit the excavation works being proposed. However, the Environment Agency's position statements provide an indication of activities that pose a risk to groundwater and means of mitigating those risks.

2. Fundamental Requirements

2.1 General

When constructing shallow excavations in sensitive areas, such as near to Buxton Thermal Springs, a precautionary approach is required. Ideally, such activities would be avoided within the Core Protection Area. However, if such activities are to be completed in the Core Protection Area, a **risk assessment** and **method statement** describing the approach to be taken should be prepared and discussed with High Peak Borough Council, as the owners and abstraction licensees of the Buxton Thermal Springs, and also appropriate regulators. The recommended approach to preparing the risk assessment and method statement is described below.

[1] February 2018 Version 1.2

No intrusive works should be completed until High Peak Borough Council has received a copy of the programme of works, including proposed starting date, and has approved the risk assessment and method statement provided.

In case of emergency: telephone the Council on 01298 28400

2.2 Legal Requirements to Protect Groundwater Quality

Under the Environmental Permitting (England and Wales) Regulations 2016 (as amended) it is a criminal offence to "cause or knowingly permit" groundwater to become polluted. Penalties include fines, imprisonment or both.

As well as legal requirements not to pollute groundwaters, civil liability may also follow where mineral waters are adversely affected by the activities of a third party which could be substantial, particularly if guidance set out in this Code of Practice is not followed. Developers should seek their own advice in this regard and take out appropriate insurance for works they may wish to carry out in advance.

2.3 Desk Study, Risk Assessment and Method Statement

The following steps should be carried out as a minimum:

1. Desk study to collate and understand background information.
2. Risk assessment to understand the risks to the Buxton Thermal Springs from the proposed activities.
3. Method statement that demonstrates that the activities can be conducted safely without detriment to the Buxton Thermal Springs, including appropriate actions if thermal groundwater is encountered.
4. Identify any requirements for regulatory consents, permits or notifications and requirements for notifications to/discussion with local stakeholders.

The desk study, risk assessment and method statement must be completed or directly supervised by someone qualified in hydrogeology or geoenvironmental engineering and having experience of completing hydrogeological desk studies and groundwater risk assessments.

A desk study review is intended to identify the sensitivity of the proposed excavation location. It should consider the local geology/hydrogeology/hydrology conditions, particularly the depth to Carboniferous Limestone, proximity to known or expected thermal water, potential land contamination issues, proximity to water features such as River Wye, septic tanks, services etc. The desk study review should also be used as the basis of preliminary discussions with stakeholders and other interested parties including regulators, conservation bodies, and landowners.

The risk assessment should include consideration of:

- The likelihood of encountering thermal water
- The likelihood of contaminating the Carboniferous Limestone by the excavation process, either by accidental contamination from the excavation equipment or by introducing near surface contamination into the Carboniferous Limestone aquifer
- The likelihood that the groundwater system will be disturbed and affect the balance between the thermal and cold groundwater systems

For all risks identified, the method statement should identify appropriate good practice for the activity and appropriate mitigation measures reduce residual risks to Buxton Thermal Springs during and following the works to acceptable levels. The method statement must show that the excavation method selected provides adequate mitigation for that risk and that there is sufficient monitoring to confirm the efficacy of the measures identified.

If the proposed excavation location has the potential to be contaminated there is a risk that the excavation could lead to pollution of groundwater and migration of contaminants to Buxton Thermal Springs. Where possible, excavation through potentially contaminated materials within the Core Protection Area should be

avoided. Where this is not possible, it is expected that work on potentially contaminated sites will follow the Environment Agency's guideance on managing risk from land contamination[2]. The process set out in this guide includes a risk assessment, which must consider Buxton Thermal Springs as one of the receptors. Construction works are also likely to be preceded by investigatory work conducted according to BS 10175:2011+A2:2017 *Investigation of potentially contaminated sites – Code of practice*. At potentially contaminated sites, separate method statements should be prepared for investigatory works (excavations and drilling) as well as for subsequent excavations during construction.

3. Technical Requirements for inclusion in the Method Statement

3.1 Supervision

The excavation works should be supervised at all times by an experienced qualified supervisor/foreman. In addition, the excavation works should be under the overall supervision of a qualified hydrogeologist.

3.2 Materials

Prior to any excavation or drilling, a supply of bentonite pellets and bentonite powder sufficient to seal any incursions of thermal groundwater (15 degrees Celsius or greater), into the trench should be provided on site. This should consist of a minimum of ten 25 kg bags of each bentonite powder and pellets.

Suitable equipment (e.g. sandbags) should be provided at each location to control groundwater if groundwater should enter any excavation. Such equipment will be required to reduce outflow of thermal groundwater whilst inflows are sealed with bentonite and/or to reduce outflow of non-thermal groundwater and maintain groundwater head in the aquifer (refer to the Method sub-heading under Section 3.4 below).

3.3 Probe Holes

Probe holes are narrow diameter borings (30 to 80 mm diameter) made using a window sampling technique. One or more probe holes should be drilled at the site of the excavation or trench to a depth of 0.5 m below the intended base of the excavation to determine ground conditions before excavation commences. Probe holes will also allow monitoring of groundwater during excavation. A long trench may require a number of probe holes at approximately 3 m centres. Additional probe holes may be required if the risk assessment identifies geological uncertainties that may affect the risk to Buxton Thermal Springs: for example uncertainty over the thickness of the Namurian cover at the site of the excavation or if geological faulting is likely.

