ARUP

Forestry England

Cannop Ponds

Heritage Impact Assessment

Reference: 286412-ARP-XX-XX-RP-YX-6101

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Job number 286412

Ove Arup & Partners Limited
Blythe Gate
Blythe Valley Park
Solihull
West Midlands B90 8AE
United Kingdom
arup.com

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Executive Summary

Arup was commissioned by Forestry England to undertake an initial Heritage Impact Assessment of Cannop Ponds, and their surroundings in the Forest of Dean. Cannop Ponds are man-made reservoirs and Forestry England have statutory responsibilities as the Undertaker (owner) under the Reservoirs Act 1975, including regular inspections, upkeep and maintenance to ensure safety of the dams. The reservoirs were built in the 19th century to supply water to Parkend Ironworks. As well as a feature of the historic landscape, and a non-designated heritage asset in its own right, Cannop Ponds are now part of a popular visitor destination, offering amenity opportunities for various groups including walkers, runners, bird & bat watchers, and anglers (subject to lease), while also providing links to cycle routes and scenic picnic areas. They also feed a small hydro-electric scheme providing power to the Forest of Dean Stone Firms to the south.

Following recent mandatory inspections, measures to be taken in the interest of safety were identified regarding, amongst others, the insufficient flood conveyance capacity of the dams and spillways, necessitating safety works to the dams.

This assessment details the historic environment baseline for the Ponds and their surroundings, identifying key heritage assets, both designated and non-designated, which could be impacted by works being considered to address the safety issues. The assessment will be used to inform and shape the development of options, which have been broadly grouped into into the following approaches:

- Option A: Do Minimum/Repair, which could include a range of scenarios, from no work to extensive repairs to the dam embankments and spillways;
- Option B: Replace Spillway(s), either directly replacing the exiting spillway (online replacement) or a new adjacent spillway (offline replacement), but may also include additional repair work to the dam embankments; and
- Option C: Discontinue the dams(s), with sub-options for re-naturalising of the valley ranging from:
  - a hands-off approach allowing the watercourse to naturally reinstate itself and reform a wetland area;
  - actively restoring the valley to create a mosaic of habitats and amenities through the incorporation of a cascade of smaller ponds, a meandering watercourse with natural flood management solutions, accessible boardwalks, and information boards to tell the story of the historic heritage and human influence on the valley.

A review of available data has identified 74 heritage assets within the 500m study area, 20 of which are within the site boundary. This includes archaeological evidence of prehistoric, Roman, medieval, post-medieval and 20th century date. The area has been profoundly shaped by its industrial history – the natural resources of iron ore, coal, timber, stone and fast flowing water, made it a centre for iron production from an early date. The Cannop ponds are a part of this industrial story; created in the 19th century to supply water to the Parkend Ironworks, and later used to supply water to the neighbouring stone processing works and railway. While water management is a core part of the Forest of Dean's industrial story, there are few places where this is so apparent as at the Cannop ponds, due to their survival and legibility in the historic landscape.

Option A (Do Minimum/Repair) has been considered to reflect the fact that a number of remedial works have already been undertaken, improving the spillway condition compared to that at the time of the Section 10 inspection. However, the repairs have not made the dams safe in the long-term and flood conveyance capacity has not been increased. Therefore, although this option would have very limited adverse impact to the ponds as a heritage asset it is not a viable option from a Dam Safety perspective and will not be considered further.

Option B (Replace Spillway) would involve removing parts of the historic structures of the Ponds and would have an adverse impact on the heritage value of the Ponds. Although there would be a loss of the current structures, modification throughout the 20th century means that replacement would fit within the existing pattern of works to the dam. There would, however, be the potential loss of evidence within the spillway and the underlying material which may survive of earlier rebuilds and repairs, which would be of archaeological

interest. Preservation by record of the existing structures through archaeological recording before and during the works, especially if combined with the use of local materials and sympathetic design, would be recommended. The majority of the dams and Ponds would retain their significance and legibility as part of the historic environment. This would be temporarily limited by the drawdown of the water level required during construction.

Option C (Discontinue the Reservoir) would result in a loss to the historic industrial landscape in the Forest of Dean as the Ponds would no longer be a legible feature of the former industrial landscape. However, it would likely be possible to retain elements of the historic structures, such as the spillway walls or parts of the dam embankments, which would allow the former industrial use to be communicated.

Both Options B and C would require consultation with heritage stakeholders as part of their design and there would likely be requirements for mitigation. Opportunities to preserve and emphasise parts of the historic structures which can be maintained should be explored and given weight in the design process. Any works are likely to require enabling works, such as the creation of a site compound, access tracks, pumping machinery and storage of materials. The areas around the Ponds have multiple features of archaeological interest. Where possible the development of the design should seek to preserve these remains and assessment should be made of the potential impacts on them.

1. Introduction

1.1 Background to the project

Arup was commissioned by Forestry England to undertake an initial Heritage Impact Assessment of Cannop Ponds in the Forest of Dean. The Ponds are reservoirs (Upper and Lower Cannop Ponds) in the Cannop Valley, situated approximately 3km east of Coleford, Gloucestershire, which were created in 1825 and 1829 to feed water to a waterwheel at the Parkend Ironworks.

The dams are subject to the Reservoirs Act (1975) which stipulates that Forestry England is responsible for the upkeep and maintenance of the dams. These statutory responsibilities include regular inspections, upkeep, and maintenance to ensure safety of the dams. Following recent mandatory inspections, measures to be taken in the interest of safety were identified regarding the structural integrity of the dams and spillways, amongst others. These measures are legally enforceable under the Reservoirs Act and Forestry England has been progressing preliminary work to address these. As part of the measures which have been completed, Forestry England commissioned flood studies, which assess the capacity of the existing spillway infrastructure to pass the design flood flows resulting from various extreme weather events. These reports have shown that both Ponds have insufficient spillway capacity to safely pass the required design and safety check flood events.

Arup has been appointed to undertake an options assessment and subsequently design a preferred solution to address the measures in the interest of safety. Several options are currently being considered. These currently include:

- Option A: Do Minimum/Repair, which could include a range of scenarios, from no work to extensive repairs to the dam embankments and spillways;
- Option B: Replace Spillway(s), either directly replacing the exiting spillway (online replacement) or a new adjacent spillway (offline replacement), but may also include additional repair work to the dam embankments; and
- Option C: Discontinue the dams(s), with sub-options for re-naturalising of the valley ranging from:
  - a hands-off approach allowing the watercourse to naturally reinstate itself and reform a wetland area; to
  - actively restoring the valley to create a mosaic of habitats and amenities through the incorporation of a cascade of smaller ponds, a meandering watercourse with natural flood management solutions, accessible boardwalks, and information boards to tell the story of the historic heritage and human influence on the valley.

1.2 Site description

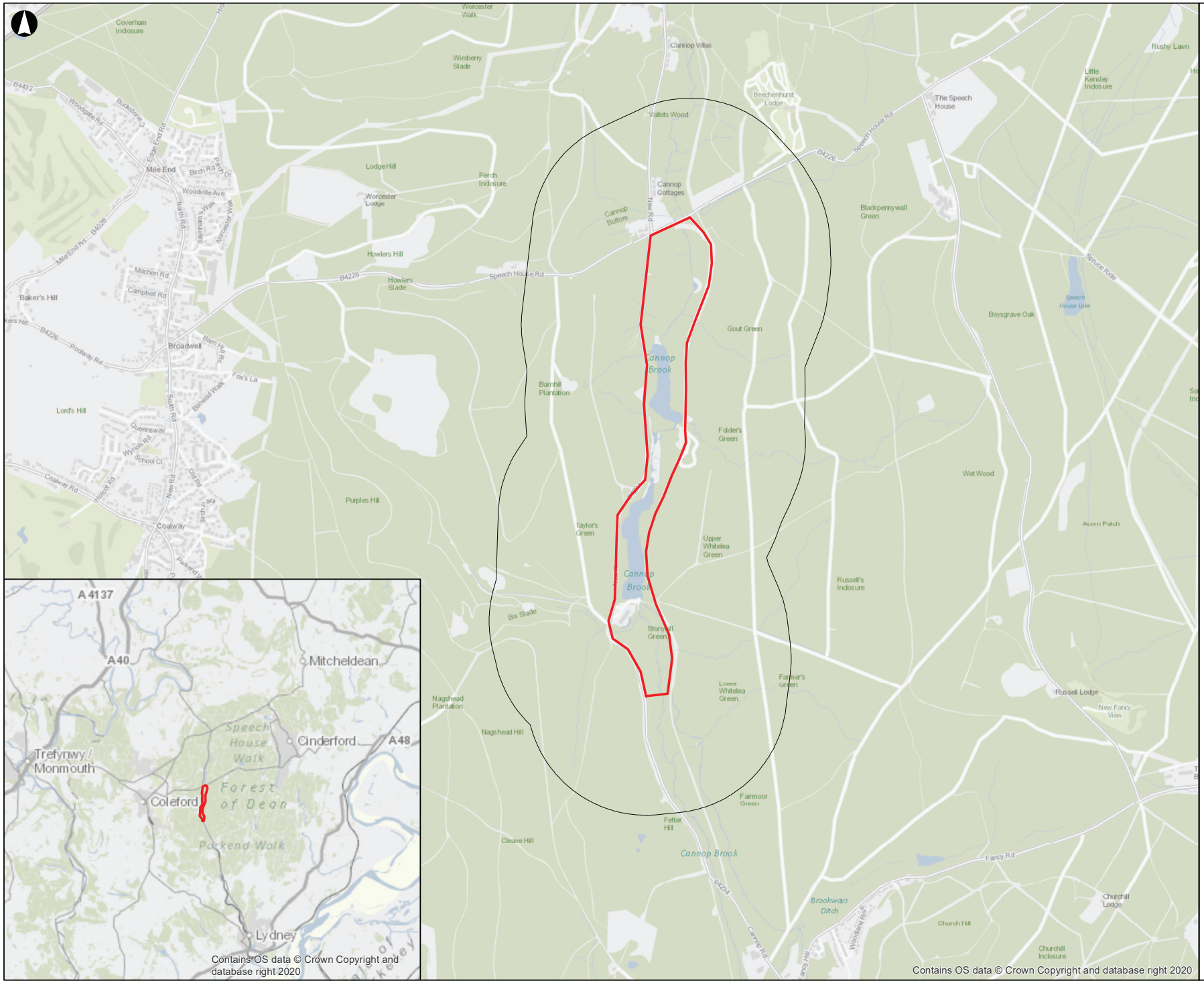
The Cannop Ponds are two reservoirs situated approximately 3km east of Coleford in the Forest of Dean. These reservoirs were originally created in 1825 and 1829 to support industrial works at Parkend Ironworks. A stone cutting plant, that later became the Forest of Dean Stone Firms, occupied the site on the Bixslade Tramway prior to the tramway embankment being used as a dam. Horses brought stone down from the quarries on the hillside, either to the cutting plant, or direct to Bixslade Wharf on what was the Severn & Wye Railway for onward transportation. There remain two active stone quarries and a coal mine in the Bixslade valley, and the remains of the tramway are visible, as is the transhipment wharf.

The Ponds have been a feature of the Forest of Dean and a focal point for the Cannop Valley for many years. They are now an amenity space used for fishing with walking and cycling routes passing nearby. The Ponds are subject to a fishing lease, and the Lower Pond is utilised by the Forest of Dean Stone Firms to power a small hydro-electric scheme that supplements the power used by the stone cutting plant.

The track bed of the former Severn & Wye Railway forms part of the Forest of Dean Family Cycle Trail, and links to the Cannop Ponds car park and picnic area.

The site, for the purposes of this assessment, is an approximately 2km corridor around the Ponds and Cannop Brook (Figure 1).

A3



Legend

- Study Area (500m)
- Site Boundary

Issue	Date	By	Chkd	Appd
P2	14-10-22	CA	JK	KW

Metres
0 205 410 820

ARUP

13 Fitzroy Street
London W1T 4BQ
Tel +44 20 7636 1531 Fax +44 20 7580 3924
www.arup.com

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Cannop Ponds Heritage Impact Assessment

Figure 1: Cannop Ponds

Scale at A3

1:15,000

Job No	Drawing Status
286412-00	**For Issue**

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1.3 Policy and best practice

Heritage assets are protected through national legislation, national and local planning policy. Those relevant to this assessment are:

- *Planning (Listed Buildings and Conservation Areas) Act 1990*;
- *National Planning Policy Framework* (NPPF) (section 16);
- Forest of Dean District Council *Core Strategy* (Policy CSP. 1); and
- Forest of Dean District Council Allocations Plan 2006 to 2026 (AP5).

Additionally, Forestry England's Land Management Plan for the Forest of Dean, *Our Shared Forest* (2019), includes plans for both cultural heritage and built heritage and archaeology.

