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Practice

STRUCTURAL REPORT ON LAND AT AIR BALLOON ROAD, BRISTOL BS5 8LD

In Respect of Coal Mining Investigation

For Moosehead Ltd

Ref 7451

October 2020

Background Information and Instructions

Planning permission for the construction of a block of six flats on the above site was granted in September 2019; Application No 18/06663F. Condition 7 of that approval requires that the risk of coal mining should be considered and investigated prior to commencement of construction.

T M Ventham Practice have been involved in the consideration of this site in respect of the possible risk from coal mining since January 2018. This report is a summary of those considerations and actions taken in the period since, and it is intended that this report shall be submitted in support for the discharge of condition 7.

Bristol Coal Mining Archives

A report was commissioned from Bristol Coal Mining Archives, a copy of which is appended. This report is dated 12/07/17. It identifies various seams that exist at considerable depths below the site, but nothing to suggest shallow workings, shafts or adits on the site.

A possible shaft was found on the site in the course of site clearance; this was discussed with Bristol Coal Mining Archives, but it was thought to be a well.

A more detailed report and risk assessment was commissioned from B.C.M.A., this is dated 13/04/18 and is also appended to this report.

"Part 5 Conclusions" in this report includes: *"Given the nature of the development however some site investigation would be recommended."*

Investigation

Three boreholes were sunk by Jackson Drilling in October 2019. The driller's logs are appended to this report. Two of the holes were taken to a depth of 30m.

Borehole one encountered made ground to a depth of 2.8m. There was a small seam of coal at 24m down to 24.5m. Other than this half metre seam, the hole was in sandstone from 2.8m to 30m.

Borehole two was in made ground to a depth of 2m, and then sandstone down to 30m, with a 200mm thick seam of coal at 24.1m to 24.3m.

There were no voids encountered in either of these boreholes.

A third borehole was put down the well shaft. This was in made ground for a depth of 12m, i.e. the depth of the well, and then encountered sandstone. This hole was continued to 13m in order to establish that this is the bottom of the well, and it was in sandstone for this bottom metre from 12m to 13m.

Conclusions of Investigation

It is concluded that there is a superficial layer of made ground over sandstone with a thin seam of coal at a depth of approximately 24m. There are no signs of mine workings on the site, and the shaft is a well, which is 12m deep.

Recommendations

The well must be excavated down to the top of the sandstone and capped at that level with a reinforced slab at that level.

All foundations to the building must be founded on the sandstone. Foundations in the area of the well must be founded on the sandstone and at least 1m back from the edge of the well. Reinforced ground beams should be used to span over the well area to support any walls over.

Conclusions

It is concluded that the proposed development can be safely carried out.

If the above recommendations are implemented, then the building will be safely supported.

T M Ventham CEng MIStructE

BRISTOL COALMINING ARCHIVES Ltd.

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Mr Martin Hill
Moosehead Ltd
c/o 14 Fernbank Road
Bristol BS6 6PZ.

Date: *12/07/17*

Our Ref: 54295

Your Ref: -

Dear Sirs

Re: - Site on Air Balloon Road Bristol BS5 8LD

Thank you for your enquiry which we received on 12/07/17.

We have searched our records and report as follows:-

Past Mining Activity

The property is situated in an area that was worked for coal in the 18th, 19th and 20th centuries and is adjacent to but not over the workings of Speedwell Colliery. The property will however be over the workings of Air Balloon Pit and possibly an earlier concern.

The geological sheets show that the Parrot Vein outcrops to the south and dips in that direction, away from the property. This seam and any workings it may contain will therefore be of no concern.

The next seam beneath the Parrot is the thin Brimstone Seam, around one foot in section and lies 35 feet beneath the Parrot. This seam is likely to be present beneath or just to the south of the southern boundary of the property and may have been worked along the crop at an early date.

Crop workings were essentially linear quarries from which the most easily accessible coal was extracted, down to a depth of about ten feet. Once exhausted these trenches would be backfilled and the land returned to agriculture.

The Muxen Vein, which could be up to four feet thick is situated 120 feet beneath the Parrot Vein and with therefore outcrop around 150 feet to the north of the property and is likely to be present beneath this part of Air Balloon Road at a depth of 50-70 feet.

This seam may have been worked beneath the property from Air Balloon Colliery. Unfortunately no plans survive from this early concern, if indeed they ever existed, as the pit closed prior to the requirement in law to keep records of this nature. Unrecorded workings in this seam beneath the property within this range cannot be ruled out.

Other seams are likely to have been worked by Air Balloon Pit at depths ranging from 100-520 feet. These seams, known as the Stibbs series, with individual names, such as, Drake, Scrag, Smiths Coal and Dolly range in thickness from one foot to three feet in section and will have been worked for three to four years only as the coal was variable and ultimately uneconomical. Generally workings of this depth and age will be of no concern, ground movement having normally long since ceased.

There are deeper workings still in the area from Speedwell Colliery, which worked a number of seams from the 1700s until closure in 1936.

Abandonment plans of the colliery show that these workings stop 250 feet to the north at a depth of 1,898 feet and 350 feet to the east at 1,656 feet deep.

Shafts and Adits

None are known inside the boundary of the property or within 50 feet.

The nearest recorded shaft is that of Air Balloon Pit, 80 feet to the south, and is known to be 606 feet deep. From this distance it is unlikely to affect the property.

A pump shaft is located 180 feet to the south west. These were common features, used to draw commercial and domestic water before the provision of the mains supply. These shafts were usually no more than 3-4 feet in diameter and will be of no concern.

Water and Drainage Levels

None are known in the vicinity.

Surface Geology

The property stands on beds of Carboniferous shales and sandstones that contain the coal seams of the Upper and Middle Coal Measures.

Subsidence

We have no knowledge of damage to property caused by subsidence specifically attributable to mining activity in the immediate area.

Disclaimer

Whilst we believe that our archive is truly comprehensive we nevertheless acknowledge that there may be documentary sources unknown to us. Consequently this report is limited to the information in our possession.

Because the information in the report is obtained from records and documents prepared by others, it follows that the company cannot accept responsibility for any inaccuracies in those records or omissions from them.

If we express an opinion as to whether any mine workings revealed by this report would affect the property, we do so, on the basis of a theoretical relationship between the depth of the workings and the size of the seam. Any risk of subsidence also diminishes with the age of the workings. However, recent experience makes it plain that if there are workings under or adjacent to the property, there may be some degree of risk.

Yours faithfully

Bristol Coalmining Archives Limited

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Coal Mining Risk Assessment Part A: Research & Level of Risk

for a block of 8 flats on a Site in Air Balloon Road, Bristol

Client: Moosehead Ltd, 14 Fernbank Road, Bristol BS6 6PZ Structural Consultant: Terry Ventham TM Ventham, 184 Kellaway Avenue, Bristol BS6 7YL	Date: 13/04/18 Our Ref: 54906 Your Ref: ____ Planning Authority: Bristol City Council Planning Application Ref: -------- *Prepared by:* Mr. I Greenfield BA Hons *Signed by:* Mrs. J J Cornwell CEng MIStructE

Proposed Elevation onto Air Balloon Road
© the client.

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Part 1. General Introduction and Desk Study

1.1. Introduction

1.1.1. Scope

The purpose of this **Coal Mining Risk Assessment** Mitigation report is to:-

- Present a desk-based review of all available information on the coal mining issues which are relevant to the application site;
- Use that information to identify and assess the risks to the proposed development from coal mining legacy, including the cumulative impact of issues;
- Set out appropriate mitigation measures to address the coal mining legacy issues affecting the site, including any necessary remedial works and/or demonstrate how coal mining issues have influenced the proposed development; and
- Demonstrate to the Coal Authority and the Local Planning Authority that the application site is, or can be made, safe and stable to meet the requirements of national planning policy with regard to development on unstable land.

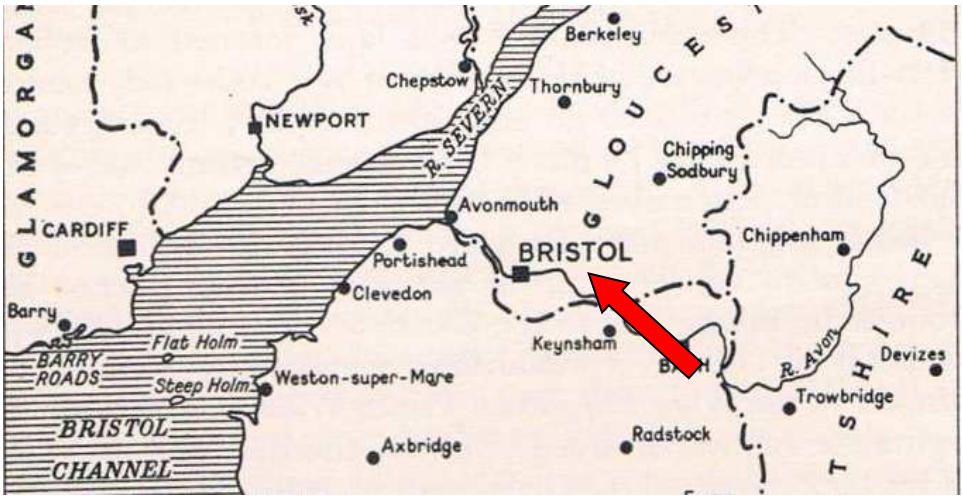
Coal Mining Risk Assessments are required to be based on up to date coal mining and geological information. It should however be stressed that there has been no recent coal mining in the district.

Abandonment plans of old mine workings only became a statutory obligation in 1872 and in consequence, with a few exceptions, only the relatively recent mining of the past 140 years or so is covered by this source. Much of the mining in the Bristol region is a lot older than this and it is therefore important to draw information from as many sources as is practicable.

This is a desk based study. No site visits have taken place.

1.1.2. The Site

1.1.2.1. Location within the region



Location of the site at Air Balloon Road, Air Balloon Hill, St George, Bristol.
This map courtesy of The City and County of Bristol by Bryan Little, 1954

Historically Kingswood, within which Air Balloon Road is situated, was always part of the south eastern portion of Gloucestershire, being outside of and beyond the eastern perimeter of the City and County of Bristol. Originally this area was forest, known at first as the Wood of Furches then during

Edward I's reign it became known as the King's Wood, Forest, or Chase. It was owned by the Crown and was both sparsely populated and lawless. The discovery of coal in the forest led first to encroachment, then disputed apportionment among local landowning families. It is from these times that most early records originate. While most of the families concerned were Gloucestershire based, some came from neighbouring counties or from further afield. Consequently surviving archive material is not therefore all in one place, but rests in each of the three county record offices, Gloucestershire, Wiltshire and Somerset and also in the City of Bristol Archive and occasionally others such as Staffordshire. Further collections are in private hands, such as those of the Duke of Beaufort, or owned by companies such as Bristol Coalmining Archives Ltd, or government agencies such as The Coal Authority.

1.1.2.2. Location within the district

The application site is in the locality of Air Balloon Road, Air Balloon Hill, a part of the parish of St George, formerly Kingswood, and specifically at the western end of Air Balloon Road. The site stands between Hillside Road, Trooper's Hill, Nag's Hill and Bell Hill with Summer Hill to the west.

The site, which is at the junction of Air Balloon Road and Hillside Road is currently believed to be unoccupied but formerly four cottages which dated from the late 19th century, stood here until the late 1960s. To the north is the housing backing onto Hillside Road, to the east, Stibbs Hill, to the west Crew's Hole and to the south, Trooper's Hill Road. There were, and in some cases remain, allotment gardens to the east, south and south west.

Originally this whole area was toward the south western end of the former Kingswood forest, just south of the Bell Hill Road, formerly part of the 'London Waye' one of the three main eastern routes out of the city. The London Waye went through Two Mile Hill, Kingswood, Warmley and Wick to Marshfield. Above this is the northern route, the former Sodbury Waye which followed the Ridgeway through Fishponds, Downend, Westerleigh and Coalpit Heath to Chipping Sodbury.

Air Balloon Road is to the south of those routes, and went through Air Balloon Hill to Bitton and beyond. This route was known as the 'The Bath Waye', a former Roman road. This crossed the former forest and went through St George and Whites Hill to Hanham High Street which thereafter becomes the Bath Road.

Aerial view of the site, courtesy of Bing Maps. Position of the property marked with a yellow star.

There has been mining along these routes out of Bristol, particularly in Two Mile Hill, a little further to the north east, in Hanham to the south east and in the wider district from an early date. After the forest was cleared the area became farmland including orchards and glasshouses connected with

horticultural nurseries and vegetable growing. The site itself and its immediate environs had been developed by 1900 but beyond the cluster of houses around Air Balloon Road, the district was largely still dedicated to general farming in 1903. Trooper's Hill farm worked this ground.

Amidst this housing and agricultural land use were several old quarries, one of which occupied a site to the south of Air Balloon Road. None are known to the north.

Allotment gardens were established after farming ceased, probably during the First World War. By that time there was a small boot factory to the north, some garages and a public house, but no other industrial or major commercial activity. The area remains today one of mainly residential use alongside the surviving allotment gardens as the photograph overleaf demonstrates.

Whilst Two Mile Hill, about half a mile (805m) to the north east was the main centre of early mining in St George there was significant mining undertaken in Potterswood to the east also. Air Balloon Hill had a pit of that name to the south west and beyond that was Crews Hole and Trooper Hill. To the west was St George itself and to the North West, Crofts End. To the north was Burchell's Green and beyond that Speedwell.

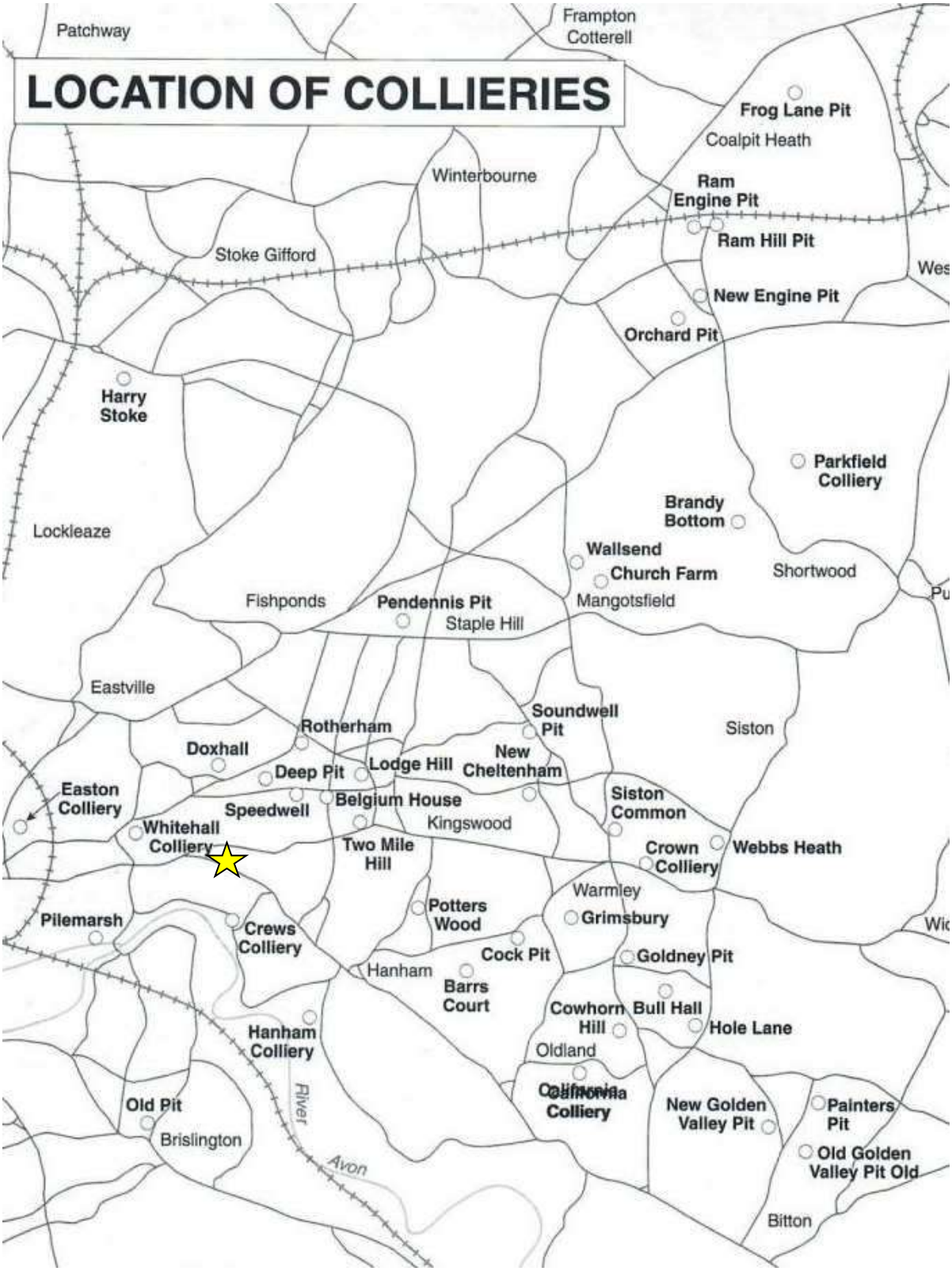
Consequently all of these were districts in which mining was once undertaken and in this general locality mining, continued into the early 20th century.

The last pit in the area was the Kingswood Colliery, the two last pits of which, Speedwell and Deep Pit closed in 1936 a few months after the Parkfield Colliery owned by the same concern. Prior to that Hanham, the closest concern, closed in 1926, Easton and Whitehall finished in 1911 and Goldney in 1909. Troopers Hill Pit went in 1908 and three pits, Pendennis, Staple Hill and Wallsend, at Mangotsfield in 1907. California (Oldland) closed in 1904 and Crown, Warmley in 1900. All of these were in Kingswood and within its original, rather than modern, boundary.

Notable closures in the district in the previous century were The Golden Valley Colliery, Bitton in 1898, Church Farm, Mangotsfield in 1891 and Siston a year earlier in 1890. Bull Hall and Hole Lane at Oldland closed around 1875, New Cheltenham closed in 1872, Potterswood and Jays Pits in 1869. Hollyguest, or Barr's Court Pit closed in 1868 and Doxall at Clay Hill in 1865. The Pyllemarsh pits shut in the late 1850s, possibly 1859 and Soundwell, one of the largest pits in the district, closed after holing through into the Old Lodge Hill workings in 1853. The last of the Lodge Hill pits finished working in 1845.

Prior to this a considerable number of other, smaller pits were operating in east Bristol, or western Kingswood and were closed before that, some had engine houses (and were therefore sizeable concerns into which a significant sum of capital had been invested) but there were a number of small works in the area many with no surviving recorded name.

These, like those south of Kingswood High Street, such as Pool Pit, Pickpocket Pit and unnamed others throughout Woodstock, Mount Hill, Lantern Bottom, Cock Road, and others at Hanham were mostly closed between 1820 and 1850. Air Balloon colliery is also probably of this date. All of these were located in the Kingswood district none survived beyond 1870. The list is by no means exhaustive.



The location of most of the larger of the Kingswood Collieries. Map abstract from John Cornwell's book Collieries of Bristol (2003 p6). The names of the pits are in bold, districts are in plain text. Air Balloon is marked with a yellow star

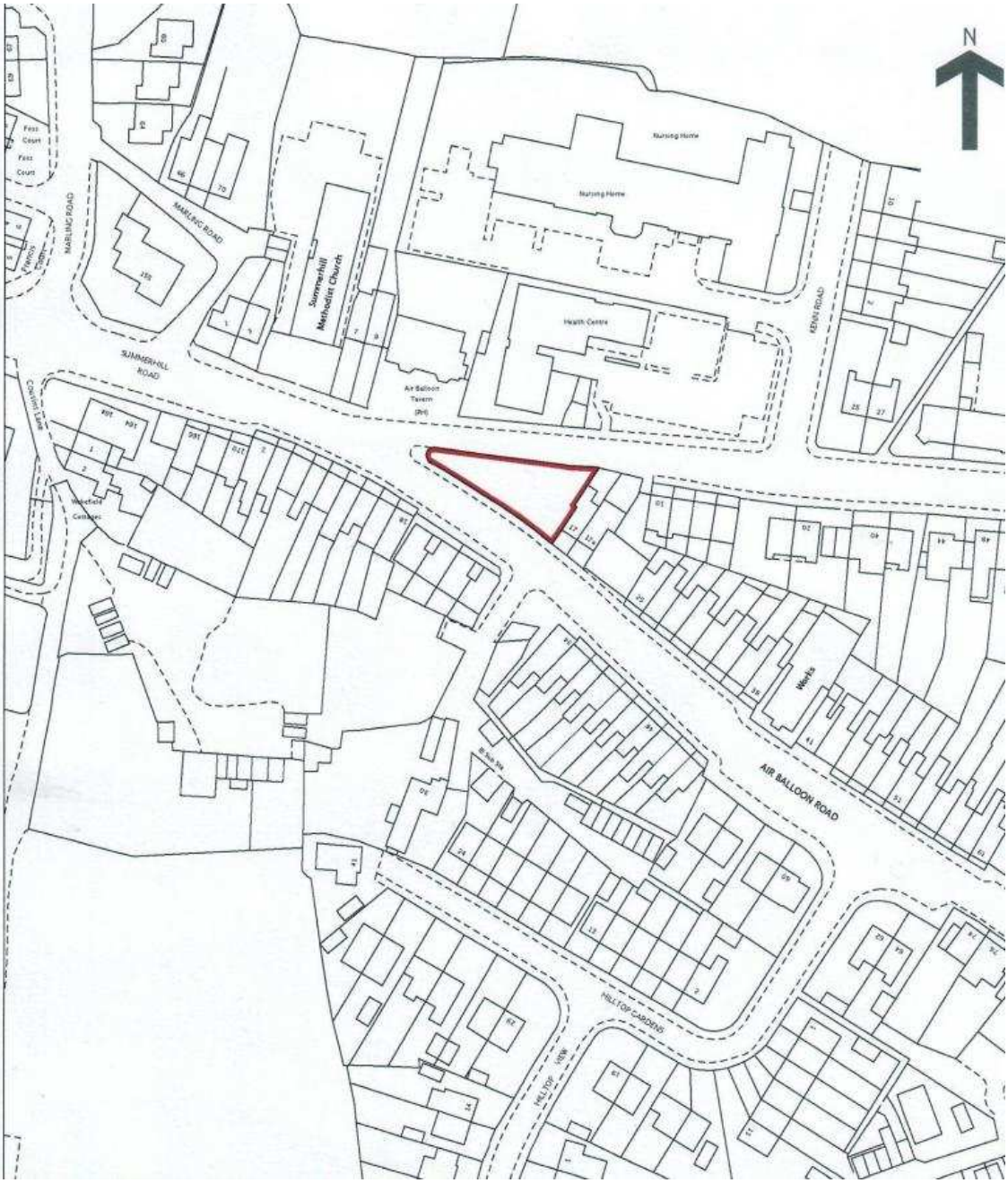
1.1.2.3. Immediate environs

Location plan has been adapted from the geological sheet which dates from the later part of the 20th century. This shows the property and its environs as they then existed.

Left, enlarged abstract of the immediate locality from the same map.

Map abstract from ST 6373 SW 67SW, 1/2500 map of 1968. Site marked with a red line

1.1.2.4. Plot Plan; Boundaries, structures and features



Location plans courtesy of client. Boundary of the plot marked in red.

1.1.3. The Project

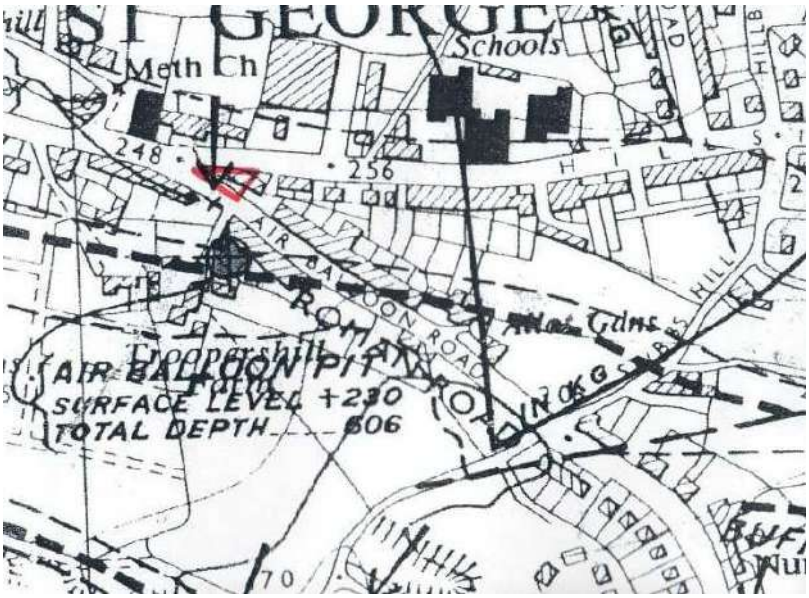
We understand that a risk assessment is required to better understand the mining heritage issues on or beneath the site prior to the construction of a detached dormer 2 bed bungalow and associated works. It is to be noted that the site is in an area which the Coal Authority considers to be at high risk from past mining activities, for which they will normally ask for a Coal Mining Risk Assessment, (CMRA). ***See Section 1.2: Methodology.***

Planning permission will be sought from Bristol City Council. The planning application number is not known. As this project is at the pre-planning stage and permission has not yet been granted, the Coal Authority have not yet had an opportunity to view this application.

We have been commissioned to prepare this CMRA as part of this planning application.

1.1.4. Surface Geology

The BGS (British Geological Survey) confirms that this site stands on the exposed part of the coalfield. The surface geology is recorded as:



South Wales Middle Coal Measures Formation –

Sedimentary Bedrock - Mudstone, Siltstone and Sandstone - formed approximately 310 to 318 million years ago in the Carboniferous Period.

Local environment previously dominated by swamps, estuaries and deltas.

Position of the site on the geological map, courtesy BGS. The boundary of the site is marked by a red line

The geological sheets ST67SW indicate that coal seams outcrop in the area, none of which are shown to crop across the site. No faults are recorded on or beneath the site by this source, but one exists just to the south east. This is considered more fully in ***Section1.4.2.4 Geological sheets and memoirs.***

1.2. Methodology

1.2.1. Why a Risk Assessment

A ***Coal Mining Risk Assessment*** (CMRA) is required for a development that falls within an area of present or past coalmining activity. Where such mining activity has taken place there is always a potential risk to any development which may be undertaken.

The Coal Authority (CA) has a legal obligation under the terms of the ***Town and Country Planning (Development Management Procedure) (England) Order 2010, Article 16, Consultations before the grant of permission; and listed in Schedule 5(k),*** to view all planning applications in order to manage the effects of past coal mining, including potential subsidence damage claims which are not the responsibility of licensed coal mine operators. The CA also deals with mine water pollution and other mining legacy issues.

To comply with this requirement, the Coal Authority (CA) has assessed all the areas where both past and present coal mining has or is taking place. They have defined areas within these coalfields which they consider to be a high risk to the stability of all structures, including buildings and pipelines that are to be constructed within them. Early shallow workings at or near the surface will particularly concern them. Good knowledge of potential hazards to foundation design can prevent last minute and

potentially expensive changes after construction has started or determine whether the project is financially viable or not.

Mostly the high risks concerned are unstable ground caused by (usually unrecorded) early mining within the shallow coal zone, and the presence or potential presence of shafts, recorded, suspected or likely.

The shallow coal zone is from the surface to 30m (98ft). Within this range there can be three types of mining, crop workings and open works, usually within the first 3-4m, bell pits, from 4-11m deep and primitive coal works working usually a single seam along the strike, from shafts 11-30m deep. Mostly, but not exclusively these types of mining occurred before any records were routinely kept. Often their presence is not identified until after groundworks have begun and this may mean that a scheme approved is unsuitable for the site and the ground conditions found without expensive remedial action.

1.2.2. Requirements of the Coal Authority and Planning departments

To carry out their legal obligation the CA has determined that all planning applications for new structures, including buildings and pipelines, within their high risk developments areas, include a CMRA based on the template found in their ***Risk Based Approach to Development Management: Version 3 : 2014***. This document is to include mitigation and recommendations to prevent any long term damage to all new structures.

Planning Authorities are required to comply with any objections raised by the Coal Authority. This prevents mining related problems arising during construction which could prove expensive to correct, both to the design of foundations and potential damage to neighbouring properties. It will also help to prevent any future damage from possible long term subsidence due to historic mining activities which can lead to potential claims.

Notwithstanding whatever is required by the CA, Planning Authorities are also keen to ensure that a decision to grant permission for a development has been considered in full possession of all the available information to prevent unsuitable schemes progressing which might require significant alteration once mining legacy issues were encountered.

1.2.3. Site Specific Requirements

For this property the CA have identified in their Non-Residential Coal Authority Report that there is one potential high risk indicator. Often the indicator identified is the potential presence of shallow coal which may have been worked at some point in the past, and on this occasion that is indeed identified by the CA as a risk at this site.

No shaft or mine entry is identified as a risk indicator but the potential presence of shallow coal could trigger a substantive concern to any planning application.

There are no other risk indicators from the Coal Authority report such as surface hazards, geological faults or mine gas.

1.2.4. The research process

Our risk assessment process considers the presence of and the risk posed by any surface hazards, mine entries, water levels, mine gas, geological lines of weakness and subsidence; whether or not a shaft is a mine entry or a well, or a water drawing shaft with a mechanical pump (pump shaft) will be also considered as these can have very different characteristics to mine shafts with which they are sometimes confused.

Of course, in the absence of complete records, the possibility of an unexpected discovery cannot be eliminated entirely. But the purpose of the coal mining risk assessment is to manage and mitigate that possibility by considering the evidence which does exist and to determine what level of risk if any is present.

In South Gloucestershire, Bristol, Bath and North Somerset there are many and varied sources, not all of which are available to the public. The reports of those who witnessed the coal works first hand in the 18th, 19th and 20th centuries, such as Cossham, Anstie, Prestwich, Strachey, Buckland and Conybeare and others, are vital and exist in a wide range of source material. This material along with geological records, mine plans, borehole data, shaft sections and site investigation results from nearby sites help provide the majority of the evidence on which a full and comprehensive assessment of the risk can be made.

Each of the source documents, some of which will often contradict other material, will be examined and evaluated to determine whether coal is indeed likely to exist at or close to the surface, within the shallow coal zone with which the Coal Authority is primarily concerned or at depth and an assessment would then be made of the probability of such coal having been worked.

Finally, although not specifically required by the Coal Authority we include a consideration of the historical, geological and technical contexts in which the coal workings, where they exist, were undertaken. The purpose of this is to understand why and when the coal was wrought and not just where the workings were so that the impact of these works is neither over nor understated.

Additionally a description of the type of coal, where known, which exists beneath the property is given. This is included because clearly in the absence of plans which would provide an unequivocal answer, a judgement needs to be reached as to whether a seam is likely to have been worked or not. Coal seams vary in quality, thickness and ease of working. Clearly a thin sulphurous seam will be less likely to have been worked than say a valuable smelting coal. Without such a distinction, no valid judgement about the probability of unrecorded workings can, we consider, be realistically made.

Similarly, it is also useful, where known to consider the method of working which can materially affect risk

The presence of and the risk posed by any surface hazards, mine entries, water levels, mine gas, geological lines of weakness and subsidence will be also considered.

By these means a level of risk for each indicator can be determined which will demonstrate that the risk either does not exist, is negligible or significant. In turn this determines whether further evidence in the form of intrusive site investigations is required to ascertain ground conditions unequivocally, or whether alternative design solutions might eliminate the perceived risk. Either way, those working to deliver the development, their clients, and both the Local Authority and Coal Authority can make their decisions in full possession of the facts as far as they exist.

1.3. Contexts

1.3.1. Historical context

Although it's widely thought the Romans used coal, in this district the first documented record of coal working is from 1223 in the **Great Pipe Roll**. A little later in 1228 the Crown, needing money, sold rights in parts of the forest to take trees – mainly oaks – and allow some grazing. This reduced the forest to some 4,000 acres. By 1276 the Constable of Bristol Castle, who was also the keeper of the forest was instructed allow Petronella da Vivonia to mine coal in her wood within the forest. It was said that she and her ancestors from time out of mind were wont to dig sea coal in her wood until she had been stopped by the Constable. This is the first evidence of mining in the forest and therefore dates from the reign of Edward 1 (1239 –1307).

Very limited extraction continued thereafter; the practice was still mostly illegal and permits were rare, timber was plentiful and cheap whereas coal, where it could be dug, was expensive and required transporting from those places, generally at a distance from the city, to where it outcropped and was worked. That equation began to change in the middle of the 16th century when demand for fuel began to increase beyond the resources locally found. Coal was increasingly worked illegally in small quantities in the Kingswood Forest, but when the works were discovered they were generally stopped and those responsible were either prosecuted or moved on elsewhere.

Until 1564 Kingswood Chase and much else of what was to become modern East Bristol was part of the Barton hundred but when that was sold by the Crown the position of the Forest or Chase and the mineral rights beneath it was unclear. This created uncertainty which the opportunists exploited. A complaint of 1615 showed illegal mining and deforestation was already well underway.

> ***Claymes do swallow up the whole forest not allowing His Majestie the breadth of a foote , the timber wood, bushes, soyle, cole mines and all other proffites carried from His Majestie unknown rights, His Majestie is only allowed herbiage for his deere.***

Ellacombe and Braine, writing in the 1800's, reproduced a map of 1610 which showed the process just beginning. At that time there were large open spaces with very few houses or structures of any kind in between. But the state of affairs remained unresolved and ultimately led to a scramble for ownership over the forest during the volatile times of the Civil War.

The Lords of the manors of the adjoining land divided the chase among themselves into Liberties, areas of control, and despite a lease from the Crown having been granted in respect of the Chase after the restoration; Lord Throckmorton, the leaseholder, was unable to prevent the continuing encroachment by the Liberty holders and their lessors. Consequently the Player and Newton families, the Chester-Masters, the Berkeleys, Lord Stafford, Weston and Langley exercised their own rule and interest. Throckmorton complained, in 1681 that the liberty holders had:

> ***…built houses above 300, and enclosed 1,000 acres of ground and made 2,000 cole pits and other pits and have thereby spoil 500 acres of ground and by means of these cottages occupying the said chase there are 1,000 horses kept therein by them…***

Certainly the 1672 map in the BRO which shows these liberties indicates the number of farms, houses, cottages and collieries had multiplied massively, endorsing Throckmorton's complaint. But the momentum was unstoppable and by 1718 he had decided that the Liberty Holders could not be contained and that the Forest was:

> ***..utterly destroyed and not possible to be restored.***

By that time the liberty holders had, for more than a quarter century, been letting parcels of land and offering leases to work coal. Sir John Newton, in 1691 was signing leases with adventurers prepared to work the coal on his claim, for periods of between 7 and 21 years.

Consequently it is unsurprising that mining, which brought migrants, their families and businesses to support them into this hitherto sparsely populated area, grew rapidly between 1690 and 1740. During this time Kingswood generally and St George , in particular became an important centre of the industry.

The coal was used in brass making, glass making, breweries, smelting, lime burning and many other purposes, along with increasing household use.

The deeper development of the pits was facilitated by the driving of water levels which drained the workings and enabled the coal to be worked deeper than had hitherto been possible. The late John Cornwell suggests that the first of these was driven in 1650 and certainly by 1750 the Old Lodge

Level had been built and was at work. Kingswood Hill is about 150ft (46m) higher than the land surrounding it, so these levels which discharged the water they had drained into brooks to the east and west enabled the coal to be worked down to the level of free drainage. This meant many more pits could be sunk and more coal raised. The new pits needed labour and people came to Kingswood from all rural districts nearby.

Sir Robert Atkyns in his ***Present and ancient state of Gloucestershire*** of 1712 and later in 1779 Samuel Rudder in his ***New History of Gloucestershire*** showed between them that the population was indeed rising rapidly. This was almost exclusively due or connected to mining. This part of Kingswood was in the parish of St George in the liberty of the Chester family, who had secured some 1,380 acres of the former forest but the situation was similar in the other liberties within the hundred and in Mangotsfield, Bitton and Stapleton, the boundaries of which were not far distant.

In this parish, St George, there were no less than 700 houses, on average five to a house, according to Rudder; and in the neighbouring parish of Stapleton, also a mining community the number of inhabitants rose from 200 to 1,280 between Atkyn's study and Rudder's a period of 67 years.

Of St George, Rudder adds

> ***Some of the coal-pits are of a prodigious depth. That at Two-mile-hill, belonging to his grace the duke of Beaufort, is 107 fathom deep. At this and many others they use a fire-engine, to draw out the water which flows in upon the miners and would prevent their working.***

Of the adjacent parish of Bitton, the western boundary of which extended to modern Hanham Rudder wrote:

> ***Great quantities of coal are dug in this parish, out of pits that are fifty yards deep and some of them more.***

Rudder says of nearby Stapleton:

> ***The greater part of the parish lies within the boundaries of the forest, or chase, of Kingswood, and is one of those places (all situated in the neighbourhood of each other) whence the City of Bristol is supply'd with its coal, which is so excellent, for its durable quality, that the very cinders will burn over and over again, 'till they are wholly reduced to vapour and ashes.***

Rudder also talks about a dramatic mine rescue in 1735 from a pit, also at Two Mile Hill about 39 fathoms (2,34ft or 71.3m) deep; just four years later John Wesley was addressing thousands of Kingswood miners on Hanham Mount.