Guidance and requirements provided in the parallel Code of Practice *Borehole Drilling in the Vicinity of Buxton Thermal Springs* should be consulted when preparing the part of the method statement concerned with constructing probe holes. In addition to those requirements, drilling of a probe hole should be stopped if:

- limestone is encountered beneath Namurian cover;
- groundwater with a temperature equal to or exceeding 15 degrees Celsius is encountered;
- groundwater is encountered that rises the ground surface and overflows continually (flowing artesian conditions); or
- evidence of contamination is encountered (unless specifically mitigated by the method statement for investigation of a potentially contaminated site).

These circumstances would suggest that the excavation/trench should be relocated, as there could be a significant risk to the Buxton Thermal Springs. In any of these circumstances High Peak Borough Council must be notified and the probe hole backfilled to ground surface with bentonite cement grout prepared with water of potable quality. The risk assessments and method statements for excavation should be reviewed in light of the information provided by the probe holes and the excavation designs may need to be revised.

[2] https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm

The temperature of water in probe holes should be monitored during excavation works. Excavations should be suspended if the water temperature exceeds 15 degrees Celsius. High Peak Borough Council must be notified and monitoring records made available for inspection. Probe holes used for monitoring should be capped at the surface and the annular space around any temporary stand-pipes adequately sealed to prevent runoff entering the holes during the works.

Following completion of the excavation, probe holes should be backfilled and sealed with bentonite cement grout prepared with water of potable quality. Probe holes completed within the base of the excavation should be sealed and the cement allowed to cure before other material is placed within the excavation. This will ensure that the probe holes are adequately sealed.

3.4 Excavation Methodology

Method

For excavated trenches and other excavations, any open trench should be restricted to no more than 5 m in length (unless existing site information has demonstrated that the thickness of Namurian strata at the location has at least 10 m thickness, in which case a longer trench length up to 12 m may be acceptable). There should be a means for sub-dividing the length of any open trench, should invasive thermal water inflow need to be held at one end of the trench or the other. This practice aims to reduce losses of thermal water during sealing of the inflow as described below

Groundwater and arisings shall not be allowed to enter natural water bodies or drains or to seep onto unprotected ground and cause seepage to the water table. Groundwater shall not be allowed to spill outside the working area.

Arrangements should be made to prevent the ingress of surface water into the trench.

Throughout the excavation of each trench the temperature of any water entering the trench and in probe holes should be carefully monitored. If water with a temperature at or exceeding 15 degrees Celsius is encountered, **the excavation must stop and the inflow must be immediately sealed**. High Peak Borough Council must be notified and monitoring records made available for inspection. The construction of a trench that encounters thermal water presents a significant risk to the Buxton Thermal Springs and the excavation/trench will not be continued unless High Peak Borough Council can be assured that the mitigation plan prepared in the method statement, or a modification of this, will provide the necessary protection to the Buxton Thermal Springs.

On-site Plant

Any on-site equipment should be clean and confirmed free of oil or fuel leakage before the work at site starts. The method statement should detail the measures to be taken to avoid contamination of the ground or the aquifer by the excavation process. Recommended minimum measures include:

- The static plant shall be supplied with drip trays and adsorbent matting to prevent loss of fuel or lubricant to the ground.
- Any equipment used to create the excavation and probe holes should be appropriately cleaned prior to use. In addition, if the excavation/drilling is expected to encounter groundwater, tools should be disinfected on arrival and before leaving the site. Disinfectants used must be safe to use in potable water applications[3], for example chlorine, hypochlorite or peracetic acid solution. It should be noted that domestic forms of disinfectant such as perfumed sodium hypochlorite or Jeyes Fluid are specifically banned. Steam cleaning or jet washing is the most suitable technique for removing debris and contaminants and should be used at locations where the discharge water will not pose an environmental risk. The wash-down area and method of cleaning should be identified in the method statement.

[3] Water UK, 2017. Principles of Water Supply Hygeine, final version 1 October 2015 (updated 1 March 2017)

Waste Collection and Disposal

The method statement should describe how materials from the excavation will be collected, assessed for potentially contaminated material (if relevant) and disposed of in an appropriate manner.

Where there is risk of encountering contaminated materials, arisings are to be collected in suitable containers and transferred to an appropriately licensed waste disposal facility. Containers used for containment of waste arisings must be covered and in sound condition.

Dewatering from the excavation could affect groundwater levels at Buxton Thermal Springs and should be avoided through use of alternative designs as far as practicably possible. However, if there is a need to dewater the excavation (for example, to remove non-thermal groundwater to maintain safe working conditions), particular care should be taken to monitor the temperature of the water being extracted to be sure that it does not exceed 15 degrees Celsius. The method statement should describe how the water will be discharged from the site in a manner that will protect groundwater and surface water courses. An Environmental Permit may be required to discharge water from the workings.

Fuel Storage and Plant Refuelling

All refuelling of plant shall incorporate methods to prevent spillage to ground or groundwater. Off-site re-fuelling and storage of petroleum products and other hazardous materials is recommended. If on-site refuelling is required it shall be undertaken on areas of hardstanding or over an impermeable surface, using a hand pump or similar method that minimises the risk of spillages. All fuel containers shall be of suitable material and labelled. All fuels stored on site must be in a lockable facility or container that is bunded to at least 110% of stored fuel capacity.

405000 405500 406000 406500

374000 373500 373000 372500

Key

Surface Water/ River Network

Core Protection Area (applies to shallow excavations and borehole drilling)

Extended Protection Area (applies to borehole drilling only)

0 100 200 300 m

1:6,000

Scale at A3:

High Peak Borough Council

Code of Practice: Excavations in the Vicinity of Buxton Thermal Springs

Figure 1.1

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