This report has been compiled following the best practice guidance and standards laid out in the following documents:

- CIfA (2020) *Standard and Guidance for Historic Environment Desk-Based Assessment*;
- CIfA (2021) *Code of Conduct: Professional Ethics in Archaeology*;
- Nixon et al (2021) *Archaeology and construction: good practice guide*. CIRIA C799;
- English Heritage (2008) *Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment*;
- Historic England (2015) *Managing Significance in Decision Taking in the Historic Environment*. Historic Environment Good Practice Advice in Planning: 2;
- Historic England (2017) *The Setting of Heritage Assets. Good Practice Advice in Planning*. Note 3 (Second Edition);
- Historic England (2019) *Statements of Heritage Significance: Analysing Significance in Heritage Assets*. Historic England Advice Note 12; and
- IEMA (2021) *Principles of Cultural Heritage Impact Assessment in the UK*.

Where there is a difference in the technical language used in policy, best practice and standards documents, professional judgement has been used to select the most appropriate. This is notably the case in the use of the NPPF terms for the significance of heritage assets, which are used instead of the Conservation Principles approach, although the underlying philosophy and approach has remained in use for this appraisal.

1.4 Scope of the assessment

NPPF states that:

"…local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting. The level of detail should be proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance. As a minimum the relevant historic environment record should have been consulted and the heritage assets assessed using appropriate expertise where necessary." (MHCLG, 2021, para 194).

The scope of this assessment is to develop an understanding of the heritage significance of the Ponds and their surroundings. It identifies known designated and non-designated heritage assets, historic landscape character and archaeological potential, sufficient to inform the development of potential options.

After an initial review of baseline data and the nature of the site, professional judgement was used to determine that a study area of 500m would be appropriate for identifying features of the historic environment relevant to the assessment. Detailed heritage baseline data are available for the site, meaning that a more extensive study area is not necessary to provide an indication of heritage potential. However, a holistic approach has been taken to ensure that potential impacts on the historic environment, such as those arising

from changes to setting, are identified regardless of study area. Designated heritage assets and non-designated heritage assets related to the site, such as the Parkend Ironworks, have been considered and discussed as relevant.

The following sources have informed the assessment:

- National Heritage List for England (NHLE) – Historic England's dataset of designated heritage assets (including Scheduled Monuments and Listed Buildings);
- The Gloucestershire Historic Environment Record (HER);
- Historic maps and documents, including Ordnance Survey maps and earlier materials held by the Gloucestershire Archives;
- Vertical aerial photographs (Google Earth – 2002-present);
- Lidar (Environment Agency);
- Geological mapping (British Geological Survey);
- Coal Authority mapping;
- Gloucestershire Historic Landscape Characterisation (HLC);
- Published histories of the Forest of Dean and its industries (Gloucestershire Archives and online);
- Forest of Dean District Council (2019) *Heritage Character Assessment*, which is part of the evidence base for the new Local Plan 2041, which is currently in development;
- South West Archaeological Research Framework (SWARF);
- Forest of Dean Research Framework (Hoyle, 2017);
- The Mining and Quarrying Archaeological Research Framework (Newman, 2016)';
- Forestry England *Our Shared Forest. Forest of Dean Land Management Plan*; and
- A walkover survey, undertaken by Arup on 19.7.22.

A gazetteer of designated and non-designated heritage assets identified within the study area is included as an appendix to this report. The locations of these assets are illustrated in Figure 4. Designated heritage assets are referred to using their NHLE ID, while non-designated heritage assets identified from the HER are referred to by their HER ID.

The sources listed in this section are discussed throughout the text, where appropriate. This includes map regression and analysis of aerial and lidar imagery, which is included alongside the discussion of relevant periods in section 2.

2. Archaeological and Historical Background

2.1 Time Periods

The archaeological and built heritage of the study area is discussed below. The historical periods used are based on Historic England's periods list disseminated through the Forum on Information Standards in Heritage (FISH, no date).

Table 1: Definitions of time periods used in this report

Period name		Date range
Prehistoric	Palaeolithic	1,000 000 – 10,000 BC
	Mesolithic	10,000 – 4,000BC
	Neolithic	4,000 – 2,200BC
	Bronze age	2,600 – 700BC
	Iron age	800BC – AD43
Roman		AD43 – 410
Early medieval		410 – 1066
Medieval		1066 – 1540
Post-medieval		1540 – 1901
20th Century		1901 – 2000
21st Century		2001 – 2100

2.2 Overview

2.2.1 Summary

A review of available data has identified 74 heritage assets within the 500m study area, 20 of which are within the site boundary. The earliest archaeological evidence is a prehistoric flint scraper, which while ephemeral when treated individually, indicates that there may be traces of early activity. The Forest of Dean is known to have been wooded during the Roman period, although charcoal burning and ironworking is known within the area. There is only one record of possible Roman remains, which are of a road surface which could be of Roman date, although a much later date has also been suggested. In the early medieval period, the area became a royal hunting forest, something which continued after the Norman Conquest. This meant that activities within the forest were highly restricted, with royal permission needed to exploit its resources of timber, iron ore, coal and stone. There are, however, considerable traces of early mining which may date to the medieval period. Mining and ironworking expanded in the post-medieval period, which is when the majority of identified heritage assets within the study area date from. There is evidence of quarrying, coal mining, iron smelting and charcoal burning as well as the infrastructure required to support these industries. This includes tramways, railways and the Cannop Ponds themselves, which were created to supply water to the Parkend Ironworks to the south. Although there was a decline, the area remained industrial well into the 20th century, with wood distillation for chemical production and stone processing happening within the site.

2.2.2 Designated heritage assets

There are two designated heritage assets within the 500m study area, both Grade II listed buildings:

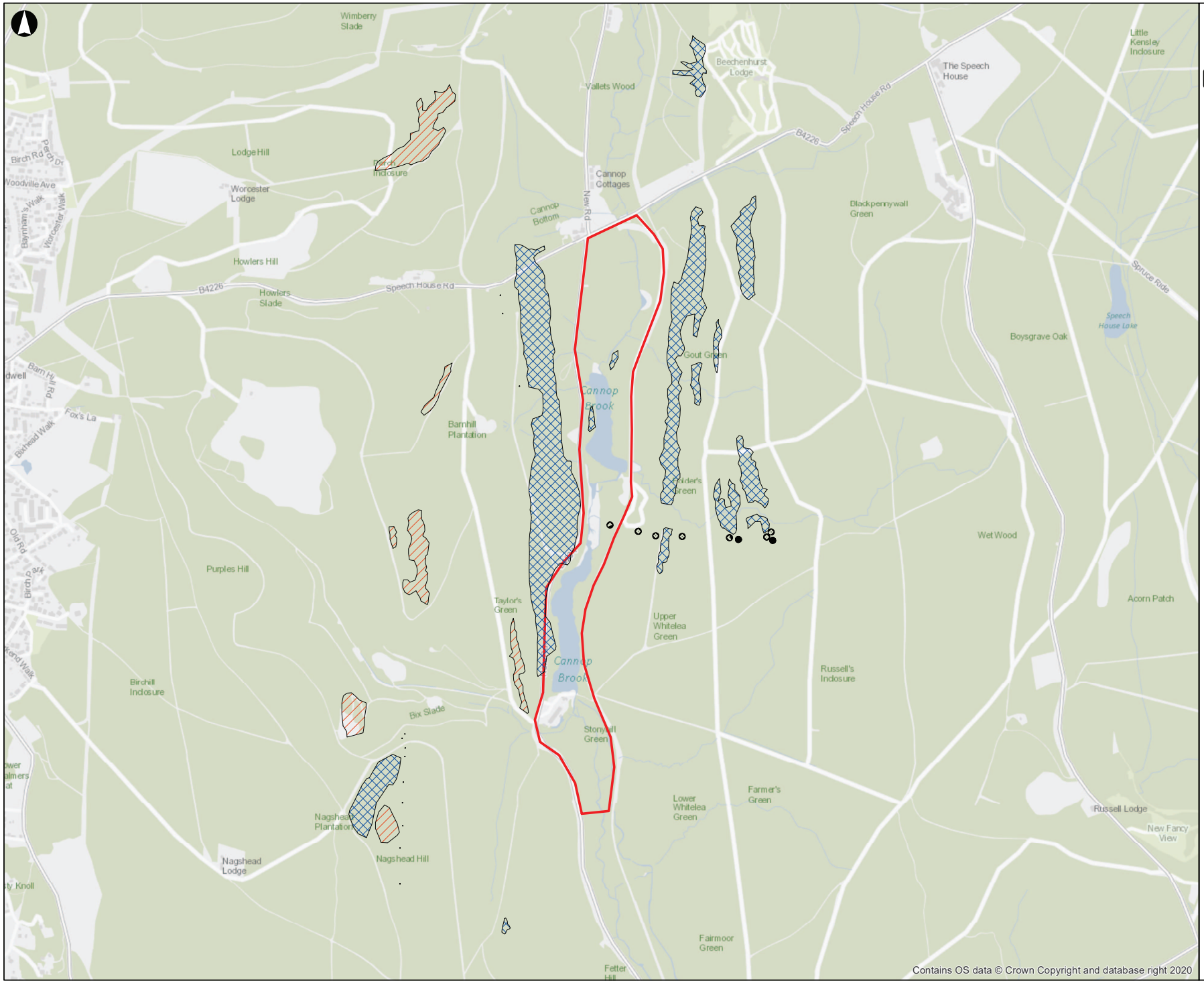
- Milestone about 275 metres east of Cannop Crossroads (NHLE: 1186465), located approximately 85m north-east of the site boundary. It is a stone milestone located on the northern side of the B4226, facing south.
- Old Furnace Level at Hopewell Colliery (NHLE: 1376766), located approximately 325m north-west of the site boundary. It is the adit head to a coal measure consisting of a vaulted tunnel and stone revetments, built in the early 19th century.

Due to the wooded nature of the site and surroundings there would be no impact to any designated heritage assets beyond the study area.

2.2.3 Non-designated heritage assets

The HER has records of 72 individual potential non-designated heritage assets within the study area, ranging in date from the prehistoric to modern periods, although there is limited evidence pre-dating the 17th century. Of these, there are 18 non-designated heritage assets within the site, including the Ponds themselves, which were created in the 19th century to supply the Parkend Ironworks.

A3



Legend

Interpretation

- Extractive Pit
- Mine shaft
- Quarry
- Site Boundary

Issue	Date	By	Chkd	Appd
P2	14-10-22	CA	JK	CA

Metres
0 162.5 325 650

ARUP

13 Fitzroy Street
London W1T 4BQ
Tel +44 20 7636 1531 Fax +44 20 7580 3924
www.arup.com

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Figure 2: Extraction identified from lidar

Scale at A3

1:12,000

Job No	Drawing Status
286412-00	**For Issue**

Drawing No	Issue
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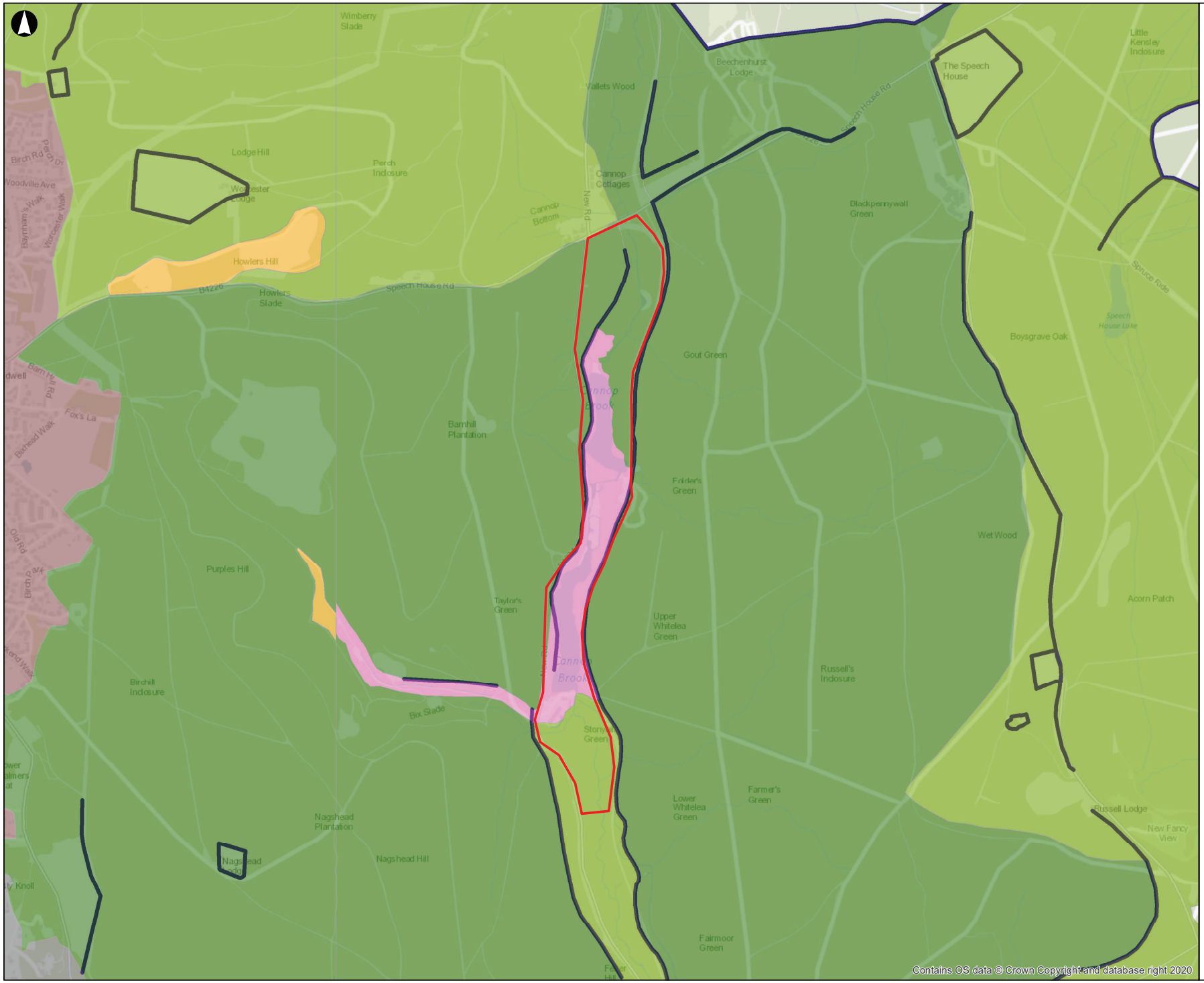
A3