The period from 1760 until 1840 was perhaps the most progressive and the number of men working in the mines and the number of separate concerns, was at its greatest. Unfortunately few records were kept and fewer still survive. At the start of this period the first steam engines were being built to drain the workings to lower depths and as the efficiency of these improved working to below 500ft (152m) was possible. Gradually the smaller and shallower pits became exhausted or uneconomic and new deeper pits were sunk like Easton and Whitehall, or old shafts deepened as at Hanham and California. By 1850, when the Soundwell Colliery closed, working to depths in excess of 1,000ft (304m) was not an uncommon practice.

Soundwell was one of the first pits to keep good records which have survived. Sadly, there are no such records of the abandoned workings from Lodge Pits into which the Soundwell miners broke in 1853, flooding the pit and ensuring its closure for good. Similar events elsewhere brought pressure to bear on those responsible for such ventures to keep proper records. In 1872 legislation was introduced

which required all colliery owners to keep mine plans and to deposit copies of abandoned workings with a mines inspectorate.

Those records exist and so most but not all of the workings below 500ft (152m) are documented and many well documented. As more seams were abandoned, more records became available.

The list of closures in the late 19th century and early 20th century (see page 4) reflected the unavoidable conclusion that with a few exceptions coal of a more consistent quality and generally cheaper too could be brought to Bristol more economically than could be brought to bank (i.e. raised to the surface) in many Bristol Collieries. The Kingswood and Bedminster Great Veins and the Ashton Great Vein below that were the exceptions and were widely worked along with certain other seams which were variable in thickness and quality from place to place.

More advanced equipment and working practices kept some of the better pits going, but the economic turbulence before and after the First World War, ensured that the commercial environment would not support inner city pits by then working relatively thin seams at considerable distances from their shafts. The last city pit was the Speedwell/Deep Pit which finally finished in 1936, despite the best efforts of those operating the colliery, the miners themselves and the people of Bristol who subscribed to help support the industry.

Although the industry ended in Bristol in 1936, apart from a short revival in the 1950s and early 1960s near Filton (the Harry Stoke drift mine) it was not until 1973 that the last pit in the coalfield closed when the Kilmersdon and Writhlington Colliery at Radstock, North Somerset finished. Even that was not the end as the records kept by NCB Surveyors at Radstock remained in the district until 1985.

Consequently there are good historical records for the 100 years from 1872 until 1973, but sparse records in the previous 100 years and almost none, with any detail at least, from the period before that.

1.3.2. Geological context

The coal measures of Bristol, South Gloucestershire and Somerset were laid down in a series of basins more than 299 million years ago. The marine environment which had produced the carboniferous limestone over which the coal measures were later to lay was swamped by land derived sediment in sweeping deltas.

On these deltas a range of tropical plants grew, died and were deposited to become peat, then ultimately by compression and aerobic exclusion, the coal seams. These in turn were separated by periodic and extended flooding in which sand and mud was laid down to create the partings of sandstone and shale between the seams. Such deposits formed in basins and there are a number in the region of which the Bristol and Somerset coalfield forms a part.

The Bristol and Somerset Coalfield stretches from Cromhall, north of Yate in the north to Beckington, near Frome in the south, an area which comprises several separate coal basins, most of which are at least partially exposed. Other areas are not so helpfully revealed; perhaps 70% of the whole coalfield is concealed beneath Mesozoic rock. That is not however the position here in Air Balloon Road, the coal measures are exposed and clearly where that is the case judgements are normally easier to make as the evidence is or once was visible.

The reason for the separation of the basins lies is the folding of the rocks, large scale displacements, both vertical and horizontal have occurred from the earliest times but the greatest upheaval took place after the coal measures had been formed, and before the Triassic deposits which cover most of the coalfield were laid down.

These massive upheavals, which Kellaway and Welch in the Geology of the Bristol Coalfield describe as a series of 'wrinkles', were caused by compressive pressure from the south and south east, creating the Mendip hills, the dramatic displacement of the seams on their northern boundary, and even their inversion of those seams in some parts. In some parts of the coalfield the effect was less pronounced, but frequent faulting was nevertheless the result.

Certainly there is significant and extensive faulting in this district. At the site itself the sheets show no major faults, although that does not necessarily mean that none exist.

The Kingswood anticline, a considerable distance to the north is the dominating feature in this area, and this involved stratum thrust up by pressure from the south which resulted in folding and then subsequent erosion. On the northern side of the anticline the seams are steeply pitched, on the southern side less so, but pressure was relieved by folding and thrust faults where seams could be displaced by as little as a few feet to several hundred, In Radstock, in the Somerset portion of the coalfield, displacement of more than 1,500ft (457m) has been recorded. Considerable disturbance is therefore not unusual.

Subsequent deposits of later material from the Triassic, Jurassic and later periods concealed the coalfield and in some areas, such as Easton, that cover remains. Elsewhere, as here that material has been eroded so that the coal measures are exposed.

The Bristol coal seams are of the same age as those of South Wales, and further afield Westphalia in Germany and Pennsylvania in the USA, all of which occupy the Upper Carboniferous period. The Bristol coals were bituminous, and about 40% were used latterly in gas making. Only some were good steam coals, household use and smith's coal being the other main markets. Almost all were thin by modern standards, the main coal the Kingswood and Bedminster Great veins being generally around 1m thick.

The coal presents in three main groups. The first group are the upper coal measures which contain the seams of the Radstock and Farrington groups and are of Westphalian age. These are the most recent formations in the coalfield and are generally covered by Triassic material.

There are no seams of the Radstock group in Bristol or South Gloucestershire, the entire range having been eroded in Permo-Triassic erosion. In Somerset however they account for up to 2,400ft (731m) of strata from the Publow formation, the highest Carboniferous rocks of Somerset, through the highly productive Radstock group to the Barren Red Formation below.

Below the Barren Red Formation, which contains no seams as the name suggests and could be up to 750ft thick (229m) thick) lie the Farrington group of seams. In Somerset these were worked at Radstock, Pensford, Bishop Sutton and of course at Farrington where the seams outcrop. In the Bristol and South Gloucestershire part of the coalfield they were worked only at Coalpit Heath, but the Avonmouth seams are likely to be of this group also. The Farrington group is at its thickest in Radstock where the measures are around 1400ft thick (427m).

Under the Farrington group, but still considered to be of the Upper coal measures are those seams known as belonging to the pennant measures. These include the whole of the Clapton Basin sequence, and the highest of the Nailsea Coals, specifically the Grace's seam. The deepest of the Farrington group is known as the Mangotsfield formation, which contains only a very few seams, mostly toward the base of the formation and just three workable within a range of up to 1900ft (579m) at its thickest at Iron Acton.

These seams were mostly worked at Mangotsfield, Coalpit Heath and Temple Cloud in Somerset with only three seams of workable thickness or quality. All present south of the property on this side of the anticline and will be of no concern.

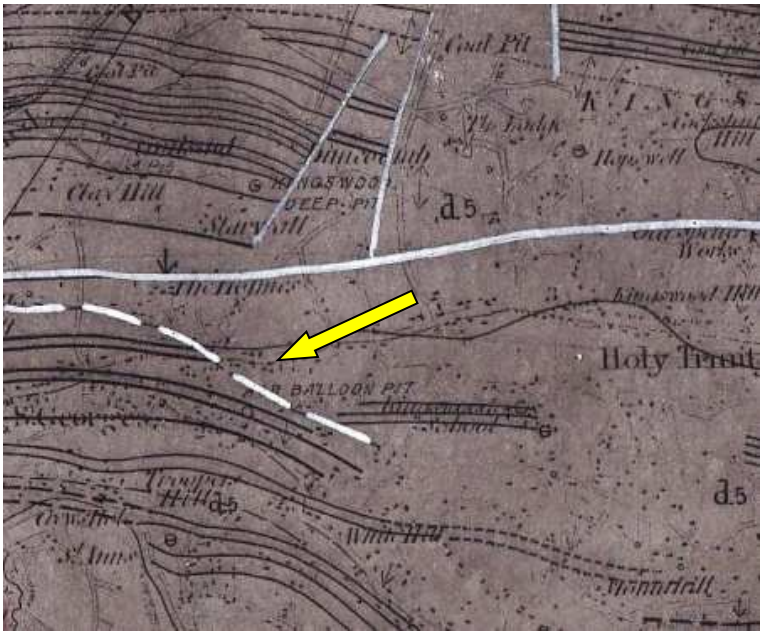
The final seams of the Upper coal measures are those of the Downend formation which occupies the measures between the Winterbourne marine band and the base of the Mangotsfield formation. In Somerset these are represented by the higher coal seams of the Nettlebridge Valley, which were worked at New Rock Colliery. In the northern part of the coalfield, in Bristol and Kingswood they were worked either side of the anticline. At Staple Hill, north of the anticline there are three main seams, but south of the anticline there are four good seams and several poorer ones. In this part of St George, these seams crop south of the site and dip south away from the property.

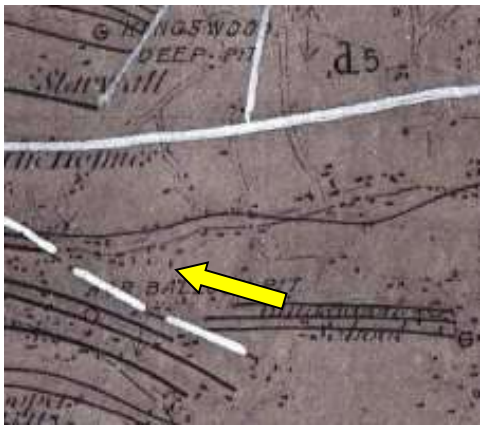
Below these seams are found the Middle Coal Measures and it is on these that the property stands. These measures contain the poor quality Stibbs seams, the better seams of the Toad Vein group and, deeper still the best quality coals of the Kingswood group. One source shows the first of these groups, the Stibbs seams, to outcrop in this area, all to the north of the site on which the property stands.

If the Stibbs seams are present, then the Doxall, the first of the Toad Vein group sequentially would be expected to lie about 900ft (274m) below the last of these according to one historical source, with the remaining Toad Vein seams and the deeper Kingswood seams at a considerable depth. This will be considered subsequently under ***Section 1.5 Probable Stratigraphy***. Other than the Stibbs seams, the crops of which are not unequivocally recorded, all of these subsequent seams are very deep indeed here and have certainly never been found within the shallow coal zone, in this area. Some were worked in the locality by Hanham Colliery and by Speedwell Pit at depth. These coals of the Middle coal measures or their equivalents were also worked in the Nettlebridge Valley at Newbury and Mackintosh Collieries.

The final seams are those of the Ashton group, mostly within the Lower Coal Measures. These were never worked here. Consequently the coal seams with which we are concerned here are those of the Middle Coal Measures specifically the Stibbs seams at the most shallow end of the sequence, down to the Kingswood seams and then the Ashton seams toward the base of that strata.

Kellaway and Welch (p98) describe the Downend (Bitton group) seams as ‘had been worked almost continuously’. These seams of the Bitton Group, the Millgrit, Rag, Buff, Parrot and minor seams associated with those were worked from Crews Hole in the West through St George, Hanham and Oldland Common to the Golden Valley in the east. They crop, according to the geological sheets, south of the property and can therefore be of no concern. The seams further south at Brislington are of the higher, Farrington group and are generally thought to be the equivalents of the Bromley seams further south still. Thus the only seams which can be present within the shallow coal zone are those of the Middle coal measures, in all probability the Stibbs seams. An early geological map from 1885 showed the demarcation between the exposed and concealed coalfield clearly; the concealed coalfield is however a significant distance to the west. Interestingly, Air Balloon Colliery is marked, but had long closed by that date.





The yellow arrow indicates the approximate position of the site. Black areas are the exposed coalfield in Hanham, pink the Mercia mudstone.

White lines are major faults known when the map was made (but not shown on the geological sheets). Note that the crop positions are from Anstie and Sanders and are not entirely reliable.

Geological data is taken from sheet ST67SW from the surveys conducted by Green, Welch and others after the Second World War using County Series maps last updated in the 1930s. These sheets show that the site is on the northern part of the coalfield to the south of an anticlinal ridge which as has been described, distorted and disturbed the coal measures. The application site is shown on the geological sheets to stand in an area where there are no recorded coalcrops in the immediate area, although the Downend seams exist to the south.

Where recorded coal crops are shown, clearly the risk of shallow mining is elevated. The types of shallow mining are described below. While no coal crops are shown here it does not necessarily follow that none exist; many smaller, thinner and poor quality seams are omitted from the geological sheets, and no mention of the Stibbs seams is made by Kellaway and Welch either on the sheets themselves or in the memoir. Many earlier commentators do mention these seams however and their existence and impact cannot therefore be ignored.

1.3.3. Technical context

1.3.3.1. Crop workings

Coal works were initially and exclusively surface open works where the coal seam cropped at the surface. These were essentially linear quarries from which the coal was extracted from the surface down to about 10ft (3m). Once exhausted they would generally be backfilled and the land returned to agriculture, although unfilled open works are still visible in the wider district at Coalpit Heath, specifically at Blackberry Brake.

Where this occurred, the stability of the ground will be necessarily compromised to some extent since the fill is likely to be more compressible than the original material.

Backfilled crop workings are evident by a linear band of coal waste, dirt and small coal. Sometimes these are hard to follow and trial trenches can confirm the presence of an outcrop, worked or intact.

These features cannot of course be present where the coal measures crop beneath a covering of later material.

1.3.3.2. Bell pits

Once surface coal was exhausted, bell pits could be sunk if the thickness and quality of the coal warranted the time and expense. The method had been long established and was similar to that practiced in as far back as Neolithic times are still visible in the Grimes Graves flint mines in Norfolk.

Rarely deeper than 9m (30ft) the majority in Bristol, South Gloucestershire and Somerset were normally 20ft (6m) or less, simply because the seams were thinner than elsewhere, and sinking short life shafts to enable deeper working was uneconomical. Professor AR Griffin has said ***Coalmining,*** p6 1971 that:

Where seams lie deeper than 20ft or so, bell pits are intolerably wasteful of labour.

Consequently unless seams were of a prime quality, this was usually the limit of sinking. He adds. (p3) that they were rarely more than about 30ft deep. Shafts would be 3-5ft (0.9-1.5m) in diameter and when the coal was reached it would be extracted in a circular pattern from the bottom of the shaft.

Right: A model of a bell pit, representing a sinking about 20ft (6m) deep. (Brora Heritage Museum)

Left: Bell pits uncovered by opencast mining in Derbyshire. These circles are the bottom of the pits

The area of extracted coal could be 12-18ft (3.7-5.5m) in diameter, and with seams 3-4ft (0.9 -1.2m) thick void migration, even after a long time, is and has been seen to be, entirely possible. Once exhausted, or unsafe, a new shaft would be sunk close to the earlier one, about 20-30ft (6-9m) distant as the photograph above illustrates.

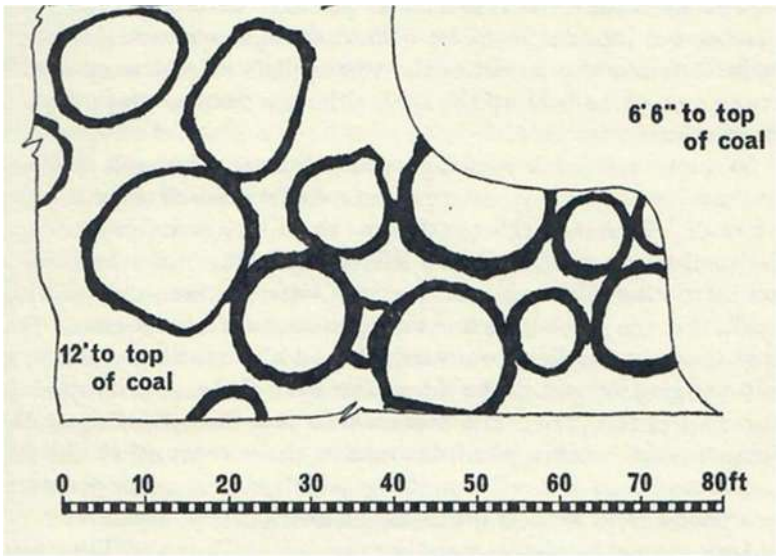
The old shaft would be filled with the debris from the new, but the fill was necessarily compressible and settlement can occur at the shaft, or from the workings, even after hundreds of years, as has been discovered in South Wales and elsewhere.

Bell pits are often evidenced on the surface by a large (5-6m) circular coal waste distribution, where, for example, earlier ploughing has spread the waste, or by black coal hollows beneath overlying soils, encountered in soil strips.

At a site at Stretton, Derbyshire the bell pit pattern was evident and accentuated by thawing snow, which showed dips and depressions where the fill had slumped. Here, AR Griffin ***Coalmining*** (p3-4) tells us that:

> ***The coal lies little more than 10ft down. The pits were sunk close together; and when the soil was removed from the workings during opencast operations it was seen that one pity bottom was separated from the next by a very narrow pillar of coal. Indeed in a few cases one pit broke through into the next.***

Occasionally bell pits were of an irregular shape. Whilst usually circular as in the examples above they could be square or oval or of no particular shape as the diagram below, also from Derbyshire shows. Almost always they were close together. Sometimes a ditch for drainage was driven across the field or common land to take away the water which plagued these early workings.



Above: Bell pits at Stretton Derbyshire, courtesy, AR Griffin, Coalmining 1971,(p5)

Obviously where deposits of later material are greater than bell pit range, these features can be discounted.

1.3.3.3. Primitive Shallow Shafts

Once the accessible coal had been exhausted by means of bell pits and crop workings, shafts were sunk deeper to exploit the seams for longer; this meant working the seam laterally beyond the footprint of the bell pit. The principle had already been established where adjacent bell pits broke through the narrow barriers of coal, but this affected the integrity and stability of the roof so some timbering to support the overburden eventually became necessary.

Workings of this kind were discovered at the old reservoir site near Cossham hospital, in Kingswood where a number of shafts were linked by narrow headings from which the coal had been extracted. These headings were surprisingly close to the surface, in some cases less than 20ft (6m) and in others 23-30ft (7-9m).

Deeper shafts had to sustain a longer working life than the bell pits in order to repay the additional expense of their sinking. Depths depended on the amount of water with which the pit had to contend, the integrity of the overlying strata and the quality and thickness of the coal.

Professor AR Griffin describes (***Coalmining***, 1971, p6) early workings below bell pit depth which had been encountered at Chopwell Colliery, Co. Durham in the early 1950s. He says:

There were no props or other supports set at all. The headings were driven about five or six feet wide in the coal. Cross headings were driven from the main heading at irregular intervals and an old miner who entered these old workings recalls that the whole area had the appearance of a honeycomb. Seen in section, the headings were arched shaped, like a modern tunnel, no doubt to give support to the sides. The apex of the arch touched the rock roof of the seam….arch shaped headways were not peculiar to Durham…it seems likely that the arch shape was fairly general in this early period.

Certainly closer to Bristol the method of working in primitive pits of this kind was generally by means of driving a fairly haphazard and meandering heading from which working places were excavated, following the best coal and avoiding areas where the seam thinned or was lost, washed out, altogether. Such patterns have been uncovered in open cast workings in South Wales and elsewhere.

By 1690, when the development of the coal beneath Kingswood chase and the outlying coal basins such as Coalpit heath was accelerating, these workings were still typically less than 130ft (40m) from the shaft although Professor Nef speaks of a mine in 1619 with an underground roadway of a mile in length, which must have been either exceptional or possibly exaggerated.

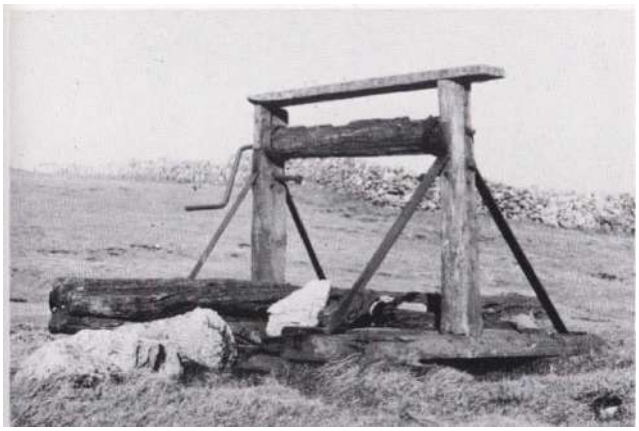
Shafts of this period were rarely deeper than 100ft (30m) in Bristol, although elsewhere pits of a similar date could be 200ft (60m) deep. This period of working therefore contributes a significant, if not the largest percentage of risk indicators.

Evidence of early heading and stall mining uncovered in South Wales in 2002 at Morriston, near Swansea. Photo courtesy of Richard Jones©

Generally, only 30-40% of the coal was removed from pre 1750 workings, according to John Cornwell. John adds that, documents in the Somerset Record Office at Taunton suggest that several pits of this kind could be connected.

One early mine plan dated 1695 shows long headings with square shafts every 100-150ft. No areas were shown extending out from these main underground roads.

Almost all the waste, small coal and stone remained in the mine and since the seams were usually thin, any resulting voids would be much less than in more modern or mechanised collieries.
Coal winding was from a windlass (below) and corves (baskets).



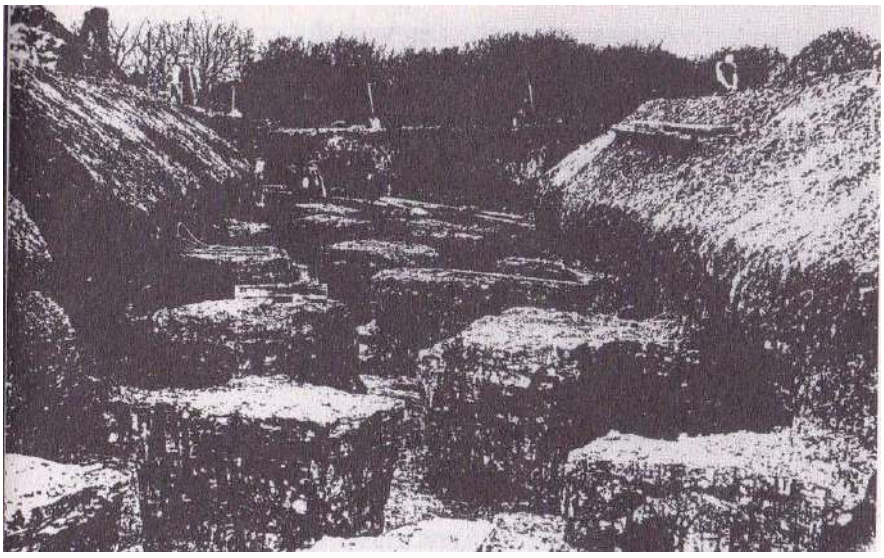
This windlass over a shaft is from a Derbyshire lead mine, but those serving coal pits in Bristol and beyond were almost exactly the same.
Courtesy Britain's old metal mines by RH Bird (Bradford Barton 1974)©

Obviously where deposits of later material are greater than the shallow mining range, these features can be discounted.

1.3.3.4. Deeper, developing mining

The first working practices as described above were wasteful and as shafts were sunk deeper it became more important to make the best use of the coal encountered. Pillar and Stall, sometimes called Bord and Pillar working was developed, coming to the Bristol district in the 18th century.

This method involved dividing the area of coal into squares or rectangles which would be worked out leaving pillars of unworked coal to support the roof. Irregular at first, the pattern became more consistent as the method was developed. Pillars typically would be 9ft square (2.75m) and the roadways 6ft (1.9m) wide. This was the first phase of working.



Pillars uncovered by opencast mining in Scotland.

The roof, which was formed of thin sandstone was removed and the stalls excavated. The reduced structural integrity of such compromised ground is all too evident from this photograph.

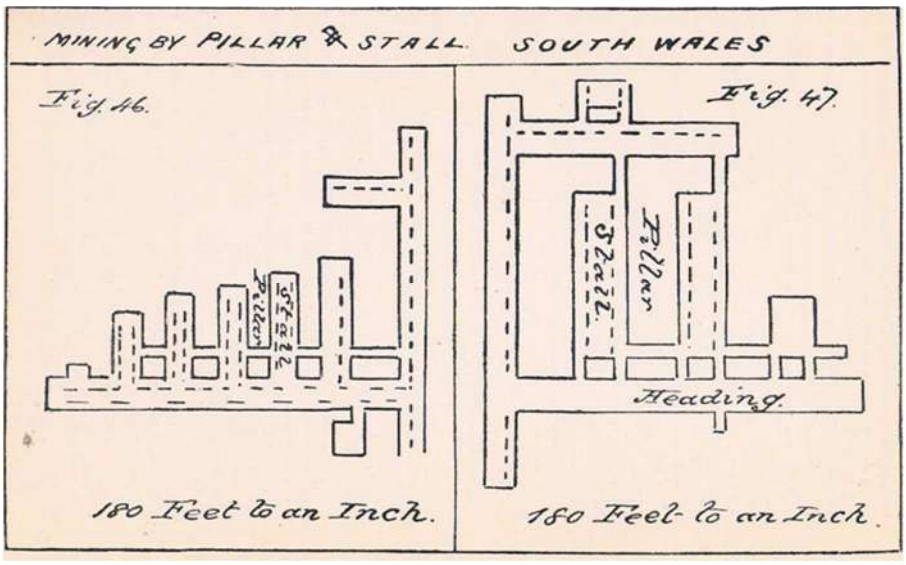
Workings uncovered at Heage in Derbyshire in the 20th century by open cast workings. These were only 20ft (6m) below the surface and show the overburden. Photo courtesy of Robert Bradley.

Second phase working involved removing or robbing the coal in the supporting pillars. This happened progressively on the retreat (meaning the extraction began at the furthest point first and then the coal worked back toward the starting point) and was done to increase the productivity of the pit by winning more coal. This meant working at the furthest point first and returning toward the shaft over months or years at the end of the life of the seam.

Second phase working in Derbyshire uncovered by opencast working.

Not all seams were second worked, but clearly where they were, settlement was rapid. Where good pillars were left, the gradual crushing of the pillars could delay settlement for considerable periods of time, and in fact experience has shown settlement is still possible from old workings now, where other

conditions conspire. Among the many factors which can affect the rate of settlement is the integrity of the roof and the floor, the size of the pillars and the presence or absence of water.



Pillar and stall mining in South Wales – from ***the Practice and Science of Mining Engineering*** *by Fairley, Newcastle, 1896*

As Danilo Bettosi BSc MSc FGS points out in his study ***Stepping on the Past – Effects and Treatment of Near Surface Coal Workings***:

> ***Coal extraction inevitably leaves void spaces that can present stability issues over time. The method of pillar and stall working in larger mining operations often led to ground conditions that retained some integrity and strength to support the overlying rock burden. In addition to this, in some pillar and stall workings the unsuitable materials were used to backfill empty stalls rather than transport spoil to the surface.***

However, practices became governed by the need to produce more coal and as demand increased and coal seams began to become worked out, the practice of pillar robbing began whereby pillars would be halved for the coal and then at a later date on exiting the workings the pillars would be removed completely, significantly increasing potential ground instability.

There is some dispute as to how widespread this method was in the Bristol, South Gloucestershire and Somerset coalfield. John Cornwell maintained that:

> ***Undulating seams, faulting and washouts make methodical working on the pillar and stall working almost impossible.***

Certainly this method was best suited to areas like Yorkshire and the West Midlands where the coal was thicker and to areas where the seams was fairly level. But from about 1750 the method was tried in Bristol, and local adaptions to work with the conditions developed. Down and Warrington however, in writing about Somerset, tell us that the method was only employed for a short time from 1869 in Nailsea and at Radstock around the same period experimentally and unsuccessfully. Plans of the workings at Ram Hill, Coalpit Heath in the northern part of the coalfield however show that the workings of that pit were laid out on this basis. Nevertheless the method was, according to John Cornwell, almost unknown in Kingswood generally where local versions of longwall mining were usual (see following section for a description of these methods).

1.3.3.5. Deep mining

Depth of working was limited by the need to remove water in the mine. Mining in excess of 500ft (152m) was possible once steam engines were introduced which could drain the workings of accumulated water. One of the first in the area was at Brislington, which recent research by David Hardwick of SGMRG has shown was operating in the mid-18th century, much earlier (1739) than had previously been assumed.

Up until then raising water was a laborious affair, even where it only needed to be brought up to the water level at say 100-150ft (30-46m). Working methods by the 19th century at these depths were longwall, a system developed in Shropshire or variations thereof, such as the topple and dukeway system, peculiar to this coalfield. Unlike pillar and stall, all or most of the coal was extracted and so subsidence occurred very shortly after the support had been withdrawn.

Hawkins and Tomlinson in their paper ***Investigation Procedure Developed during a Large Development on the Bristol Coalfield*** describe the system thus:

> ***Workers first drove a horizontal roadway and then, as the roadway progressed, gangs of three miners advance a cut of limited width in an up-dip direction forming a stepped face. With this type of mining it was possible to remove most of the coal at almost any angle of dip, the ground then being allowed to subside.***

Depth of working was limited, by the need to remove water in the mine. Mining in excess of 500ft (152m) was possible once steam engines were introduced which could drain the workings of accumulated water. One of the first in the area was at Brislington, which recent research by David Hardwick of SGMRG has shown was operating in the mid-18th century (1739), much earlier than had previously been assumed or believed.

Undercutting the coal on a face at Coalpit Heath Colliery about 1900 (Burrows collection, BRO

Generally, settlement occurred in such cases as soon as support was removed, and at the depths concerned, void migration to the surface generally is not a major risk factor so long after abandonment.

1.3.3.6 Types of coal

Whilst during early phases of working any accessible coal was worked, as the effort to reach the seams increased so the decision to invest capital to do so had to be more carefully considered. The deeper the workings were, the more it was important that the thickness and quality of the coal along with the proximity to the market made the effort commercially viable.

With levels being driven from 1625 to 1750 in east Bristol to drain the Kingswood Hill coal works to a depth of 200ft (61m) and the introduction of Newcomen engines from about 1745, pits then working could not afford to cut thin seams or bring poor quality coal which was difficult to sell. Therefore, generally the capital and the efforts required to develop seams was directed where the return was greatest. In 1875, an unattributed contributor to the book ***Bristol and Its Environs*** remarked that:

> ***The whole of the seams are non-fiery, worked with naked lights and run from five feet to 22 inches. Thinner than this they will not pay for working.***

In Kingswood, the Toad Vein group were worked extensively before 1835; the main coals of this group were the Doxall, Upper Five Coals and the Kingswood Toad Vein itself. Locally some other seams thickened or improved and were worked over a limited area, but these were the main ones.

The Kingswood Great Vein group were the main coal seams worked throughout Kingswood by 1840. The best of these was the Kingswood Great Vein itself, which Handel Cossham described in 1875 as:

> ***a steam coal rivalled only by some of the best Welsh coals. It is not only valued as a steam coal but is largely in use as a house coal in the neighbourhood of Bristol.***

Also of merit were the Lower Five Coals, Thurfer, Giller's Inn and Kingswood Little veins, and below these, among the Red Ash. Deeper still the Ashton group contained at least three good seams in the Great, Little and Top seams.

None of the latter (the Ashton seams) crop at the surface in Kingswood and were only worked at Easton and Speedwell at depth in this district.

Some of these seams were worked nearby. Certainly, the Kingswood Great vein, which was recorded on the mine plans to be present beneath the property, was worked by Speedwell Colliery. Most of the workings of this pit were to the north of the site, in the Middle coal measures. The other seams of this group will be present beneath the site, but are deep. Others above this group may exist and are likely to have been sufficiently thick or of good quality to have been workable.

Among those seams is a set of around six in number, which were of the Toad Vein group and are present above these Kingswood seams. The deepest of these Toad Vein seams is generally known as the Trough Vein, with the Toad Vein itself probably 40ft (12m) above that seam. Several workable coals were found above that in most parts of the coalfield, although the position here is less certain.

The highest seam in the Toad Vein group is the Doxall Vein (called the Brittain's seam in Soundwell), a seam which was worked with some success in the early part of the 19th century, but the workings were by no means extensive. Occasionally, as in Redfield, the seam shown on the mine plans as the Doxall, is in fact, the Kingswood Great Vein, which has caused some confusion.

It is not known with any certainty the sequential distance between the Doxall Vein the highest of the Toad Vein group and the Kenn Moor, the deepest recognised seam of the Downend formation, according to some sources, on the southern limb of the anticline. John Anstie estimated it in his general section at around 900ft (275m) which is probably too much; Kellaway and Welch are more cautious and say:

> ***On the southern limb of the Kingswood anticline, the seams between the Doxall Vein and the New Smiths Coal (the seam above the Kenn Moor seam) are little known although some may have been worked quite extensively in the distant past. Among them are the so-called 'Dolly' and 'Plox' Veins, but the nomenclature of these coals was described by Anstie in 1873 as "local" the seams being 'not always in the order in which they are given by local miners' Attempts have been made to resolve these difficulties and to relate the Kingswood coals to those of Warmley and the Golden Valley at Bitton, but no success has been***

achieved. Even the correlation of the New Smiths Coal marking the base of the local pennant sandstone is open to question and the position of the upper boundary of the old Lower coal series is only a rough approximation.

Certainly on the southern side of the anticline, what can be said is that a further set of seams lie stratigraphically above the Toad Vein group and were found in Easton. Among these were some very poor seams such as the Whitehall, Queenbower and Polecat. Although all these seams received some attention at the outcrop and occasionally in the shallower workings, mostly from the 17th and early 18th centuries, in Easton there is no certainty that they were present in this area. Another group, the Stibbs series, lie above these in Anstie's sequence of seams on the southern limb and these lie just below the Downend formation, which all crop to the south. The Stibbs seams here are believed top crop to the north of the site and were worked by the Air Balloon Colliery to the south of the site. These seams will be present beneath the site therefore at a depth somewhere between their cops and the depths recorded in the Air Balloon shaft.

On the northern side of the anticline, many of the coals found on the southern side are absent, but the same uncertainty exists surrounding the distance between the Downend formation and the deeper seams of the Middle coal measures. On the northern limb the deepest recognised seam of the Downend formation is the Hen Vein and the strata below it effectively barren until the Doxall Vein is reached. Kellaway and Welch say:

The distance from the Doxall Vein to the Hen Vein can only roughly be determined and little is known about the seams which occur within the intervening strata. In the view of Anstie (1873, p42) and other early geologists the apparent absence of workable coals between the Doxall and Hen Veins in the northern limb of the Kingswood anticline was due to faulting. In this way Anstie accounted for the statement of old miners that the seams on reaching the anticlinal from the south 'rolled over and die out'. However, it seems more probable that that the change is due to the original deterioration of the seams rather than to structural causes.

Bristol coals were essentially bituminous and most have strong coking properties. From around 1875 about 40% of the output won by the 3,500 or so miners then employed in Bristol went to make coal gas. Works at Eastville and elsewhere were significant customers. Their specifications were strict and could vary with demand which meant that the production of a seam, brought to bank might not be sold as had been hoped.

Contemporary records show that Yate Colliery for example, met this obstacle frequently. This could in turn mean that poorer seams had then to be sold at a discount and there was therefore a further incentive to leave indifferent seams in the ground in the hope that they could eventually be worked economically.

Just because a seam exists therefore does not mean it was worked; the thickness, quality, depth of the seam and distance from the market were all factors which affected the decision to work or ignore a coal seam. Whilst during early phases of working any accessible coal was worked, as the effort to reach the seams increased so the decision to invest capital to do so had to be more carefully considered. The deeper the workings were, the more it was important was the thickness and quality of the coal along with the proximity to the market made the effort commercially viable.

1.3.3.7 Risk factors

It is clear from the foregoing sections that the type of coal its thickness and its depth can affect the possibility of whether it was worked or not. Equally the condition of the roof, floor, method of working and possibly reworking can affect ground stability even after an extensive period of abandonment. Coal workings are therefore not all the same nor do they present the same level of risk.

Subsidence occurs through general consolidation and long term settlement of fill within voids. These movements include:

Crush or thrust, where a seam has been worked by pillar and stall and both a hard floor and a strong roof exist. If pillars of insufficient size and strength are left, these will be unable to resist the roof pressure over time and cause the remaining pillars to crumble.

Creep, where there is a strong roof, but with a soft fireclay floor. Changes in the water level can also denude the floor and destabilise it and therefore the integrity of the pillars.

Failure of roof supports in abandoned underground roadways. This can be long after abandonment where props were of strong and water resistant timber. Oak props and bars, still in good condition after around 250 years of service were found in an underground roadway during excavations when the Bristol ring road was under construction in the 1980s near Barr's Court, south west of Cock Road, in the east of Bristol near Warmley and Longwell Green.