Legend

- Site Boundary

HLC Type

- Surviving early woodland
- Surviving early woodland?
- Disused industrial site
- Active industrial site
- Modern settlement - irregular
- Modern settlement - organised
- Crown woodland enclosure boundaries

Issue	Date	By	Chkd	Appd
P2	14-10-22	CA	JK	CA

Metres
0 162.5 325 650

ARUP

13 Fitzroy Street
London W1T 4BQ
Tel +44 20 7636 1531 Fax +44 20 7580 3924
www.arup.com

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Figure 3: Historic Landscape Characterisation

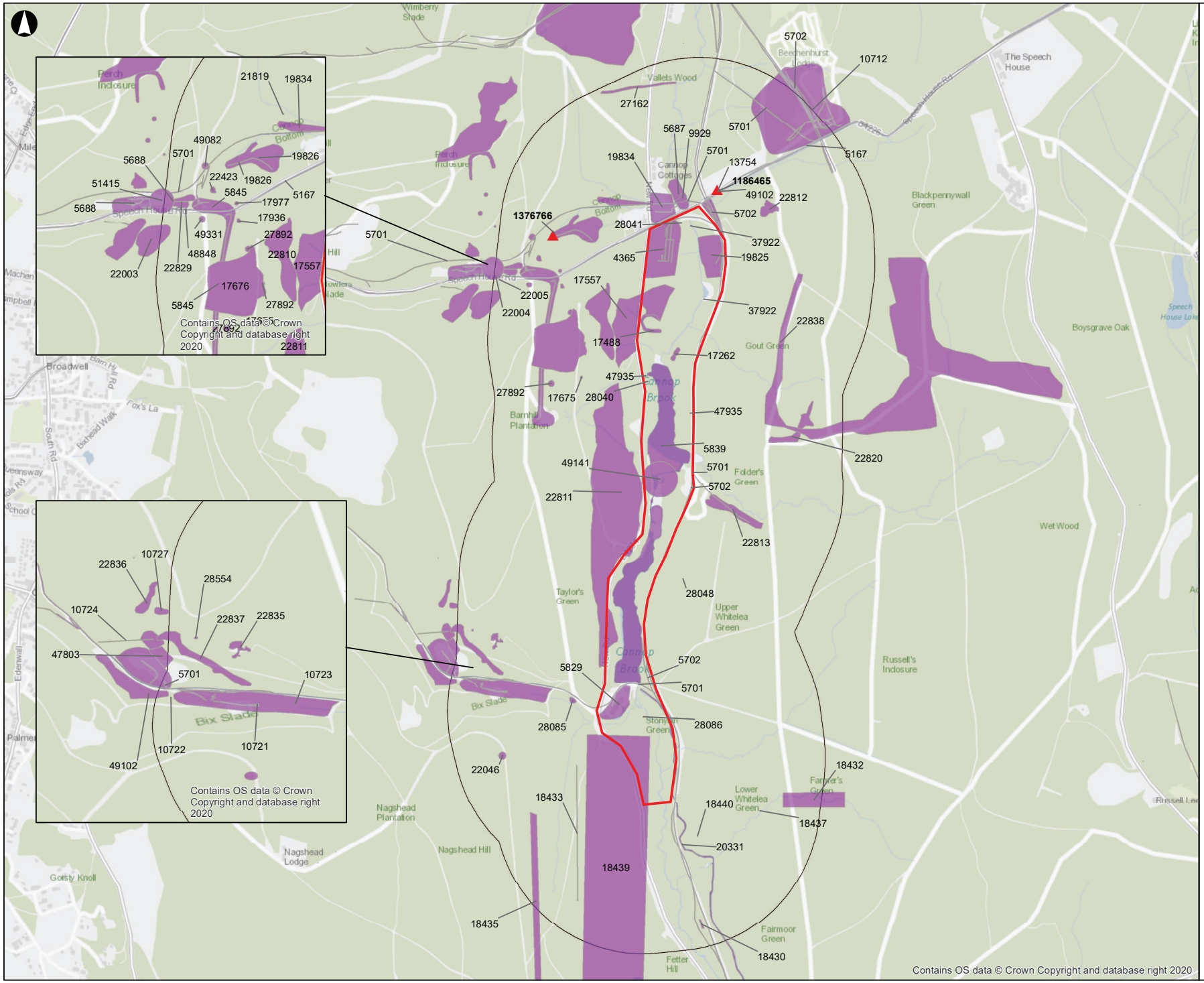
Scale at A3

1:12,000

Job No	Drawing Status
286412-00	**For Issue**

Drawing No	Issue
003	**P2**

A3



2.3 Topography and Geology

The topography and geology of the Forest of Dean have been central to the area's historic development. The bedrock geology of the study area includes the Cinderford and Coleford Formations. Overlying the bedrock geology is superficial alluvium and head (gravel, sand, silt and clay) deposits. The alluvium, a mixture of clay, silt, sand and gravel, is found along the floodplain of the Cannop Brook (BGS, 2022). These deposits are unlikely to have paleoenvironmental interest.

The Cinderford and Coleford Mudstone Formations are part of the South Wales Upper Coal Measures Formation which include seams of coal, iron ore bearing sandstone and limestone. Coal and iron ore were mined or quarried from the rock, and the limestone and sandstone were also quarried for building stone and to burn for lime. These resources, along with the timber and charcoal which could be harvested from the forest and the coal measure clays which were exploited for brick manufacture, have been exploited since at least the Iron Age and are central to how the history of the site and its surroundings can be understood. Figure 2 shows areas of mineral and stone extraction identified from lidar and shows that there was extensive use of the study area for its resources.

The site lies within the Cannop Valley, a corridor cut by the Cannop Brook across the Forest of Dean from north to south. The area is within the Forest of Dean and Lower Wye National Character Area (Natural England, 2015). The forest was established as a royal hunting preserve and retains much of this historic character as a mosaic of woodland and clearings, with settlement around the fringes of the woodland, established as the Statutory Forest in 1883 (Forestry Commission, 2022). The area is within a bowl-shaped landform, with woodland covering the flatter central plateau. The Gloucestershire HLC assessment (Hoyle, 2006, reproduced in part on Figure 3) shows that the majority of the woodlands surrounding the site are considered to be surviving early woodland or potentially surviving early woodland, likely dating to the medieval period or earlier. Crown woodland enclosure boundaries, most likely dating to the post-medieval period, follow the topography of the valley, indicating areas where trees were protected from grazing (see section 2.8). The remainder of the site is mapped as an active industrial area, reflecting the ongoing stone cutting site south of the Ponds and its connection to quarries to the west. Forest edge settlements are mapped along the boundaries of the woodland.

2.4 Prehistoric

There is very limited evidence of prehistoric activity in the study area, with only one record within the HER data from this period. This is a late Neolithic flint scraper, a small tool used for processing animal skins or other materials such as wood or fibrous plants, found at Bixslade approximately 450m west of the site (HER: 28554, Figure 4). However, there is evidence from the wider region which can provide context for this artefact and give an indication of what the site may have been like in prehistory, although evidence is limited by the lack of archaeological excavation in the study area. There is little trace of Palaeolithic peoples who may have occupied the area of the Forest of Dean during the warmer periods between Ice Ages (interglacials). From the end of the last glacial period, there begins to be more evidence of human activity in this region, with traces of temporary campsites used by the hunter gatherer people of this time from the Wye Valley (Hoyle, 2017). During the Mesolithic period there is evidence of people moving along the valleys across the Forest of Dean plateau, with occasional finds of flint tools scattered across the area (Hosfield et al, 2007). The landscape would have been wooded and the valleys would have been accessible routeways for people moving through the area, providing a base for hunting, fishing and birding and gathering wild plantlife. Mesolithic people may also have been deliberately burning parts of the forest to create clearings, which would have given them an advantage in hunting. Pollen preserved in waterlogged soils from the Forest of Dean indicates that burning was taking place (Hosfield et al, 2007), although there is no way to directly support the interpretation of deliberate fire-setting.

As with earlier prehistory, evidence from the Neolithic largely comes from artefacts, many of which were found during fieldwalking in the cultivated areas beyond the wooded forest. The flint scraper from Bixslade is an outlier in this, although it is not known whether the density of Neolithic finds from the lighter, cultivated soils around the forest edge is an indicator of the density of Neolithic activity or the bias of past survey (Hoyle, 2017).

As well as hunting, there is evidence that small-scale mining was taking place in the Forest of Dean, potentially as early as the Bronze Age. There are a small number of small, hand-held cobble tools thought to

have been used for crushing iron ore to extract iron ochre pigment and hammerstones have also been found in old ironstone workings (Timberlake, 2016). There is limited evidence for Bronze Age settlement, although there are ritual monuments from this period, including standing stones and barrows (burial mounds) (Hoyle, 2017). The most obvious evidence of Iron Age settlement and activity comes from four hillfort sites, but there are also traces of possible field and land ownership boundaries within the Forest, which may date to this period (Hoyle, 2017).

2.5 Roman

As in the prehistoric periods, the Forest of Dean remained as woodland during the Roman period, despite widespread forest clearance elsewhere in the south-west (Straker et al, 2007). This does not mean, however, that the area was uninhabited; the Forest of Dean was an important iron working area for the Romans, who mined iron ore and made charcoal for iron production (Holbrook, 2007). There is also evidence of coal mining and stone quarrying; a villa site near Woolaston had traces of probably domestic coal use and quern stones made from local sandstone have been found (Holbrook, 2007).

There is only one record of a possible Roman non-designated heritage asset within the study area, but its dating is uncertain. The HER includes a record from 1905 of the 'trace of a Roman pavement' (HER 5167), However, the HER record states that this is more likely the remains of 19th century road repairs.

2.6 Early medieval

There is no direct evidence for early medieval activity in the study area. For the initial centuries of the post-Roman period this is consistent with the wider Forest of Dean area where evidence is limited to some possible re-occupation of hillfort and villa sites (Hoyle, 2017). There is also limited evidence of how the political influence and control of the Anglo-Saxons initially spread into the area. In the late Saxon period, however, we know that an area roughly the same as the modern Statutory Forest had been reserved as a Royal Demesne, an area of woodland and waste set apart for exclusive use as a royal hunting forest (Hoyle, 2017). Figure 3 shows areas of surviving early woodland. It is likely that much of this woodland dates, at least, to the early medieval period, corresponding with the site's location within the royal forest.

2.7 Medieval

Following the Norman Conquest, the royal demesne continued to be reserved as a royal forest and Forest Law was enacted to specify what could and could not be done within the area. As a result, the area of the site continued to be removed from settlement and remained peripheral to settlement-related activities, which were clustered around the margins of the forest (Hoyle, 2017). However, the lack of settlement is not indicative of a lack of activity; in the first few centuries post-Conquest the Forest of Dean was one of the most important iron producing regions in the country, and ironstone and coal extraction, charcoal burning and smelting were all happening within the forest, albeit by the Crown or by those authorised to do so (Baggs and Jurica, 1996). In 1296 Edward I established 'freemining' rights in the forest, which was consolidated into current law by the 1836 Freemining Act. This gave men born in the Hundred of St Briavels, who had worked for a year and a day in a mine in the Hundred, the rights to a 'gale' – an area to be worked for minerals (Natural England, 2015). Gale stones, which marked the boundaries of these mining areas, are known within the study area (HER: 47936 and 49102). Although undated, they are likely to be of medieval or post-medieval date.

There is evidence of medieval coal extraction in the study area, with groups of either medieval or early post-medieval coal pits and bell pits running along both sides of the Cannop valley (HER: 18432, 22810, 22811, 22820). Although the Ponds were not created until the 19th century, it is unlikely that there are remains of medieval workings under them, as they lie in the valley bottom which would have been crossed by the Cannop Brook. However, it is possible that the water was used in the mining process and there could be leats or other water management features obscured by the current water-levels.

2.8 Post-medieval

The early part of the post-medieval period was marked by considerable expansion of industrial activity within the Forest of Dean. Within the study area there is evidence of extensive quarrying, mining, charcoal burning, and ironworking dating to the post-medieval period. Figure 2 shows areas of extraction identified

from Lidar (see also discussion in section 2.3). Long stretches of land are dotted with former mine shafts, adits and spoil tips, the surface remains reflecting the horizontal seams of coal sought by the historic miners. To the west of the Cannop Brook limestone and sandstone were quarried from outcroppings, used to produce lime and as building stone.

The relatively easily won resources of coal, ironstone, lime and timber for charcoal allowed it to grow as an important centre for ironworking. Early post-medieval ironworking relied on charcoal as fuel, replaced later by coke, a processed product of coal, which allowed mass production of iron (Alfrey and Clark, 1993). This was fired in a furnace with iron ore and limestone to produce molten pig iron and slag (a waste product). Blast furnace technology was introduced in the 16th century and meant that furnaces would be operated for many months at a time, requiring fast-flowing water for water-wheel driven bellows (Hart, 1971). There are two iron furnaces known within the study area, the King's Furnace of 1612 (HER: 5687) and the Cannop Hill Foundry of 1835 (HER:5688), both located on the northern side of Speech House Road and likely using the power of the Cannop Brook for power. Of particular importance to the site, although beyond the study area, is the Parkend Ironworks, located approximately 1.5km south-east of the site. The Parkend furnace operated from 1799 but fell out of use due to competition with the Staffordshire and South Wales iron industries, as the local Forest of Dean coal was not well suited to coking (Baggs and Jurica, 1996). However, following technological advances in iron manufacture using the local coke, the Forest of Dean Iron Company was able to reopen the Parkend furnace and make it a major centre of the Forest of Dean's iron industry (Baggs and Jurica, 1996). The expansion and modernisation of the works required power, which was generated first by a waterwheel and then by steam engine. Parkend used water from the Cannop Brook for this, first creating the Lower Cannop Pond in 1825 by flooding an old quarry, then the Upper Cannop Pond in 1829 (Baggs and Jurica, 1996; HER: 5839). A leat supplied the water from the Ponds, likely the dry channel which leaves the lower Pond at NGR SO 608100 (GSIA, 1992; HER: 20331; Photograph 1).

Photograph 1: Leat running south from Lower Cannop Pond (leat location indicated by arrows)

Further evidence of the iron industry can be found in the study area in the form of charcoal burning platforms (HER: 18435-7, 18439, 22.406, 27892 and 27981), and ironstone workings (HER: 18433, 18439). Coal mining is another major feature, developing from small scale bell-pits and drift mines to more extensive mining operations in the 19th century. Within the study area there are 29 records within the HER of coal mining related features, including coal shafts, coal levels, spoil tips and drift mines (HER: 5845, 10712, 10721-4, 10726-7, 18430, 18432, 18439-40, 19826, 21819, 22004-6, 22423, 22810-12, 22820, 22829-30, 22836-7, 28046, 28085-6). Of these, three are located within the site boundary – two to the south of Lower Cannop (HER: 18439 and 28086) and an area along the valley side to the west of the Ponds (HER: 22811).

There is also a Grade II listed adit head built in 1810-20 (NHLE: 1376766), located approximately 330m north-west of the site.

Another significant industry in the study area is stone quarrying and cutting. There is evidence of quarrying within the site – the Lower Cannop Pond is reported to have been formed by flooding a former quarry (Baggs and Jurica, 1996) and the HER includes the site of the Cannop Stone Works in the northern part of the site (HER: 19825, Photograph 2) and hollows interpreted as stone extraction pits just north of Upper Cannop Pond (HER: 17262). South of Lower Cannop Pond is the former Bixlade Stone Works, now the Forest of Dean Stone Firms Ltd, which is thought to have been active since the 18th century (HER: 5829). The stone works processed sandstone from the Bixhead Quarries to the west (GSIA, 1992, HER: 10720). Across the study area lidar and historic maps show the locations of former quarries (HER: 10720, 17675, 17936, 17977, 20624, 22003, 22835-7). These would have produced stone for building or lime but also for immediate local use in construction within the forest.

Photograph 2: Remains of Cannop Stone Works in the northern part of the site

Subsidiary industries also developed in the forest in the post-medieval period. Within the study area this included the Cannop Chemical Works, which opened in 1835 to the north of Speech House Road (HER: 19834 and 9929). This produced chemicals from wood, including lead acetate, wood tar, wood pitch, lampblack, naphtha, acetic and sulphuric acid until its closure in 1902.

Connecting all these industries, both to each other and to markets beyond the forest, required the development of infrastructure networks. The earliest of these are no doubt represented in some of the multi-phase earthworks found in groups around former mines and quarries. However, the site is enclosed by three more significant pieces of historic infrastructure. In 1796, the Forest of Dean Turnpike road was created (HER: 48848), still in use as Speech House Road. It crossed the Cannop valley immediately north of the site. A milestone on the northern side of the former turnpike road is Grade II listed, located approximately 85m north-east of the site (NHLE: 1186465).

In 1812 the Severn and Wye Tramroad, used for horse-drawn wagons, was built between Lydbrook and Lydney, with branch lines to connect industrial sites (HER: 5701). The mainline of the tramroad ran north to south to the east of the site, now followed by a cycle path. A 2km branch tramway connected Cannop Wharf to Bixhead Quarry (GSIA, 1992). This branch crosses the site immediately south of Lower Cannop Pond, now metalled and used as a footpath, although it remained in use as a horse-drawn tramway until 1947 (GSIA, 1992; Photographs 3 and 4).

Photograph 3: View of former tramroad, looking north-west towards Lower Cannop Pond

Photograph 4: Bridge carrying former tramroad over spillway, with path following tramroad towards Bixlade Quarry to the west

In 1868 the Severn and Wye Railway from Lydney to Lydbrook was constructed, along with branch lines and mineral loops, reusing sections of the older tramroad (HER: 5702). The railway line is now disused and dismantled but survives as a broad corridor to the east of the Cannop Ponds, with surviving traces of former loading platforms along its route (Photographs 5 and 6).

Photograph 5: Former railway line east of the Cannop Ponds

Photograph 6: Former platform to the west of the disused railway line

The growth of the iron industry led to considerable deforestation for charcoal production in the 16th and 17th centuries (Baggs and Jurica, 1996). In 1668 it was recognised that the felling of trees needed to be slowed and the Dean Forest (Reafforestation) Act was brought into law. This led to the enclosure of the forest to prohibit unauthorised pasturing of livestock or extractive activities (Natural England, 2015). Figure 3 (above) shows boundaries of Crown woodland enclosure mapped within the study area. These are still visible today and were observed on the site visit (Photograph 7). The forest's timber was an important resource to the nation, vital for shipbuilding, which prompted these measures to protect supply (Baggs and Jurica, 1996). The HER includes record of drainage channels and banks in the site and study area which are likely related to tree planting and forestry management (HER: 17557, 17676). The enclosure of the forest is integral to the historic landscape character today, which remains densely wooded despite its intense industrial history (see Figure 3).

Photograph 7: Enclosure bank west of Upper Cannop Pond (red arrows indicating bank)

No detailed pre-Ordnance Survey maps showing the area of the site were available to view at Gloucestershire Archives[1]. The earliest map available for this assessment, therefore, was the 1831 Ordnance Survey Old Series map (1 inch to the mile) which shows the site as being formed of two long Ponds with woodland on both sides[2], corresponding to the documented history of the Ponds. However, although the tramroads can be seen on the map, there are no industries shown in the area of the site. The 1st edition 6":mile Ordnance Survey map of 1883 (Figure 5) shows the site at a larger scale, allowing details of the Ponds' shape and their associated systems of weirs, channels and sluices to be made out. The Severn & Wye Railway had replaced the former tramway along the eastern side of the Cannop valley, connecting to the tramroad which continued westwards along the southern bank of Lower Cannop Pond towards the Bixlade Quarries. Both Ponds used sluices and weirs to control the flow of water out from the Ponds, with dams to retain the water levels. Although not labelled, the leat which had been created to feed the Parkend Ironworks can be seen to the south-east of Lower Cannop Pond. An area of colliery spoil, associated with the 'Whitelea Colliery (disused)' to the east of the Ponds, covered part of the area between the Upper and Lower Ponds. This can be observed as earthworks on the site today (Photograph 8).

The late 19th century Ordnance Survey maps are also a useful source of data on features of the historic environment including marker stones and wells, which may survive but be difficult to identify on the ground due to the development of the undergrowth around them (HER: 28040, 28041, 49092).

[1] Both the 1608 Map of the West Part of the Forest of Dean (D13747/1) and the 1859 Map of the Township of West Dean (PC1707) were requested. The former is held as tif images on a CD ROM but no drive was available to view the maps, while the latter is fragmentary and the site is located in a section which does not survive south of Speech House.

[2] Not reproduced due to copyright restrictions but available online at https://visionofbritain.org.uk (Sheet 43),

Figure 5: Ordnance Survey 6":mile map of 1883 (used under license from Promap until July 2023)

Photograph 8: Earthworks relating to colliery spoil in the central part of the site

2.9 Modern

The area of the site and study area continued to see industrial developments in the 20th century. Where in earlier centuries mining had been restricted by the high water table, improvements in pumping technology made it possible, and commercially viable, to sink deeper mines. Cannop colliery (HER: 5843) was opened in 1906, approximately 500m north of the site, and is noted for having very high water in the mine which needed to be pumped to allow access to the coal seams. Within the site a wood distillation works was opened in 1913-14 (HER: 4365) and two stone works operated – the Cannop Stone Works just south of Speech House Road (HER: 19825) and the Bixlade Stone Works (now the Forest of Dean Stone Firms Ltd, HER: 5829) south of Lower Cannop Pond. The three works can be seen on the Ordnance Survey 6":mile map of 1924 (Figure 6) although the stone works are likely to have been present from the 19th century at least.

The wood distillation works reflects the change, seen across the Forest of Dean in the 19th century, away from iron smelting with charcoal to smelting with coke. This reduced the demands on timber and charcoal production and opened the way for alternative charcoal product industries to develop (Hart, 1971). The wood distillation works at Cannop was built by the Crown and produced charcoal, tar, alcohol and acetate of lime, initially for the Ministry of Munitions during the First World War and then as a commercial concern until 1971 (Baggs and Jurica, 1996).

The Ponds themselves were modified in the early years of the 20th century following issues of leaking, low water levels and pollution. From at least the late 19th century the Ponds, although initially built to supply water to the Parkend Ironworks, had been stocked for fishing. Letters held in the Gloucestershire Archives detail repeated complaints about dying fish resulting from low water levels and water pollution (D9096.F3.874). There are records of repairs, estimated as £202.15.19 in 1904, including works to the Lower Cannop spillway. These repairs, along with further works in 1976, are recorded in the stonework on the Lower Cannop weir (Photograph 9). The early 20th century works were designed to raise the water levels in the Ponds and enable it for use by the Bixlade Stone Works and the railway. Although the majority of the changes are too small to be seen in the revised Ordnance Survey mapping (Figure 6), the higher water levels can be seen from the increased size of the Ponds, particularly the upper Pond, which extended further up the Cannop valley forming marshy ground. Although only the major works are apparent in the engraved stone, it is clear that maintenance was undertaken throughout the 20th century. For example, a letter dated 15th May 1909 states that a leak was developing in the bank of the lower Pond (D9096.F3.874).

Photograph 9: Records of works carved into the stonework at Lower Cannop weir

Other 20th century developments in the study area include the creation of a military depot to the east of the site during the Second World War (HER: 22838) and the Hopewell drift mine, located to the north-west of the site, opened in 1976 (HER: 51415).

In addition to the heritage assets identified above, there are several earthworks present within the site, including a C-shaped trench (HER: 20694) and a horseshoe-shaped ditch (HER: 17488), both identified from lidar data, which are undated (see section 2.10).