Typical settlement in a timber supported roadway

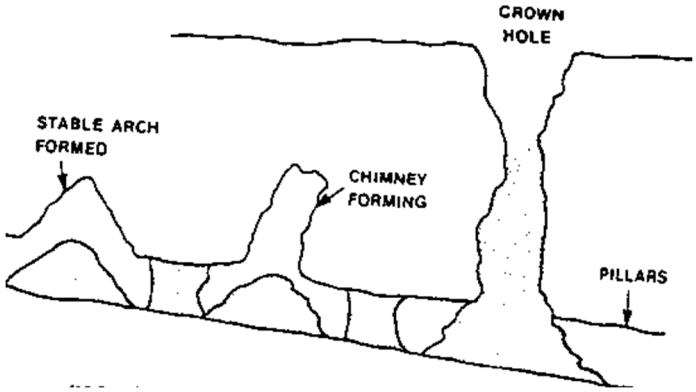
Sudden changes can also occur after this process is complete for example when the equilibrium of the ground is altered. This is often the result of water, particularly groundwater levels since that can change the engineering properties of soils but other factors can also have a material effect. Among these are additional weights on the ground by materials, or buildings and structures, vibration from movements, particularly heavy plant or traffic and earth moving or blasting in the vicinity. Subsidence from more recent deeper mining beneath the site can also impact on old workings close to the surface. Several studies have been undertaken around the subject. Generally these show that most subsidence occurs in superficial deposits above the ***rockhead***. Rockhead is defined as the boundary between unconsolidated deposits and bedrock regardless of its state of weathering.

I Statham and G Treharne of Arup Geotechnics assert that recent research on South Wales mining subsidence has assembled a database of over 400 subsidence incidents attributable to abandoned mining. They found that:

> ***Over 75% (of cases) were collapses into workings at outcrop; or mine entrances. The remainder were almost always crown holes, whose upper limit of migration through rock was generally 8 to 12 times the void height.***

Whereas this research was conducted in South Wales, the seams in Bristol are not functionally dissimilar and if anything are thinner still. The findings are therefore germane to this area also and in consequence we suggest it is beneficial to discriminate the shallow mining phase between three separate sub phases albeit we recognise that mining of each sub-phase may have been undertaken simultaneously across a district.

These phases are considered in ***Section 3.1 Mining Legacy***



Formation of chimneys, stable arches and crown holes- courtesy of Arup Geotechnics

Shaft collapse

The NCB booklet The Treatment of disused mine shafts and adits (1982, p14) identifies the issues unequivocally. It says

The ground near a shaft may subside or even suddenly collapse. Collapse can take place at both unfilled and if an insecure fill is lost, at filled shafts. At a filled or partially filled shaft the movement may show as a hole roughly equal in diameter to that of the shaft if the lining remains intact, or if the ground is solid, unbroken rock. Shaft linings deteriorate and if and loose rock or wet surface deposits flow into a shaft, a crater with sides sloping at the angle of repose of the materials will be formed – the radius at the surface of the crater corresponding to the depth of the slipped material (see Fig 1).

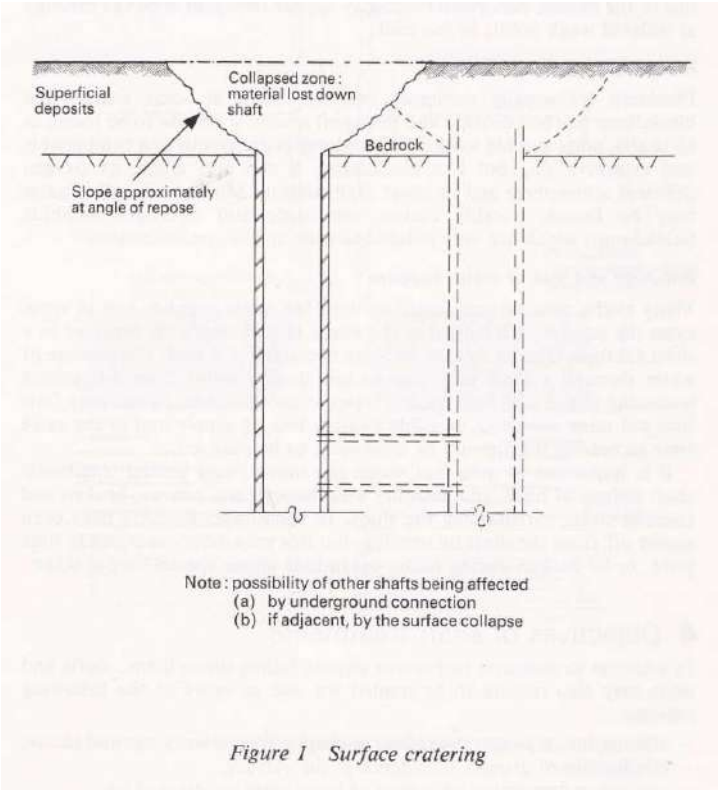


Figure 1 Surface cratering

In a collapse, other shafts nearby or connected by underground workings may be affected. Ground movement frequently occurs as a result of unusually wet or dry weather. Assuming that general consolidation and long term settlement of a shaft have ceased, subsidence or collapse may result from

- Change in the equilibrium of the fill or the surrounding ground; and
- Overloading or shock to the surrounding ground.

Apart from concealed shafts, or recorded shafts where the type of fill or method of stabilization is unknown, other considerations include sub surface hazards such as hidden fan (ventilation) drifts, water levels and mine gas release.

The first two are essentially voids which present a danger of collapse, Their potential presence should be considered and appropriate caution exercised in site investigations or groundworks,. The third is a more specific risk

Mine gas

Almost all former collieries will have some gas trapped underground. The only way this can be released into the atmosphere is through a mine entry which is either unfilled or uncapped, or where the integrity of those measures has been compromised, perhaps by a partial collapse.

The main gases are

Firedamp – methane, a chemical compound with the chemical formula CH_4
Blackdamp – ***Carbon Dioxide and Nitrogen***

Both are asphyxiates, Firedamp is explosive also, whilst Blackdamp will be found in virtually all shafts. Other more poisonous and toxic gases are rarer but can occur, particularly after disturbance.

Geological sheets sometimes show a single shaft symbol where more than one shaft may once have existed and different sources can plot shaft and crop positions with marked variation, and caution should therefore be exercised in interpretation. Ground conditions can provide useful clues; depressions, voids and waterlogged ground.

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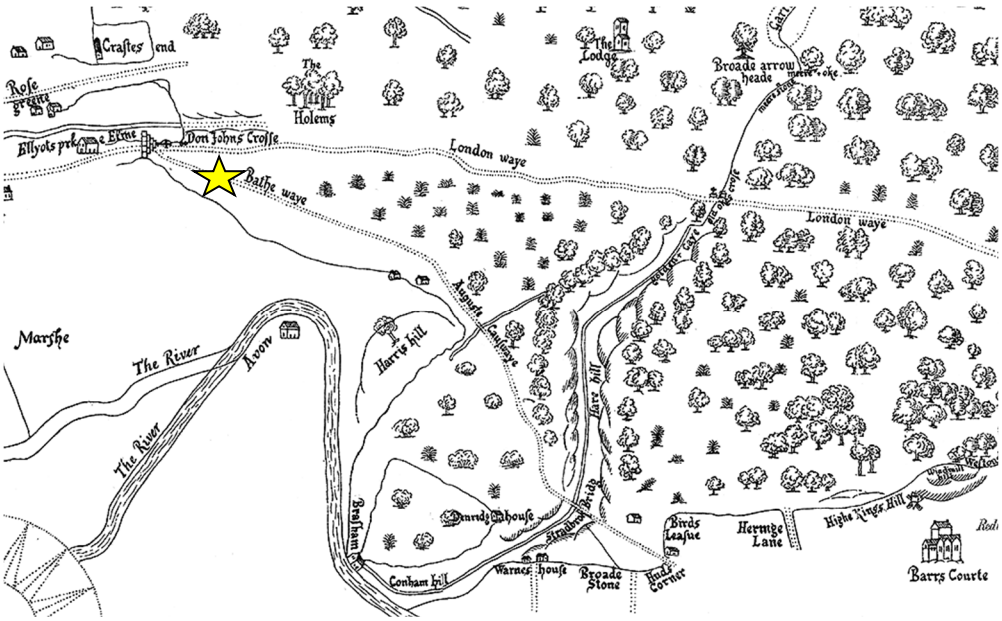
1.4. Review of available information from the searched sources.

1.4.1. Map record

As has been shown Kingswood Chase was wild and remote even after it was split into liberties and gradually developed from the 17th and 18th centuries. A map in Ellacombe and Brains' History of the parish of Bitton used a map in the then possession of Thomas William Chester-Master, a leading coal owner. This showed the area to be almost exclusively still forest, with just a few quarries on the periphery of the chase and some houses along the various main ways out of Bristol. These, as described elsewhere were the Westerley and Sodbury Waye, through Fishponds, the Mangotsfield Waye through Staple Hill, the London Waye, through Two Mile Hill and Warmley and the Bathe

Waye, through Hanham.That part of the forest which became Air Balloon Road is between the London Waye and the Bath Waye at the western edge of this interesting map.



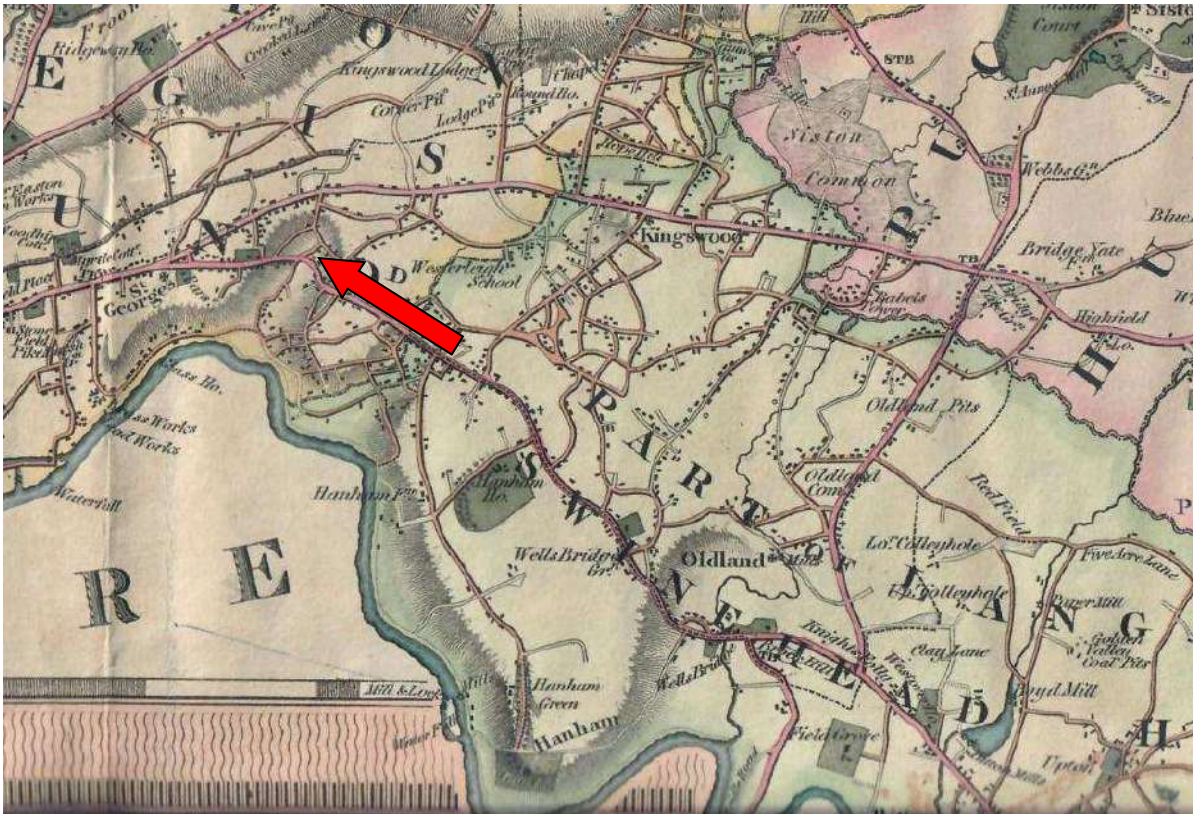
Extract from map in possession of the Chester Master referred to by Ellacombe and Brain.

One of the earliest useful maps is Isaac Taylor's of 1777. Earlier maps existed but only covered Bristol, or were mapped at a scale which was unhelpful. Taylor's map showed Kingswood and the ribbon development that was being established along the roads which crossed the chase. The features shown, included some engine houses such as Soundwell and Warmley, along with many coal works. Recognisable landmarks such as Kingswood Lodge (but not Barr's Court) are shown, as are coal pits north of the site. Nothing which might indicate mining is shown in the vicinity of Air Balloon Road.

By 1800 when Benjamin Donne's map of that date was drawn this area was still considered too far distant and too rural to be included in his map of Bristol. Even by the time of the 'Old Series' maps which cover the Bristol area, one of which was published in 1817, the other 1830, the position had scarcely altered. Surveys for these were carried out from the mid-1790s into the early 19th century and from these early maps it is evident that the district's rural character was essentially intact, apart from some collieries, latterly the railways and further to the north west, brickworks, and industrial concerns such as the Spelter Works at Conham. There is nothing to suggest there was then, or had been previously, mining in this location.

Bryant's 1824 map of Bristol shows no pits working in the area at that date; although this cannot be relied upon to indicate that none were working.

Abstract of Bryant's map of 1824. A red arrow marks the approximate position of the site, a larger abstract of which appears below.



Abstract of Bryant's map of 1824. A red arrow marks the approximate position of the site. A detail of which is on the previous page.

Ordnance Survey maps were not produced until the early part of the 19th century. The first were the 'Old Series' maps two of which covers the Bristol area, one published in 1817, the other 1830.

The surveys for these were carried out from the mid-1790s into the early 19th century and from these early maps the area on which Air Balloon Road now stands was demonstrably already partially developed at that time.

No coal pits are shown in this precise location on the Old Series Map and some of those marked on the Bryant map (further north) are omitted. One marker is the location of a residence called the Holmes. North of Air Balloon Hill Road on this map; it appeared also on the Ellacombe map of 1610, but is missing from the Bryant map. Nevertheless it helps to identify the area on which Air Balloon Road was later built, which is due south of this feature on the early map.

Unfortunately no tithe maps survive for this area.

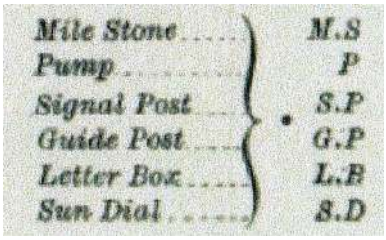
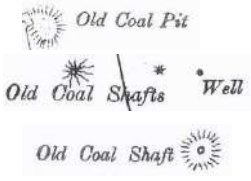
The original village of St George was much smaller and the centre was to the east of this site. Some properties existed in the early 19th century as the Old Series Map shows and more were added in the late 19th century, as our map abstract from the First Edition Ordnance Survey (County Series 1/2500 map) demonstrates. What was still at that time, a modest settlement of a predominately rural nature, grew substantially when the electric tramway was introduced, in around 1895. According to many local historians this opened up the area and extensive development took place after that date. The original houses in Air Balloon Road are of this period; the 1903 map showing that they had been built by that date. The Air Balloon Public House had also been established by that time. Further properties were built in the middle and toward the end of the 20th century.

There is no record of wells present on the site although there are some in the immediate vicinity, mainly along and to the north of Summer Hill Road. A water source is likely to have been necessary south of this in the former fields; even though there was no housing here originally and the market gardens were working at some distance away. These fields were probably used for livestock farming which would require surface tanks, probably supplied by a well, possibly from one of those on the Air Balloon Hill Road or on the southern side of Summer Hill Road. Often where there is an inexplicable number of wells that can suggest that the shafts were sunk originally as coal shafts. That is not the case here, although interestingly there is such a line of wells north of Summer Hill Road.

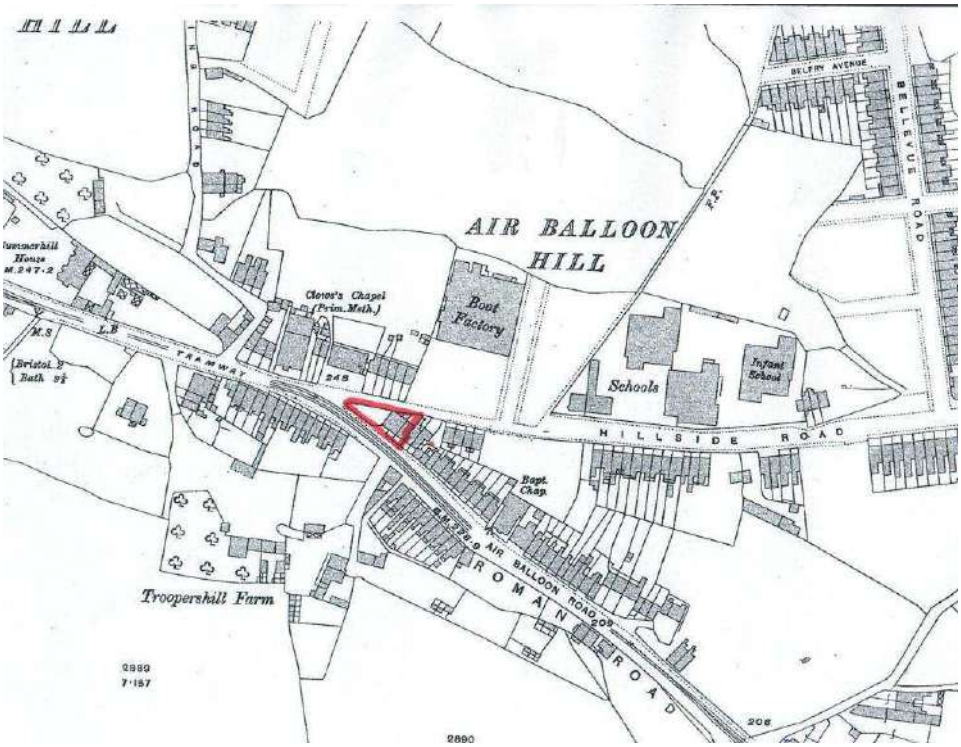
There is a pump shaft in the immediate vicinity (within 500ft (152m)). This was located near the Methodist chapel. Such shafts were identified by the letter 'P' on the map legends.

The Ordnance Survey characteristic sheets issued for 1/2500 maps on 9th April 1893 show how old coal pits and wells were recorded on those maps. No such symbols appear here and we can conclude that that there were no old coal pits recorded in this location by those cartographers.

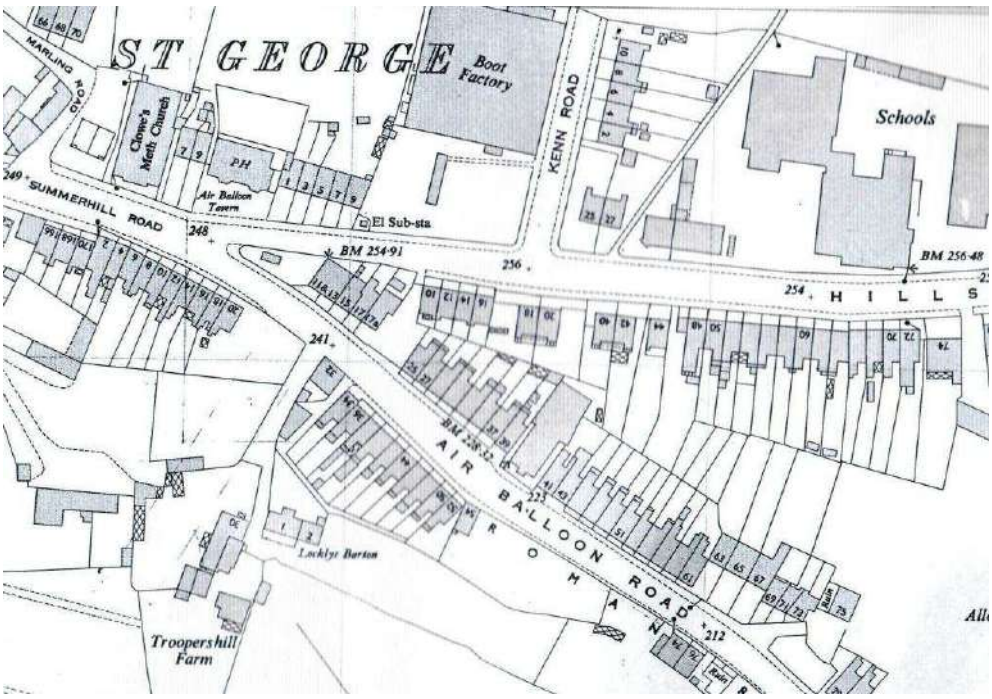
The table below shows the labels and symbols used by the OS to differentiate between pumps, wells and old coal pits and mine shafts.

Ordnance Survey County map Pump Shaft	Ordnance Survey County map Well Shaft	Ordnance Survey County map Mine Shaft
		

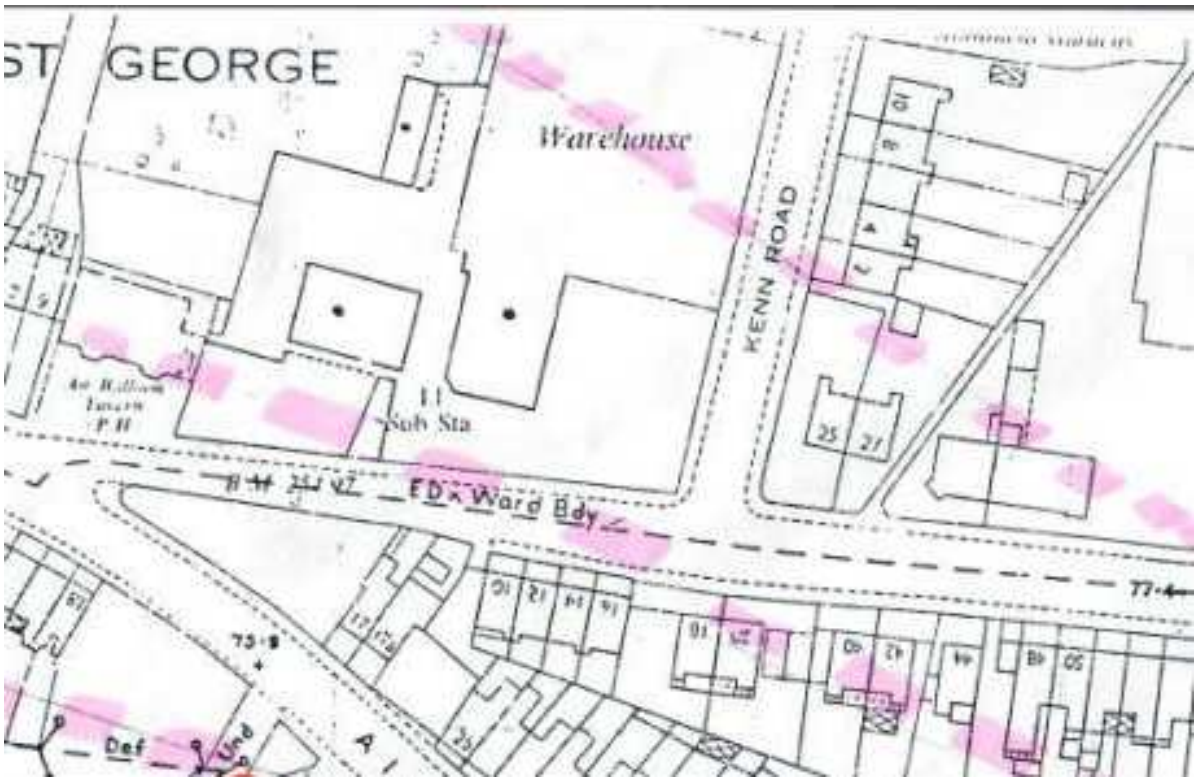
Prior to the provision of the mains supply wells were the main source of domestic and commercial water, but troughs in fields were often fed by water piped from springs. However according to the map record, no shafts for water drawing have ever existed here, on this precise site.



1918 map OS map



1950 OS map, 1/1250 and, next page, 1967



1.4.2. Previous reports & desk studies

1.4.2.1. The Residential Coal Authority Mining report (001)

There is a recent Coal Authority report which has been submitted with the risk assessment request.

The report, which is dated 18th March 2018 states that:

> ***The property is in a surface area that could be affected by underground mining in 2 seams of coal at 470m to 600m (1,541ft – 1,968ft) depth and last worked in 1885.***
>
> ***Any movement in the ground due to coal mining activity should have stopped now.***

Where the Coal Authority are concerned that there might be a possibility of shallow coal and unrecorded workings within the seams they normally include the following caveat:

> ***In addition the property is in an area where the Coal Authority believe there is coal at or close to the surface. This coal may have been worked at some time in the past. The potential presence of coal workings at or close to the surface should be considered prior to any site works or future development activity. Your attention is drawn to the Comments on the Coal Authority information section of the report.***

This caveat is expressed here, and in all probability refers to the Stibbs seams.

Certainly, the presence of shallow coal is indicated from other sources, the Howard Humphreys Study (see section 1.4.2.3 below), which suggests there is shallow coal.

The Coal Authority report records the presence or absence of nearby mine entries. It states that:

There are no known coal mine entries within, or within 20 metres of, the boundary of the property.

This statement is endorsed by the geological sheets, the Howard Humphreys study and Bristol Coalmining Archives report. There is however one recorded mine entry within 500ft (152m) of the property. This is the Air Balloon Pit which is about 100ft (30m) to the south.

Where the Coal Authority believes that there is a reasonable possibility of unrecorded shafts the following warning is normally given:

Records may be incomplete. Consequently there may exist in the local area mine entries of which the Coal Authority has no knowledge.

This warning is given here. We may therefore conclude that the Coal Authority consider that an unrecorded shaft is possible.

The report does not suggest that coal mining subsidence, former open cast workings, mine gas, coal mining geology (faults) or any other surface hazards have ever caused problems at this property or within 50m (165ft).

1.4.2.2. Bristol Coalmining Archives Coal report(s)

A report was commissioned for this site in 2017. This report, which is dated 12 July 2017 states that:

The property is situated in an area that was worked for coal in the 18th, 19th and 20th centuries and is adjacent to but not over the workings of Speedwell Colliery. The property will however be over the workings of Air Balloon Pit and possibly an earlier concern.

The geological sheets show that the Parrot Vein outcrops to the south and dips in that direction, away from the property. This seam and any workings it may contain will therefore be of no concern.

The next seam beneath the Parrot is the thin Brimstone Seam, around one foot in section and lies 35 feet beneath the Parrot. This seam is likely to be present beneath or just to the south of the southern boundary of the property and may have been worked along the crop at an early date.

Crop workings were essentially linear quarries from which the most easily accessible coal was extracted, down to a depth of about ten feet. Once exhausted these trenches would be backfilled and the land returned to agriculture.

The Muxen Vein, which could be up to four feet thick is situated 120 feet beneath the Parrot Vein and with therefore outcrop around 150 feet to the north of the property and is likely to be present beneath this part of Air Balloon Road at a depth of 50-70 feet.

This seam may have been worked beneath the property from Air Balloon Colliery. Unfortunately no plans survive from this early concern, if indeed they ever existed, as the pit closed prior to the requirement in law to keep records of this nature. Unrecorded workings in this seam beneath the property within this range cannot be ruled out.

It adds

Other seams are likely to have been worked by Air Balloon Pit at depths ranging from 100-520 feet. These seams, known as the Stibbs series, with individual names, such as, Drake, Scrag, Smiths Coal and Dolly range in thickness from one foot to three feet in section and

will have been worked for three to four years only as the coal was variable and ultimately uneconomical. Generally workings of this depth and age will be of no concern, ground movement having normally long since ceased.

And

There are deeper workings still in the area from Speedwell Colliery, which worked a number of seams from the 1700s until closure in 1936.

Abandonment plans of the colliery show that these workings stop 250 feet to the north at a depth of 1,898 feet and 350 feet to the east at 1,656 feet deep.

And of mine entries the report says:

None are known inside the boundary of the property or within 50 feet.

The nearest recorded shaft is that of Air Balloon Pit, 80 feet to the south, and is known to be 606 feet deep. From this distance it is unlikely to affect the property.

A pump shaft is located 180 feet to the south west. These were common features, used to draw commercial and domestic water before the provision of the mains supply. These shafts were usually no more than 3-4 feet in diameter and will be of no concern.

Bristol Coalmining Archives reports uniquely comment on water levels which were a particular feature of the Kingswood coalfield. But in this precise location whilst there are water levels in the vicinity (within 550ft (152m) there are none beneath or near to the property. It says:

None are known in the vicinity.

The report also agrees with the Coal Authority report there is no known settlement around the property. It says:

We have no knowledge of damage to property caused by subsidence specifically attributable to mining activity the immediate area.

1.4.2.3. Environmental Geology Study in the Bristol Area

This was conducted by the Geotechnical Engineering Unit of Consulting Engineers Howard Humphreys in the mid-1980s. The study considered most but not all of Bristol and Kingswood and fortunately does cover the area within which stands Air Balloon Road.

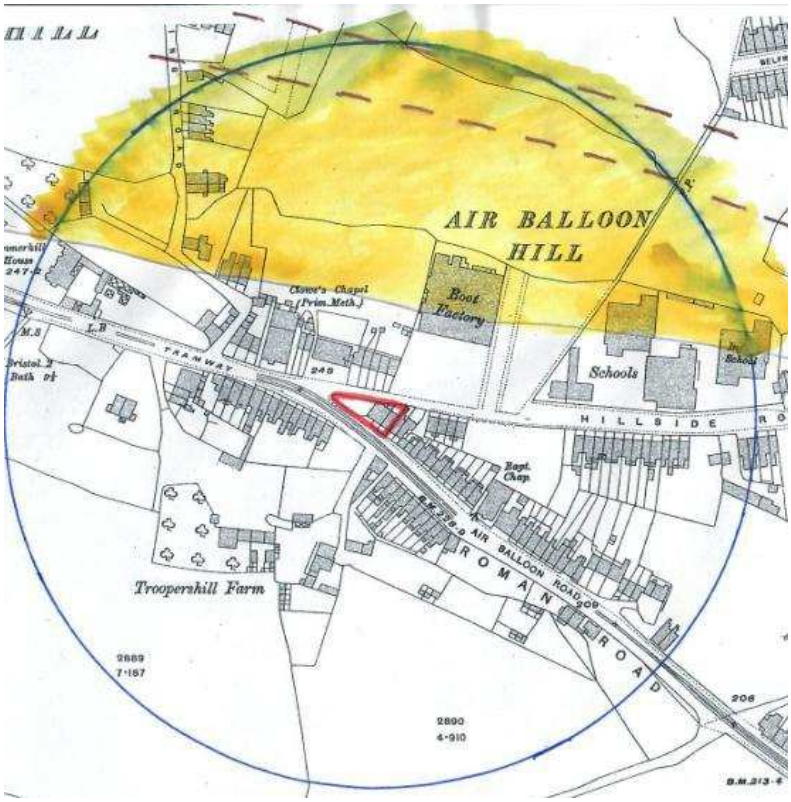
This source had the benefit of close scrutiny of the mining plans, geological sheets and other material held by the then NCB Survey Office which at that time was at Radstock. The study was conducted for the then Department of the Environment.

It suggested that the depth to the first coal seams beneath this part of St George was within 25m of the surface and this would therefore mean, that there was shallow coal as the Coal Authority report suggested. That contention will be considered in Section 5.2 Probable Stratigraphy.

The study suggests that the dip of the seams was between in 1 in 1 (45°) and 1 in 3 (18°) over the whole. Clearly this is a considerable range, and the exact seam gradient will therefore have an effect on how deep the coal might lie.

No faults are shown across the site or close to it although one is recorded south of Air Balloon Road.

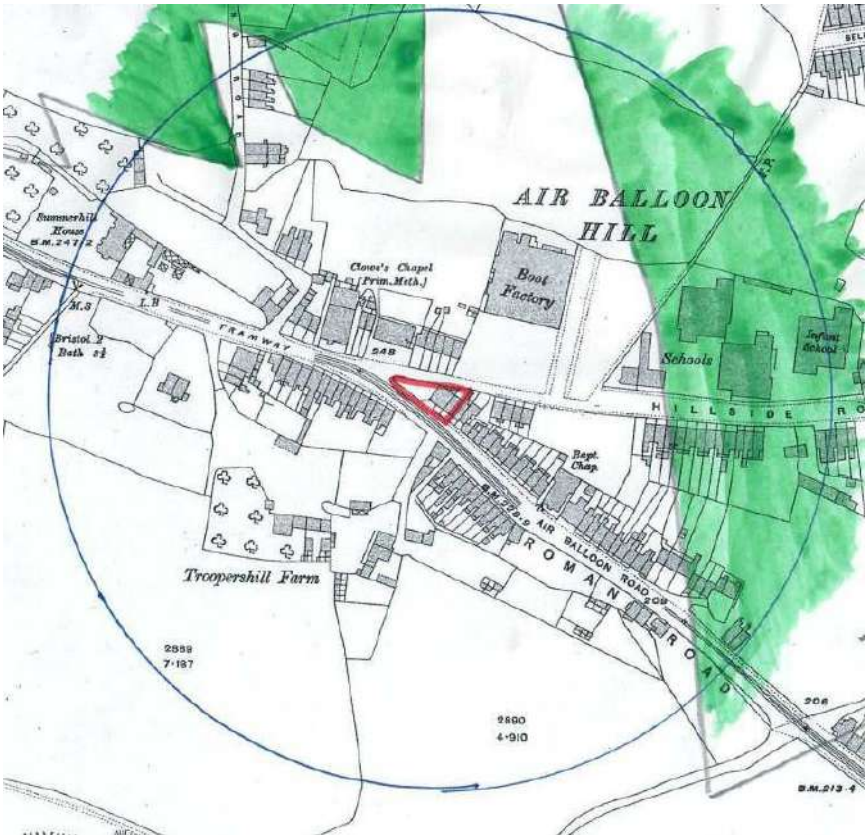
The report shows workings beneath the site pre 1872, in the Stibbs seams. All crop to the north of the site and none would, on this basis lie at shallow depths.



Workings in the Stibbs Series seams pre 1872 according to the Howard Humphreys study (Theme Map H7 (ii)) plotted on the 1918 composite OS county map. Below these are the seams of the Whitehall group, and below those still, the Kingswood Toad

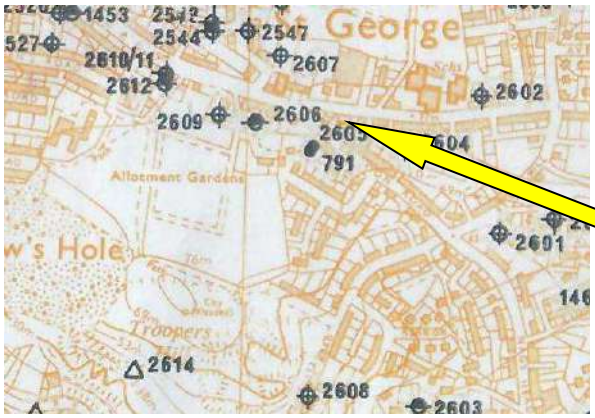
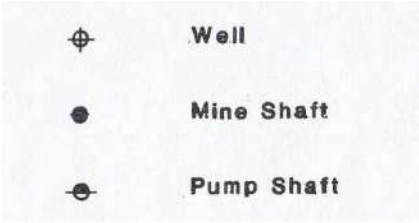
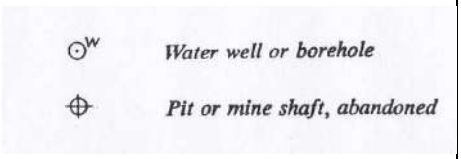
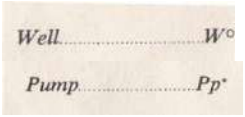
These seam positions which are used in the study are broadly similar to those drawn up by William Sanders and later by John Anstie in his 1871 report to the Coal Commissioners, and these were meant to be indicative only, so caution should be exercised when considering this.

The report shows workings beneath the site post 1872, in the Great Vein which concurs with the Bristol Coalmining Archives report.



Workings in the Kingswood Great Vein post 1872 according to the Howard Humphreys study (Theme Map H7 (ii)) plotted on the 1918 composite OS county map

The study also shows mine entries, pump shafts and wells (Theme Map G7). As the authors of the study chose to use the widely recognised symbol for a disused mine shaft to represent a well, this has often led to confusion when identifying them. Further, where the study shows a pump shaft, some reports have incorrectly interpreted this as mine pumping or engine shaft. This can lead to erroneous conclusions which are unhelpful. Near to this site such shafts of all three types exist, but none are shown as being present by the Study on the site itself.

Symbols used for shafts – mine, pump & wells	
(a). on the Howard Humphreys Study; 	 *Approximate position of the application site* *Extract from Theme map G7 courtesy of Howard Humphreys Geotechnical Unit*
(b). on the geological sheets;	
(c). and on OS maps.	

1.4.2.4. Geological sheets & memoirs

As has been shown, the geological sheets indicate that the surface geology in the area is Downend Member - Sandstone. This is a sedimentary bedrock formed approximately 310 to 315 million years ago in the Carboniferous Period. Coal seams are by this source shown to outcrop in the vicinity, that is within 500ft (152m) although none across the site itself. The nearest recorded coal crop on the geological sheet (67SW) is the Parrot Vein, in the Downend formation, about 150ft (46mm) to the south.

From the map it can be seen that, according to this source, there is one recorded shaft in the vicinity that is with 500ft (152m). This is the Air Balloon shaft 150ft (46m) to the south, sunk, it would appear on the crop of the Parrot Vein.

The sheets show also two faults which were proven in the Great Vein, These are to the north west, north east, east and south east of the site. Their presence explains why the Great vein and its related seams were not worked beneath the property.

The eastern fault was proved at its nearest point, 350ft (107m) to the east and the western fault, 180ft (55m) to the north. This fault may continue south beneath the western edge of the property.