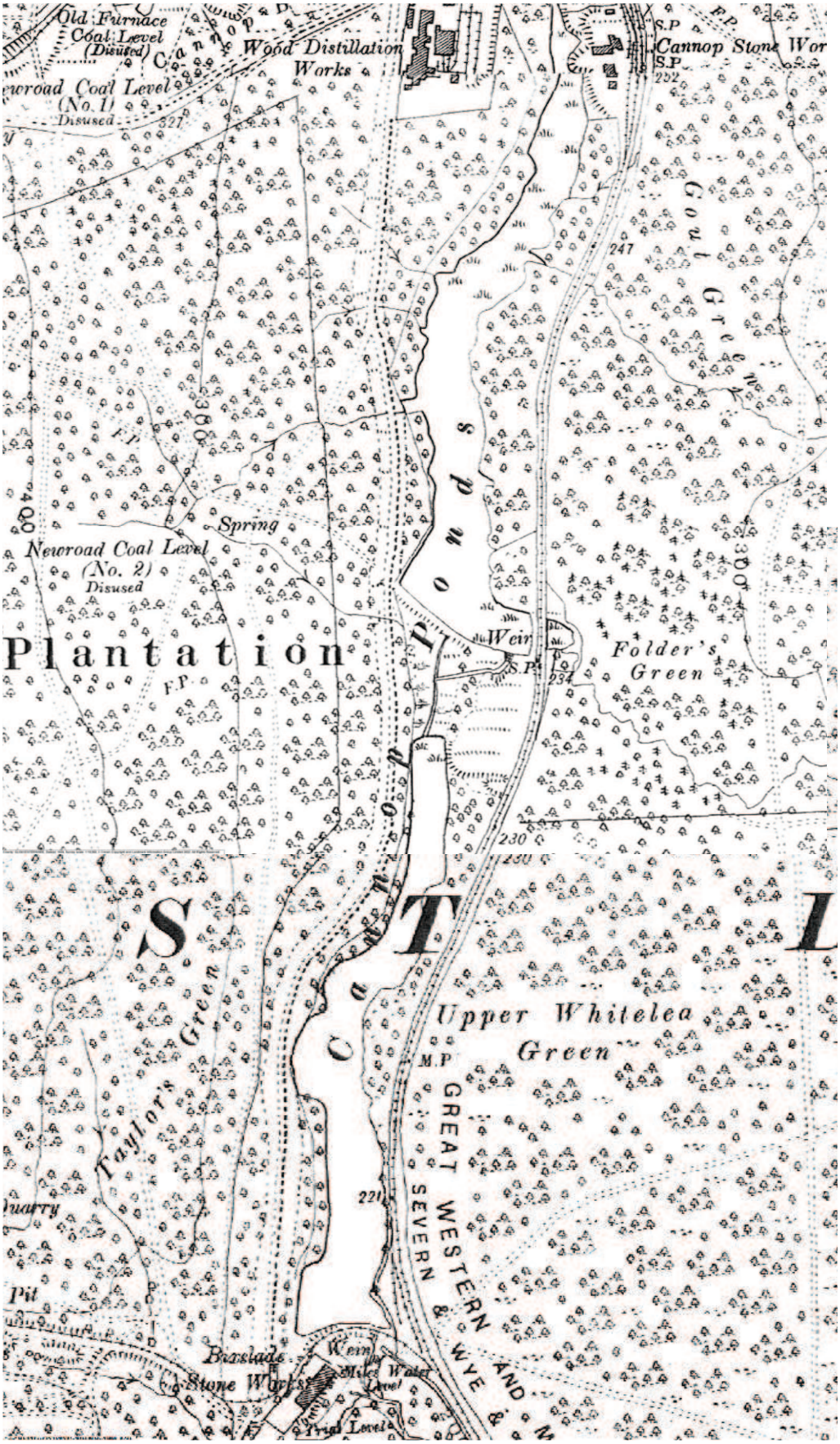


Figure 6: Ordnance Survey 6":mile map of 1924 (used under license from Promap until July 2023)

2.10 Archaeological potential

The known heritage assets within and around the site, alongside the wider archaeological and historical background of the area and data collected from lidar analysis, map regression and walkover survey, allow an idea of archaeological potential to be developed.

The Ponds date to the 19th century and were created by damming and flooding a section of the Cannop Valley. Associated with the Ponds there are numerous features which are of archaeological interest, including weirs, sluices, bridges and the dam structures. Although appearing naturalistic, there is little about the Ponds which has a natural origin. Photograph 10 and Photograph 11 are examples of this, showing the slag edging around the Upper Cannop Pond and the substantial earthen embankment which was constructed to hold the water. Features of archaeological interest associated with the Ponds have been present around the water's edge and further features are likely to be present, particularly within the Pond embankments.

Photograph 10: Upper Cannop Pond, including spillway and slag edging

Photograph 11: Upper Cannop Pond embankment

As well as the Ponds, there are extensive traces of tramways and disused railways across the site. This is particularly apparent in the broad corridor of the former Severn and Wye Railway, now a cycle path, but there are also former tramroads crossing south of Lower Cannop Pond and connecting former industrial sites in the north of the site. Earlier linear features include the boundaries of Crown woodland enclosure, surviving as earthworks along both sides of the Ponds (Photograph 7)

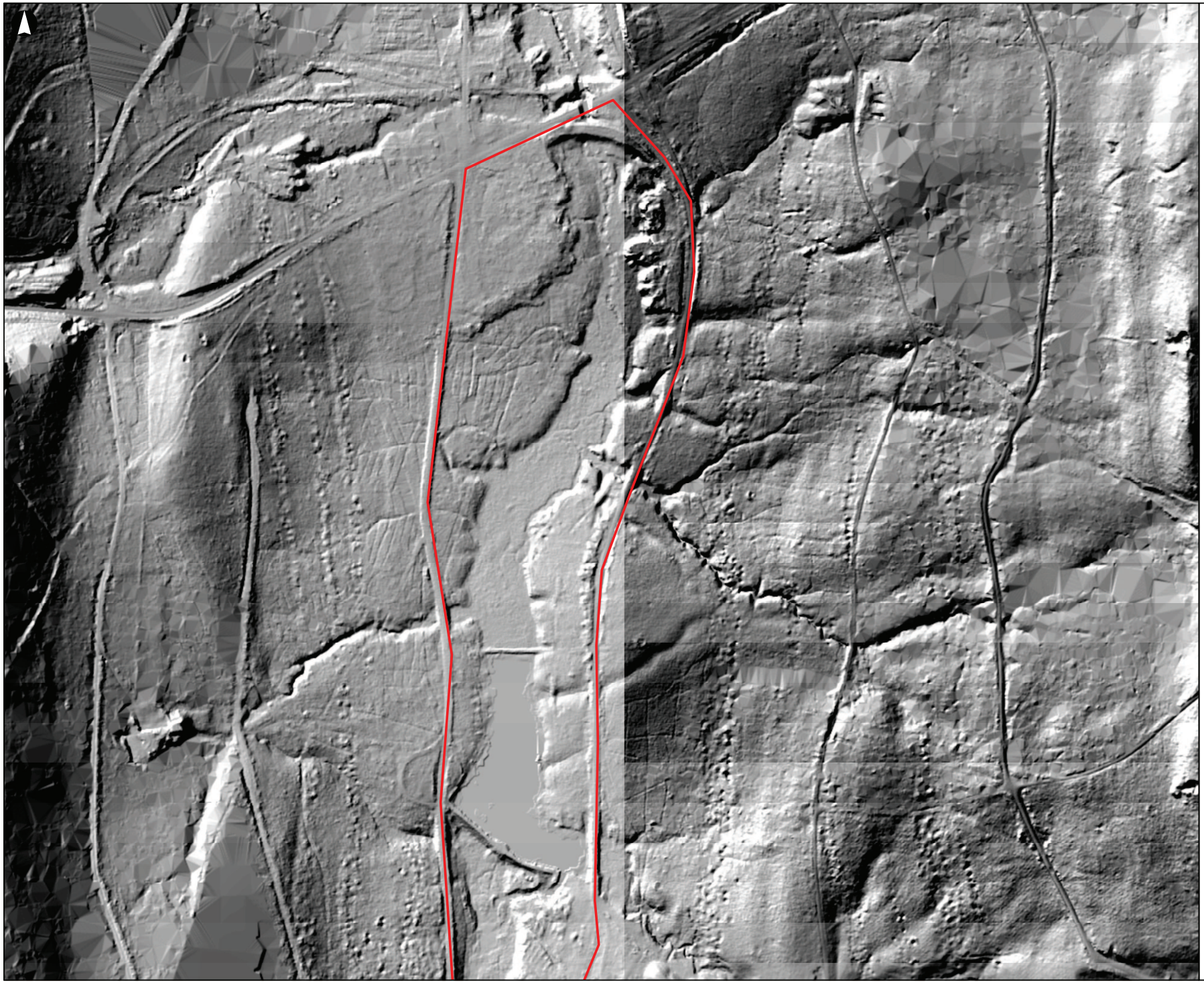
There are likely to be archaeological remains of the demolished Cannop stone works (HER 19825) and Wood Chemical Works (HER 4365), which are located in the northern part of the site. Features could include foundations, Ponds, tramlines and industrial waste deposits.

Between the Upper and Lower Ponds there is an area of rough earthworks crossed by drainage channels and evidence of former mine workings. This area may be of particular archaeological interest as it may provide evidence of what the Cannop valley was like prior to the Pond creation.

To the south of Lower Cannop Pond there are several features of interest. The first is the leat thought to have supplied Parkend Ironworks (HER: 20331). However, there is also evidence of historic mining across this area including coal and ironstone bell pits of medieval or post-medieval date (HER: 18439) and a trial level (HER: 28086). Traces of historic mining are also likely to be found along the western boundary of the site (HER: 22811).

Features identified from lidar data, as well as the unannotated lidar imagery, are shown in Figure 7-Figure 10.

A3



Legend

Site Boundary

Lidar 1m DTM @Environment Agency 2020
Open Government License

Issue	Date	By	Chkd	Appd
P2	14-10-22	CA	JK	KW

Metres
0 50 100 200

ARUP

13 Fitzroy Street
London W1T 4BQ
Tel +44 20 7636 1531 Fax +44 20 7580 3924
www.arup.com

Client

Forestry England

Job Title

Cannop Ponds Heritage Impact Assessment

Figure 7: Lidar (1m DTM) (North)

Scale at A3

1:4,000

Job No	Drawing Status
286412-00	**For issue**

Drawing No	Issue
007	**P2**

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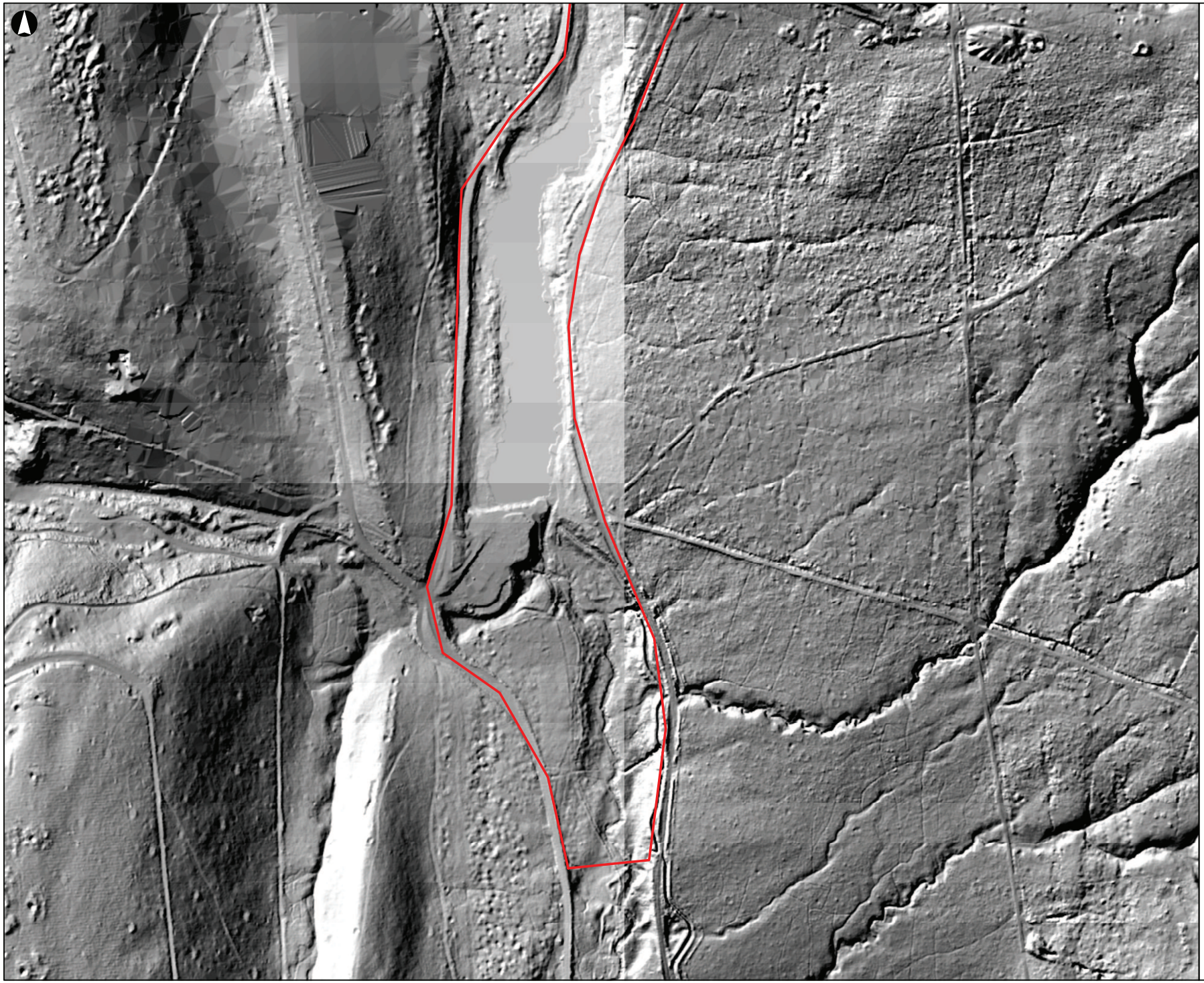
A3



Legend

Site Boundary

Lidar 1m DTM @Environment Agency 2020
Open Government License

Issue	Date	By	Chkd	Appd
P2	14-10-22	CA	JK	KW

Metres
0 50 100 200

ARUP

13 Fitzroy Street
London W1T 4BQ
Tel +44 20 7636 1531 Fax +44 20 7580 3924
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Client

Forestry England

Job Title

Cannop Ponds Heritage Impact Assessment

Figure 8: Lidar (1m DTM) (South)

Scale at A3

1:4,000

Job No	Drawing Status
286412-00	**For issue**

Drawing No	Issue
007	**P2**

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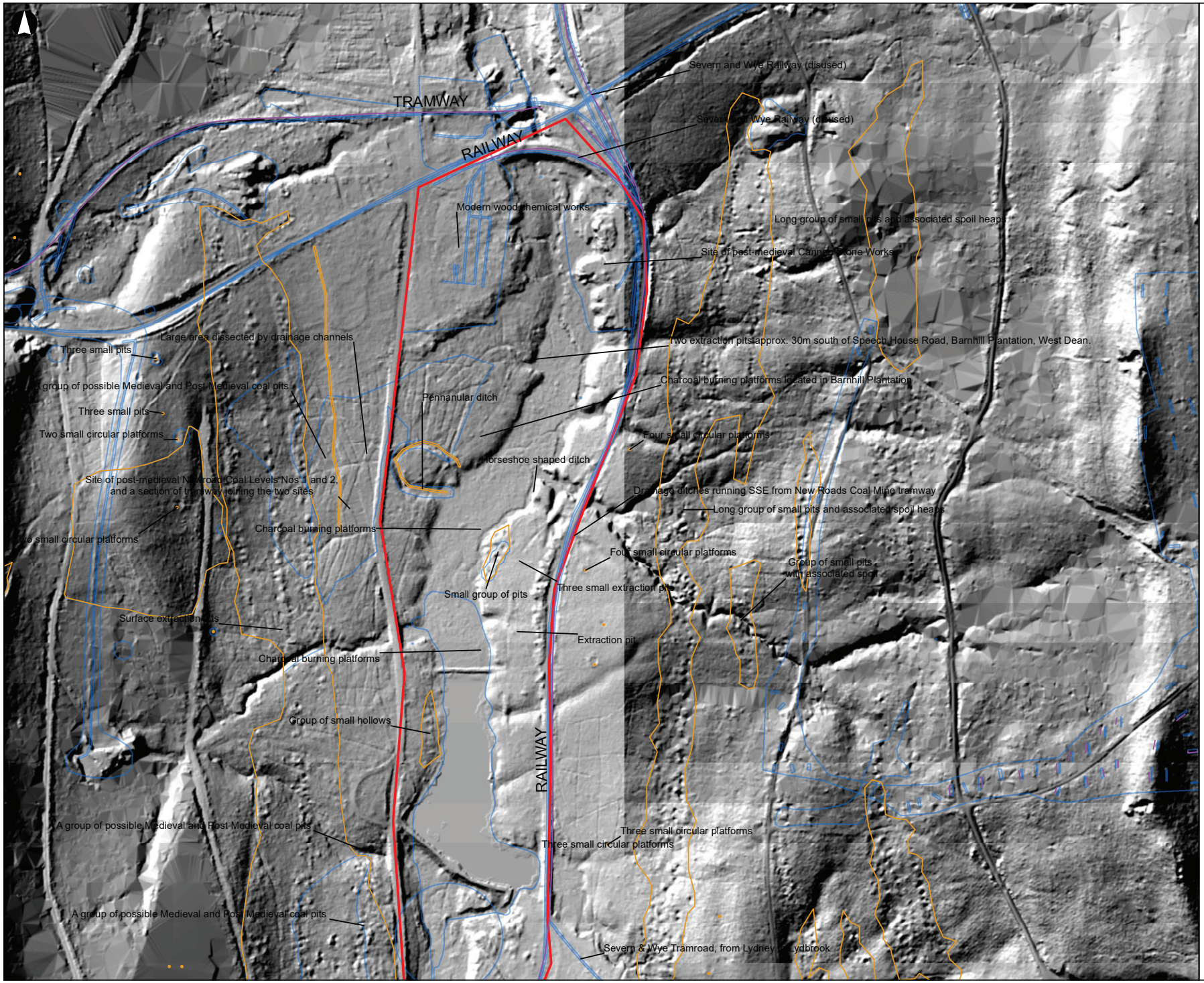
A3



Legend

- NMP Lines
- Lidar (2006 survey)
- Site Boundary
- HER records

Issue	Date	By	Chkd	Appd
P1	14-10-22	CA	JK	KW

Metres
0 50 100 200

ARUP

13 Fitzroy Street
London W1T 4BQ
Tel +44 20 7636 1531 Fax +44 20 7580 3924
www.arup.com

Client
Forestry England

Job Title
Cannop Ponds Heritage Impact Assessment

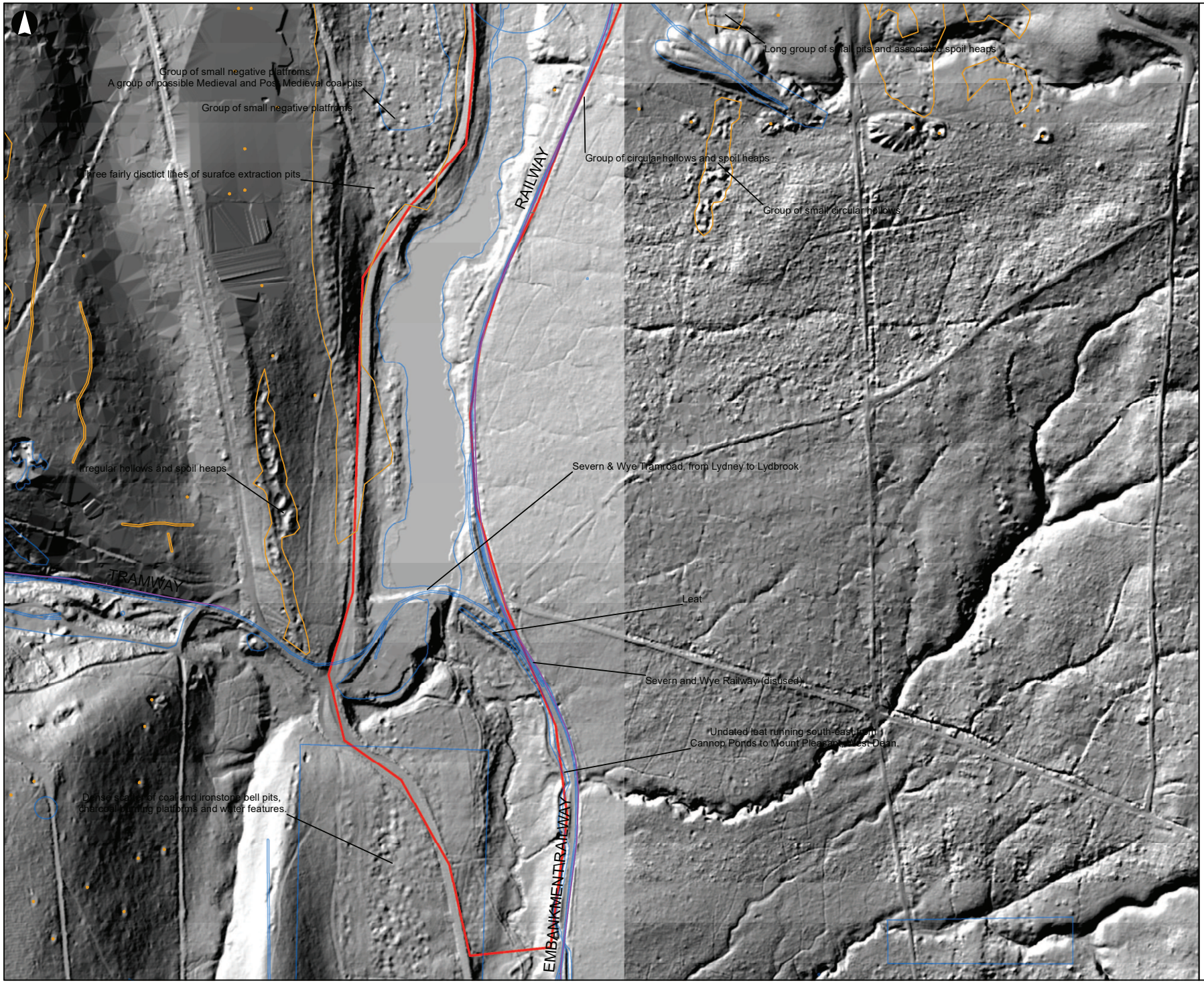
Figure 9: Lidar (1m DTM) with annotation (North)

Scale at A3
1:4,000

Job No	Drawing Status
286412-00	For Issue

Drawing No	Issue
009	P2

A3



Legend

- NMP Lines
- Lidar (2006 survey)
- HER records
- Site Boundary

Issue	Date	By	Chkd	Appd
P2	14-10-22	CA	JK	KW

Metres
0 50 100 200

ARUP

13 Fitzroy Street
London W1T 4BQ
Tel +44 20 7636 1531 Fax +44 20 7580 3924
www.arup.com

Client
Forestry England

Job Title
Cannop Ponds Heritage Impact Assessment

Figure 10: Lidar (1m DTM) with annotation (South)

Scale at A3
1:4,000

Job No	Drawing Status
286412-00	**For Issue**

Drawing No	Issue
010	**P2**

3. Significance

This section is intended to provide an overview of the significance of heritage assets which are likely to be impacted by the options being considered for the Cannop Ponds. Heritage assets where the options currently being considered are unlikely to have an impact, which includes both of the designated assets within the study area, are not discussed.

In line with policy and best practice (see section 1.3) the significance of heritage assets is described in terms of their:

- Archaeological;
- Historic;
- Artistic; and
- Architectural interest.

3.1 Cannop Ponds

The Upper and Lower Cannop Ponds are an important part of the Forest of Dean's industrial landscape. They illustrate, in physical form, the historical developments in metallurgy which took place in the early 20th century which allowed iron to be successfully smelted using locally produced coke, a development which spurred a resurgence in the local iron industry and led to the reopening of the Parkend Ironworks. The Ponds were created to supply water to the Parkend Ironworks' waterwheel, with water carried by a leat still observable to the south-east of Lower Cannop Pond. The Ponds continued to support local industry, providing water to the Forest of Dean Stone Firms and the Severn and Wye Railway into the 20th century. More recently, the Ponds have become emblematic of the shift from the Forest of Dean's use as a place of resource extraction and industry to one of leisure and tourism and are a tranquil space close to foot and cycle paths.

The Ponds have historic interest through their association with several important local industries and specifically connect to a shift to the larger-scale production of the 19th century which required water to provide continuous power to the blast furnaces.