Surface geology at the site from Geological sheet ST67 SW

Surface geology within the district, from the same map. Courtesy BGS both maps.

The boundaries of the plot on each abstract are indicated by a red line

The sheets indicate although do not state unequivocally the seam to which this pit was probably sunk. This was, from other sources, the Stibbs seams. The sheets tell us that the pit was 606ft (185m) deep. The pit is likely therefore to be working seams which outcrop to the north in the vicinity of or further to the north of the property. John Anstie, a mining engineer who visited the area in the 1870s recorded these as the Drake, Scrag, Smith Coal, Dolly and Plox seams. Elsewhere these same seams are ascribed other, local names but are usually recorded as the Stibbs seams. The Howard Humphreys Study records them as such although does not identify individual names. Neither the geological sheets, nor the Geology of the Bristol Coalfield memoir by Kellaway and Welch mention the Stibbs seams.

Kellaway and Welch (p99) do however give an account, of the measures within the Downend formation, among which is the Parrot which like all the others of this formation crops to the south and they also allude to those seams below that group, in which we have more interest. They say:

> ***From Hanham to Oldland Common the productive part of the Downend formation can be traced by belts of old workings to the margin of the concealed area at Redfield Hill and***

Bitton. The principal coals worked in this belt were the Parrot, Buff, Rag and Millgrit veins, which, with the New Smiths Coal were extensively worked. Though commonly less than 24" thick the Parrot Vein was especially valued because of its superior quality. Anstie (1873, p37 fig 8) noted that by 1871 the lowest level of the workings of the Parrot Vein (there 18" thick) in the New Golden Valley Pit [6860 7102] was already 640 yards below the surface.

Above the Millgrit Vein 2 or 3 thin coals including the Fig and Francombe veins (see California Colliery, fig 27) have been proved in massive pennant sandstone but that none was of workable thickness.

There is also evidence of seam splitting. Thus the Millgrit is said to split into an Upper and Lower Millgrit at Hanham [6373 7204} and Old Pyllemarsh [6174 7298] collieries.

And,

The identities of the seams shown on the published maps (six inch 67 SW and one inch sheet 264) are doubtful, especially at White's Hill and Hanham where the rocks may be structurally disturbed.

Below the Parrot, the distance to the lower coals was variable. The source says:

The Winterbourne Marine Band has nowhere been located in this area and the base of the Downend formation cannot be accurately determined: It is almost certainly situated between the Parrot Vein and the New Smith's Coal which are separated by about 700ft (213m) at Bitton. At California Colliery (between Bitton and Hanham) the interval was less.

Hereabouts the interval from the Parrot vein to the New Smith's Coal varies from 380ft to 480ft (116-146m) the changes being due to rapid variations in thickness both of the coals and the intervening measures.

Consequently some uncertainty can be expected further west still around Air Balloon Road. Further uncertainty arises because the geological sheets cannot be relied upon completely according to the geologists (Kellaway and Welch) who compiled them. The absence of information surrounding the seams below the Parrot seam is unhelpful, but it is likely that the outcrops will exist where or close to the positions identified by the Howard Humphreys Study.

Of the much deeper seams, the geological sheets have limited information. Seam horizons in the Kingswood Great Vein are shown but conclusions are from this information impossible to draw as the locations are too far away for reliable judgements to be made. Fortunately more accurate information is available on the mine plans (see below).

1.4.2.5. Mine plans

There are plans belonging to the East Bristol Coal Co. for the area some of which were based, it is thought, on verbal reports given to Anstie, Cossham and others. Certainly this is true of the earlier workings.

Of the earlier pits, workings were mapped as a general overview which show the extent if not always the depth of the seams or the dates worked.

Later workings, which were subject to the provisions of the Coal Mines Regulation Act 1872, did show depths to the seams worked, as the plan below shows. From this we can see that the Kingswood Great Vein was not worked beneath the property but was worked in 1879 to the west and 1882 to the east.

These plans show other workings in the area but no shafts. Had any of significance existed these would have been recorded however tentatively; the Air Balloon pit is for example shown on the plan as a pencil annotation. The plan show seam horizons in the Great Vein on the far side of the two faults which surround the property but none beneath the site. On the eastern side the Great Vein is at a depth of around 1,500ft BOD, with a spot height there of about 255ft (78m). This indicates that the Great Vein lay and was worked at a depth of around 1,755ft (535m) whereas on the far side of the western fault the workings are deeper, at about 1,900ft (579m) BOD, plus 248ft (26m), equating to 2148ft (655m). These depths are a range within which the Coal Authority depths fall.

These are the nearest deep workings and are from Speedwell Colliery in the Great Vein. A second seam, the Lower Five Coals was worked nearby but not beneath the property and this is true also of the Kingswood Little Vein, the deepest of the three. No workings are shown in the Toad Vein group, the coals which exist between the deep coals mentioned above and the Stibbs seams which are believed to exist (but are not shown) at shallow depth.

No underground haulage roads or other features are shown on these plans.

1.4.2.6. Shaft sections & boreholes

There are shaft sections in Prestwich and Anstie, and also a rudimentary one given on the geological sheet within 500ft (152m). The closest section, indeed the only section within this range is the Air Balloon Colliery shaft section off Air Balloon Road, about 100ft (30m) to the south, and we reproduce it below overleaf.

Shaft Section : Air Balloon Colliery, off Air Balloon Road, Bristol (Single shaft)		Grid Ref: 6309 7337 Treatment Unrecorded.		BGS sheet ST67SW One inch 264	
Source, Prestwich, 1871 p55 Dip unrecorded°		Imperial To		Metric To	
Surface + 230ft	(i.e 230ft AOD) 55m	Thickness	Cumul	Thickness	Cumul
Coal Measures,		180ft	180ft	55m	55m
Drake Seam		1ft 6 in	181ft 6 in	0.45m	55.45.
Coal Measures		58ft 6in	240ft	17.8m	73.25m
Scrag Seam		3ft	243ft	0.91m	74.16m
Coal Measures		93ft	336ft	28.3m	102.46m
Smith Coal seam		1ft 4in	337ft 4 in	0.4m	102.86m
Coal Measures		58ft 8in	396ft	17.9m	120.70m
Dolly seam		1ft	397ft	0.3m	121.01m
Pit Bottom 600ft (183m)					

NB. Prestwich says that the bottom of the shaft was 200 yards, which is 600ft.

The geological sheets show pit bottom as 606 ft. Anstie says there is one seam below the Dolly which he identifies as the Plox; this was not, he says in ***The Coalfields of Somersetshire and Gloucestershire*** (p39) proved.

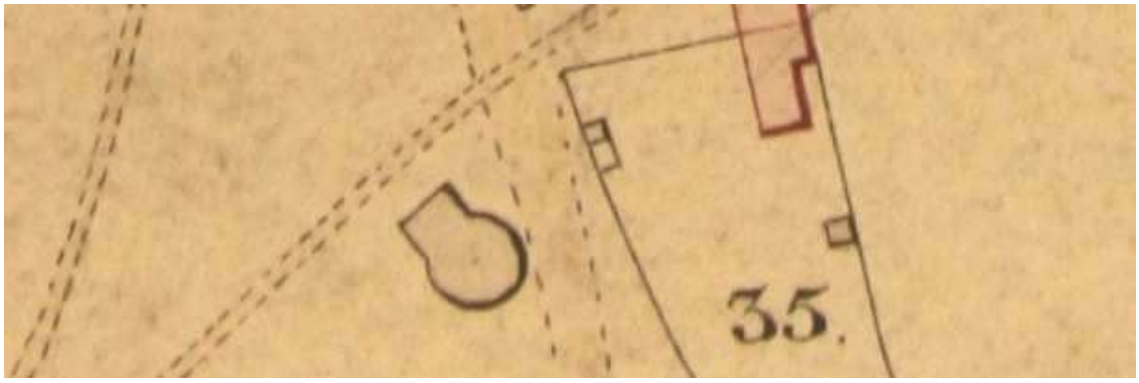
There are no boreholes on the site in the public record or of which we are aware from our own archive. Nor are there any in the immediate area that is within 500ft (152m).

1.4.2.7. Map Record, Leases and archive material

In addition to those maps already explored often there are often others, including tithe maps and estate plans which, on the exposed part of the coalfield, sometimes indicate structures once connected with collieries.

Unlike further north, in Stapleton, to the north east in Mangotsfield and to the east in Bitton where there are useful estate maps some of which date from the late 18thcentury, here there are none of that nature known.

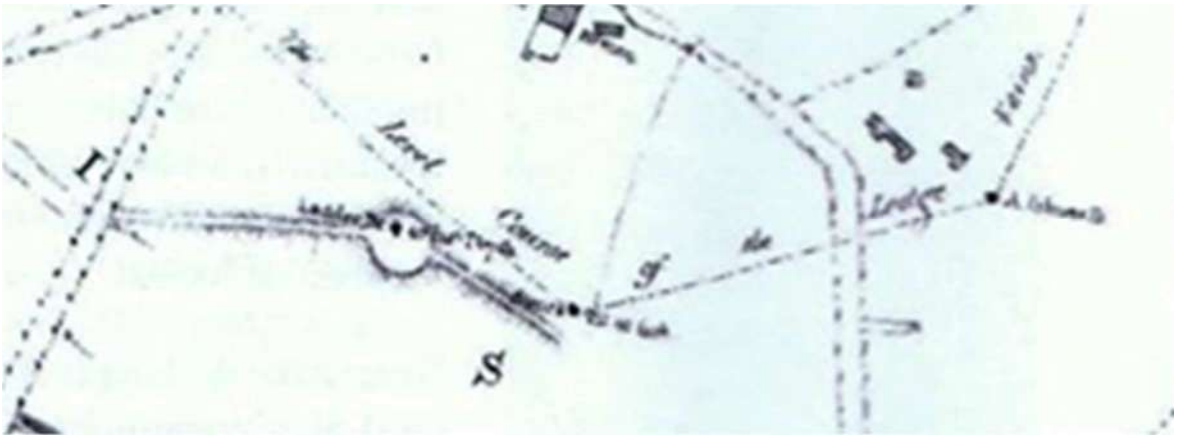
Later maps such as those produced under the tithe laws, often date from the 1820-1850 periods and can show features of mining heritage with considerable detail. This might mean ventilation fans, horse gins, and engine houses or spoil heaps among the most visible. A good example of these features when they are shown can be seen at Siston, where horse gins are shown along with their distinctive houses (see below) working pits, which were in the region of 100-120ft (30-37m) deep.



These worked the coal in close proximity to each other over a narrow band, ranging from formerly worked areas to deeper inaccessible coal.

The tithe was essentially a tax, and in consequence the purpose of the map was to identify titheable assets from which revenue could be drawn. They were not necessarily a complete representation of what was on the ground, just a record of functional assets in the landscape. Abandoned mines were a liability rather than an asset and brought no income. In turn, they could therefore yield no tithe and so unlike the Siston example above, which was working and could be taxed; abandoned features usually held no interest for the cartographer and would generally be ignored.

Regrettably no tithe map appears to have survived from this area, or if it has it is not in a publicly accessible collection. Unless such a map exists and has detail of this kind, no horse gins are visible in the remaining map record in this part of the district, to our knowledge, although some do exist further north east, for example at Ladder Pit between Charlton Road and Lodge Hill Road and others still were discovered further to the north east during the construction of the ring road.



A horse gin and water level shown on the 1840 tithe map on Lodge Hill. There are no similar structures here in Air Balloon Road.

The absence of such features does not however necessarily mean in itself that no horse gins ever operated here, just that those pits which had used them had almost certainly closed well before 1842.

1.4.2.8. Physical surface remains

There are no physical remains, for example evidence of spoil heaps, fan drifts, shaft or heapstead walling, structures or similar within the site which might indicate mining to our knowledge.

1.4.2.9. Contemporary commentators

Air Balloon Hill was originally in the parish of Easton, part of Kings Barton. Other parishes within this hundred were Mangotsfield, Clifton and Stapleton. The Barton hundred was then the considerable tract of land north and east of the early city of Bristol, the eastern part of which was wild, remote and a dedicated deer forest, or chase for the benefit of Bristol Castle.

Easton at the end of the 16th century was at that time much larger than it later became known. Sir Robert Atkyns in his 1712 history of the county, described Easton as accounting for all the land 3 miles east of the city gate. Thus the modern districts of Easton, Two Mile Hill and St George were all within its boundary, although Hanham was in the neighbouring parish of Bitton, in a separate hundred, as were outlying villages like Westbury-on-Trym, Syston and Horfield. We are told that the then district of Easton contained 400 houses, and whilst mining is not mentioned specifically, industries such as glass making, copper and brass works which all used coal had been established and were noteworthy.

Consequently St George, as such had not been created at the start of the 18th century although the lands which were to become St George, had more than a century earlier been bought by Thomas Chester, of Knowle, who held the whole of Easton from 1608.The Chester family became leading coal owners over succeeding generations and their interests were widespread. By 1756 expansion of industry and population required that Easton needed to be split into two parishes, the first near to the city was St Phillip and Jacob, whilst the further distant became St George. Upper and Lower Easton then became distinct from the remainder of the manor in which Air Balloon Road now stands.

There is therefore an entire section on St George in Rudder's ***A new History of Gloucestershire*** originally published in 1774, with several references specifically to coal mining, and others to glass and brass works.

Quite why Atkyns does not mention mining, whereas Rudder does, is uncertain. The industry was well under way at both the beginning and end of the 18th century during which these histories were written.

In this part of Kingswood contemporary information is therefore relatively scarce. Already considered is the lack of estate maps such as those by Sturge from 1790 showing the Lodge Levels; this extends no further south than Two Mile Hill, nor west toward Air Balloon Hill. There are maps by Maule from 1803 and 1806 which covered Stapleton and St George. The best known is the 1806 map ***A Plan of the parish of St George and that part of the parish of Stapleton called Kingswood in the county of Gloucestershire***. The earlier plan, from 1803, covered Stapleton.

These maps or plans identified seam outcrops in the Great Vein group at Two Mile Hill and elsewhere, but access to the original plan is restricted. We do however know that the Howard Humphreys study team had access to these plans in the 1980s. Presumably it was from this source that they took the Stibbs seams outcrops, although that is conjecture.

The very helpful and early plan of the mines and levels belonging to Newton and Player in Bitton and Mangotsfield does not extend this far west, stopping at the Bitton boundary, in Hanham.

Had a tithe map survived it would have probably the best source other than the Maule maps, and would have confirmed whether or not there was evidence of a pit in this area in 1842. By this time the first houses on Air Balloon Hill had been built, but Air Balloon Road was still mainly fields and would remain so for some time. The name Air Balloon Hill, incidentally probably dates from the period 1784-1810 when ballooning became a craze, and many balloons were released from Bristol and other locations in the district. The pit must date from after this time, to receive the name it did.

Buckland and Conybeare (1824) give some information on what they call Easton (they wrote before the creation of St George) although not specifically on Air Balloon Hill. They give a wide ranging general assessment, and say of it (p266) that it was from a section:

> ***….in lower coal shale on the southern side of Kingswood, and on the north bank of the Avon between Bitton and Bristol at Golden Valley, Haul Lane, Custom Hill, Hanham, Crew's Hole, and Pyle marsh. The whole of this series has been driven through by a great cross level in Mr Whittuck's workings and the new level colliery and the river Avon.***

They name 14 seams all of which outcrop north of the Millgrit, the first viable coal.

They give the seam gradient as follows:

> ***The dip is from S to SW 1 in 2.***

Their section was obtained by halving the horizontal intervals observed in a cross drift, at a colliery operated by Whittuck, the precise position of which is unclear, but is certainly east of St George, as Whittuck operated in Hanham. The detail should therefore be treated with some caution although it does illustrate the sequence which might be expected throughout Bitton, Oldland Common and Hanham, and further west at Crews Hole and Pyllemarsh and elsewhere in St George.

Rev Buckland & Conybeare's (1824) General section of the seams of the Upper coal measures on the southern limb of the anticline around Hanham from South Western Coal District of England (p266)					
	Descending Order	Fathoms	Feet	Inches	Metres
1 &2	Two seams un-named				
3	A thin seam	0	0	6	0.15
	Interval	75	0	0	137.16
4	Fig Seam	0	0	8	0.20
	Interval	8	0	0	14.63
5	Francombe seam – from 6 inches to	0	2	0	0.61
	Interval	6	0	0	10.97
6	Millgrit seam, sometimes parted into two seams, from 1 foot to	0	3	0	0.91
	Duns	6	0	0	10.97
7.	Rag seam, from 0 to	0	5	0	1.52
	Duns	12	3	0	22.86
8	Buff seam, from 1ft to	1	0	0	1.83
	Interval	10	0	0	18.29
9.	Parrot's or Smith's seam from 1ft to	0	3	0	0.91
	Interval	1	3	0	2.74
10.	Little seam	0	0	8	0.20
	Interval	4	3	0	8.23
11	Brimstone Seam	0	0	8	0.20
	Interval	25	0	0	45.72
12	Muxton seam, very variable in thickness	?	?	?	?
	Interval	37	3	0	68.58
13.	Scragg Seam	0	1	6	0.46
	Interval	22	0	0	40.23
14.	Great Seam	0	1	6	0.46
Beneath is a little seam called Plox of variable thickness					

The section is worth repeating here because whilst the Golden Valley coals, the Millgrit through to the Parrot Vein all outcrop to the south and dip in that direction away from the property, the last three in the sequence Scragg, the Great and the Plox, are almost certainly of the Stibbs series. It is these coals which the Howard Humphreys Study shows as cropping close to the site.

Consequently according to this source, the vertical distance between the Parrot and the first of the Stibbs seams, the Scrag, is of the order of 400ft (122m) with the 'Great seam' a further 132ft (40m) deeper. If this is accurate then the Stibbs Great Vein would lie at a depth of 532ft (162m) where the Parrot outcrops to the south of the site at Air Balloon Road on the site of the Air Balloon Colliery. With a dip of 1 in 2, reported by Buckland and Conybeare, the horizontal distance between the crops of the Parrot Vein and Stibbs Great Vein would, on that basis be expected to be of the order of 1,000ft (305m) north of the Air Balloon Pit and the crop of the Parrot. In fact it's rather greater, according to the Howard Humphreys Study.

In 1871, John Anstie, the mining engineer reporting to the Coal Commissioners described the area between St George and Bitton where the Parrot Vein and the seams of the same group outcropped. This included the Golden Valley Colliery to the east where good records, the best available today, of these seams were made and kept:

> ***The seams in the upper, or Golden Valley group on the other hand are distinctly traceable, both by their outcrops and by a belt of considerable collieries, most of them now exhausted but indicating the value of these coals. One of these shafts is to be found at the***

north side of Stonehill and several others at the back of Hanham Hall, in which the extreme depth of the workings is from 80-120 yards.

These locations are to the east of Air Balloon Road and show mining there reached depths of 240ft-360ft (73-110m). Mining occurred further west however, because Anstie talks about an old shaft near the church recently reopened and deepened. He says:

Near to the church, at Jeffries Hill is a colliery which has been at work at no very distant date, and is now being reopened and the shaft sunk deeper, where the upper coals, the Millgrit and the Rag had been worked. The outcrops of these two seams follow lines from the Stonehill Farm, where they cross the turnpike road, afterwards running nearly parallel to it, to the church at Jeffries Hill.

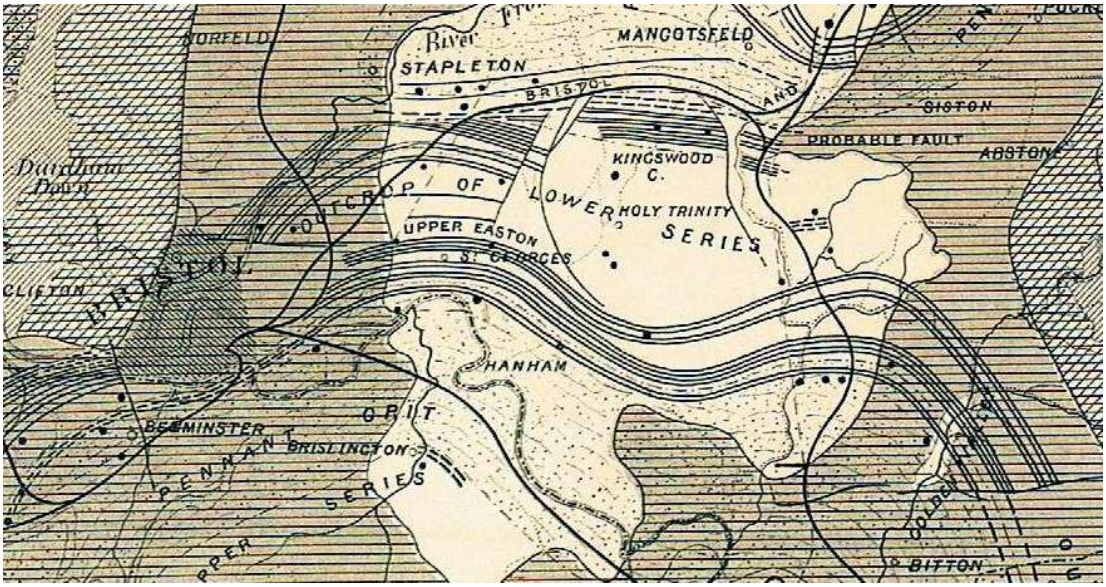
He adds:

The outcrops of the Devil's seam, Buff and Parrot seams follow lines about 500 yards north of those of the Millgrit and Rag seams. Near to Jeffries Hill the angle of dip is rather greater and the outcrops close in together a little, widening out however as they reach Trooper's Hill, where the shallow workings of all of them are clearly traceable.

From this it is clear that these 'Golden Valley' seams were worked to a considerable extent and that the early workings existed over a wide band, albeit south of Air Balloon Hill. Whilst these seams are of no concern to the proposed development, their relative positions are a marker and help to indicate where the crops of the deeper seams might lie; it is these seams which were shown by the Howard Humphreys Study to crop across Air Balloon Hill, to the north of Air Balloon Road.

Anstie's outcrop positions are recorded on a plan, an abstract of which appears below, which accompanied his report; from this it can be seen that only the general position of (some of) the seams at the surface has been recorded; that limited effort having been made to record local irregularities due to the short period of time he had to conduct his enquiries. Whereas here, the geology is relatively straightforward elsewhere it is highly complicated. It is interesting to note for example that the area east of the White-faced fault around Kingswood Lodge is devoid of coal seam outcrops, although some are known to exist; Anstie cannot have known about the Maule map, and the seams it showed therefore, or they would surely have been included in his mapping. This does not complicate the position here, but it is an indication that the Anstie material cannot always be accepted without critical inspection.

Further, Anstie relied heavily on an earlier work done by William Sanders, who created the first geological map of Bristol on a scale of one inch to four miles. This was begun in 1835 and not completed until 1862, just nine years before Anstie's visit. The outcrop positions Sanders plotted came from his own surveys drawn onto parish maps, many of which were of different scale. Some differences from later geological maps are therefore to be expected.



Anstie's schematic of the coal seam outcrops of the Bristol Coalfield The Stibbs group of seams passes through the name 'St George'

Anstie's account continues:

> ***The outcrops of the "Devils", "Buff" and "Parrot" seams follow parallel lines about 500 yards to the north of those of the Millgrit and Rag seams. Near to Jefferies hill (east of this site on the border with Hanham) the dip is rather greater and the outcrops close in together a little, widening out however as they reach Troopers Hill (to the south of the site)where the shallow workings of all of them are clearly traceable.***

Then:

> ***We find pits at Whitehall and about a half a mile due north of Troopers' Hill occurs the old "Air Balloon" Colliery of which the following section was given to the author***
>
> ***VI Drake Seam…1ft 6 inches at 60 yards depth***
> ***VII Scrag Seam..3ft at 80 yards depth***
> ***VIII Smith Coal seam..1ft 4 inches at 112 yards depth***
> ***IX Dolly seam 1ft thick at 132 yards depth***

Plox seam not proved

> ***These coals were worked for three or four years but ultimately abandoned, as they have been in most places being too variable to be economically wrought.***

He adds the warning that:

> ***It will be observed that the names given here are local, and different to those at the Golden Valley Colliery, and it may also be stated that the above is not always the order in which they are given by local miners.***

Anstie goes on to compare and contrast the sequence given at Air Balloon Colliery with others at Golden Valley Colliery and another at Lawrence Hill, an early pit recorded by Buckland and Conybeare. He concedes that an accurate correlation is not possible and says of the seams which he calls the Whitehall seams, rather than the Stibbs that:

All that seems to be clearly established is that this Whitehall group consists of four seams, which we call Nos. VI, VII, VIII and IX;' that they lie in about 60-70 yards of strata and in about the same position indicated on the sections the thickness of the middle beds being generally greater than the highest and lowest; but in this part of the coalfield they are rarely worth working.

Handel Cossham, the Bristol East MP and Coal owner writing with his colleagues Edward Wethered and Walter Saise in the ***Colliery Guardian*** in 1875 described both the methods of working and the sequence of coals worked here. The first part of the article talks of the level which drained pits dating from 1625 and adds that the limit of capability was the drainage levels that the Lords of the manors, had driven to drain their pits. These pits were generally to the north, and north west and north east. A water level of this kind was driven to the east in Hanham, none are known though in this part of St George. That level ran down to the river Avon further to the east to drain the pits in the main part of Hanham and it is therefore of no concern to us here.

The second part of the article the writer describes the coals and their use. Most of the coal seam sequences are covered, but not all; the section which concerns this site is that which includes the coal seams below the Parrot, in the southern part of the Bristol Coalfield. The first seam described is the Fig, and below this the Francombe, Millgrit, Rag, Devils or Black and Buff seams are each covered before the Parrot is described. Cossham's account continues with the Parrot Vein:

Then comes the "Parrot" seam, a coal about 18" thick, but a valuable smith's coal. This vein has the peculiar buff-coloured ash, which nearly always characterises the Pennant series of the district, and which we propose to notice hereafter.

At the Golden valley pit, this vein has been worked 900 yards to the deep of the shaft by a series of inclines. In other districts it proves to be a seam of black coal shales, with a good fireclay bottom.

The Muxen vein comes next, and, as the name implies, its character is not good, being chiefly composed of "muck" or "rubbish".

The Great Cuckoo, with a good fireclay bottom of excellent quality and the Little Cuckoo veins finish this group.

Beneath these seams those of the Stibbs (or Whitehall) seams lie. The article names these as the Drake, Scragg, Dolly and Plox but these names, as Anstie found are often substituted for others or appear in a different sequence.

Cossham provides no clue as to the interval between these seams and the best indication we have is the Golden Valley Section (see probable stratigraphy).

He says a great deal however about the seams which, he considered, like John Anstie, were replicated, albeit with different names in the Golden Valley Colliery. His account continues:

Below this group (the Golden Valley seams) we come to another series, five in number (Anstie identified four) called the Stibbs series (Anstie called them the Whitehall group), and bearing the respective names of the "Drake", "Scragg", "Smith's Coal", "Dolly" and "Plox".

They were worked many years ago at the "Air Balloon Hill Pit" near Hanham to a depth of 80 yards and have been followed, more or less, all along the outcrops where not covered by secondary rocks.

The inference from this is that these seams were little worked, if at all, where covered by Trias, and to a small extent only where exposed. Undoubtedly this is the reason why these coals were still intact and potentially worth the effort of reopening earlier workings as was the case further east in Cadbury Heath at Goldney and Coronation pits, both in the early 20th century. Had these coals been more extensively worked in earlier times, those ventures, which proved to be of marginal viability anyway, would not have been entertained at all.

The seams were variable at best and according to Handel Cossham. He says of them that they:

> ***Give a large proportion of small coal (at that time unsalable) producing in some cases a good and in others an inferior smiths' coal.***

The Cossham article equates the two lowest seams, the Dolly and Plox, to the (Warmley) New Smiths Coal and the Kenn Moor seam both of which were 30 in (0.8m).

Cossham goes onto describe the strata below the Stibbs Series, which he had studied in detail from discoveries at his pits in Easton and Speedwell, and those at other collieries such as the Bitton pits where, for example, cross measure drifts had helped to clarify the position with seams long since abandoned for which little or no documentary evidence survived or existed.

Below the Stibbs Series there is, Cossham states, a very hard siliceous stone much quarried for roadstone under which is a small seam of coal called the Holmes Vein which he described as having been worked to a small extent. These workings were however where the stone outcropped which the geological sheets show is in the Whitehall area, to the north west of Air Balloon Hill. Cossham confirms this stating that:

> ***A little to the north of the outcrop of this stone is a line of pit heaps, most of them of very ancient date, others only 40-50 years old (making them from 1820-1830). They mark the workings on two seams, called respectively the Whitehall and the Queenbower seams.***
>
> ***The former is generally about 2 feet (0.6m) thick with a good top and floor. The latter is forty fathoms (240ft or 73m) under the Whitehall Vein.***

These seams will therefore be present below the Stibbs (or Whitehall group) and above the deeper still seams of the Toad Vein group. They will be much deeper than the shallow coal zone and of no concern to the proposed development.

1.4.2.10. Site Investigation results

We have not been informed of the results of any ground investigations undertaken on the site apart from the discovery of s shaft, presumed to be a well.

No other site investigations are known to us within the immediate vicinity (500ft or 152m).

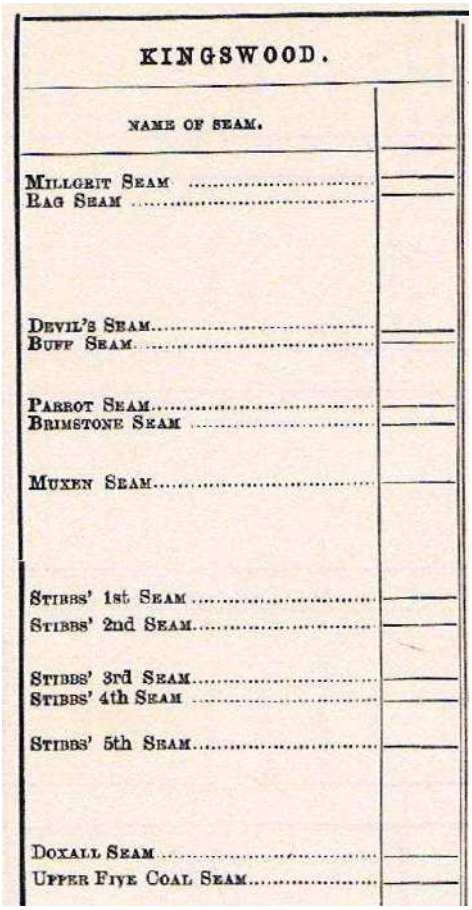
1.5. Probable Stratigraphy

Whilst it is clearly very helpful to understand what coal exists and at what depth an element of doubt will always exist unless conclusive borehole or shaft data is available close to or on the site. In some areas of Bristol, South Gloucestershire and North Somerset the construction of a stratigraphy is happily straightforward. Where good shaft sections survive for example such judgements are easy to reach.

In this part of south Gloucestershire we are fortunate in that there is one shaft in the immediate vicinity that is within 500ft (152m) for which a rudimentary section was made, the Air Balloon Colliery, and this was only 30m or so distant. This shows that the pit was sunk through the Stibbs or

Whitehall seams, and their depths at that pit are recorded. Anstie incorporates those seams within a general section taken from that pit and others, including the Golden Valley Colliery.

Anstie's section is however incomplete; it suggests that there were no seams of any kind between the Muxen, the last seam of the Golden Valley group and the first of the Stibbs seams (see below) whereas Cossham points to several seams found at the Golden Valley pit, some or all of which may or may not prove to the west of that shaft. These included the Great and Little Cuckoo, the last of which was called the Jones seam at that pit. Also, no seams are shown on this section below the Stibbs seams, although Cossham tells us that there were at least two, the Whitehall and Queenbower seams, between the last of the Stibbs seams and the Doxall coal, which was the first of the Toad Vein group.


KINGSWOOD.

NAME OF SEAM.

Millgrit Seam
Rag Seam
Devil's Seam
Buff Seam
Parrot Seam
Brimstone Seam
Muxen Seam
Stibbs' 1st Seam
Stibbs' 2nd Seam
Stibbs' 3rd Seam
Stibbs' 4th Seam
Stibbs' 5th Seam
Doxall Seam
Upper Five Coal Seam

Left: Anstie's g*eneral section of the Upper Coal Measures and their relationship with the Middle Coal Measures – which most commentators accept begin with the Doxall Vein.*

This section also gives no depths or distances between the seams, unfortunately, although another section produced by Anstie later indicated that there was some 220ft (67m) between the Muxen and Stibbs No.1 seam and 340ft (104m) between the Parrot and that seam.

Correlation of Whitehall (Stibbs') Seams

Air Balloon	Anstie	Cossham	Golden Val
	Parrot	Parrot	Parrot
	Muxen	Muxen	Muxen
		G.Cuckoo	
		L.Cuckoo	Jones seam
			Ragged
Drake	Stibbs No.1	Drake	Adams
Scragg	Stibbs No.2	Scragg	Coking
			Coal
Smith's	Stibbs No.3	Smith's	
Coal		Coal	
Dolly	Stibbs No.4	Dolly	New
			Smiths
Plox	Stibbs No.5	Plox	Kenn Moor

These are just three of the sequences. Others have the same names but in a different order, others still miss out some seams altogether.

There are a number of other difficulties in this area in addition to the variable nomenclature. Not the least of these is the disagreement between the geological sheets and the Howard Humphreys study, of the exact position of the Parrot Vein outcrop. The geological sheet shows the Parrot cropping at the Air Balloon Colliery site, and then traced from there westwards to the western end of St Georges Park in Redfield where it disappears under the Triassic cover. The Howard Humphreys study, on the other hand, shows it, and the deeper Muxen seam as unrecorded (i.e unworked) west of Hanham, a mile to the south east. This must be inaccurate; the Parrot is known to thin to the west, but it was a quality coal, which was highly considered and sold well.

Another area of uncertainty lies with the position of the Stibbs seams on the Howard Humphreys theme maps. The study place the most shallow of these, the Drakes seam or No.1 seam, 500ft (152m) to the north of the northern boundary of the site and 700ft (213m) north of the Air Balloon shaft. It gives a seam gradient range of 1 in 1 to 1 in 3 for the seams beneath the site. So, at a gradient of 1 in

1, the Drakes seam would be expected to lie at a depth of 700ft (213m) at the shaft, if it cropped where the study indicates and at a 1 in 3 gradient, the seam would lie at 233ft (68m) in the shaft. In fact the section affirms that the seam lay at a depth of 180ft (55m) which would require a seam gradient of about 1 in 4. No faults are shown between the outcrop of that seam and the Air Balloon shaft.

Whilst not uncommon, a 1 in 4 seam gradient does not sit with other evidence. Buckland and Conybeare, it will be recalled, asserted in 1824, when these pits may well have been working, that the seam gradient here was 1 in 2. Were that accurate then the Stibbs seams must necessarily crop much closer to the property than the study shows. On this basis the No.1 or Drakes' seam would in fact crop about 180ft (55m) north of the northern boundary of the sites, and dip toward it reaching a depth of 90ft at the northern perimeter – just inside the shallow coal zone. But as this seam was just 1ft 6 inches (0.4m) thick, any workings it might contain would be unlikely to be of any concern now.

We think this the most plausible scenario. The Howard Humphreys study consistently plots the seam outcrops further north than they appear on the geological sheets, from Easton through St George and Hanham to Oldland Common. It cannot be said unequivocally that the seam position is wrong, but the evidence would suggest that the crops of the Stibbs seams at least are more likely to lie further south than is shown given the seam depths recorded at the Air Balloon Pit.

If however the Howard Humphreys Study is correct, or very nearly so, then the Stibbs seams will be deeper than the shallow coal zone across the entire site; and if Anstie is right and the interval between the Stibbs No.1 seam and the Muxen is 220ft (67m) then, since the No.1 seam lies at a depth of 180ft (55m) in the Air Balloon shaft, the Muxen must crop further south; further, the Parrot Vein which was sequentially higher than the Muxen, must in consequence crop further south still and not at or just south of the shaft.

Kellaway and Welch warned that the outcrop positions on the geological sheets were sometimes questionable and this appears to confirm that. They say, (p99):

> ***The identities shown on the published maps (six inch ST67SW, one inch sheet 264) are doubtful, especially at White's Hill and Hanham where the rocks may be structurally disturbed, The base of the group of coals is marked by a very strong quartzose sandstone which emerges from beneath the Triassic rock at Redfield [6175 7355] and continues then along the southern margin of St George's Park where it forms a ridge or feature extending by way of Summer Hill Road to the western end of Air Balloon Road, near the old shaft of Air Balloon Pit [6309 7332]. Here, sandstones and Quartz conglomerates crop out on the ridge overlooking the valley leading to Crew's Hole.***
>
> ***At Stibbs Hill [63339 73337] the coal seams formerly worked in the old Air Balloon Pit (Anstie, 1873, p39) are supposed to crop out. These include the "Smith's Coal" and the Scragg Vein. The latter is reputed to overly the New Smith's Coal of Warmley. No evidence of the presence of these coal crops could be found, but this may be due to the great age of the workings and the heavily built up ground.***

This then is evidence that the Stibbs seams outcrop, as might be expected, at their namesake Stibbs Hill and not further north as plotted by the Howard Humphreys Study, between Hillside Road and Bell Hill Road and indeed further north than that.