Parts of the Ponds also have archaeological and, potentially, architectural interest, which is contained in what their physical structure can potentially tell us about their history and usage. Specifically:

- Embankments: the dam embankments are likely to be a combination of earth, rubble and puddling clay but their exact formation is not known, nor is how much they used earlier features in their establishment, such as quarry excavation or mining spoil in their establishment. The Lower Cannop Pond embankment, in particular, was part of the Bixhead branch of the Seven and Wye Tramroad and there may be features within it which predate the creation of the Pond. These features, if present, would be of interest as so much of current knowledge of the former industries around the site relies on Lidar survey and historic mapping, meaning that the pre-Pond industrial landscape is not well understood. There are also likely to be remains of different phases in the construction, repair and redevelopment of the Ponds, which would be of interest.
- Weirs, spillways and sluices: these features are of both archaeological and, potentially, architectural interest. Engravings indicate that there have been multiple phases of repair and reconstruction but there may be unseen elements of the earlier structures which would be of interest.
- Bridges: the current bridges appear to be relatively modern in construction, but there may be historic elements contained within them which would be of archaeological interest.
- Materials: it was identified during the site visit that slag is used extensively around the edges of the Ponds. The material selection, be that of local or imported stone or waste materials such as slag, are of archaeological interest and link to the historic character of the Ponds and their surroundings.

3.2 Former infrastructure

Beyond the immediate footprint of the ponds, there are a number of significant post-medieval features, including the leat to Parkend Ironworks, former tramroads and the course of the Severn and Wye railways. These features are of archaeological and historic interest, associated with the industries of the Forest of Dean and illustrative of the nature of the historic industrial landscape. While sections are apparent as earthworks and existing structures, other remains will survive below ground as buried archaeological remains and are of archaeological interest for the evidence they contain.

3.3 Other archaeological remains

In addition to the known features of the Ponds and former infrastructure, there are also further known archaeological remains identified from lidar and there may also be potential previously unrecorded archaeological remains. All such remains would be of archaeological interest. In broad terms, their relative significance would be as follows:

- Pre-medieval remains: there is a low potential for pre-medieval remains in the area, based on the baseline assessment undertaken for this study. Given the Forest's peripheral relationship to settlement and other activity in the prehistoric, Roman and early-medieval periods, and the impact of later industrial activity, remains are likely to be isolated and/or fragmentary. Isolated finds would be of limited archaeological interest.
- Medieval and later – there is a high potential for archaeological remains of mining, quarrying, industrial waste and related features. These features are of archaeological and historic interest.

4. Preliminary Impact Assessment

4.1 Reasons for the scheme

In 2021 a Section 10 inspection was undertaken of the Lower Cannop Pond which categorised it as a 'Category C' reservoir. This meant that a series of Measures in the Interests of Safety (MITIOS) were required. This included the removal of a trash screen from the entrance to the spillway channel, rebuilding of parts of the spillway walls, repairs to the spillway slab, a new flood assessment and routeing exercise to be carried out and the removal of stones placed on the overflow and the original top water level restored. These have all been undertaken and certified as complete in 2021. The one remaining MITIOS is the replacement of the spillway.

The flood routeing assessment carried out as one of the MITIOS identified that the current spillway has insufficient capacity and in an adverse storm event, there would be overtopping of the dam and out-of-channel flow down the spillway which is a threat to the safety of the dam. As a result, any remedial works at the site will also need to give due consideration to this conveyance shortfall and increase overflow capacity.

Subsequent to the inspection and studies, review of the overall condition of the site by Forestry England and Arup has also identified further risks at the site:

- A history of voiding in the main embankment both close to and away from the spillway. Any works which focus solely on the spillway would not investigate or address those potential wider issues which would remain a risk to Forestry England.
- The hydroturbine pipework was installed at depth through the embankment without any oversight from reservoir engineers. The form of construction and condition of the pipe is unclear and there are reports of issues with separation of one of the joints within the embankment. There is no way of isolating the pipe from the reservoir and the flood study showed that in adverse storm events where the reservoir level rises, the water flows through the 1200mm diameter pipe and overtops the walls of the sluice gate structure leading to out-of-channel flow and potential erosion of the downstream embankment.

During the works undertaken in 2021, a number of other issues were identified and further works were undertaken in order to make the dam safe. The most significant part of this was mass concrete infill of significant voiding beneath the spillway slab close to the inlet. Concrete was used to fill the voids.

To address the remaining MITIOS – the removal of the spillway – in a way which also deals with the additional safety issues highlighted through the repair works, Arup has been appointed to undertake an options assessment and subsequent design works of a preferred solution. The overarching project objectives are as follows:

1. Identify, design and implement a cost-effective solution to enable MITIOS certification which provides a sustainable and long-term, safe solution (50+ years).
2. Implement a solution which also addresses the shortfall in flood conveyance capacity which was identified in the flood study undertaken following the Section 10 inspection.
3. Meet Forestry England's objectives for wildlife improvements as set out in 'Growing the Future: 2021-26' –
    a. providing valuable, high-quality, sustainably managed habitats for wildlife;
    b. Identifying potential key sites in our working forests where we can use more wilding activities, such as low-density grazing and more meandering watercourses; and
    c. Reintroducing and translocating plant and animal species to support the rich ecosystems in the nation's forests.
4. In developing the solution, consideration should be given to maintaining or ideally improving the environmental, ecological, heritage, and amenity value of the asset.

5. Deliver a scheme which addresses concerns around dam safety posed by the condition and insufficient capacity of the weir and spillway.

6. Design a solution which does not lead to an unacceptable risk of flooding in the downstream catchment.

4.2 Detail of the options

4.2.1 Overview

This Heritage Impact Assessment has been commissioned to inform the option development through providing an understanding of the potential heritage implications of the options under consideration.

Three broad types of option are being considered, each with a range of variations possible within them:

- Option A: Do Minimum/Repair;
- Option B: Replace Spillway(s); and
- Option C: Discontinue the Reservoir(s).

4.2.2 Option A: Do Minimum/Repair

The concept of Option A is that the remedial works undertaken to date have made the spillway safer than at the time of the Section 10 inspection. Further repairs and improvements could be undertaken while leaving the existing structure largely in place. Options range from no works to major refurbishment. Additional works would also be required to address the concerns with voiding in the main embankment and the hydroturbine pipework issues. The range of options within Option A are:

- No works;
- Business As Usual – Reactive Repair Works;
- Repair Spillway;
- Repair Existing Spillway & Provide Auxiliary Spillway; or
- Repair Existing with New Forebay & Major Upgrades.

Option B is to replace the spillway. A new spillway would provide sufficient flood conveyance capacity to pass the safety requirements for the dam. The construction work would include the complete removal of the existing structure, with any underlying defects uncovered and addressed as part of the works. Additional works would also be required to address the concerns with voiding in the main embankment and the hydroturbine pipework issues. Construction activities would likely require a temporary, partial or complete drawdown of the reservoir to enable works.

There are two variations on Option B:

- Online Spillway Replacement; or
- Offline Spillway Replacement.

Both options would allow the Ponds to be retained, although online replacement would require a lengthy drawdown of the water levels to allow construction.

Option C is to discontinue the reservoir, which is the only truly reliable long term solution. At nearly 200 years old, the dam will have already exceeded the original design life. There are different extents to which the reservoir could be discontinued. Each would essentially involve the drawing down of the reservoir, the removal of the spillway and cutting through of the dam embankment, construction of a new bridge to reconnect the footpath, and the associated works to the upstream reservoir area:

- Discontinue Reservoir with Small Pond Retained Upstream
- Discontinue Reservoir with Historic Stream / Brook Reinstated; or

- Discontinue Reservoir and Introduce NFM and/or Beavers to Reinstated Watercourse.

Each of these options is considered below in relation to how they could impact the heritage assets identified through this assessment and how these impacts could affect their significance.

4.3 Impact Assessment

4.3.1 Comparative Impacts

Option	Variation	Discussion
A Do Minimum/ Repair	No Works	This option would not satisfy the MITIOS requirements or project objectives. The emergency repairs undertaken to date were not intended as a long term solution, leaving a significant risk of dam failure with associated threat to public safety, environmental and infrastructure damage. As a result it is likely to be discounted as a viable option. However, were it possible to repair the dams without making substantial alterations there would be very limited impact to the Ponds as a heritage asset or to their significance. The Ponds have been modified and maintained across their nearly 200 year history and further works, providing they were done sensitively, are unlikely to cause harm. The options to provide an auxiliary spillway or replacing the forebay would result in more substantial change to the historic structures but would fit into the pattern of continued repair and replacement over the last century and would be unlikely to constitute substantial harm.
	Business As Usual – Reactive Repair	
	Repair spillway	
	Repair Existing Spillway and provide auxiliary spillway	
	Repair Existing with new forebay and major upgrades	
B Replace Spillway	Online Replacement	This option would involve fully removing the existing spillway, investigating any underlying defects and replacing the structure with a new spillway, which would have a slightly larger footprint. Although there would be a loss of the current spillway arrangement, this structure has been substantially modified and its replacement would fit within the existing pattern of works to the dam. There would, however, be the potential loss of evidence within the spillway and the underlying material which may survive of earlier rebuilds and repairs, which would be of archaeological interest. Preservation by record of the existing structures through archaeological recording before and during the works, especially if combined with the use of local materials and sympathetic design, would be recommended. The majority of the dam and Pond would retain their significance and legibility as part of the historic environment. This would be temporarily limited by the drawdown of the water level required during construction.
	Offline Replacement	As with the option to replace the spillway online, this option would involve fully removing the existing spillway with all the effects described above. It would also involve a loss of any archaeological remains and/or historic structures within the area of the new offline spillway construction. There would be a shorter period of drawdown required, which would limit the temporary effect to the historic landscape from the reduction of the water levels.
C Discontinue Reservoir	Discontinue with small pond retained upstream	Discontinuing the reservoirs, with associated dewatering of the Ponds, would be a significant loss to the historic industrial landscape in the Forest of Dean. Although the water itself is not a historic structure, the Ponds are a historic landscape feature which is an important contributor to the legibility of the historic industrial landscape in the Forest of Dean, and the main surviving example of their type in the area. However, options which would allow the retention of parts of the historic structures, such as the spillway and/or part of the embankment would allow some of the historic character and legibility to be retained, especially if interpretation measures are put in place. There are precedents for this, for example the Upper and Lower Neuadd schemes in the Brecon Beacons. An ideal version of this option would involve the retention of parts of the embankment and spillway alongside the retention of a small pond, which could act as a symbol for the previous waterbodies. Variations of this option, including the restoration of the pre-1820s streamcourse or the use of NFM and/or beavers would be neutral in terms of their impact to the historic environment (beyond the discontinuance of the reservoir).
	Discontinue with historic stream/brook retained	
	Discontinue and introduce NFM and/or beavers to reinstated watercourse	

Option	Variation	Discussion
All options		While the current options focus on the Cannop Ponds, works to repair, replace or discontinue their use are likely to require enabling works, such as the creation of a site compound, access tracks, pumping machinery and storage of materials. The areas around the Ponds have multiple features of archaeological interest, including the leat thought to have supplied Parkend Ironworks, the former tramway and railway lines, and remains of former quarrying, mining and processing. Where possible the development of the design should seek to preserve these remains and assessment should be made of the potential impacts on them.

Table 2: Comparison of potential impacts

5. Conclusion

The Cannop Ponds are an important part of the Forest of Dean's industrial landscape, connected intrinsically with its history of ironworking. Modifying or removing the Ponds, as is likely to be required to improve their safety and provide a long term, resilient, solution to their management, will have an adverse impact on their significance, although there are ways which can be explored to minimise this, depending on the option selected.

Both local planning policy (Forest of Dean District Council, 2018, AP5) and Forestry England's (2019) landscape management plan stress the importance of preserving features of the industrial landscape of the area, although it is acknowledged that while [Forestry England] 'will actively seek to avoid demolition or removal of structures that become dangers, …that may be unavoidable in some cases' (Forestry England, 2019). As such, while works to the Ponds are likely to be in tension with the stated emphasis of both the District Council and Forestry England to preserve the Forest's industrial features, safety requirements do allow for such works to take place. There likely will be, however, a requirement for sensitive design and mitigation that could add to the costs and duration of the scheme.

Consultation with the LPA archaeologist and, potentially, the Association of Industrial Archaeologists, should be undertaken during the design process to inform the most sensitive way to preserve the heritage values of the Ponds. This document should also be revised, or an addendum produced, to make an assessment of the impacts of the finalised design.

All works to the Ponds will likely have a requirement for pre-commencement, construction-phase and design mitigation, potentially including archaeological recording of structures, archaeological monitoring and excavation, retention of historic features within the design, use of specific materials and styles, interpretation and heritage input into landscape design.