Whilst this rules out the possibility that the Muxen might crop in the vicinity of the site, as might have been thought from the geological sheet, it does introduce the possibility that one of the two Cuckoo seams might crop in the area. Of the two, the deeper Jones seam is the most likely – the Golden Valley sequence shows it to lie 207ft (63m) above the Adams seam, which, if Kellaway and Welch are correct, is the equivalent of the Scragg Vein. This would place the Jones seam - which was only

1ft 6 inches (0.4m) thick – at a depth of about 33ft (10m) in the Air Balloon shaft. Even at a seam gradient of 1 in 3 this would mean the seam cropped south of the application site.

In respect of the seams between the lowest of these Stibbs seams and the Doxall Vein, the highest of the Toad Vein group, Kellaway and Welch say of this sequence (p84) that:

> ***On the southern limb of the Kingswood anticline, the seams between the Doxall Vein and the Warmley New Smith's Coal are little known although some may have been worked quite extensively in the distant past. Among them are the so called Dolly and Plox Veins but the nomenclature of these coals was described by Anstie in 1873 as 'local', the seams being not always in the order in which they are given by local miners.***

In one section Anstie indicates that there is some 900ft (274m) between the Doxall and deepest of the Stibbs seams and 350ft between the Queenbower coal and the Doxall. Above the Queenbower, Anstie says is a thick coal 4 feet thick, he places this on his section 330ft (100m) above the Queenbower. No name is given to this seam but Cossham talks of a seam 40 fathoms (240ft or 73m) above the Queenbower with a good roof and floor which he calls the Whitehall seam. Anstie does not name this seam either in the text or in sections.

Cossham makes it clear that both the Whitehall and Queenbower seams are marked by a line of pit heaps, most of them of very ancient date, north of the outcrop of a siliceous stone, the Holmes Rock. This is found north of Air Balloon Hill Road. Consequently these seams must be much deeper at Air Balloon Road.

On the balance of evidence it seems clear that the Stibbs seams must crop further south than they are shown to do on the Howard Humphreys theme map and equally the Parrot and the Muxen must crop further south than they are shown by the Geological sheets.

It must be remembered, as several commentators have said that the names, sequences and depths given by old miners were not always consistent or entirely reliable and therefore caution should be exercised in consideration of these records. The best that can be said is that the evidence suggests that the most likely interpretation is that there are no coal seams within the shallow coal zone over most of the site, and just one, the Stibbs No.1 or Drakes seam at the deepest part of the range at the northern boundary, getting progressively deeper beneath the site, toward the southern boundary. A second seam, the Jones seam may crop south of the site, but this is by no means certain. For any of these seams to lie within the shallow coal zone over the major part of the site, the coal seam gradient would have to be half that reported by Buckland and Conybeare, early geologists who had the benefit of talking directly to the miners who had once worked these seams.

Part 2. References

2.1. Primary Sources

Provider / Source	Product	Date	Ref	Notes
Coal Authority	Residential Coal Authority Mining Report	2018	001	Supplied. Date of issue 19 March 2018
Bristol Coalmining Archives	Coal report	2017	002	Supplied. Date of issue 12 July 2017.
Ordnance Survey	Geological sheets	1955	003	67SW
Ordnance Survey	1st edition County Series 2nd edition County Series	1882 1903 1916	004 005 006	
East Bristol Collieries Ltd(unattributed)	Mine plans, various seams,	No date	007	Plans of known workings up until 1936
Tithe map			008	Not found
Howard Humphrey Geotechnical Engineering Unit. Leatherhead Surrey	Environmental Geology Study in the Bristol Area	1981	009	G 7 H7 (i) & H7 (ii) L7, M7
Parliamentary Papers	Report of the commissioners Appointed to enquire into the several matters relating to coal in the United Kingdom	1871	010	Reserves, seams worked, shaft sections in Somerset, Bristol & South Glos.
Bristol Record Office (BRO)	Leases, plans. Contemporary accounts		011	Not examined in detail; some material seen
Gloucester Record Office (GRO)	Leases, plans. Contemporary accounts		012	Not examined in detail
Somerset Record Office (SRO)	Leases, plans. Contemporary accounts		013	Not examined in detail
Wiltshire Record Office (WRO)	Leases, plans. Contemporary accounts		014	Not examined in detail
Other Archives	Records as specified		015	Not examined in detail
HMSO	Report of the Commissioners on Coal	1871	016	Sections, seam accounts, list of closed pits, etc
City and County of Bristol	Previous planning application		017	None known

(BRO - Bristol Records Office; HMSO – Her Majesty's Stationary Office)

2.2. Secondary Sources of information

A number of secondary sources are consulted which include:-

Author	Title	Date	Ref	Publisher
Buckland and Conybeare	The South Western Coal District of England	1824	018	
I Stratham and G Treharne	Subsidence due to abnormal Mining in South Wales	1991	019	Arup Geotechnics
AB Hawkins and D Tomlinson	Planning and Construction of an Industrial Site on the Bristol Coalfield	1987	020	Geological Society
AB Hawkins and D Tomlinson	Investigation procedure developed during a large development on the Bristol Coalfield	1986	021	Institution of Civil Engineers
Danilo Bettosi BSc MSc FGS study	Stepping on the Past Effects and Treatment of Near Surface Coal Workings		022	
Kellaway and Welch	The Geology of the Bristol District	1993	023	(BGS
John Cornwell	Collieries of Somerset and Bristol	2003	024	Landmark
South Gloucestershire Mines Research Group	Kingswood Coal	2008	025	SGMRG
Peter Brown	The Bristol & South Gloucestershire Coalfield	1994	026	Self-published
Steve Grudgings	Draining the Kingswood Coalfield - Some perspectives on the Kingswood Collieries drainage levels	2008	027	Bias Journal No.14
Bryan Little	The City and County of Bristol – a study in Atlantic civilisation	1954	028	
Angus Buchannan and Neil Cossons	Industrial Archaeology of the Bristol region	1969	029	David and Charles
Bristol & Gloucestershire Archaeological Society	A Gloucestershire and Bristol Atlas	1961	030	
Samuel Rudder	A new History of Gloucestershire *Originally published in 1774*	1977	031	Alan Sutton
Sir Robert Atkyns	The ancient and present state of the County of Gloucestershire *Originally published in 1712*	1972	032	Glos. Library
John Evans	A Chronological History of Bristol	1824	033	
John Anstie	The Coalfields of Somersetshire and Gloucestershire	1871	034	1871
Ministry of Fuel and Power	Bristol and Somerset Coalfield	1946	035	HMSO
Handel Cossham	Colliery Guardian	1875	036	
AR Griffin	Coalmining	1970	037	David & Charles
John Ulrich Nef	The Rise of the British Coal Industry (Volumes 1 & 2)	1966	040	Frank Cass & Co Ltd

2.3. Site Investigations carried out close by

s

Description of investigation	Item No	Type	Date	Notes
Undertaken on this site	036			None of which we are aware
Undertaken on adjacent sites	037			None of which we are aware
Boreholes in the vicinity	038			None in the immediate vicinity (500ft or 152m).
Shaft sections	039		1871	There is a shaft section from Air Balloon Colliery, 100ft (30m) distant
Quarries and open works	041			None are known
Tunnels and Cuttings	042			None are known

Part 3. Mining Legacy and Risk Assessment

3.1. Mining Legacy.

3.1.1. Coal workings

3.1.1.1. Mining in the shallow Coal zone

The shallow coal zone with which the Coal Authority is primarily concerned is within 30m (98ft) of the surface but within this range are, as described previously under technical context (Section:1.3) three distinct bands of activity from first exploitation in open works, to primitive pits from which later techniques were developed and greater depths subsequently reached.

(a). Coal seam outcrops (0-10ft that is 0m-3m)

There is no evidence that coal seam outcrops may be present at the surface across, or near to the site, even allowing for the possibility that the outcrop positions given by the Howard Humphreys Study may be inaccurate to a greater or lesser extent.

The Howard Humphreys Study, shows a coal seam outcrops well to the north and whilst we believe for the reasons we have set out in the previous section (Probable stratigraphy) that these crops are plotted too far north, even allowing for an adjustment none would be expected to crop across the site. Another seam, not recorded in this area, might exist, if one contributor (Cossham) is correct, but even this would not be present on the site, but south of it.

Our view is that the most likely assessment is these seams of the Stibbs group do crop in this area, to the north of Air Balloon Road and Hillside Road, although not as far north as the study suggests. None of these seams are of good quality although all were worked to some extent according to Cossham in the St George area. The seams dip south, and the dip is probably around 1 in 2.

Coal seam outcrops are therefore unlikely although still possible if one or more of the many variables is significantly different to the evidence which survives.

Low Risk

(b). Very shallow and primitive early mining (Bell pits) 10ft- 35ft (3m-10m)

There is unlikely to be coal within this range, and therefore there is a low risk of bell pits. Workings in these seams at the surface occurred at an early date to the north and to the east but to what extent has never been established. The absence of bell pits suggests the seam or seams were worked only to a limited extent along the crops in those locations but not here; it is most probable that they were insufficiently viable to be developed further by sinking shallow shafts either bell pits or deeper works. John Cornwell expressed the opinion that where one bell pit was found, others were almost certainly nearby, and since none at all have been found in Air Balloon Road or nearby the possibility that some might now be encountered is improbable.

Low Risk

(c). Shallow, developing early mining 33ft-100ft (10-30m)

There is likely to be coal within this range which we believe to have been of poor quality in this district and possibly thin. Only one seam is thought to be present within this range and that toward the northern boundary of the site. The Howard Humphreys Study shows no workings here prior to 1872.

There is one nearby shaft but this suggests that the coal was almost exclusively below the shallow coal range and whilst unrecorded working may exist, these will be deeper than the shallow coal zone over almost all of the site.

Further there are no incidences of subsidence in the area, which might have suggested early shallow working

The photo below shows pit props from mining of this kind, from the 17th century, in Hanham. The workings were in Buff Vein and were excavated in the 1980s. Nothing of this nature has been found here.

Low Risk

3.1.1.2. Mining to moderate depths

This covers mining in transition from simple works covering a few acres/hectares drained by and raising coal by means of a windlass to pits working in a recognisably modern way with pumping engines to dewater the workings.

(a). Mining from 100ft to 246ft (30m to 75m)

There is probably coal within this range, but in undistinguished coals worked for a limited period and to a limited extent according to Anstie, Cossham and others. A pit existed 100ft (30m) to the south which is known to have cut these seams at depths which suggest the coals are present within this range beneath the application site.

Pits of this kind tended to work to the rise, that is up the seam gradient and the probability is that the Air Balloon Colliery worked in this way beneath the site, even though the Howard Humphreys Study suggested otherwise. The possibility of workings within these relatively moderate depths between 100ft to 246ft (30m to 75m) is therefore high, even though the seams were poor.

John Anstie tells us that:

> ***These coals were worked for three or four years but ultimately abandoned, as they have been in most places being too variable to be economically wrought.***

Consequently the pit, which will probably date from either the very late 18th century – the start of the Air Balloon craze after which the location was named – or the very early 19th century, will have worked a very small take probably less than 10 acres in this time, but that would be sufficient to include the application site at the corner of Air Balloon Road.

It should be stressed however that this range is deeper than the shallow coal zone, of primary concern to the Coal Authority. Consequently while there may be coal there, which could have been worked, and probably was, the risk of ground movement at the surface now highly improbable.

Low Risk

(b). Mining from 246-490ft (75m to 150m)

There is coal within this range but almost certainly of an insufficient quality to have rewarded the working.

Low Risk

3.1.1.3. Deeper Mining (in excess of 500ft - 152m)

There are coal seams this deep, down to at least 2,500ft (762m), but according to the mine plans only the Kingswood Great Vein at a depth of around 1,660ft (506m) is known to have been worked here and even that seam was not worked beneath the site according to the mien plans.

Longwall mining was the method then employed and no ground movement at the surface from workings in these seams so far below the shallow coal zone would be conceivable, even were other workings to extend beneath the site, which according to the East Bristol mine plans they do not.

Other seams certainly exist but were not worked.

No Risk

3.1.2. Shafts and Adits

Shafts can be vertical or sloping (slant or drift mines). They can have been sunk as wells or pump shafts to reach water but found coal which was subsequently worked or sunk to reach suspected coal seams and abandoned and used to draw water subsequently. Air shafts are vertical mine entries sunk to ventilate workings or water levels. All are essentially vertical or inclined voids which, apart from the most primitive, are normally stone or brick lined to protect their structural integrity; diameter of shafts can vary from 1.5 to 4m or more.

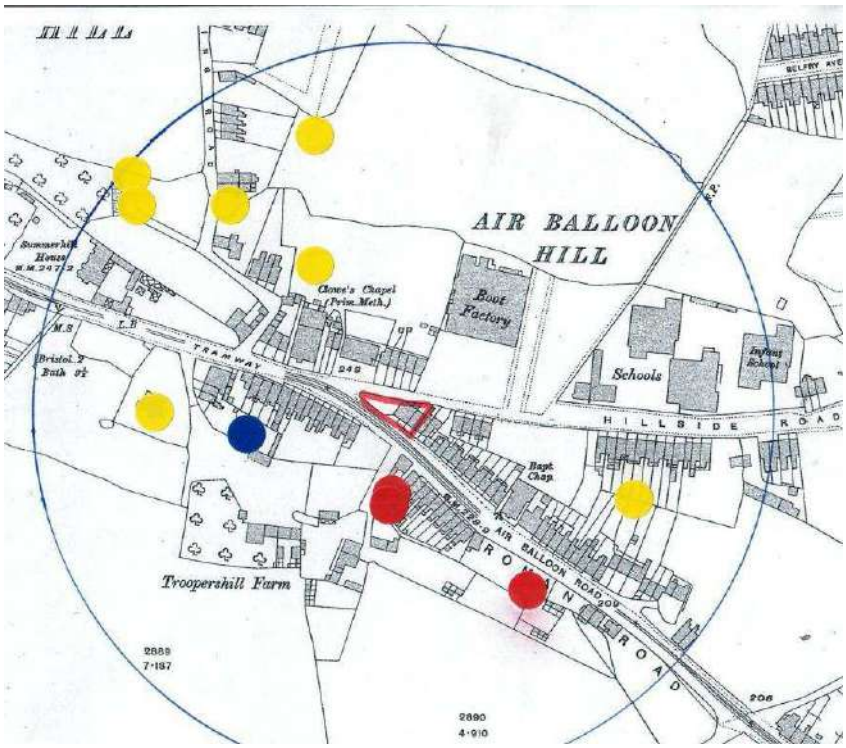
(a). Vertical mine entries, drifts & air pits

The Coal Authority report showed no recorded shaft on or within 20m (66ft) of the boundaries of the site.

The Howard Humphreys Study shows no shafts on the site.

The County Series maps show no shafts on the site, nor any nearby. No shafts are shown by any source within 100ft (30m) of the boundary; there are however two shafts, both wells, within 500ft (152m). These shafts are shown below:

:



Shafts in the vicinity. Red dots are mine entries, yellow dots are wells and blue dots are pumps.

The presence of shafts may be indicated by depressions at the surface where the underlying fill has slumped. Other indicators are pit dirt and old building foundations, particularly circular ones which might suggest a horse gin, and therefore a nearby shaft. Wet or rough ground may also be an indicator. If such an indicator is present it is probably prudent to undertake appropriate measures to locate and identify suspected shafts before any work is begun.

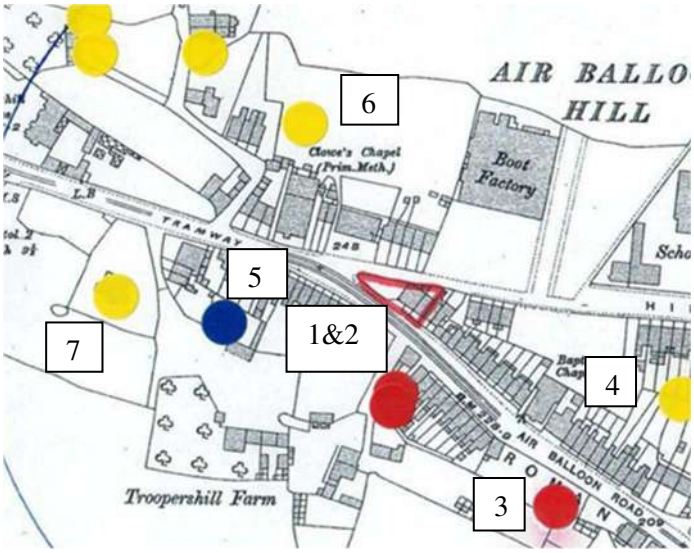
The NCB, predecessor of the Coal Authority, advised that:

> ***The normal method of searching for concealed shafts is by excavation and drilling but in some cases geophysical methods may be helpful.***

Divining has also been shown to identify shaft locations.

The risks associated with old shafts were considered in ***Section 1.2***.

Notes: HHS: Howard Humphreys Study. BCA Bristol Coalmining Archives CA Coal Authority Geo Geological sheets OSM Ordnance Survey map Tythe map

Shaft No.1 (red dot), Source Geological sheet & HHS (2605). Shown as a mine entry, provenance unknown.	
Shaft No.2 (red dot) Source HHS (791) Shown as a mine entry, provenance unknown.	
Shaft No.3 (red dot) Source East Bristol Mine Plans. Shown as a later pencil annotation of Air Balloon Mine entry, possibly for information only.	
Shaft 4 (yellow dot) Source HHS (2604) & OSM. Shown as a well.	
Shafts No.5 (blue dot) Source HHS (2606) & OSM. Shown as a pump.	
Shaft No.6 (yellow dot) Source HHS (2607) & OSM. Shown as a well.	
Shaft No.7 (yellow dot) Source HHS (2609) & OSM. Shown as a well.	

Site in Air Balloon Road Air Balloon Hill, St George
Mine entries, wells & pump shafts

There are no shafts on the site nor none sufficiently close to be a concern. Should one of the recorded shafts collapse, the zone of influence would not extend onto or have an impact on the site. Unrecorded shafts are unlikely but as always in an area where mining has once been undertaken cannot be entirely discounted.

Low Risk

(b). Pump shafts & wells

There are two shafts one of which was sunk as a well and the other as a pump shaft to the west of the site and which were once associated with the farm, which occupied the ground on the south western side of Air Balloon Road prior to the development of the area. None appear on, or within 100m of the property.

These pump shafts and wells are recorded on the County Series Map and the Howard Humphreys Study. A pump shaft is a well on which a hand pump once was fitted, and not a pump engine shaft as is sometimes thought. As the County series map records, those which are shown here are a domestic water drawing shaft of the kind similar to that shown left.

There is an unrecorded shaft on the site, thought to be a well which may have served a house which once stood on the site now occupied by N^{os} 17 and 17A. This well has not been recorded on any tythe map or on the later County Series Maps. See photographs in ***Appendix E.***

There are very few others within the immediate area (500ft or 152m) see diagram above. There is no evidence to suggest that further unrecorded shafts of this kind might be encountered, although the remote possibility of another unrecorded well cannot be entirely discounted.

Neither well or pump shafts are likely to be of any concern.

Very Remote Risk

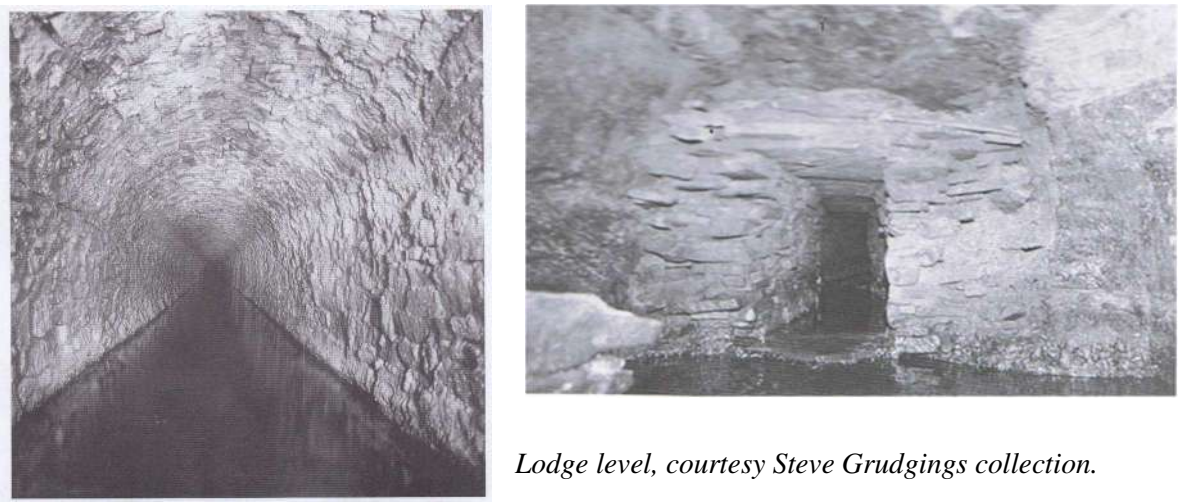
3.1.3. Water and Drainage Levels

The BCA report on a nearby property reports that:

> ***None are known in this vicinity.***

Unrecorded levels are extremely unlikely. Even were an unrecorded water level to exist, which is improbable, generally these were sturdily built but were not larger than was needed since every additional inch on the height or width would add considerably to the cost of construction.

Typically these levels were two feet (0.6m) square but could be just 18 inches (0.46m) square as the Lodge level was, as illustrated (photo courtesy of the Steve Grudgings' collection). Water levels were well built, almost always lined, usually with stone.



Lodge level, courtesy Steve Grudgings collection.

The Coal Authority reports do not identify the presence of water levels and none is shown on the Howard Humphreys Study.

Very Low to No Risk

3.1.4. Coal Mining Geology

This section considers the effect of lines of weakness and instability encountered through coal mining operations.

The Coal Authority report says that the Authority is not aware of:

> ***....any damage caused by geological faults or other lines of weakness that have been affected by coal mining.***

The area is faulted, but most of these upheavals and disturbances occurred before the Triassic period.

According to the Howard Humphreys study there is a recorded fault which passes from east to west to the north of the site and the geological sheets how others to the north and east but these have not caused any damage to any property to our knowledge.

Low to No Risk

3.1.5. Opencast Coal Mining

The Coal Authority report states that the property is not:

> ***... within the boundary of an opencast site from which coal has been removed by opencast methods***
>
> ***Nor is it ..within 200m (656ft) of the boundary of an opencast site from which coal is being removed.***
>
> ***Nor is it ..within 800m (2,625ft) of the boundary of an opencast site for which the Coal Authority is determining whether to grant a license or for which a license to remove coal by opencast methods has been granted.***

In fact, there has been no opencast coal in this part of Bristol nor is it conceivable that there is ever likely to be such activity in the foreseeable future.

No Risk

3.1.6. Coal Mining Subsidence

This section considers the evidence of subsidence in the locality.

The Coal Authority report says it is not aware of:

> ***a damage notice or claim for the property or any property within 50 metres since 31st October 1994.***

It goes on to say that:

> ***There is no current Stop Notice delaying the start of remedial works or repairs to the property.***

The BCA report on the nearby property says:

> ***We have no knowledge of damage to property caused by subsidence specifically attributable to mining activity in the immediate area.***

Low Risk

3.1.7. Mine gas

Air in mine workings is contaminated with small quantities of noxious gases, even under normal conditions but with abnormal conditions as with old workings the problem is increased 100 fold (DT Simon, Safety Engineer, NCB South Wales Division). The main gases are Methane, Nitrogen Carbon Monoxide and Carbon Dioxide. Generally the Bristol coalfield was not considered a gassy district and until the NCB took control, naked flame working was common. Nevertheless it is clear that old workings will always generate gas although this fortunately remains trapped below ground in normal conditions.

The Coal Authority report however states that there is:

No record of mine gas emission requiring action by the Coal Authority within the boundary of the property.

Bristol, South Gloucestershire and Somerset pits were generally naked flame collieries in which mine gas was rarely a problem. Prestwich, writing in 1871 states that:

Few coalfields are so free from firedamp. In many collieries it is almost unknown.

Had action been necessary to attend to a gas emission which required action by the Authority we would expect that this would have been common local knowledge and it is not.

No Risk

3.1.8. Hazards related to Coal Mining

The Coal Authority report says that the property:

has not been subject to remedial works by or on behalf of the Authority under its emergency Surface Hazard Call Out procedures.

Generally this means that no call out to deal with an unexpected surface hazard. These include but are not limited to

- **Accidental entry**

serious injury or death, drowning or asphyxiation

- **Movement or collapse of ground**

the ground near a shaft could collapse leaving a hole roughly equal to the shaft diameter if the lining remains intact, but much wider if not. In such circumstances the diameter of the crater would be proportional to the depth of the slump of fill and the integrity of the rock through which the shaft was sunk. Equally other concealed features such as ventilation fan drifts could open up and cause injury

- **Presence of gas**

some shafts and old workings will contain firedamp (mainly methane) which can be explosive. Most will have blackdamp, (carbon dioxide and Nitrogen) while a few may contain carbon monoxide or Hydrogen Sulphide (stinkdamp) both of which are highly poisonous even at very low concentrations. There is a danger of asphyxiation therefore if a shaft cap is pierced

- **Pollution and loss of water supplies**

.. Shafts often pass through aquifers which are used for water supplies and if the content of the shaft becomes toxic, these supplies can be polluted.

Again, had such an occurrence occurred we imagine it is unlikely to have escaped local attention and would have been widely reported as has occurred elsewhere in the coalfield. It has not.

No Risk

3.2. Risk Assessment

Coal Mining Issue	Recorded within site?	Recorded within Vicinity (100m)?	Unrecorded, but probable?	Risk
Coal seam outcrops and potential filled early open works (crop workings) surface to 3m (10ft) depth	No	Yes Crops are shown on the Howard Humphreys Study to the north and on the geological sheets to the south. None are shown on the site and none would be expected.	No. There is a remote possibility of an unrecorded seam – possibly the Cuckoo outcropping close to the southern boundary, but the main worked seams are all well to the south. The Stibbs Series seams, whilst probably nearer to the site than the Howard Humphreys Study shows, are still too far to the north to crop here.	**Low Risk.** Stibbs seams crop well to the north, and the Downend formation seams (Parrot etc.) well to the south.
Bell Pits & shallow primitive shafts mainly from the late 17th & early 18th centuries 3m-10m depth (10-30ft)	No	No None have been found.	Bell pits are unlikely. There are almost certainly no coals close to the surface within bell pit range. No evidence of bell pits exists at Air Balloon Hill and none in Air Balloon Road in this location.	**Low Risk.** No bell pits would be expected as there is almost certainly no coal within bell pit range.
Shallow mining mainly from the 17th to early 18th century 10m -30m depth (30-98ft)	No	No There is no evidence of shallow mining of this kind here.	Yes; coal may exist at the deepest part of this range toward the northern boundary and may have been worked by the Air Balloon Pit. This is more possible however than probable.	**Low Risk.** Whilst there is most probably one seam at the deepest part of this range over a limited part of the site, the seam is thin (0.4m) and, if worked at all, which is uncertain, any resulting voids almost certainly could not migrate to the surface now.
Intermediate mining mainly from the mid to late 18th century 30m – 100m depth 98ft -330ft)	No	Yes	The Air Balloon Colliery did work the Stibbs seams within this range and at a distance less than 100m. The pit worked for only 3-4 years and probably will have worked this far north in that time.	**Low Risk.** There is coal within this range, as suggested by the Coal Authority, and whilst there is no firm evidence to suggest it was ever developed here it is very likely to have been worked given the proximity of the Air Balloon shaft.
Recorded or unrecorded deep mining mainly from the late 18th and early 19th centuries between 100-200m (330ft -660ft) in depth	No	Yes	Probably worked by Air Balloon down to around 500ft (152m) or thereabouts for a limited time.	**No Risk**. The coal seams are too deep to be of any concern.
Recorded or unrecorded deep mining mainly from the mid-19th century or later of 200m or more in depth	No	No	Seams exist but according to the East Bristol Coal Company plans all including the Kingswood Great Vein - are unworked here. The Doxall Vein is likely to be the first workable coal within this range but it was not worked.	**No Risk.** The coal seams are too deep to be of any concern.
Water and Drainage Levels	No	No	No water levels would be expected.	**Low to None.** Since no levels are known the risk is very small. Even were an unrecorded level present it is likely to be relatively deep and narrow in section. Such features rarely cause problems but if blocked can cause the water table to rise.
Mine entries (shafts and adits)	No	Yes No recorded mine entry is present on the site or within 30m.	There is one mine entry within 500ft (152m) and only two water drawing shafts within that range. One mine entry is in close proximity (that is within 100m) and is about 100ft (30m) distant. An unrecorded shaft on the site itself cannot be discounted but is highly unlikely.	**Very Low.** The possibility that an unrecorded shaft might be encountered is unlikely, but as always this cannot be entirely discounted. The Air Balloon shaft is not within the zone of influence which might impact on the site, should there be a collapse of the shaft.
Coal mining geology (fissures)	No	Yes. According to the Howard Humphreys study there is an east west fault to the north of the site in the allotment gardens and others to the north and east are marked on the mine plans.	The Coal Authority have no records which might indicate that this is a risk.	**Very Low to None.**
Record of past mine gas emissions	No	No	Unlikely, given the absence of shafts on the site from which gas might be released. The closest shaft which has an undisputed mining heritage is about 100ft (30m). The Coal Authority have no records which might indicate that gas is a risk.	**Very Low to None.**
Recorded coal mining surface hazard	No	No	There are no recorded surface hazards. The Coal Authority have no records which might indicate that this is a risk.	**Very Low to None.**
Surface mining (modern opencast workings)	No	No	None possible.	**None.**

Part 4. Mitigation and Further Recommendations

4.1.1. Investigation

See separate recommendations provided by client's chartered engineer.

Please note: *"Prior written permission from The Coal Authority is required for intrusive activities which will disturb or enter any coal seams, coal mine workings or coal mine entries (shafts and adits). Further information on The Coal Authority's permissions process can be found at:* ***www.coal.gov.uk/services/permissions/index.cfm"***

4.1.2. Foundation Design

See separate recommendations provided by client's chartered engineer.

Part 5. Conclusion, etc.

5.1. Conclusion

This site is at the junction of Air Balloon Road, Hillside Road and Summer Hill Road. We know that seams outcrop and dip toward the property, the coal crops striking in a west to east direction, before curving south east toward the centre of Stibbs Hill. From that district they derive their name, the Stibbs seams. These seams cropped from their emergence beneath the Triassic cover in the west in Redfield, then describe an arc, south of St Georges Park toward Summer Hill, Bell Hill, Air Balloon Hill and Stibbs Hill, beyond this they are found in Hanham, Cadbury Heath, Oldland and Bitton. Contemporary commentator all say they were largely of poor quality and thin, although evidently in some locations at certain times they found enough of a market to be worked for a limited time and to a limited extent. They were at their best, toward the east of the coalfield in Warmley and Cadbury Heath.

Nevertheless some crop working must initially have occurred on Stibbs Hill and the crops are likely to have been followed at an early date both east and west of that location in the hope that the coal would improve sufficiently to warrant deeper working. The only location where that was considered worthwhile was here at Air Balloon Hill.

The Air Balloon Colliery was sunk, according to the geological sheets on or just behind the crop of the Parrot Vein, a Downend formation coal of good quality. Closer attention suggests however that this cannot be correct. The depth of the Stibbs seams in that shaft indicate conclusively that the Parrot Vein must outcrop significantly further south than is shown given the known intervals between the Stibbs seams and the Parrot Vein. This must also be true of the Muxen Vein, deeper than the Parrot, but of the same group.

Kellaway and Welch warn that the published crops in this area are in their own words 'doubtful' and in their defence the crops give are merely conjectural, not proven. The geological sheets do not show the Stibbs crops, but the Howard Humphreys Study does, and it too places these too far to the north. This must be so because if the seams cropped where they were plotted the seam gradient between them and their recorded position in the Air Balloon shaft would require a seam gradient of 1 in 4. Buckland and Conybeare, writing in 1824, spoke with miners who had worked these seams, if not here, to the west at Lawrence Hill. There the seam gradient was 1 in 2. If the seam gradient here was nearer to 1 in 4 than 1 in 2 and the crop positions given by the Howard Humphreys study are accurate then all these seams will lie at depths in excess of the shallow coal zone beneath the whole site. If the Buckland and Conybeare seam gradient (1 in 2) applies here, and there is no means of knowing without boreholes, then the coal seam outcrops will be closer to the site and the highest seam of the group might just enter the shallow coal zone at the northern perimeter of the site adjacent to Hillside Avenue. If the gradient is any shallower, it will not.

We know that the Stibbs seams were worked here, the Air Balloon pit is just 100ft (30m) to the south and pits of this period usually worked to the rise, that is toward the property. But that said, the seams – all of them of the Stibbs group - were 180ft, 240ft (55 and 73m) and more deep. Workings probably extend beneath the property therefore but at depths far deeper than the shallow coal zone with which the Coal Authority is concerned. All these seams were only worked for three or four years according to both Anstie and Cossham, both writing in the 1870s. All were thin and the voids cannot migrate to the surface from so far beneath the application site.

That is not to say there are no coal seams within the shallow coal zone. The Howard Humphreys Study indicated that there were coal seams within 25m of the surface and the Coal Authority warned that shallow seams might be present. We agree that this is a possibility. There were however very few seams between the Muxen (which crops to the south of the site) and the Stibbs seams which we know crop to the north. The most likely candidate is the Jones seam, or its equivalent in this part of Bristol, possibly known as the Great Cuckoo. Like the first of the Stibbs seams this was not a thick seam, just 0.4m thick and of insufficient consequence for any commentator of the time to remark on its quality. If it exists at all, and this is by no means certain as it is mentioned only in regard to pits on the eastern side of the coalfield, it was almost certainly left unworked.

Deeper seams were not worked here because the set fell between two faults, one to the east another to the north. Workings in the Kingswood Great Vein were so deep in this district that even were the mine plans wrong, and unrecorded workings existed, they would be far too deep to be of any concern.

The risk then coalesces around the position, thickness and variability of the Stibbs seams. No-one knows the exact positions; the best estimate is that given by the Howard Humphreys Study, even though the crop positions indicated by this study have been shown to be somewhat different from other sources in some parts of Bristol. Nevertheless no other source plots a conjectural outcrop for the Stibbs seams and even with the possibility that these seams outcrop closer to the site they must still be too deep to have an impact on ground stability.

Given the nature of the development however some site investigations would be recommended, particularly as there is a remote possibility that the Great Cuckoo/Jones seam might crop in this location somewhere and trenches dug should either locate the seam or discount its presence, eliminating the need for any special treatment.

Fortunately all other risk indicators are not a concern. There are no shafts within a radius 60ft (20m) which might affect the site from an unexpected collapse and none would be anticipated. There is no evidence of shafts, horse gins or engine houses on the application site on the map record.

Mine gas, surface hazards, geological faults and water levels are not a risk, and there has been no subsidence.

In conclusion our view is that whilst there is some mining heritage here, the seams are poor and all contemporary commentators state that they were never worked to any great extent in the area. The main area of mining is to the south in the Parrot and Buff veins and whilst the Stibbs seams were worked at the Air Balloon Pit and these workings will almost certainly extend beneath the site, they are too deep to be of any concern and were in any event undertaken for a very short time only. There is a slight possibility that there may be some crop workings which may have created soft ground, but bell pits and shallow shafts either on, or close to the site can almost certainly be discounted. The deep mining in the Kingswood Great Vein is of no concern.

5.2. Disclaimer

Whilst we believe that our archive is truly comprehensive we nevertheless acknowledge that there may be documentary sources unknown to us. Consequently, this report is limited to the information in our possession.

Because the information in the report or risk assessment is obtained from records and documents prepared by others, it follows that the company cannot accept responsibility for any inaccuracies in those records or omissions from them.

If we express an opinion as to whether any mine workings revealed by this report would affect the property, we do so, on the basis of a theoretical relationship between the depth of the workings and the size of the seam. Any risk of subsidence also diminishes with the age of the workings. However, recent experience makes it plain that if there are workings under or adjacent to the property, there may be some degree of risk.

Mrs Jennifer Cornwell CEng MIStructE
Bristol Coalmining Archives Ltd

Appendices

App.	Provider	Title	Ref	Date
A	Coal Authority	Non-Residential Mining Report	51001809284001	19th March 2018
B	Bristol Coalmining Archives	Standard Mining Report	54295	12th July 2017
C	Landmark Information	Sitecheck Assess	SAS-128822120	16 June 2017
D	From client	Sketch Scheme Elevations and Plans	--	5th Dec 2017
E	From client	Photograph of a Well		2 Jan 2018
F	Bristol Coalmining Archives	List of Pit Closures		

App. A. Coal Authority

Title	Ref	Date
Non-Residential Mining Report	51001809284001	19th March 2018

The Coal Authority

Resolving the impacts of mining

CON29M Non-Residential Mining Report

ADVERTISING RIGHT CORNER OF AIR
BALLOON ROAD
HILLSIDE ROAD
ST GEORGE
BRISTOL
BS5 8LD

Date of enquiry:	19 March 2018
Date enquiry received:	19 March 2018
Issue date:	19 March 2018
Our reference:	51001809284001
Your reference:	

CON29M Non-Residential Mining Report

This report is based on, and limited to, the records held by the Coal Authority and the Cheshire Brine Subsidence Compensation Board's records, at the time we answer the search.

Client name

Martin Hill

Enquiry address

ADVERTISING RIGHT CORNER OF AIR BALLOON ROAD, HILLSIDE ROAD, ST GEORGE, BRISTOL, BS5 8LD

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Mansfield
Nottinghamshire
NG18 4RG

www.groundstability.com

/company/the-coal-authority
/thecoalauthority
/coalauthority

Approximate position of property

Summary

Has the search report highlighted evidence or potential of		
1	Past underground coal mining	Yes
2	Present underground coal mining	No
3	Future underground coal mining	Yes
4	Mine entries	Yes
5	Coal mining geology	No
6	Past opencast coal mining	No
7	Present opencast coal mining	No
8	Future opencast coal mining	No
9	Coal mining subsidence	No
10	Mine gas	No
11	Hazards related to coal mining	No
12	Withdrawal of support	No
13	Working facilities order	No
14	Payments to owners of former copyhold land	No
15	Information from the Cheshire Brine Subsidence Compensation Board	No

For detailed findings, please go to page 4.

Detailed findings

1. Past underground coal mining

The property is in a surface area that could be affected by underground mining in 2 seams of coal at 470m to 600m depth, and last worked in 1885.

Any movement in the ground due to coal mining activity should have stopped.

In addition the property is in an area where the Coal Authority believe there is coal at or close to the surface. This coal may have been worked at some time in the past. The potential presence of coal workings at or close to the surface should be considered prior to any site works or future development activity. Your attention is drawn to the Comments on the Coal Authority information section of the report.

2. Present underground coal mining

The property is not within a surface area that could be affected by present underground mining.

3. Future underground coal mining

The property is not in an area where the Coal Authority has plans to grant a licence to remove coal using underground methods.

The property is not in an area where a licence has been granted to remove or otherwise work coal using underground methods.

The property is not in an area likely to be affected from any planned future underground coal mining.

However, reserves of coal exist in the local area which could be worked at some time in the future.

No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

4. Mine entries

There are no known coal mine entries within, or within 20 metres of, the boundary of the property.

There may however be mine entries/additional mine entries in the local area which the Coal Authority has no knowledge of.

5. Coal mining geology
The Coal Authority is not aware of any damage due to geological faults or other lines of weakness that have been affected by coal mining.

6. Past opencast coal mining
The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.

7. Present opencast coal mining
The property does not lie within 200 metres of the boundary of an opencast site from which coal is being removed by opencast methods.

8. Future opencast coal mining
There are no licence requests outstanding to remove coal by opencast methods within 800 metres of the boundary.

The property is not within 800 metres of the boundary of an opencast site for which a licence to remove coal by opencast methods has been granted.

9. Coal mining subsidence
The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31st October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

10. Mine gas
The Coal Authority has no record of a mine gas emission requiring action.

11. Hazards related to coal mining
The property has not been subject to remedial works, by or on behalf of the Authority, under its Emergency Surface Hazard Call Out procedures.

12. Withdrawal of support
The property is not in an area where a notice to withdraw support has been given.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

13. Working facilities order
The property is not in an area where an order has been made, under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

14. Payments to owners of former copyhold land

The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

15. Information from the Cheshire Brine Subsidence Compensation Board

The property lies outside the Cheshire Brine Compensation District.

Comments on the Coal Authority information

The Coal Authority own the copyright in this report and the information used is protected by our database right.

In view of the mining circumstances a prudent developer would seek appropriate technical advice before any works are undertaken.

Therefore if development proposals are being considered, technical advice relating to both the investigation of coal and former coal mines and their treatment should be obtained before beginning work on site. All proposals should apply good engineering practice developed for mining areas. No development should be undertaken that intersects, disturbs or interferes with any coal or mines of coal without the permission of the Coal Authority. Developers should be aware that the investigation of coal seams/former mines of coal may have the potential to generate and/or displace underground gases and these risks both under and adjacent to the development should be fully considered in developing any proposals. The need for effective measures to prevent gases entering into public properties either during investigation or after development also needs to be assessed and properly addressed. This is necessary due to the public safety implications of any development in these circumstances.

Additional remarks

Information provided by the Coal Authority in this report is compiled in response to the Law Society's Con29M Coal Mining and Brine Subsidence Claim enquiries. The said enquiries are protected by copyright owned by the Law Society of 113 Chancery Lane, London WC2A 1PL. Please note that Brine Subsidence Claim enquiries are only relevant for England and Wales. This report is prepared in accordance with the Law Society's Guidance Notes 2006, the User Guide 2006 and the Coal Authority and Cheshire Brine Board's Terms and Conditions applicable at the time the report was produced.

Disclaimer

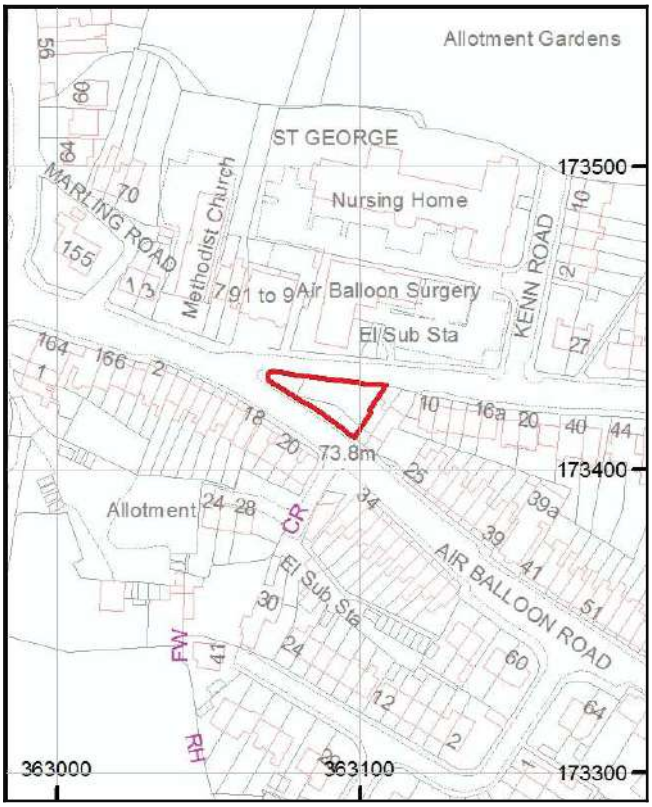
Alternative formats

If you would like this report in an alternative format, please contact our communications team.

Enquiry boundary

Key

Approximate position of enquiry boundary shown



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Nottinghamshire
NG18 4RG

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/thecoalauthority
/coalauthority

VAT receipt

Issued by	The Coal Authority 200 Lichfield Lane Mansfield Nottinghamshire NG18 4RG
Tax point date	19 March 2018
Issued to	MARTIN HILL 14 FERNBANK ROAD REDLAND BRISTOL BS6 6PZ
Property search for	ADVERTISING RIGHT CORNER OF AIR BALLOON ROAD HILLSIDE ROAD ST GEORGE BRISTOL BS5 8LD
Reference number	51001809284001
Date of issue	19 March 2018
Cost	£91.50
VAT @ 20%	£18.30
Total received	£109.80
VAT registration	598 5850 68

App. B. Bristol Coalmining Archives

Title	Ref	Date
Standard Mining Report	54295	12th July 2017

BRISTOL COALMINING ARCHIVES Ltd.

The Old Tenniscourt Farmhouse,
Wells Road, HALLATROW,
Nr Bristol Somerset, BS39 6EJ,
Tel. No: (01761) 453622
Fax. No: (01761) 453607
Email:reports@bristolcoalmining archives.co.uk

Mr Martin Hill
Moosehead Ltd
c/o 14 Fernbank Road
Bristol BS6 6PZ.

Date: *12/07/17*

Our Ref: 54295

Your Ref: -

Dear Sirs

Re: - Site on Air Balloon Road Bristol BS5 8LD

Thank you for your enquiry which we received on 12/07/17.

We have searched our records and report as follows:-

Past Mining Activity

The property is situated in an area that was worked for coal in the 18th, 19th and 20th centuries and is adjacent to but not over the workings of Speedwell Colliery. The property will however be over the workings of Air Balloon Pit and possibly an earlier concern.

The geological sheets show that the Parrot Vein outcrops to the south and dips in that direction, away from the property. This seam and any workings it may contain will therefore be of no concern.

The next seam beneath the Parrot is the thin Brimstone Seam, around one foot in section and lies 35 feet beneath the Parrot. This seam is likely to be present beneath or just to the south of the southern boundary of the property and may have been worked along the crop at an early date.

Crop workings were essentially linear quarries from which the most easily accessible coal was extracted, down to a depth of about ten feet. Once exhausted these trenches would be backfilled and the land returned to agriculture.

The Muxen Vein, which could be up to four feet thick is situated 120 feet beneath the Parrot Vein and with therefore outcrop around 150 feet to the north of the property and is likely to be present beneath this part of Air Balloon Road at a depth of 50-70 feet.

This seam may have been worked beneath the property from Air Balloon Colliery. Unfortunately no plans survive from this early concern, if indeed they ever existed, as the pit closed prior to the requirement in law to keep records of this nature. Unrecorded workings in this seam beneath the property within this range cannot be ruled out.

Other seams are likely to have been worked by Air Balloon Pit at depths ranging from 100-520 feet. These seams, known as the Stibbs series, with individual names, such as, Drake, Scrag, Smiths Coal and Dolly range in thickness from one foot to three feet in section and will have been worked for three to four years only as the coal was variable and ultimately uneconomical. Generally workings of this depth and age will be of no concern, ground movement having normally long since ceased.

There are deeper workings still in the area from Speedwell Colliery, which worked a number of seams from the 1700s until closure in 1936.

Abandonment plans of the colliery show that these workings stop 250 feet to the north at a depth of 1,898 feet and 350 feet to the east at 1,656 feet deep.

Shafts and Adits

None are known inside the boundary of the property or within 50 feet.

The nearest recorded shaft is that of Air Balloon Pit, 80 feet to the south, and is known to be 606 feet deep. From this distance it is unlikely to affect the property.

A pump shaft is located 180 feet to the south west. These were common features, used to draw commercial and domestic water before the provision of the mains supply. These shafts were usually no more than 3-4 feet in diameter and will be of no concern.

Water and Drainage Levels

None are known in the vicinity.

Surface Geology

The property stands on beds of Carboniferous shales and sandstones that contain the coal seams of the Upper and Middle Coal Measures.

Subsidence

We have no knowledge of damage to property caused by subsidence specifically attributable to mining activity in the immediate area.

Disclaimer

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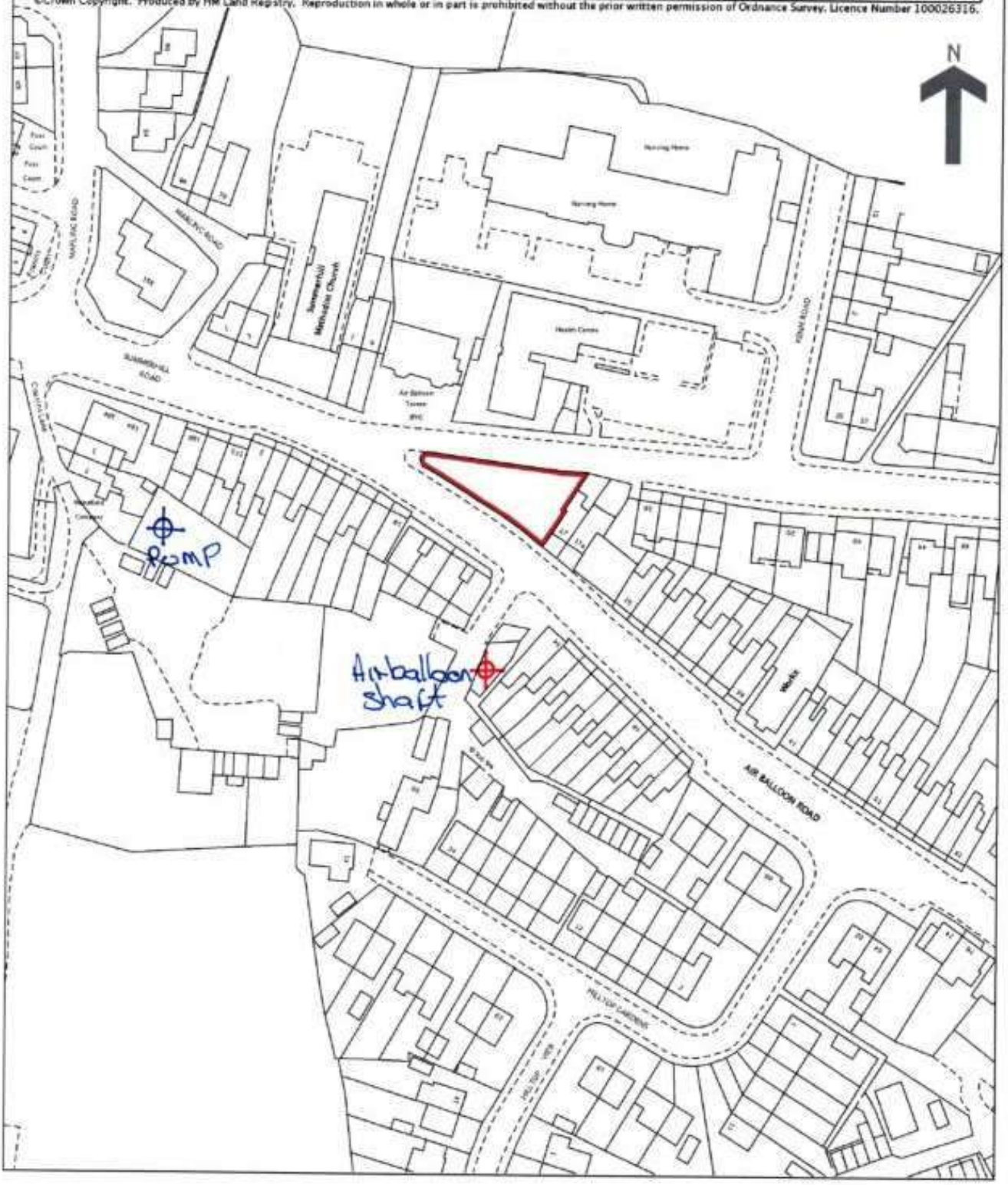
If we express an opinion as to whether any mine workings revealed by this report would affect the property, we do so, on the basis of a theoretical relationship between the depth of the workings and the size of the seam. Any risk of subsidence also diminishes with the age of the workings. However, recent experience makes it plain that if there are workings under or adjacent to the property, there may be some degree of risk.

Yours faithfully

Bristol Coalmining Archives Limited

HM Land Registry
Official copy of title plan

Title number **BL68679**
Ordnance Survey map reference **ST6373SW**
Scale **1:1250**
Administrative area **City of Bristol**



App. C. Landmark Information

Title	Ref	Date
Sitecheck Assess	SAS-128822120	16 June 2017

Sitecheck Assess

Land on north side of Air Balloon Road , Air Balloon Road, Bristol, BS5 8LA

Prepared for:
TM Official Search
TM Group (UK)
1200
Delta Business Park
Swindon
Wiltshire
SN5 7XZ
Report Reference: SAS_128822120_1_1

Report Date: 16-JUN-2017

Customer Reference: 16768219

National Grid Reference: 363090 173420

Site Area: 386 m²

If you have any questions on the contents of this Report please contact Landmark Customer Helpdesk which is open from 9:00am - 5:30pm, Monday - Friday, via one of the following channels:

Telephone: 0844 844 9966
Fax: 0844 844 9980
Email: info@landmarkinfo.co.uk
Website: www.sitecheck.co.uk

Sitecheck Assess

Professional Opinion
on environmental risk

PASSED

The Sitecheck report dated 16-JUN-2017 and reference SAS_128822120_1_1 for Land on north side of Air Balloon Road , Air Balloon Road, Bristol, BS5 8LA has examined the sources of potential contamination in terms of historical land use, environmental data and current land uses where known.

The report has highlighted the presence of Historical Tanks And Energy Facilities on or within 25m of the site boundary.

INTRODUCTION

This professional opinion determines the level of environmental risk, as to whether a pollutant linkage exists which is created when there is a source of contamination, a pathway for it to travel along and receptors, which may be harmed. This risk-based approach underpins the government approach to contaminated land. If a pollutant linkage exists the property may be regarded by the local authority as being "Contaminated Land" for the purposes of Part 2A of the Environmental Protection Act 1990.

In completing this report, Argyll Environmental has undertaken a review of data made available to it. No site inspection, further enquiries or investigation of surface or ground conditions has been carried out by Argyll Environmental. No information as to the age, value and type of property has been made available. It is important to note that it is not known by Argyll Environmental for what purpose the report has been commissioned.

FACTORS AFFECTING THIS PROPERTY

Potential Sources:

A review of historical mapping has revealed no historical or current potentially contaminative uses of concern on site.

A review of selected 1:2,500 and 1:1,250 scale Ordnance Survey mapping covering a period from 1949 - 1956 has identified that the site is on or within 25 metres of Electrical Sub Station Facilities.

Potential Pathways:

- Direct human contact with soil (and water).
- Contamination transport to shallow groundwater.
- Contamination transport to deep groundwater.

Sitecheck Assess

Professional Opinion
on environmental risk

Potential Receptors:

The property itself, surrounding properties and their respective occupants may be considered as receptors. Buildings and people can suffer harm by definition of Part 2A of the Environmental Protection Act 1990.

Current Ordnance Survey mapping indicates residential dwellings within 25 metres of the site boundary.

The groundwater vulnerability map, Sheet 37 Southern Cotswolds, has revealed that the site is located above a Minor Aquifer (Variably permeable).

Although minor aquifers seldom produce large quantities of water for abstraction they may be important for local supplies and supplying base flow to rivers.

CONCLUSIONS:

In the professional opinion of Argyll Environmental, the level of risk associated with the information disclosed in the associated Sitecheck Assess report:

1) is unlikely to have an adverse effect on the value of the property, and
2) is not such that the property would be designated "contaminated land" within the meaning of Part IIA of the Environmental Protection Act 1990.

OTHER ENVIRONMENTAL FACTORS:

In this case the following environmental factors have been identified which a client may wish to be investigated before proceeding further:

An area of Mining Instability
An area which may be affected by coal mining activity

Please refer to the relevant section in the report for each of the above factors.

Approved by

Argyll Environmental Ltd

Sitecheck Assess

Professional Opinion
on environmental risk

SOURCES OF ADDITIONAL PROFESSIONAL GUIDANCE:

If the report is for valuation, or investment, or other forms of lending decision making there may be issues arising from the current occupation, which need to be examined. The Royal Institution of Chartered Surveyors has provided guidance with respect to such matters and specific reference should be made to the guidance note 'Contamination, the environment and sustainability - Implications for chartered surveyors and their clients' published April 2010. This guidance note is referred to in UKGN1.1 paragraph 2.2 of the RICS Valuation Standards (6th Edition) (The "Red Book").

It is recommended that the client reviews the outputs of any valuation report, which should include a Property Observation Checklist, contained at Appendix A for commercial property or Appendix B for rural property in the Royal Institution of Chartered Surveyors guidance note 'Contamination, the environment and sustainability - Implications for chartered surveyors and their clients'. Completion of these checklists does not constitute an environmental assessment for the purposes of Professional Indemnity Insurance where many surveyors are unlikely to have appropriate indemnity cover. Any contamination, which is observed on the site by the surveyor during the normal course of their inspection, can also be recorded.

If the property is let, the landlord or the tenant (as appropriate) should take legal advice as to whether the covenants in the lease constitute legal or financial burdens. The Law Society's "Environmental Law Handbook-6th Edition" provides valuable assistance.

In leases with no express covenants dealing with environmental matters, lawyers and surveyors need to be aware of the extent to which the repairing of covenants can be applied and, when advising tenant clients in particular, will need to draw attention to the client's obligations to comply with enacted legislation.

Should contamination have been observed on site a suitably qualified, insured and experienced professional, preferably with the Specialist in Land Condition (SiLC) accreditation, should quantify whether this could give rise to an action by a regulator or any other party. A suitable management plan for action incorporated in a Land Quality Statement in accordance with RICS guidance should be put in place and appropriate matters taken up with the tenant / occupier.

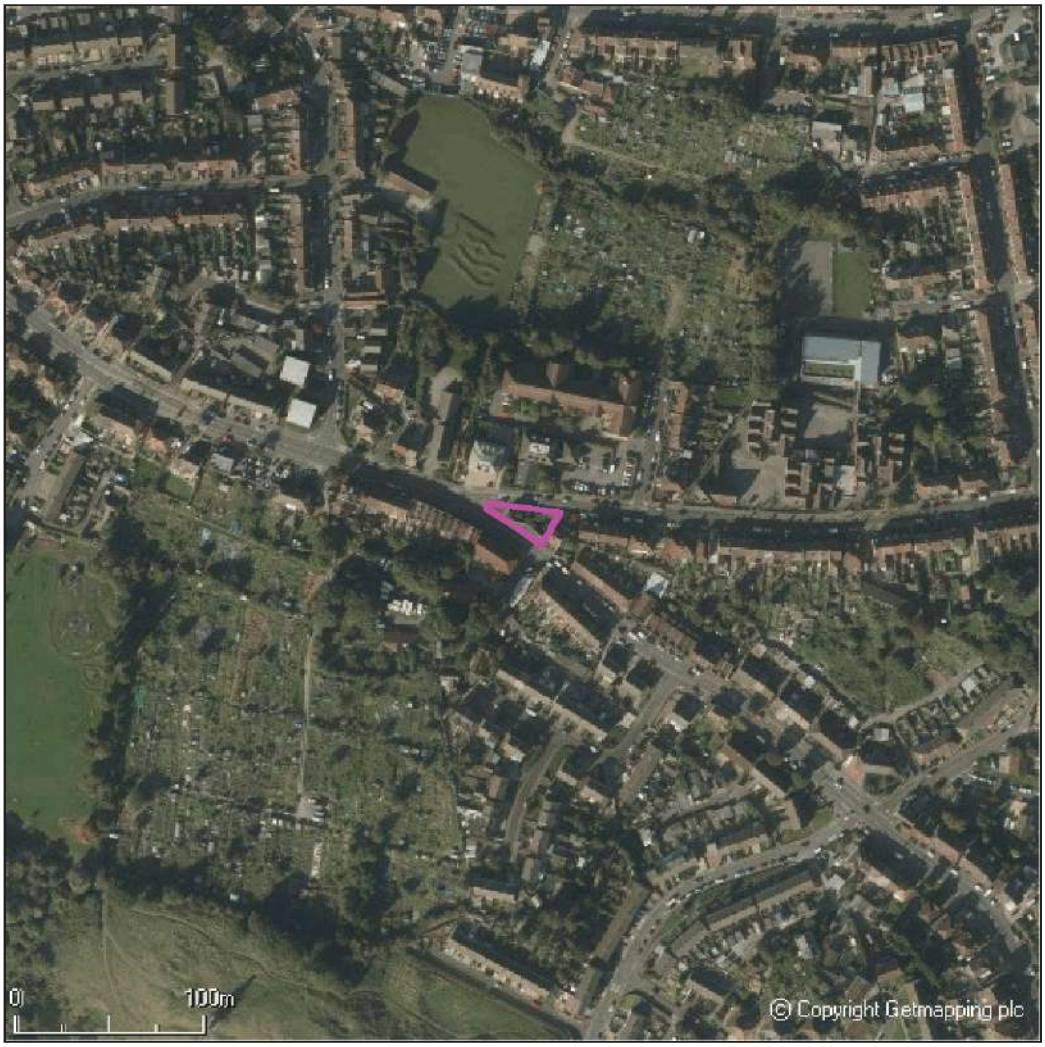
In terms of development this report should be seen as a precursor to a thorough investigation of the property for planning control purposes. The DTI funded guidance published by the Construction Industry Research and Information Association (CIRIA) Brownfields-managing the development of previously developed land-a clients guide may be a useful starting point.

Report Sections and Details	Page
Summary of Site	-
This section comprises contaminant, pathway and receptor information found on site. Other factors which may affect the site are also included.	
Aerial Photo	1
The aerial photo gives an overall view of the area. The smaller large-scale Ordnance Survey map includes the site boundary and search zone buffer at 500m.	
Location Map	2
The large-scale Ordnance Survey map includes the site boundary and search zone buffer at 500m. The smaller aerial photo also includes the site boundary.	
Summary Table	3
This section comprises of a summary table of the information found on site and in its vicinity.	
Current Land Use	7
This section contains a map, which shows current land use features. The following pages detail these features and identify the Reference Number and direction.	
Historical Land Use	13
This section contains a map, which shows historical land use features. The following pages detail these features and identify the Reference Number and direction. A table listing all the maps used to source this information is included.	
Sensitivity	18
This section contains a map, which shows pathway and receptor features. The following pages detail these features and identify the Reference Number and direction. This section also contains a separate Flood Map and flood details.	
Other Factors	21
This section contains information on other factors which may affect the site and its vicinity.	
Useful Information	23
This section contains information which may be of use when interpreting the report.	
Useful Contacts	24
All textual information is linked by the 'Contact Ref' to this quick reference list of contacts. These contacts may be able to supply additional information or answer any subsequent query relating to that record.	

If you would like any further assistance regarding this report then please contact
Landmark on (Tel) 0844 844 9966, (Fax) 0844 844 9980, Email: helpdesk@landmark.co.uk

Sensitivity Pathways	Page No.	Reference Number (Map ID)
Groundwater Vulnerability		
Geological Classification: Minor Aquifer (Variably permeable) - These can be fractured or potentially fractured rocks, which do not have a high primary permeability, or other formations of variable permeability including unconsolidated deposits. Although not producing large quantities of water for abstraction, they are important for local supplies and in supplying base flow to rivers, Soil Classification: Soils of High Leaching Potential (U) - Soil information for restored mineral workings and urban areas is based on fewer observations than elsewhere. A worst case vulnerability classification (H) assumed, until proved otherwise, Map Scale: 1:100,000, Map Name: Sheet 37 Southern Cotswolds, Contact Ref: 2	20	-

Other Factors Geological	Page No.	Reference Number (Map ID)
Coal Mining Affected Areas		
In an area which may be affected by coal mining activity. It is recommended that a coal mining report is obtained from the Coal Authority. Contact details are included in the Useful Contacts section., Contact Ref: 5	21	-
Mining Instability		
Risk: Inconclusive Coal Mining,	21	-
Radon Potential - Radon Affected Areas		
Affected Areas: The property is in a Lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level)., Source: British Geological Survey, National Geoscience Information Service, Contact Ref: 4	21	-
Radon Potential - Radon Protection Measures		
Radon Protection Measures: None, Source: British Geological Survey, National Geoscience Information Service, Contact Ref: 4	21	-
Potential for Landslide Ground Stability Hazards		
Hazard Potential: Very Low, Contact Ref: 4	21	-
Potential for Collapsible Ground Stability Hazards		
Hazard Potential: Very Low, Contact Ref: 4	21	-



Site
Land on north side of Air Balloon Road ,Air Balloon Road,Bristol,BS5 8LA

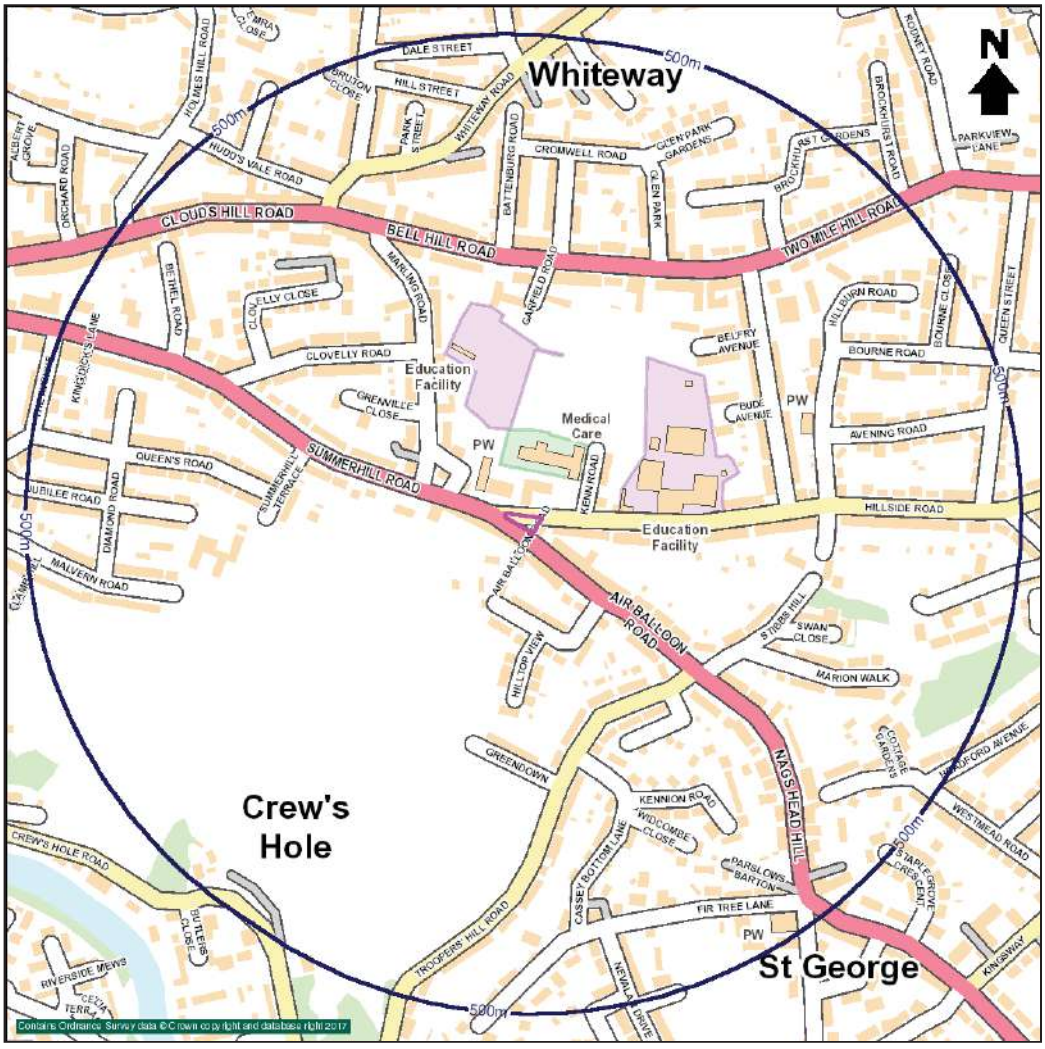
Grid Reference
363090, 173420

Report Reference
SAS_128822120_1_1

Customer Reference
16768219

Size of Site
386 m²

If you would like any further assistance regarding this report then please contact
Landmark on (Tel) 0844 844 9966, (Fax) 0844 844 9980, Email: helpdesk@landmark.co.uk



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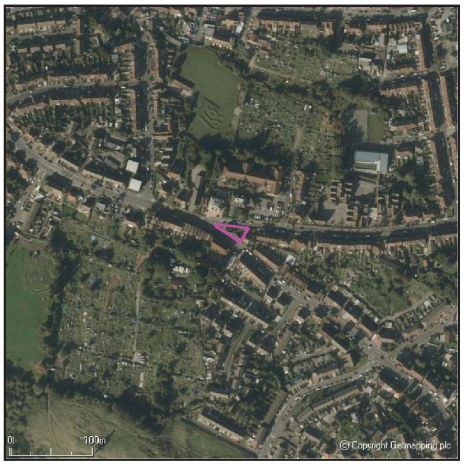

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Current Land Use	On Site	0-250m	250-500m
Contaminants	**0**	**8**	**54**
Waste / Landfill Sites			
BGS Recorded Landfill Sites	0	0	0
Licensed Waste Management Facilities (Landfill Boundaries)	0	0	0
Licensed Waste Management Facilities (Locations)	0	0	0
Local Authority Recorded Landfill Sites	0	0	1
Registered Landfill Sites	0	0	2
Registered Waste Transfer Sites	0	0	0
Registered Waste Treatment or Disposal Sites	0	0	0
Statutory Authorisations			
Local Authority Pollution Prevention and Controls	0	0	2
Contaminated Land Register Entries and Notices	0	0	0
Radioactive Substances Register	0	0	0
Discharge Consents			
Discharge Consents	0	1	6
Water Industry Act Referrals	0	0	0
Industrial Processes			
Integrated Pollution Controls	0	0	0
Integrated Pollution Control Registered Waste Sites	0	0	0
Environmental Permitting Regulations - Industry	0	0	0
Local Authority Integrated Pollution Prevention And Control	0	0	0
Storage of Hazardous Substances			
Control of Major Accident Hazards Sites (COMAH)	0	0	0
Explosive Sites	0	0	0
Notification of Installations Handling Hazardous Substances (NIHHS)	0	0	0
Planning Hazardous Substance Consents	0	0	0
Contraventions			
Local Authority Pollution Prevention and Control Enforcements	0	0	0
Enforcement and Prohibition Notices	0	0	0
Planning Hazardous Substance Enforcements	0	0	0
Prosecutions Relating to Authorised Processes	0	0	0
Prosecutions Relating to Controlled Waters	0	0	0
Substantiated Pollution Incident Register	0	0	0

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Current Land Use	On Site	0-250m	250-500m
Contaminants	**0**	**8**	**54**
Potentially Contaminative Uses			
Contemporary Trade Directory Entries	0	6	35
Fuel Station Entries	0	0	2
Miscellaneous			
BGS Recorded Mineral Sites	0	1	6

Historical Land Use	On Site	0-250m	250-500m
Contaminants	**0**	**15**	**35**
Potentially Contaminative Uses			
Historical Tanks And Energy Facilities	0	12	25
Potentially Contaminative Industrial Uses (Past Land Use)	0	2	8
Potentially Infilled Land			
Former Marshes	0	0	0
Potentially Infilled Land (Non-Water)	0	1	2
Potentially Infilled Land (Water)	0	0	0

Sensitivity	On Site	0-250m	250-500m
Pathways and Receptors	**1**	**0**	**0**
Pathways			
Groundwater Vulnerability	1	n/a	n/a
Drift Deposits	0	n/a	n/a
Historical Flood Liabilities	0	0	0
Extreme Flooding from Rivers or Sea without Defences	0	0	n/a
Flooding from Rivers or Sea without Defences	0	0	n/a
Areas Benefiting from Flood Defences	0	0	n/a
Flood Water Storage Areas	0	0	n/a
Flood Defences	0	0	n/a

Sensitivity Pathways and Receptors	On Site 1	0-250m 0	250-500m 0
Environmentally Sensitive Receptors			
Areas of Outstanding Natural Beauty	0	0	0
Environmentally Sensitive Areas	0	0	0
Local Nature Reserves	0	0	0
Marine Nature Reserves	0	0	0
National Nature Reserves	0	0	0
Nearest Surface Water Feature	0	0	0
Ramsar Sites	0	0	0
Sites of Special Scientific Interest	0	0	0
Source Protection Zones	0	0	0
Special Areas of Conservation	0	0	0
Special Protection Areas	0	0	0
Water Abstractions	0	0	0
Protected Countryside Areas			
Forest Parks	0	0	0
National Parks	0	0	0
National Scenic Areas	0	0	0

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Other Factors Geological	On Site 10	0-250m 5	250-500m 0
Brine Compensation Area	0	n/a	n/a
Coal Mining Affected Areas	1	n/a	n/a
Mining Instability	1	0	n/a
Man-Made Mining Cavities	0	0	0
Natural Cavities	0	0	0
Non Coal Mining Areas of Great Britain	0	1	n/a
Radon Potential - Radon Affected Areas	1	n/a	n/a
Radon Potential - Radon Protection Measures	1	n/a	n/a
Potential for Collapsible Ground Stability Hazards	1	0	n/a
Potential for Compressible Ground Stability Hazards	1	1	n/a
Potential for Ground Dissolution Stability Hazards	1	0	n/a
Potential for Landslide Ground Stability Hazards	1	1	n/a
Potential for Running Sand Ground Stability Hazards	1	1	n/a
Potential for Shrinking or Swelling Clay Ground Stability Hazards	1	1	n/a

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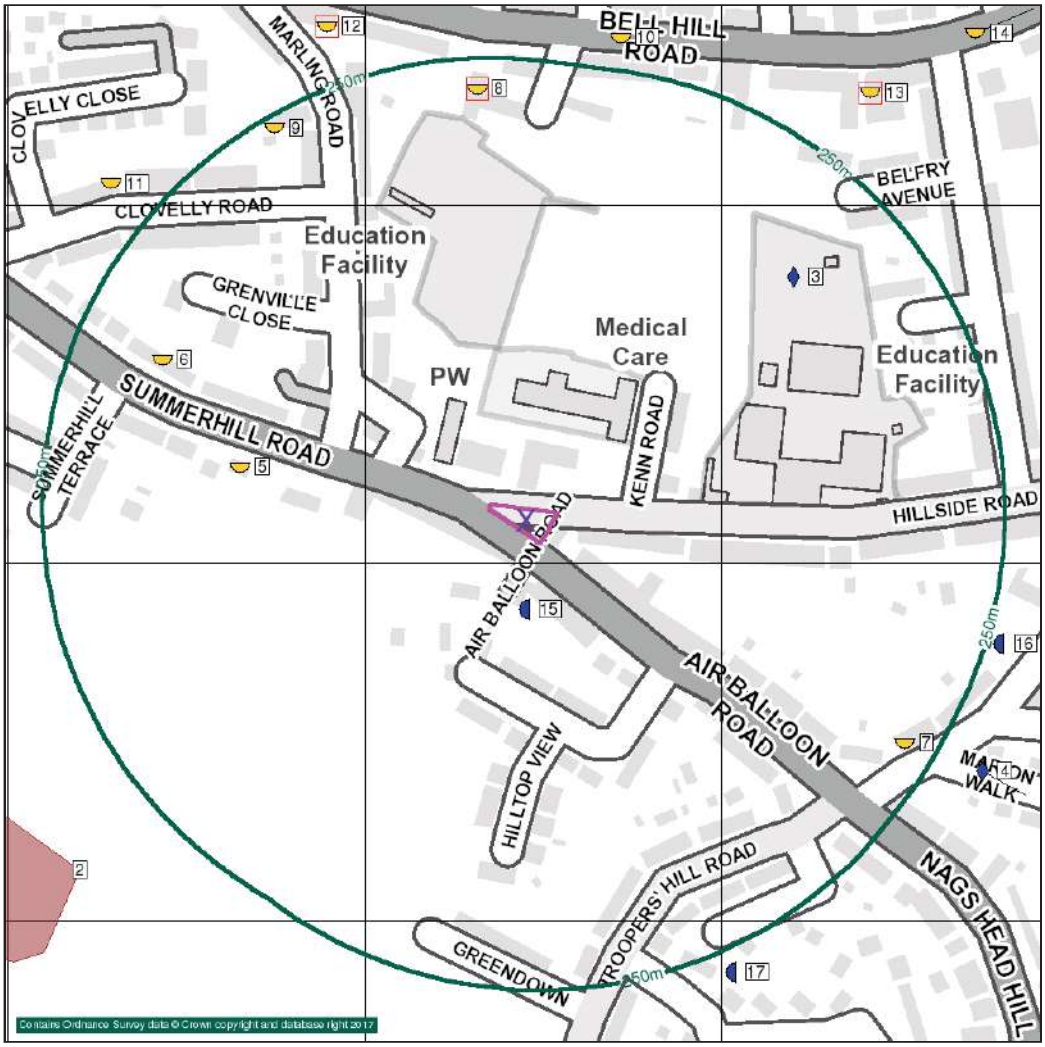
BELL HILL ROAD
MARLING ROAD
CLOVELLY CLOSE
CLOVELLY ROAD
Education Facility
GRENVILLE CLOSE
SUMMERHILL TERRACE
SUMMERHILL ROAD
PW
Medical Care
KENN ROAD
BELFRY AVENUE
Education Facility
HILLSIDE ROAD
AIR BALLOON ROAD
AIR BALLOON ROAD
HILLTOP VIEW
MARDEN WALK
TROOPERS HILL ROAD
NAGS HEAD HILL
GREENDOWN
250m
Contains Ordnance Survey data © Crown copyright and database right 2017


General
Site Boundary
Search Buffer
Bearing Reference Point
Reference Number
Miscellaneous
BGS Recorded Mineral Site
Potentially Contaminative Use
Potentially Contaminative Use
Potentially Contaminative Use (High Risk)
Waste/Landfill Sites
BGS Recorded Landfill Site
Licensed Waste Management Facilities (Landfill)
Local Authority Recorded Landfill Site
Registered Waste Transfer Site
Registered Waste Treatment or Disposal Site
Registered Landfill Site
Point Location of Registered Landfill Site
BGS Recorded Landfill Site (Point)
Licensed Waste Management Facilities (Location)
Local Authority Recorded Landfill Site (Point)
Registered Waste Transfer Site (Point)
Registered Waste Treatment or Disposal Site (Point)
Registered Landfill Site Potential Landfill Buffer
Contraventions
Local Authority Pollution Prevention and Control Enforcement
Planning Hazardous Substance Enforcement
Prosecution Relating to Authorised Processes
Enforcement and Prohibition Notice
Substantiated Pollution Incident Register
Prosecution Relating to Controlled Waters
Storage Of Hazardous Substances
COMAH
Planning Hazardous Substance Consent
Explosive Site
NIHHS
Industrial Processes
Integrated Pollution Control
Integrated Pollution Prevention Control
Integrated Pollution Control Registered Waste Site
Local Authority Integrated Pollution Prevention and Control
Statutory Authorisations
Local Authority Pollution Prevention and Control
Contaminated Land Register Entry or Notice (Point)
Contaminated Land Register Entry or Notice
Registered Radioactive Substance
Discharge Consents
Discharge Consent
Water Industry Act Referral

Contaminants Waste / Landfill Sites	Ref No.	Search Buffer	Direction
Local Authority Landfill Coverage			
Name: Bristol City Unitary Authority, - Has no landfill data to supply, Contact Ref: 6	-	On Site	NE
Local Authority Recorded Landfill Sites			
Not Supplied, Reference: Not Supplied, Positional Accuracy: Positioned by the supplier, Boundary Quality: Moderate, Contact Ref: 1	2	250-500m	SW
Registered Landfill Sites			
Avon Valley Reclamation Ltd, Old Quarry At Crews Hole Road, St George, Bristol, Avon, Reference: L/BL/T/ 42A, Status: Record superseded, Superseded, Positional Accuracy: Manually positioned to the address or location, Boundary Quality: Not Applicable, Contact Ref: 2	-	250-500m	SW
Avon Valley Reclamation Ltd, Old Quarry At Crews Hole Road, St George, Bristol, Avon, Reference: L/BL/T/ 42A, Status: Licence lapsed/cancelled/defunct/not applicable/surrendered, Cancelled, Positional Accuracy: Manually positioned to the address or location, Boundary Quality: Not Applicable, Contact Ref: 2	-	250-500m	SW

Statutory Authorisations	Ref No.	Search Buffer	Direction
Local Authority Pollution Prevention and Controls			
Whiteways Service Station, 19-29 Bell Hill Road, St George, BRISTOL, Avon, BS5, Part B - Fuel and Power Industry Sector, Reference: Ep130, Status: Permitted, Positional Accuracy: Manually positioned to the address or location, Contact Ref: 3	-	250-500m	N
Texaco Whiteway Service Station, Bell Hill, St George, Bristol, Bs5 7lt, Part B - Fuel and Power Industry Sector, Reference: Not Supplied, Status: Permitted, Positional Accuracy: Manually positioned to the address or location, Contact Ref: 3	-	250-500m	N

Discharge Consents	Ref No.	Search Buffer	Direction
Discharge Consents			
Wessex Water Services Ltd, Bude Avenue Football Pitch Cso, St Georges, Bristol, Sewerage Discharge, Reference: 011180, Version: 1, Status: Authorisation revoked, Revoked, Positional Accuracy: Located by supplier to within 100m, Contact Ref: 2	3	0-250m	NE
Wessex Water Services Ltd, Hillburn Road Cso, Junc Avening Road, St Georges, Bristol, Sewerage Discharge, Reference: 011182, Version: 1, Status: Authorisation revoked, Revoked, Positional Accuracy: Located by supplier to within 100m, Contact Ref: 2	-	250-500m	E
Wessex Water Services Ltd, Outside 36 Marion Walk, Bristol, Sewerage Discharge, Reference: 011181, Version: 1, Status: Consent revoked or revised: New Consent issued (Section 37(1)), Positional Accuracy: Located by supplier to within 100m, Contact Ref: 2	4	250-500m	SE

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Contaminants Discharge Consents	Ref No.	Search Buffer	Direction
Discharge Consents			
Wessex Water Services Ltd, Troopers Hill Road, Outside Myrtle House, Bristol, Sewerage Discharge, Reference: 011177, Version: 1, Status: Authorisation revoked, Revoked, Positional Accuracy: Located by supplier to within 100m, Contact Ref: 2	-	250-500m	S
Wessex Water Services Ltd, Marioin Walk, In Field At Rear Of No22, Bristol, Sewerage Discharge, Reference: 011237, Version: 1, Status: Consent revoked: Discharge ceased (Water Resources Act 1991, Schedule 10 & 6), Positional Accuracy: Located by supplier to within 100m, Contact Ref: 2	-	250-500m	SE
Wessex Water Services Ltd, Outside 65 Whiteway Road, Bristol, Sewerage Discharge, Reference: 011176, Version: 1, Status: Authorisation revoked, Revoked, Positional Accuracy: Located by supplier to within 100m, Contact Ref: 2	-	250-500m	N
Wessex Water Services Ltd, Opposite 1 Holmes Hill Road, Bristol, Sewerage Discharge, Reference: 011170, Version: 1, Status: Authorisation revoked, Revoked, Positional Accuracy: Located by supplier to within 100m, Contact Ref: 2	-	250-500m	NW

Potentially Contaminative Uses	Ref No.	Search Buffer	Direction
Contemporary Trade Directory Entries			
Summerhill, 144-148, Summerhill Road, Bristol, BS5 8JU, Car Dealers - Used, Status: Inactive, Positional Accuracy: Automatically positioned to the address	5	0-250m	W
Level A Ltd, 113, Summerhill Road, Bristol, BS5 8JT, Boilers - Servicing, Replacements & Repairs, Status: Inactive, Positional Accuracy: Automatically positioned to the address	6	0-250m	NW
Rotalight Ltd, 5, Stibbs Hill, Bristol, BS5 8LH, Lighting Manufacturers, Status: Inactive, Positional Accuracy: Automatically positioned to the address	7	0-250m	SE
T R S, 68-72, Bell Hill Road, Bristol, Avon, BS5 7LU, Garage Services, Status: Inactive, Positional Accuracy: Automatically positioned to the address	8	0-250m	N
Auto Connect, 70, Bell Hill Road, Bristol, BS5 7LU, Car Dealers, Status: Active, Positional Accuracy: Automatically positioned to the address	8	0-250m	N
Greg'S Gypsy Bowtops, 37-39, Marling Road, Bristol, BS5 7LN, Caravan Dealers & Manufacturers, Status: Active, Positional Accuracy: Automatically positioned to the address	9	0-250m	NW
First Choice, Bell Hill Rd, Bristol, BS5 7LJ, Commercial Vehicle Dealers, Status: Inactive, Positional Accuracy: Manually positioned to the road within the address or location	10	250-500m	N
M J Lawrence, 26, Clovelly Road, Bristol, BS5 7LS, Ultrasonic Equipment Manufacturers, Status: Inactive, Positional Accuracy: Automatically positioned to the address	11	250-500m	NW
Tyre & Exhaust Services, 30-38, Bell Hill Road, Bristol, BS5 7LJ, Tyre Dealers, Status: Inactive, Positional Accuracy: Automatically positioned to the address	12	250-500m	N
Smart Price Ltd, 30-38, Bell Hill Road, Bristol, BS5 7LJ, Tyre Dealers, Status: Active, Positional Accuracy: Automatically positioned to the address	12	250-500m	N

Contaminants Potentially Contaminative Uses	Ref No.	Search Buffer	Direction
Contemporary Trade Directory Entries			
Hilliers Ltd, 140, Bell Hill Road, Bristol, BS5 7NF, Garage Equipment, Status: Active, Positional Accuracy: Automatically positioned to the address	13	250-500m	NE
Total Equipment, 140, Bell Hill Road, Bristol, BS5 7NF, Garage Equipment, Status: Inactive, Positional Accuracy: Automatically positioned to the address	13	250-500m	NE
Pearce Hydraulics, 140, Bell Hill Road, Bristol, BS5 7NF, Garage Equipment, Status: Inactive, Positional Accuracy: Automatically positioned to the address	13	250-500m	NE
South West Fluid Power Ltd, 140, Bell Hill Road, Bristol, Avon, BS5 7NF, Hydraulic Equipment & Accessories - Sales & Service, Status: Inactive, Positional Accuracy: Automatically positioned to the address	13	250-500m	NE
Pearce Hydraulics Ltd, 140, Bell Hill Road, Bristol, BS5 7NF, Garage Equipment, Status: Active, Positional Accuracy: Automatically positioned to the address	13	250-500m	NE
Etch Designs, 24, Bell Hill Road, Bristol, BS5 7LJ, Glass Engravers & Decorators, Status: Inactive, Positional Accuracy: Automatically positioned to the address	-	250-500m	NW
B S Domestic Appliance Repairs, 6, Hillburn Road, Bristol, BS5 7PW, Domestic Appliances - Servicing, Repairs & Parts, Status: Active, Positional Accuracy: Automatically positioned to the address	-	250-500m	E
B S Domestic Appliance Repairs, 6, Hillburn Road, Bristol, BS5 7PW, Electrical Appliance Repairs, Status: Inactive, Positional Accuracy: Automatically positioned to the address	-	250-500m	E
Texaco, 19-29, Bell Hill Road, Bristol, BS5 7LT, Petrol Filling Stations, Status: Active, Positional Accuracy: Automatically positioned to the address	-	250-500m	N
Whiteways Service Station, 19-29, Bell Hill Road, Bristol, BS5 7LT, Petrol Filling Stations, Status: Inactive, Positional Accuracy: Automatically positioned to the address	-	250-500m	N
Bristol Autocare Ltd, 93, Summerhill Road, Bristol, BS5 8JT, Engine Rebuilding & Reconditioning, Status: Active, Positional Accuracy: Automatically positioned to the address	-	250-500m	NW
R Hawker & Son Coal Merchants, Myrtle House, Troopers Hill Road, BRISTOL, BS5 8BW, Coal & Smokeless Fuel Merchants & Distributors, Status: Inactive, Positional Accuracy: Automatically positioned to the address	-	250-500m	S
Bristol & Bath Pest Control, Bristol, Avon, Bs5 8lj, Pest & Vermin Control, Status: Active, Positional Accuracy: Manually positioned within the geographical locality	-	250-500m	SE
Begbrook Motors, 10, Whiteway Road, Bristol, BS5 7QR, Car Body Repairs, Status: Inactive, Positional Accuracy: Automatically positioned to the address	-	250-500m	N
Frenchies Autos, 3 Two Mile Hill Rd, Bristol, Avon, BS15 1AZ, Garage Services, Status: Inactive, Positional Accuracy: Manually positioned to the road within the address or location	14	250-500m	NE
Avon Valley Services Ltd, 1, Parslows Barton, Bristol, BS5 8QH, Garage Equipment, Status: Inactive, Positional Accuracy: Automatically positioned to the address	-	250-500m	SE
Avon Valley Services Ltd, 1, Parslows Barton, Bristol, Avon, BS5 8QH, Garage Equipment, Status: Inactive, Positional Accuracy: Automatically positioned to the address	-	250-500m	SE
Motorcraft, 74, Nags Head Hill, Bristol, BS5 8LW, Car Dealers - Used, Status: Active, Positional Accuracy: Automatically positioned to the address	-	250-500m	SE

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Contaminants Potentially Contaminative Uses	Ref No.	Search Buffer	Direction
Contemporary Trade Directory Entries			
Bristol Car Mart, 74, Nags Head Hill, Bristol, BS5 8LW, Car Dealers - Used, Status: Inactive, Positional Accuracy: Automatically positioned to the address	-	250-500m	SE
Moto Emporium (Bristol), 74, Nags Head Hill, Bristol, BS5 8LW, Car Dealers - Used, Status: Inactive, Positional Accuracy: Automatically positioned to the address	-	250-500m	SE
Alan Thompson, 98-100, Clouds Hill Road, Bristol, BS5 7LF, Car Breakers & Dismantlers, Status: Inactive, Positional Accuracy: Automatically positioned to the address	-	250-500m	NW
Brown'S Creative Metal, 170, Hillside Road, Bristol, BS5 7PR, Machine Shops, Status: Active, Positional Accuracy: Automatically positioned to the address	-	250-500m	E
Dave The Cleaner, 102, Whiteway Road, Bristol, BS5 7QX, Carpet, Curtain & Upholstery Cleaners, Status: Inactive, Positional Accuracy: Automatically positioned to the address	-	250-500m	N
Alex@Noskip, 65, Queen Street, Kingswood, Bristol, BS15 8AT, Waste Disposal Services, Status: Inactive, Positional Accuracy: Automatically positioned to the address	-	250-500m	E
Alex'S Rubbish Clearance, 65, Queen Street, Kingswood, Bristol, BS15 8AT, Waste Disposal Services, Status: Inactive, Positional Accuracy: Automatically positioned to the address	-	250-500m	E
St George Motor Co Ltd, 47-49, Summerhill Road, Bristol, BS5 8HG, Car Dealers - Used, Status: Inactive, Positional Accuracy: Automatically positioned to the address	-	250-500m	NW
St George Motor, 47-49, Summerhill Road, Bristol, BS5 8HG, Car Dealers, Status: Inactive, Positional Accuracy: Automatically positioned to the address	-	250-500m	NW
Summerhill Car Care, 47-49, Summerhill Road, Bristol, BS5 8HG, Car Dealers - Used, Status: Inactive, Positional Accuracy: Automatically positioned to the address	-	250-500m	NW
Carwise, 47-49, Summerhill Road, Bristol, BS5 8HG, Garage Services, Status: Inactive, Positional Accuracy: Automatically positioned to the address	-	250-500m	NW
C & C Tyres, 47-49, Summerhill Road, Bristol, BS5 8HG, Exhaust & Shock Absorber Centres, Status: Inactive, Positional Accuracy: Automatically positioned to the address	-	250-500m	NW
Car Wise, 47-49, Summerhill Road, Bristol, Avon, BS5 8HG, Mot Testing Centres, Status: Inactive, Positional Accuracy: Automatically positioned to the address	-	250-500m	NW
Fuel Station Entries			
Whiteway Service Station, 19-29, Bell Hill Road, Bristol, BS5 7LT, Fuel Station, Status: Open, Positional Accuracy: Automatically positioned to the address,	-	250-500m	N
Swallow Service Station, 47-49 Summerhill Road, St George, BRISTOL, BS5 8HG, Fuel Station, Status: Obsolete, Positional Accuracy: Automatically positioned to the address,	-	250-500m	NW

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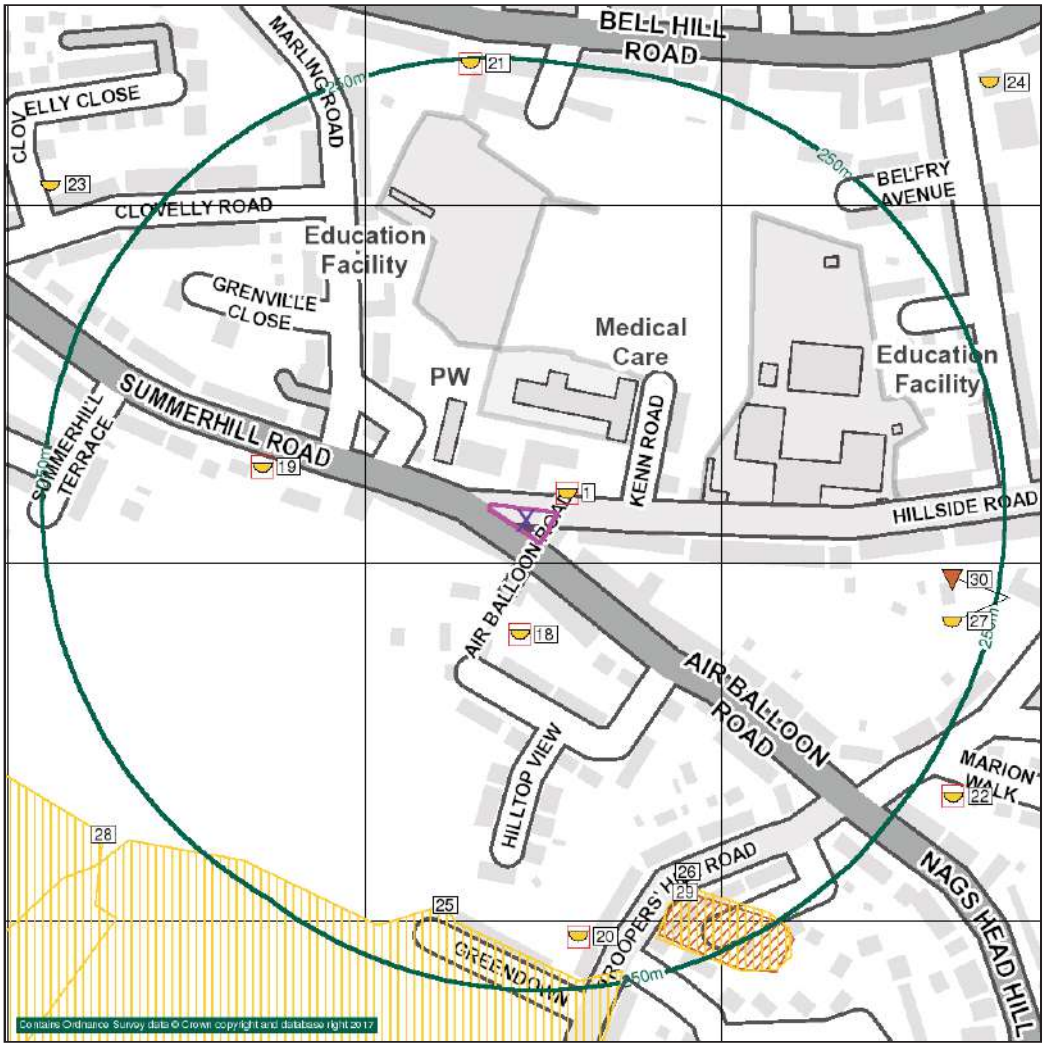
Contaminants Miscellaneous	Ref No.	Search Buffer	Direction
BGS Recorded Mineral Sites			
Air Balloon Pit, Air Balloon Road, St George, Bristol, Avon, Status: Ceased, Reference: 191103, Positional Accuracy: Located by supplier to within 10m, Contact Ref: 4	15	0-250m	S
Air Balloon Hill, , St George, Bristol, Avon, Status: Ceased, Reference: 19423, Positional Accuracy: Located by supplier to within 10m, Contact Ref: 4	16	250-500m	E
Nagshead Hill, , Whites Hill, Bristol, Avon, Status: Ceased, Reference: 61343, Positional Accuracy: Located by supplier to within 10m, Contact Ref: 4	17	250-500m	SE
Air Balloon Hill, , St George, Bristol, Avon, Status: Ceased, Reference: 19424, Positional Accuracy: Located by supplier to within 10m, Contact Ref: 4	-	250-500m	E
Troopers' Hill, , St George, Bristol, Avon, Status: Ceased, Reference: 19411, Positional Accuracy: Located by supplier to within 10m, Contact Ref: 4	-	250-500m	S
Troopers' Hill, , Bristol, Avon, Status: Ceased, Reference: 11757, Positional Accuracy: Located by supplier to within 10m, Contact Ref: 4	-	250-500m	SW
Troopers' Hill, , St George, Bristol, Avon, Status: Ceased, Reference: 19412, Positional Accuracy: Located by supplier to within 10m, Contact Ref: 4	-	250-500m	SW

If you would like any further assistance regarding this report then please contact
Landmark on (Tel) 0844 844 9966, (Fax) 0844 844 9980, Email: helpdesk@landmark.co.uk



General	Potentially Contaminative Use		Potentially Infilled Land	
Site Boundary	Point Feature	Point Feature (High Risk)	Point Feature	Point Feature (High Risk)
Search Buffer	Area Feature	Area Feature (High Risk)	Area Feature	Area Feature (High Risk)
Bearing Reference Point	Line Feature	Line Feature (High Risk)	Line Feature	Line Feature (High Risk)
Reference Number				

Contaminants Potentially Contaminative Uses	Ref No.	Search Buffer	Direction
Historical Tanks And Energy Facilities			
Electrical Sub Station Facilities, Scale of Mapping: 1:1,250, Date of Mapping: 1949 - 1956	1	0-250m	NE
Electrical Sub Station Facilities, Scale of Mapping: 1:2,500, Date of Mapping: 1971	1	0-250m	NE
Electrical Sub Station Facilities, Scale of Mapping: 1:2,500, Date of Mapping: 1951	1	0-250m	NE
Electrical Sub Station Facilities, Scale of Mapping: 1:1,250, Date of Mapping: 1969	1	0-250m	NE
Electrical Sub Station Facilities, Scale of Mapping: 1:2,500, Date of Mapping: 1971	18	0-250m	S
Electrical Sub Station Facilities, Scale of Mapping: 1:1,250, Date of Mapping: 1969	18	0-250m	S
Potential Tanks, Scale of Mapping: 1:1,250, Date of Mapping: 1969	19	0-250m	W
Potential Tanks, Scale of Mapping: 1:2,500, Date of Mapping: 1971	19	0-250m	W
Electrical Sub Station Facilities, Scale of Mapping: 1:2,500, Date of Mapping: 1971	20	0-250m	S
Electrical Sub Station Facilities, Scale of Mapping: 1:1,250, Date of Mapping: 1969	20	0-250m	S
Potential Tanks, Scale of Mapping: 1:1,250, Date of Mapping: 1961 - 1969	21	0-250m	N
Potential Tanks, Scale of Mapping: 1:2,500, Date of Mapping: 1971	21	0-250m	N
Electrical Sub Station Facilities, Scale of Mapping: 1:1,250, Date of Mapping: 1956	22	250-500m	SE
Electrical Sub Station Facilities, Scale of Mapping: 1:2,500, Date of Mapping: 1971	22	250-500m	SE
Electrical Sub Station Facilities, Scale of Mapping: 1:1,250, Date of Mapping: 1969	22	250-500m	SE
Electrical Sub Station Facilities, Scale of Mapping: 1:1,250, Date of Mapping: 1972	23	250-500m	NW
Potential Tanks, Scale of Mapping: 1:1,250, Date of Mapping: 1964 - 1972	-	250-500m	NW
Potential Tanks, Scale of Mapping: 1:2,500, Date of Mapping: 1971	-	250-500m	N
Potential Tanks, Scale of Mapping: 1:1,250, Date of Mapping: 1961	24	250-500m	NE
Electrical Sub Station Facilities, Scale of Mapping: 1:2,500, Date of Mapping: 1971	-	250-500m	NE
Electrical Sub Station Facilities, Scale of Mapping: 1:1,250, Date of Mapping: 1969	-	250-500m	NE
Potential Tanks, Scale of Mapping: 1:2,500, Date of Mapping: 1971	-	250-500m	N
Potential Tanks, Scale of Mapping: 1:1,250, Date of Mapping: 1955 - 1972	-	250-500m	N
Electrical Sub Station Facilities, Scale of Mapping: 1:2,500, Date of Mapping: 1971	-	250-500m	NE
Electrical Sub Station Facilities, Scale of Mapping: 1:1,250, Date of Mapping: 1969	-	250-500m	NE
Electrical Sub Station Facilities, Scale of Mapping: 1:2,500, Date of Mapping: 1951	-	250-500m	NE
Electrical Sub Station Facilities, Scale of Mapping: 1:1,250, Date of Mapping: 1949	-	250-500m	NE

If you would like any further assistance regarding this report then please contact
Landmark on (Tel) 0844 844 9966, (Fax) 0844 844 9980, Email: helpdesk@landmark.co.uk

Contaminants Potentially Contaminative Uses	Ref No.	Search Buffer	Direction
Historical Tanks And Energy Facilities			
Electrical Sub Station Facilities, Scale of Mapping: 1:2,500, Date of Mapping: 1971	-	250-500m	E
Electrical Sub Station Facilities, Scale of Mapping: 1:1,250, Date of Mapping: 1969 - 1977	-	250-500m	E
Electrical Sub Station Facilities, Scale of Mapping: 1:1,250, Date of Mapping: 1972	-	250-500m	NW
Electrical Sub Station Facilities, Scale of Mapping: 1:2,500, Date of Mapping: 1951	-	250-500m	NW
Electrical Sub Station Facilities, Scale of Mapping: 1:1,250, Date of Mapping: 1950 - 1955	-	250-500m	NW
Electrical Sub Station Facilities, Scale of Mapping: 1:2,500, Date of Mapping: 1951 - 1971	-	250-500m	W
Electrical Sub Station Facilities, Scale of Mapping: 1:1,250, Date of Mapping: 1950 - 1969	-	250-500m	W
Potential Tanks, Scale of Mapping: 1:1,250, Date of Mapping: 1972	-	250-500m	NW
Tanks, Scale of Mapping: 1:2,500, Date of Mapping: 1971	-	250-500m	SW
Tanks, Scale of Mapping: 1:1,250, Date of Mapping: 1969	-	250-500m	SW
Potentially Contaminative Industrial Uses (Past Land Use)			
General quarrying, Date of Mapping: 1887	25	0-250m	S
General quarrying, Date of Mapping: 1887	26	0-250m	SE
General quarrying, Date of Mapping: 1890	27	250-500m	E
Heap, unknown constituents, Date of Mapping: 1988	28	250-500m	SW
General quarrying, Date of Mapping: 1904	-	250-500m	S
General quarrying, Date of Mapping: 1887	-	250-500m	E
Metal casting/foundries, Date of Mapping: 1887	-	250-500m	SE
Chemical manufacturing general, Date of Mapping: 1887 - 1938	-	250-500m	SW
Clay bricks & tiles [manufacture], Date of Mapping: 1887 - 1904	-	250-500m	SW
Factory or works - use not specified, Date of Mapping: 1955	-	250-500m	SW

If you would like any further assistance regarding this report then please contact
Landmark on (Tel) 0844 844 9966, (Fax) 0844 844 9980, Email: helpdesk@landmark.co.uk

Contaminants Potentially Infilled Land	Ref No.	Search Buffer	Direction
Potentially Infilled Land (Non-Water)			
Unknown Filled Ground (Pit, quarry etc), Date of Mapping: 1887	29	0-250m	SE
Unknown Filled Ground (Pit, quarry etc), Date of Mapping: 1988	30	250-500m	E
Unknown Filled Ground (Pit, quarry etc), Date of Mapping: 1988	-	250-500m	E

If you would like any further assistance regarding this report then please contact
Landmark on (Tel) 0844 844 9966, (Fax) 0844 844 9980, Email: helpdesk@landmark.co.uk

Map Details

The following maps have been analysed for Historical Tanks and Energy Facilities

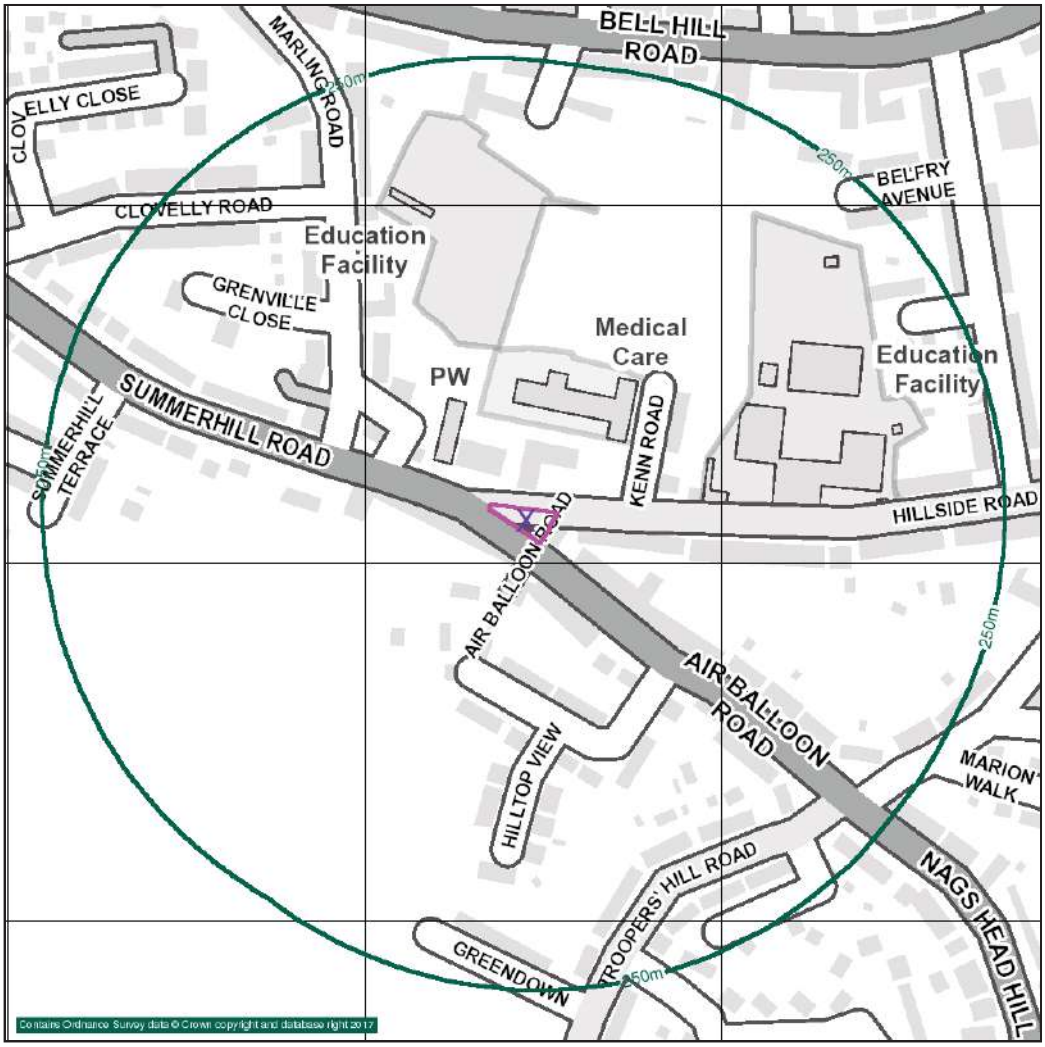
1:1,250	Mapsheet	Published
Ordnance Survey Plan	ST6373SW	1949
Ordnance Survey Plan	ST6373SW	1956
Ordnance Survey Plan	ST6373SW	1964
Ordnance Survey Plan	ST6373SW	1969
1:2,500	**Mapsheet**	**Published**
Ordnance Survey Plan	ST6373	1951
Ordnance Survey Plan	ST6373	1971

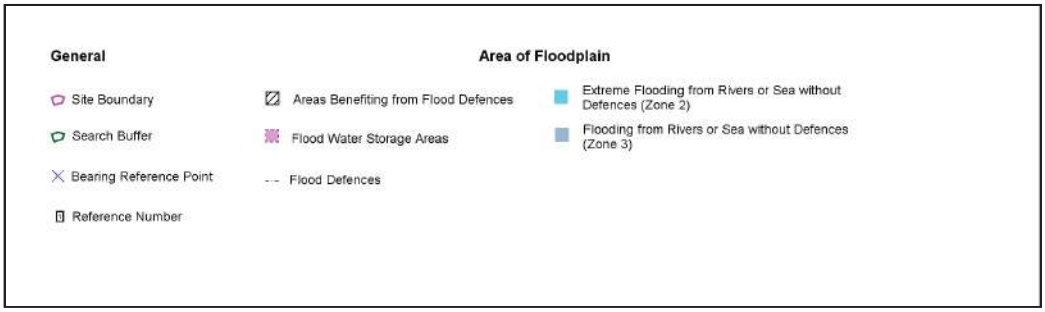
The following maps have been analysed for Potentially Contaminative Uses and Potentially Infilled Land information

1:10,000	Mapsheet	Published
Ordnance Survey Plan	ST67SW	1988
1:10,560	**Mapsheet**	**Published**
Somerset	006_NE	1887
Gloucestershire	072_SW	1890
Gloucestershire	072_SW	1904
Somerset	006_NE	1905
Somerset	006_NE	1921
Gloucestershire	072_SW	1921
Somerset	006_NE	1938
Gloucestershire	072_SW	1938
Ordnance Survey Plan	ST67SW	1955

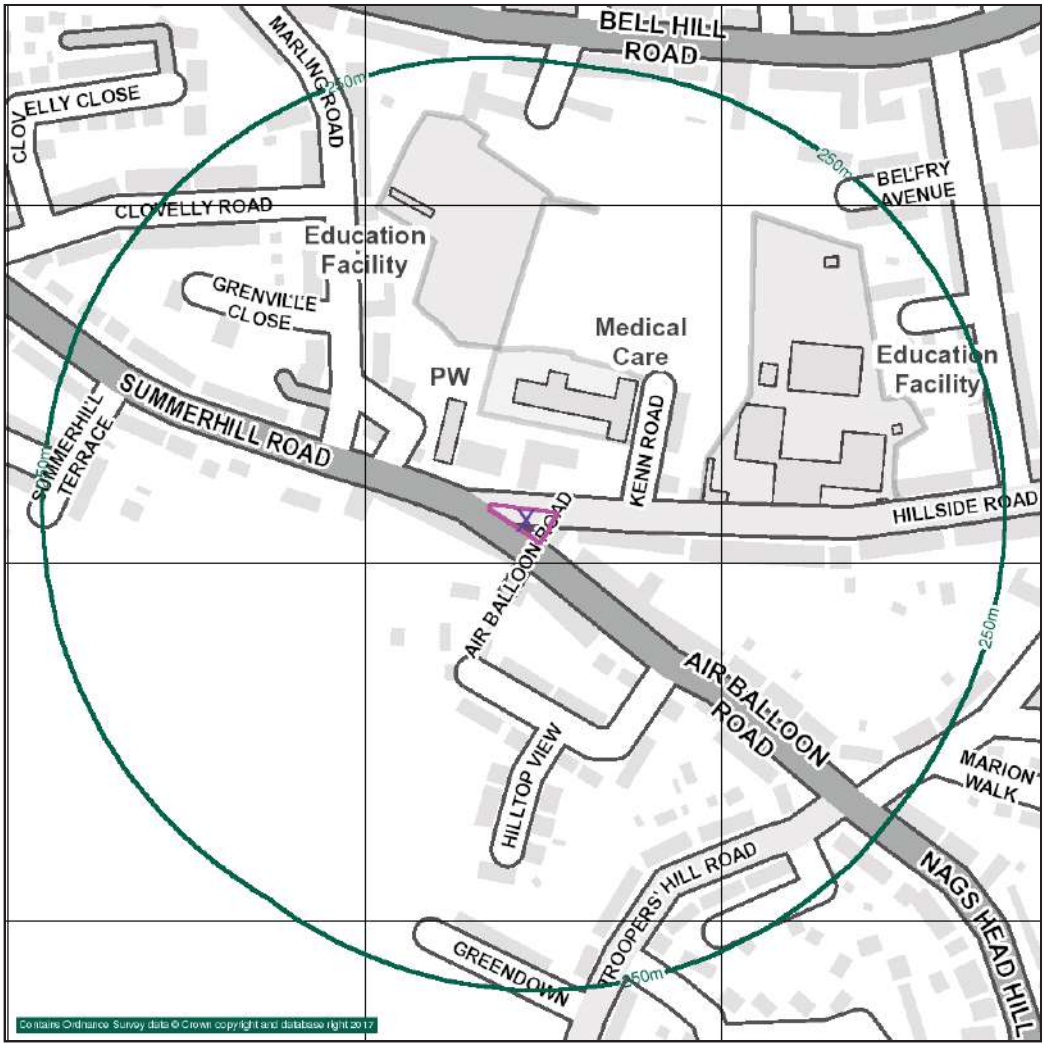
If you would like any further assistance regarding this report then please contact
Landmark on (Tel) 0844 844 9966, (Fax) 0844 844 9980, Email: helpdesk@landmark.co.uk

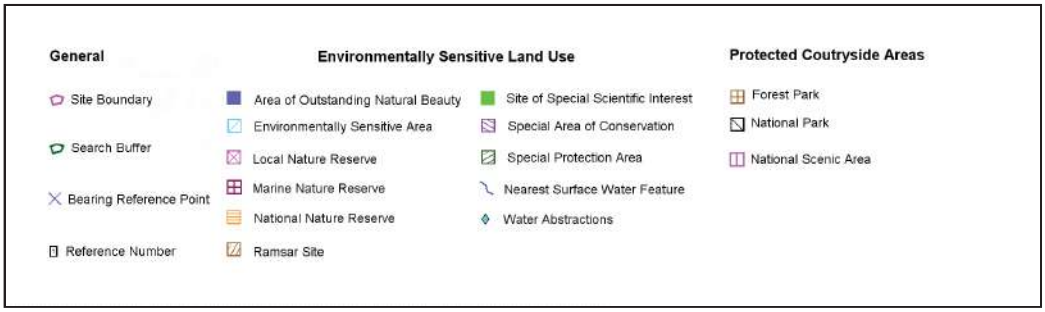
Flood Map


BELL HILL ROAD
MARLING ROAD
CLOVELLY CLOSE
CLOVELLY ROAD
250m
BELFRY AVENUE
Education Facility
GRENVILLE CLOSE
Medical Care
PW
Education Facility
SUMMERHILL TERRACE
SUMMERHILL ROAD
KENN ROAD
HILLSIDE ROAD
AIR BALLOON ROAD
AIR BALLOON ROAD
HILLTOP VIEW
MARION WALK
TROOPERS' HILL ROAD
NAGS HEAD HILL
GREENDOWN
Contains Ordnance Survey data © Crown copyright and database right 2017


General
Site Boundary
Search Buffer
Bearing Reference Point
Reference Number
Area of Floodplain
Areas Benefiting from Flood Defences
Flood Water Storage Areas
Flood Defences
Extreme Flooding from Rivers or Sea without Defences (Zone 2)
Flooding from Rivers or Sea without Defences (Zone 3)

Sensitivity Map





Pathways and Receptors Pathways	Ref No.	Search Buffer	Direction
Groundwater Vulnerability			
Geological Classification: Minor Aquifer (Variably permeable) - These can be fractured or potentially fractured rocks, which do not have a high primary permeability, or other formations of variable permeability including unconsolidated deposits. Although not producing large quantities of water for abstraction, they are important for local supplies and in supplying base flow to rivers, Soil Classification: Soils of High Leaching Potential (U) - Soil information for restored mineral workings and urban areas is based on fewer observations than elsewhere. A worst case vulnerability classification (H) assumed, until proved otherwise, Map Scale: 1:100,000, Map Name: Sheet 37 Southern Cotswolds, Contact Ref: 2	-	On Site	NE
Drift Deposits			
None	-		-
Extreme Flooding from Rivers or Sea without Defences			
None	-		-
Flooding from Rivers or Sea without Defences			
None	-		-
Areas Benefiting from Flood Defences			
None	-		-
Flood Water Storage Areas			
None	-		-
Flood Defences			
None	-		-

If you would like any further assistance regarding this report then please contact
Landmark on (Tel) 0844 844 9966, (Fax) 0844 844 9980, Email: helpdesk@landmark.co.uk

Other Factors Geological	Search Buffer	Direction
Brine Compensation Area		
No		-
Coal Mining Affected Areas		
In an area which may be affected by coal mining activity. It is recommended that a coal mining report is obtained from the Coal Authority. Contact details are included in the Useful Contacts section., Contact Ref: 5	On Site	NE
Mining Instability		
Risk: Inconclusive Coal Mining,	On Site	NE
Non Coal Mining Areas of Great Britain		
Hazard Potential: Highly Unlikely Contact Ref: 4	0-250m	N
Radon Potential - Radon Affected Areas		
Affected Areas: The property is in a Lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level)., Source: British Geological Survey, National Geoscience Information Service, Contact Ref: 4	On Site	NE
Radon Potential - Radon Protection Measures		
Radon Protection Measures: None, Source: British Geological Survey, National Geoscience Information Service, Contact Ref: 4	On Site	NE
Potential for Collapsible Ground Stability Hazards		
Hazard Potential: Very Low, Contact Ref: 4	On Site	NE
Potential for Compressible Ground Stability Hazards		
Hazard Potential: No Hazard, Contact Ref: 4	On Site	NE
Hazard Potential: Moderate, Contact Ref: 4	0-250m	SW
Potential for Ground Dissolution Stability Hazards		
Hazard Potential: No Hazard, Contact Ref: 4	On Site	NE
Potential for Landslide Ground Stability Hazards		
Hazard Potential: Very Low, Contact Ref: 4	On Site	NE
Hazard Potential: Low, Contact Ref: 4	0-250m	S
Potential for Running Sand Ground Stability Hazards		
Hazard Potential: No Hazard, Contact Ref: 4	On Site	NE
Hazard Potential: Very Low, Contact Ref: 4	0-250m	SW

Other Factors Geological	Search Buffer	Direction
Potential for Shrinking or Swelling Clay Ground Stability Hazards		
Hazard Potential: No Hazard, Contact Ref: 4	On Site	NE
Hazard Potential: Very Low, Contact Ref: 4	0-250m	S

If you would like any further assistance regarding this report then please contact
Landmark on (Tel) 0844 844 9966, (Fax) 0844 844 9980, Email: helpdesk@landmark.co.uk

Registered Landfill Sites

At present no complete national data set exists for landfill site boundaries, therefore a point grid reference, provided by the data supplier, is used for some landfill sites. In certain cases the point grid references supplied provide only an approximate position and can vary from the site entrance to the centre of the site. Where the exact position of the site is unclear, Landmark construct either a 100 metre or 250 metre "buffer" around the point to warn of the possible presence of landfill. The size of this "buffer" relates to the positional accuracy that can be attributed to the site. The "buffer" is shown on the map as an orange cross-hatched circle and is referred to in the map legend as Potential Landfill Buffer. Where actual boundaries are available, the landfill site area is shown on the map as a red diagonal hatched polygon and referred to in the map legend as Registered Landfill Site.

Local Authority Recorded Landfill Sites

Local Authority landfill data are sourced from individual local authorities that were able to provide information on sites operating prior to the introduction of the Control of Pollution Act (COPA) in 1974. Appropriate authorities are listed under Local Authority Landfill Coverage with an indication of whether or not they were able to make landfill data available. Details of any records identified are disclosed. You should be aware that if the local authority 'Had landfill data but passed it to the relevant environment agency' it does not necessarily mean that local authority landfill data is included in our other Landfill datasets. In addition if no data has been made available, for all or part of the search area, you should be aware that a negative response under 'Local Authority Recorded Landfill Sites' does not necessarily confirm that no local authority landfills exist.

Flooding

The Sitecheck report flood map plots all flood related features revealed within the search area as supplied by the relevant environment agency. However, to avoid confusion, the text entry in the body of the report only reveals the detail of the nearest feature in each flood data set. This is also reflected in the summary table where only a single entry is included to indicate the search buffer of the nearest occurrence.

Mining Instability Data

The Mining Instability data was obtained on Licence from Ove Arup + Partners Limited (for further information, contact mining.review@arup.com). No reproduction or further use of such data is to be made without the prior written consent of Ove Arup + Partners Limited. The information and data supplied in the Product are derived from publicly available records and other third party sources and neither Ove Arup + Partners nor Landmark warrant the accuracy or completeness of such information or data.

If you would like any further assistance regarding this report then please contact
Landmark on (Tel) 0844 844 9966, (Fax) 0844 844 9980, Email: helpdesk@landmark.co.uk

Contact Names and Addresses

1 Bath and North East Somerset Council Planning Services Department

Trimbridge House
Trim Street
Bath
BA1 2DP

www.bathnes.gov.uk

2 Environment Agency National Customer Contact Centre (NCCC)

PO Box 544
Templeborough
Rotherham
S60 1BY

Telephone 03708 506 506

enquiries@environment-agency.gov.uk

Please note that the Environment Agency/Natural Resources Wales/SEPA have a charging policy in place for enquiries.

3 Bristol City Council Environmental Health Department

Brunel House
St Georges Road
Bristol
Avon
BS1 5UY

Telephone 0117 922 3810
Fax 0117 922 3886

4 British Geological Survey Enquiry Service

British Geological Survey
Kingsley Dunham Centre
Keyworth
Nottingham
Nottinghamshire
NG12 5GG

Telephone 0115 936 3143
Fax 0115 936 3276

enquiries@bgs.ac.uk
www.bgs.ac.uk

5 The Coal Authority Property Searches

200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

Telephone 0345 762 6848
Fax 01623 637 338

groundstability@coal.gov.uk

6 Bristol City Council

The Council House
College Green
Bristol
Avon
BS1 5TR

Telephone 0117 922 2000
Fax 0117 922 3886

www.bristol-city.gov.uk

Other Contacts

Institution of Civil Engineering Surveyors

26 Market Street
ALTRINCHAM
Cheshire
WA14 1PF

Telephone 0161 928 8074

www.ices.org.uk/ices.asp

The Association of Geotechnical and Geoenvironmental Specialists

Foreham Street
83 Copers
Cope Road
Beckenham
Kent
BR3 1NR

Telephone 020 86588212

www.ags.org.uk/

The Environmental Auditors Registration Association

Welton House
Limekiln Way
Lincoln
LN2 4US

Telephone 01522 540069

www.greenchannel.com/iea/earahome.htm

The Environmental Industries Commission

45 Weymouth Street
London
W1N 3LD

Telephone 020 79351675

www.eic-uk.co.uk/

The Institution of Civil Engineers

One Great George Street
Westminster
LONDON
SW1P 3AA

Telephone 0207 222 7722
Fax 0207 222 7500

www.ice.org.uk

The Royal Institution of Chartered Surveyors

12 Great George Street
Parliament Square
London
SW1P 3AD

Telephone 020 7222 7000

www.rics.org.uk/

Argyll Environmental Ltd

1st Floor
98-99 Queens Road
Brighton
BN1 3XF

Telephone 0845 458 5250
Fax 0845 458 5260

info@argyllenviro.com
www.argyllenvironmental.com

Landmark Information Group Limited

Legal and Financial
Imperium
Imperial Way
Reading
Berkshire
RG2 0TD

Telephone 0844 844 9966
Fax 0844 844 9980

info@landmarkinfo.co.uk
www.landmarkinfo.co.uk

Search Code

IMPORTANT CONSUMER PROTECTION INFORMATION

This search has been produced by Landmark Information Group Ltd, Imperium, Imperial Way, Reading, Berkshire, RG2 0TD. Telephone: 0844 844 9966, Fax No: 0844 844 9980, email: helpdesk@landmark.co.uk which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- Provides protection for homebuyers, sellers, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom.
- Sets out minimum standards which firms compiling and selling search reports have to meet.
- Promotes the best practice and quality standards within the industry for the benefit of consumers and property professionals.
- Enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Code will:

- Display the Code logo prominently on their search reports.
- Act with integrity and carry out work with due skill, care and diligence.
- At all times maintain adequate and appropriate insurance to protect consumers.
- Conduct business in an honest, fair and professional manner.
- Handle complaints speedily and fairly.
- Ensure that all search services comply with the law, registration rules and standards.
- Monitor their compliance with the Code.

COMPLAINTS

If you have a query or complaint about your search, you should raise it directly with the firm, and if appropriate ask for your complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award up to £5,000 to you if the Ombudsman finds that you have suffered actual financial loss and/or aggravation, distress or inconvenience as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs Contact Details:
The Property Ombudsman Scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Web site: www.tpos.co.uk
Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk.

PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE

Search Code

COMPLAINTS PROCEDURE

If you want to make a complaint, we will:

- Acknowledge it within 5 working days of its receipt.
- Normally deal with it fully and provide a final response, in writing, within 20 working days of receipt.
- Keep you informed by letter, telephone or e-mail, as you prefer, if we need more time.
- Provide a final response, in writing, at the latest within 40 working days of receipt.
- Liaise, at your request, with anyone acting formally on your behalf.

Complaints should be sent to:

Head of Customer Relations
Landmark Information Group Ltd
Landmark UK Property
Imperium
Imperial Way
Reading
RG2 0TD

Telephone: 0844 844 9966

E-mail: helpdesk@landmark.co.uk

Fax: 0844 844 9980

If you are not satisfied with our final response, or if we exceed the response timescales, you may refer the complaint to The Property Ombudsman Scheme (TPOs): Tel: 01722 333306, E-mail: admin@tpos.co.uk.

We will co-operate fully with the Ombudsman during an investigation and comply with his final decision.

LANDMARK STANDARD TERMS & CONDITIONS

Full Terms and Conditions can be found on the following link:

http://www.landmarkinfo.co.uk/Terms/Show/515

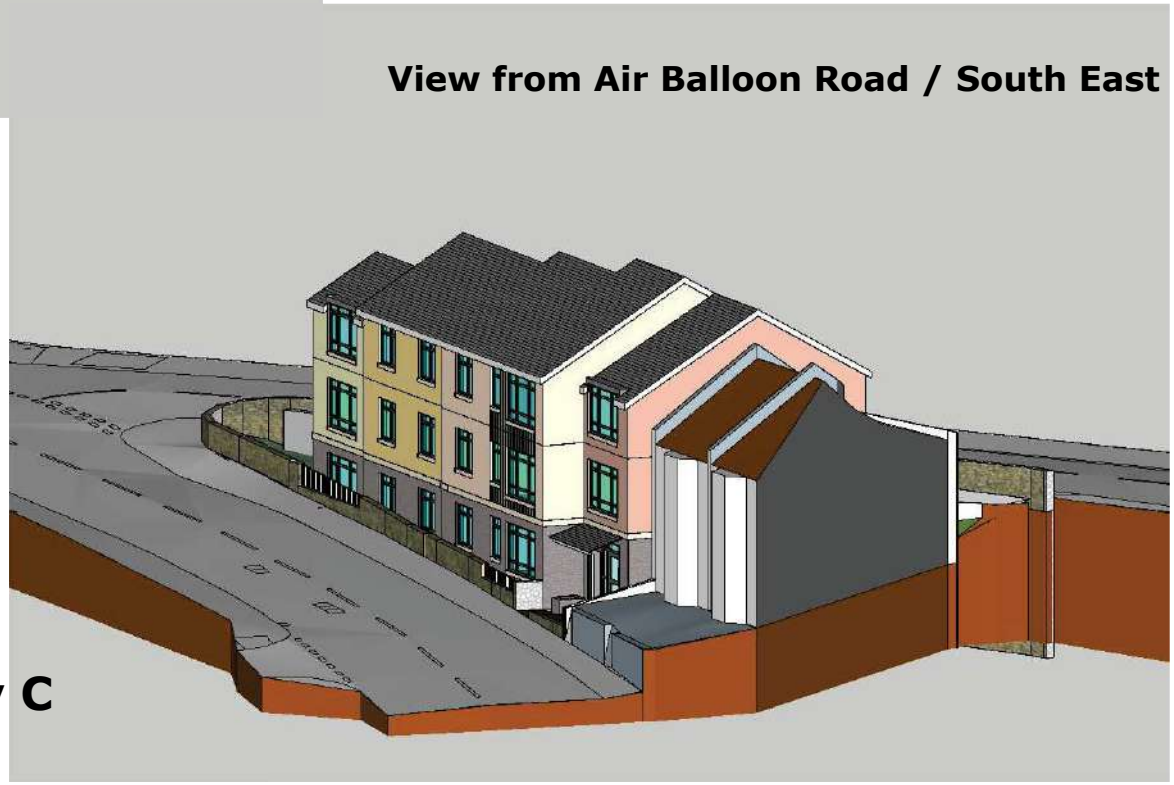
App. D. From client

Title	Ref	Date
Sketch Scheme Elevations and Plans	--	5th Dec 2017

AIR BALLOON ROAD
SKETCH SCHEME 5 Dec 2017 P1 Rev C

View from Hillside Road / North

View from Air Balloon Road / South East



AIR BALLOON ROAD
SKETCH SCHEME 5 Dec 2017 P2 Rev C

Elevation to Air Balloon Road 1:100 @ A3

0 5 10

AIR BALLOON ROAD
SKETCH SCHEME 5 Dec 2017 P3 Rev C

Western Elevation (from Junction of Air Balloon Road & Hillside Road 1:100 @ A3

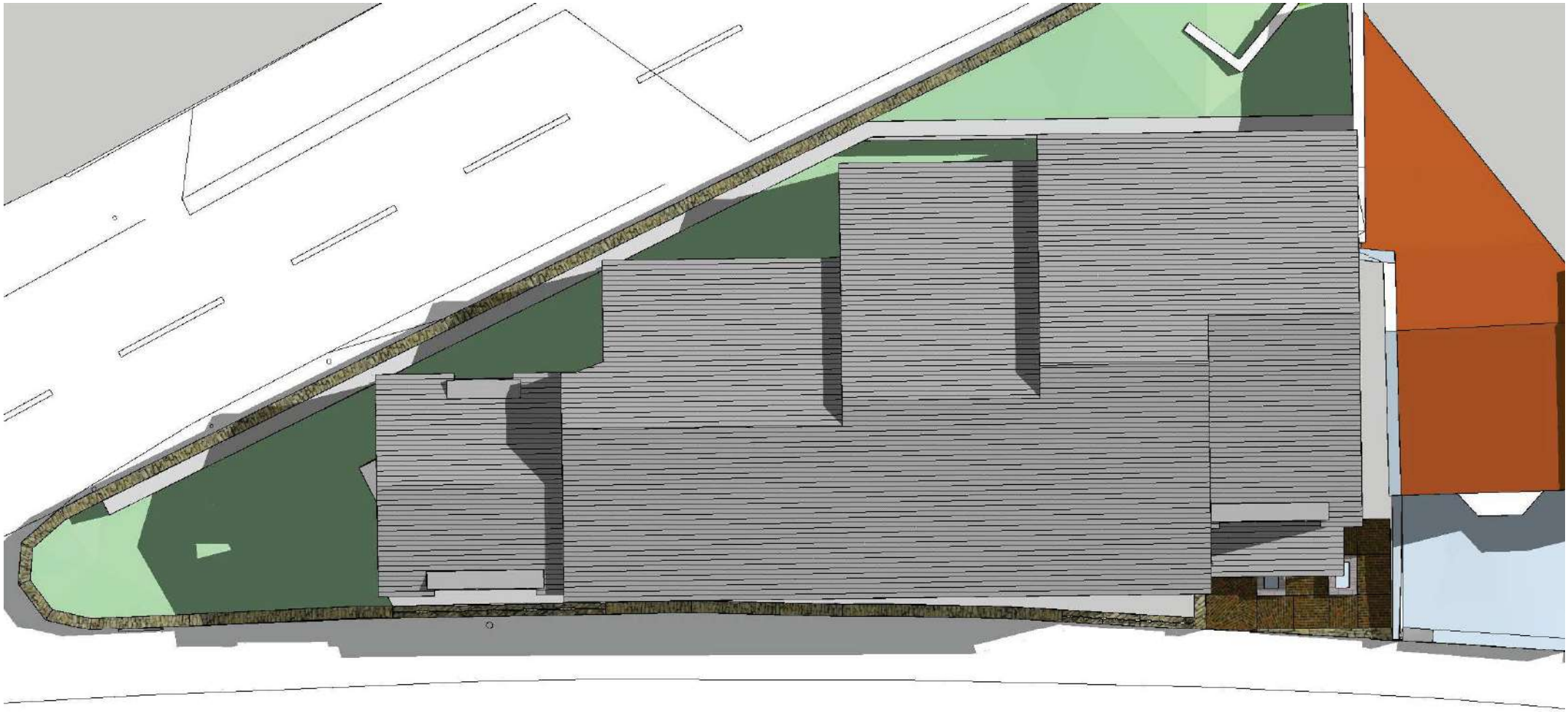
0 5 10

AIR BALLOON ROAD
SKETCH SCHEME 5 Dec 2017 P4 rev C

Elevation to Hillside Road 1:100 @ A3

0 5 10

AIR BALLOON ROAD
SKETCH SCHEME 5 Dec 2017 P5 Rev C



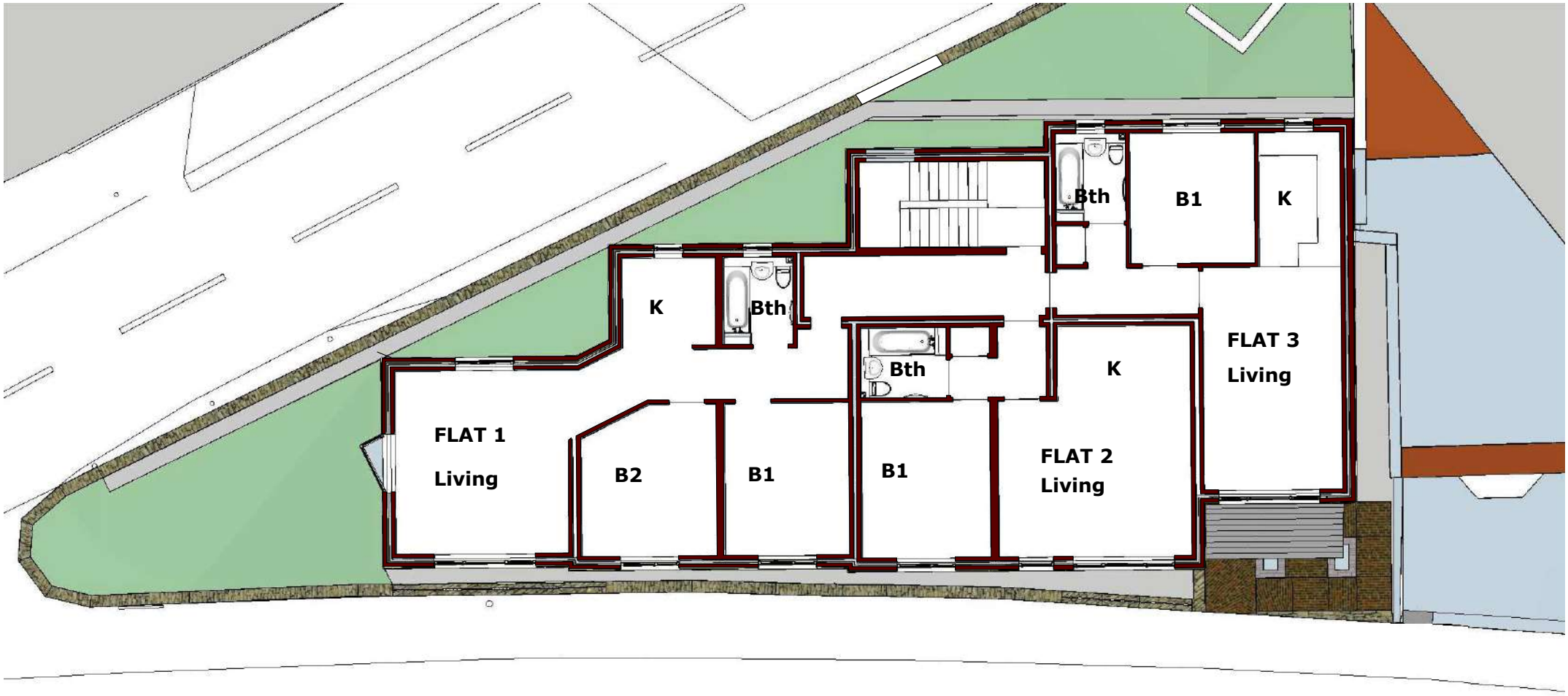
Roof / Site Plan 1:100 @ A3

AIR BALLOON ROAD
SKETCH SCHEME 5 Dec 2017 P8 Rev C

Ground Floor Plan 1:100 @ A3

0 5 10

AIR BALLOON ROAD
SKETCH SCHEME 5 Dec 2017 P6 Rev C



First & Second Floor Plans 1:100 @ A3

0 5 10

AIR BALLOON ROAD
SKETCH SCHEME 5 Dec 2017 P7 Rev C

App. E. T. M. Ventham

Title	Ref	Date
Photograph of a Well		2 Jan 2018

4

App. F. List of Pit Closures

List of Pit Closures found in *Section 1.1.2.2*

This list is not exhaustive; it is only the pits to which reference has been made in the above section.

	District	Pit	Location	Closure Date
1900's	Kingswood	Speedwell	Speedwell	1936
	Kingswood	Deep Pit	Speedwell	1936
	Mangotsfield	Parkfield	Parkfield	1936
	Kingswood	Hanham	Hanham	1926
	Western Pits	Easton	Easton	1911
	Western Pits	Whitehall	Whitehall	1911
	Kingswood	Goldney Pit	Cadbury Heath	1909
	Crews Hole	Troopers Hill Pit (Mine)	Crews Hole	1908
	Kingswood	Pendennis	Staple Hill	1907
	Kingswood	Staple Hill Colliery	Staple Hill	1907
	Kingswood	Wallsend	Mangotsfield	1907
	Kingswood	California	Oldland	1904
	Kingswood	Cowhorn Hill shaft	Oldland	1904?
	Kingswood	Crown Colliery	Warmley	1900
1800's	Golden Valley	The Golden Valley Colliery	Bitton	1898
	Mangotsfield	Church Farm	Mangotsfield	1891
	Kingswood	Siston Common Colliery	Siston Common	1890
	Kingswood	Bull Hall	Oldland	1875
	Kingswood	Hole Lane	Oldland	1875
	Kingswood	New Cheltenham Pit	New Cheltenham	1872
	Kingswood	Potterswood	Potterswood	1869
	Kingswood	Jays Pit	Potterswood	1869
	Kingswood	Hollyguest, or Barr's Court Pit	Longwell Green	1869
	Kingswood	Doxall	Clay Hill	1865
	Western Pits	Pyllemarsh Pits	Pyllemarsh	1859?
	Kingswood	Soundwell	Soundwell	1853
	Kingswood	Lodge Hill Pit - final	Lodge Hill, Fishponds	1845

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DRILLER'S LOG

Strata Record

Depth	Description
	0800 - 1530 STANDING, No one on site
	1530 - 1630 unload
	Borehole Complete / Incomplete

Drill Run Record

Depth from	to	OH/Core	Time o'clock	Run (mins)	Core Length	Core Recov'	Flush return	Casing Depth	Water Level

Penetration Testing and Sampling

Depth from	to	Type	1	2	3	4	5	6	N Blows U	Sample Length	Casing Depth	Water Level

Groundwater Records

WATER ENCOUNTERED	1	2	3
Depth Struck			
Casing Depth			
Inflow			
Depth 5 mins			
Depth 10 mins			
Depth 15 mins			
Depth 20 mins			
Cut off at			

PIEZOMETER / STANDPIPE

WATER LEVELS	Depth	Casing	Time
Morning			
Evening			
Other			

FIELD RECORDS

Piezometer/Standpipe	From	To
Plain Pipe		
Slotted Pipe		
Filter		
Bentonite Seal		
Grout/Backfill		
Borehole Dia.		

FLUSH	From	To
Flush Type		
Loss of Flush		

Excavation Dimensions:

Backfill:

Remarks: Visitors, Instructions, Weather, etc.

S/C	Core	O/Hole	Case	W

Move	Drill	Stand	Break	Work

SITE: Air Balloon Rd

JOB No.

RIG TYPE: Blue Geo 205

Crew: Kris / Jim

DAY: Tuesday

DATE: 22-10-19

Driller's Signature

Move From:

BH No.:

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DRILLER'S LOG

Strata Record

Depth	Description
	30 mins set up
0m	made ground
	Sandstone

Drill Run Record

Depth from	to	OH/Core	Time o'clock	Run (mins)	Core Length	Core Recov'	Flush return	Casing Depth	Water Level
0m	28m	OH					Y		
2.8m	13.5m	OH					Y	3m	

Groundwater Records

WATER ENCOUNTERED	1	2	3
Depth Struck			
Casing Depth			
Inflow			
Depth 5 mins			
Depth 10 mins			
Depth 15 mins			
Depth 20 mins			
Cut off at			

PIEZOMETER / STANDPIPE

WATER LEVELS	Depth	Casing	Time
Morning			
Evening			
Other			

Penetration Testing and Sampling

Depth from	to	Type	1	2	3	4	5	6	N Blows U	Sample Length	Casing Depth	Water Level

Borehole Complete / Incomplete

FIELD RECORDS

Piezometer/Standpipe	From	To
Plain Pipe		
Slotted Pipe		
Filter		
Bentonite Seal		
Grout/Backfill		
Borehole Dia.		

FLUSH

	From	To
Flush Type: WATER	0m	13.5m
Loss of Flush		

Excavation Dimensions:

Backfill:

Remarks: Visitors, Instructions, Weather, etc.

6 barrow fills @ 40 mins each

S/C	Core	O/Hole	Case	W

Move	Drill	Stand	Break	Work

Crew: Kris / Jim / Luke

Driller's Signature:

SITE: Air balloon Rd

JOB No.:

RIG TYPE: blue geo 205

DAY: Wednesday

DATE: 23-10-19

Move From:

BH No.: 01

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DRILLER'S LOG

Strata Record

Depth	Description
13.5m	Sandstone
	Coal
	Sandstone
	NO VOIDS FOUND
	30 mins set-up on BH02
0m	made ground
	Sand stone

Drill Run Record

Depth from	Depth to	OH/Core	Time o'clock	Run (mins)	Core Length	Core Recov'	Flush return	Casing Depth	Water Level
13.5m	21m	OH					Y	3m	
21m	24.5m	OH					Y	3m	
24.5m	30m	OH					Y	3m	
0m	2m	OH					Y		
2m	4m	OH					Y	3m	

Penetration Testing and Sampling

Depth from	Depth to	Type	1	2	3	4	5	6	N Blows U	Sample Length	Casing Depth	Water Level

Borehole Complete / Incomplete

Groundwater Records

WATER ENCOUNTERED	1	2	3
Depth Struck			
Casing Depth			
Inflow			
Depth 5 mins			
Depth 10 mins			
Depth 15 mins			
Depth 20 mins			
Cut off at			

PIEZOMETER / STANDPIPE

WATER LEVELS	Depth	Casing	Time
Morning			
Evening			
Other			

FIELD RECORDS

Piezometer/Standpipe	From	To
Plain Pipe		
Slotted Pipe		
Filter		
Bentonite Seal		
Grout/Backfill		
Borehole Dia.		

Excavation Dimensions:

FLUSH

	From	To
Flush Type 01	13.5m	30m
WATER 02	0m	4m
Loss of Flush		

Backfill:

S/C	Core	O/Hole	Case	W

Move	Drill	Stand	Break	Work

Remarks: Visitors, Instructions, Weather, etc.

7 bowser fills @ 40 mins each

Crew: Kris / Jim / Luke

Driller's Signature:

SITE: Air Balloon Rd

JOB No.:

DAY: Thur

Move From:

RIG TYPE: blue geo 205

DATE: 24-10-19

BH No.: 02 / 01

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DRILLER'S LOG

Strata Record

Depth	Description
4m	Sandstone
	Borehole Complete / Incomplete

Drill Run Record

Depth from	Depth to	OH/Core	Time o'clock	Run (mins)	Core Length	Core Recov'	Flush return	Casing Depth	Water Level
4m	20m	OH					Y	3m	

Penetration Testing and Sampling

Depth from	Depth to	Type	1	2	3	4	5	6	N Blows U	Sample Length	Casing Depth	Water Level

Groundwater Records

WATER ENCOUNTERED	1	2	3
Depth Struck			
Casing Depth			
Inflow			
Depth 5 mins			
Depth 10 mins			
Depth 15 mins			
Depth 20 mins			
Cut off at			

PIEZOMETER / STANDPIPE

WATER LEVELS	Depth	Casing	Time
Morning			
Evening			
Other			

FIELD RECORDS

Piezometer/Standpipe	From	To
Plain Pipe		
Slotted Pipe		
Filter		
Bentonite Seal		
Grout/Backfill		
Borehole Dia.		

FLUSH

	From	To
Flush Type		
Loss of Flush		

Excavation Dimensions:

Backfill:

Remarks: Visitors, Instructions, Weather, etc.

6 bowser fills @ 40 min each

S/C	Core	O/Hole	Case	W

Move	Drill	Stand	Break	Work

Crew: Kru/Ethan/Luke

Driller's Signature:

SITE: Air ballon Rd

JOB No.:

RIG TYPE: blue Geo 205

DAY: Friday

DATE: 25-10-19

Move From:

BH No.: 02

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DRILLER'S LOG

Strata Record

Depth	Description
20m	Sandstone
	coal
	Sandstone

Drill Run Record

Depth from	Depth to	OH/Core	Time o'clock	Run (mins)	Core Length	Core Recov'	Flush return	Casing Depth	Water Level
20m	24.1m	OH					Y	3m	
24.1m	24.3m	OH					Y	3m	
24.3m	30m	OH					Y	3m	

Groundwater Records

WATER ENCOUNTERED	1	2	3
Depth Struck			
Casing Depth			
Inflow			
Depth 5 mins			
Depth 10 mins			
Depth 15 mins			
Depth 20 mins			
Cut off at			

PIEZOMETER / STANDPIPE

WATER LEVELS	Depth	Casing	Time
Morning			
Evening			
Other			

Penetration Testing and Sampling

Depth from	Depth to	Type	1	2	3	4	5	6	N Blows U	Sample Length	Casing Depth	Water Level

Borehole Complete / Incomplete

FIELD RECORDS

Piezometer/Standpipe	From	To
Plain Pipe		
Slotted Pipe		
Filter		
Bentonite Seal		
Grout/Backfill		
Borehole Dia.		

Excavation Dimensions:

FLUSH

	From	To
Flush Type: WATER	20m	30m
Loss of Flush		

Backfill:

Remarks: Visitors, Instructions, Weather, etc.

6 bowser fills @ 40 mins each

S/C	Core	O/Hole	Case	W

Move	Drill	Stand	Break	Work

SITE: Air balloon Rd

JOB No.:

RIG TYPE: blue geo 205

Crew: Kris / ~~Ethan~~ Fred / Luke

DAY: Monday

DATE: 28-10-19

Driller's Signature:

Move From:

BH No.: 02

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DRILLER'S LOG

Strata Record

Depth	Description
0m	made ground Sadston
	1 hour backfill BH 01, 02, 03 with bentonite pellets
	27 bags used in total
	Borehole Complete / Incomplete

Drill Run Record

Depth from	Depth to	OH/Core	Time o'clock	Run (mins)	Core Length	Core Recov'	Flush return	Casing Depth	Water Level
0m	12m	OH					Y		
12m	13m	OH					Y		

Penetration Testing and Sampling

Depth from	Depth to	Type	1	2	3	4	5	6	N Blows U	Sample Length	Casing Depth	Water Level

Groundwater Records

WATER ENCOUNTERED	1	2	3
Depth Struck			
Casing Depth			
Inflow			
Depth 5 mins			
Depth 10 mins			
Depth 15 mins			
Depth 20 mins			
Cut off at			

PIEZOMETER / STANDPIPE

WATER LEVELS	Depth	Casing	Time
Morning			
Evening			
Other			

FIELD RECORDS

Piezometer/Standpipe	From	To
Plain Pipe		
Slotted Pipe		
Filter		
Bentonite Seal		
Grout/Backfill		
Borehole Dia.		

Excavation Dimensions:

FLUSH

	From	To
Flush Type: WATER	0m	13m
Loss of Flush		

Backfill:

Remarks: Visitors, Instructions, Weather, etc.

1 bowser fill @ 40 mins

45 mins setup on scaffolding

S/C	Core	O/Hole	Case	W

Move	Drill	Stand	Break	Work

Crew: Kris / Fred / Luke

Driller's Signature:

SITE: Air balloon Rd

JOB No.:

RIG TYPE: blue geo 205

DAY: Tuesday

DATE: 29-10-19

Move From:

BH No.: 03

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