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Abbreviations

BGS	British Geological Survey
CIfA	Chartered Institute for Archaeologists
DTM	Digital Terrain Model
GSIA	Gloucestershire Society for Industrial Archaeology
HER	Historic Environment Record
HLC	Historic Landscape Characterisation
MITIOS	Measures in the Interests of Safety
NCA	National Character Area
NGR	National Grid Reference
NHLE	National Heritage List for England
NPPF	National Planning Policy Framework

Appendix A

Gazetteer

A.1 Designated heritage assets

NHLE ID	Designation	Name	Description	Period
1186465 (HER: 13754)	Grade II Listed Building	Milestone about 275 metres east of Cannop crossroads	Milestone. 19th century, with slightly cambered top, tooled sides, inscription painted black.	Post-Medieval
1376766 (HER:19826)	Grade II Listed Building	Old furnace level at Hopewell Colliery	Adit head to coal measures, a rare surviving early example in the Forest of Dean. Early 19th century, dressed stone. Built in 1810-20 by David Mushet. Elliptically vaulted tunnel and stone revetments to the banks of the cutting at its entrance. Originally there was a plateway through the tunnel with a drainage channel beside it, but the floor of the tunnel is now covered in gravel.	Post-Medieval

A.2 Non-designated heritage assets

Rows shaded in grey are heritage assets located within the site

HER no.	Name	Description	Period
4365	Modern wood chemical works, known as the Wood Distillation Works. Dating to 1913-1914 and located at Speech House Road.	The wood distillation plant was built about 50 yards south of the former Cannop Chemical Works in 1913-1914. The site of His Majesty's Acetone Factory was established in 1913 by the Office of Forest and Woods at Coleford to manufacture acetate of lime, an essential raw material in the manufacture of acetone. During the Great War, the works were controlled by the Ministry of Munitions and designated His Majesty's Acetone Factory.	20th – 21st century
5167	Traces of possible Roman road	In 1905, Codrington mentions that the "trace of Roman pavement" was probably the remains of extensive road repairs carried out in the Forest of Dean in the 19th century. However, the site was visited by D.A. Davies of the Ordnance Survey in April 1958 resulting in no trace of paving or antiquity. However, there is a possibility of Roman remains.	Roman
5687	Site of post medieval furnace known as King's Furnace at Cannop (part of the Kings Iron Works), Coleford	King's Furnace, Cannop built in 1612 by the Earl of Pembroke's lessees for the King, just north of where Howler's Slade Stream joins Cannop Brook. Whether the power was from Ponds or from the Cannop itself is unclear. In 1642 the furnace was leased to William and Thomas Dunning through John Browne, the Gunfounder. It was partially destroyed in 1644 during the Civil War. Nicholl describes the stone body of the furnace as being usually 22ft. square, the blast being kept up by a water wheel not less than 22ft. diam. acting upon two pairs of bellows	Post-Medieval

HER no.	Name	Description	Period
		(18ft. x 4ft.) and kept in blast for several months together.	
5688	Post-medieval Cannop Hill Foundry (iron & brass), dating from the 19th century, located on the north side of the Speech House Road (B4226), Cannop	Cannop Hill Foundry at Howler's Slade was built c.1835 by Trotter Thomas & Co. In March 1841 the foundry consisted of two air furnaces, a store, a fitting shop, a steam engine and a burning and boring mill. The foundry continued in operation until 1957 when Herbert Young moved the works to the old Bilson Gasworks premises in Cinderford where it still operates. A spoil heap was identified from aerial photographs within the COGIS polygon for Cannop Hill Foundry. It is unclear whether this spoil heap relates to the demolition of the foundry or the nearby Vallets Coal Level. The latter interpretation was reached during the National Mapping Programme project. There is now a free mine on the site, which is open to the public as the Hopewell Colliery Museum.	Post-Medieval
5701	Severn & Wye Tramroad, from Lydney to Lydbrook, with various branch lines and connections to industrial concerns (19th-20th century). (Tramroad bridge over Pidock's Canal has LBII status)	All sections of the Tramroad are visible as earthworks on aerial photographs. It was built in 1812 and was extended for short distances from time to time as the nearby quarries developed. It was used to connect the industrial community in the area.	Post-Medieval
5702	Severn and Wye Railway (disused), from Lydney to Lydbrook, with docks branch and a mineral loop. (Cookson terrace has LBII status)	The Severn and Wye Valley Railway utilized sections of the Severn and Wye Tramroad (HER: 5701) during its construction which started c.1868. The railway ran from Lydbrook Junction to Lydney. It has a main branch from Parkend Junction to Coleford and a mineral loop from Tuft Junction to Wimberry Junction with a branch to Bilson. The line was opened to passengers in 1875. In 1879 the Severn and Wye Railway Company was amalgamated with the Severn Bridge Railway Company. This linked Lydney with Sharpness and Berkeley Road Junction. The Lydney to Lydbrook Junction line and its branches were closed to passengers in 1929 and were entirely closed in 1964. The line from Lydney to Sharpness was closed in 1960 and from Sharpness to Berkley Road Junction in 1964.	Post-Medieval
5829	Post medieval stone working site, possibly dating to the 18th, 19th and 20th centuries. Known as Bixlade Stone Works and located at the southern end of Cannop Ponds, North of Parkend	Served by Bixshead Quarries (HER: 5816) continue to market "Bichead Blue" and "Barnhill Grey" sandstone. The Forest of Dean Stone Firms Ltd was the successors to enterprises that have cut up massive blocks of sandstone here (known in the trade as "Forest Marble") over the last 200 years.	Post-Medieval
5839	Post-medieval Cannop Ponds, West Dean	Parkend Furnace (HER: 5616) was powered by a leat from Cannop Ponds, which were formed for this purpose	Post-Medieval

HER no.	Name	Description	Period
5843	Site of post-medieval Cannop Colliery, located at the eastern edge of Sallow Vallets Inclosure near the Pedalabikeaway cycle centre	Cannop Colliery which began sinking in 1906 and during 1907 reached a depth of 87 yards had to contend with 3,000 gallons of water a minute. There were two pits each 14ft in diameter. They met the Coleford High Delf seam, 4ft 9in thick at 205 yards. By 1909, large feeders of water had been encountered varying from 2,000 to 3,400 gallons of water a minute. Evans' Steam Sinking Pumps were adequate down to 112 yards where the feeders attained their maximum; electric turbine pumps were installed at this depth and sinking with the Evans' pumps continued below it. In 2011, an archaeological desk-based assessment was carried out for the Gloucestershire County Council Highways Depot within the former colliery site. This area was occupied by stables until their demolition in the 1960s. It is thought the proposed construction work may have the potential to impact on below-ground remains of these buildings.	Modern
5845	Site of post-medieval Newroad Coal Levels Nos 1 and 2, and a section of tramway joining the two sites, located in the north-east part of Barnhill Plantation	Newroad Coal Level No.1: short sections of the tramway in the vicinity of the level, earthworks and structures are also shown on this map. It is labelled as 'Newroad Coal Level (No.1) (Disused)' on the OS 2nd-3rd edition 25" maps of c.1900 and c.1925. Newroad Coal Level No.2: It is labelled on the OS 2nd edition 25” map of c. 1900. It is shown as ‘Newroad Coal Level (No.2) Disussed’ on the OS 3rd edition 25” map of c. 1925. Tramway: It connects the two Newroad Coal Levels is shown on the OS 2nd edition 25” map of c. 1925.	Post-Medieval
9929	Embanked pond of unknown date on the site of Cannop Chemical Works.	The pond is shown as an unlabelled feature with associated earthworks on the OS 1st-3rd edition 25" maps of c.1880, c.1900 and c.1925	Post-Medieval
10712	Site of post-medieval Speech House Colliery which was opened in 1841 and closed in 1906, located at the site now occupied by Beechenhurst Lodge.	Speech House Colliery was also known as Speech House Hill Colliery and Great Western Colliery. Opened in 1841 by Richard James and taken over in 1873 by the Great Western Coal Consumers Co Ltd, closed in 1906. The main shaft and headframe were maintained as an emergency exit for Lightmoor Colliery until 1937 when pumping finally ceased. The remains of the tramway embankment and two spoil heaps are visible as earthworks on aerial photographs. The largest spoil heap is irregular in shape and measures approximately 195 metres by 133 metres. The second heap is to the northeast and takes the form of the more familiar finger dumps. It measures up to 146 metres by 97 metres. The	Post-Medieval to 20th – 21st century

HER no.	Name	Description	Period
		spoil heaps are in part separated by a tramway embankment that measured approximately 140 metres in length.	
10720	Bixslade Mine Quarry (1859) or later Mine Train Quarry, located at Slade Hill	The quarry is in an area of Pennant sandstone, and the quarry face contained several near vertical veins of iron ore and iron ore deposits were clearly visible on a number of the loose rocks within the quarry interior. The earthwork remains of a Post Medieval quarry at Bix Slade were visible on aerial photographs. Iron ore has also been recovered from the quarry, although the precise date of this mining activity is currently unknown.	Post-Medieval
10721	Site of post-medieval Union Coal Pit, located at Slade Hill.	The Post Medieval Union Pit was situated on Slade Hill within Barnhill Plantation. It was in operation from the early 19th century and had closed by 1925. It was connected to the Bixslade branch of the Severn and Wye Railway. Union Pit spoil heap is visible as an earthwork on aerial photographs.	Post-Medieval
10722	Site of post-medieval Bixslade Deep Coal Level, located at Slade Hill, Nagshead Plantation.	The site is located within a wooded valley containing a complex of coal levels and shafts, many pre-1820 with a drainage adit, small colliery and tramway of 1812 with in situ sleepers. A small stone quarry and a free mine with modern fan house and drift are still working.	Post-Medieval
10723	Post-medieval shaft located at Slade Hill	The site is located in a wooded valley containing a complex of coal levels and shafts, many pre 1820 with a drainage adit, small colliery and tramway of 1812 with in situ sleepers. A small stone quarry and a free mine with modern fan house and drift are still working.	Post-Medieval
10724	Site of post-medieval Mapleford Engine Coal Level and section of tramway, Slade Hill.	Located on the north side of Bixslade, between Bixhead High Level and Bixhead Quarry, in an overgrown gully behind a tip. The whole mine is now in a very unstable state.	Post-Medieval
10726	Post-medieval air shaft, located adjacent to a track in Barnhill Plantation	'Air Shaft' recorded on the OS 3rd edition 25" map of c.1925. In 2002, it shown as 'Disused Air Shaft' on the modern OS Land-Line data	Post-Medieval or 20th Century
10727	Site of a post-medieval coal shaft, Taylor's Green, West Dean	A small round spoil heap is visible on aerial photographs. It has a slight depression at the centre which may be the remains of a shaft. This feature is located within an area where stones	Post-Medieval

HER no.	Name	Description	Period
		were quarried, and coal is mined, and it may represent either of these industries.	
17262	Three small extraction pits on the east bank of Cannop Brook, Gout Green, West Dean. Identified during 2006 GCC Forest of Dean Archaeological Survey, verified on the ground by 2016-19 Foresters' Forest Lidar Validation Survey.	In 2006, small negative discrete hollows were identified through LiDAR. Titled - Forest of Dean, Gloucestershire: LiDAR Survey of selected areas of woodland and the aggregates resource area. It is interpreted as an extractive pit. In 2020, features were then verified on the ground by the 2016-19 Foresters' Forest Lidar Validation Survey. A description of it, " Extraction Pit. Three small shallow extraction pits alongside a path and stream, likely used for stone"	Undated
17488	Horseshoe shaped ditch approx.115m north of Cannop Ponds, Barnhill Plantation West Dean. Identified during 2006 GCC Forest of Dean Archaeological Survey, verified on the ground by 2016-19 Foresters' Forest Lidar Validation Survey.	In 2006, one of 66 features was located during the 2006 Forest of Dean LIDAR Survey and verified on the ground by the 2016-2019 Foresters' Forest Lidar Validation Survey. A description of it, " Watercourse. Horseshoe shaped ditch running from stream to the Ponds near the road then back to the stream. There are parallel drainage ditches running into the north arm of the ditch. A manmade ditch and embankments cut through the horseshoe ditch in two places and a drainage ditch from the opposite side of the road enters the horseshoe at the westerly end. On the northernmost point of the land inside the ditch is a large amount of medium sized stone, giving the impression of the remains of a building or stone wall, although there is no other clear evidence." It is 60m in length and 50m in width.	Undated
17557	Large area dissected by drainage channels, located NW of Cannop Ponds, Barnhill Plantation. Identified during 2016-19 Foresters' Forest Lidar Validation Survey.	The feature was identified during the 2016-19 Foresters' Forest Lidar Validation Survey. Does not appear to have been recorded during earlier lidar studies of the area, although it appears to be visible in Lidar images. A description of it, "Levelled area. A large area is dissected by drainage channels, several running east-west with herringbone ditches running into these from either side. Possible oak plantings 50yrs+. No terraces seen"	Undated
17675	Extraction pit approx.140m west of New Road car park, Barnhill Plantation West Dean. Identified during 2006	In 2006, one of many small negative discrete hollows was identified through LiDAR. Titled - Forest of Dean, Gloucestershire: LiDAR Survey of	Undated

HER no.	Name	Description	Period
	GCC Forest of Dean Archaeological Survey, verified on the ground by 2016-19 Foresters' Forest Lidar Validation Survey.	selected areas of woodland and the aggregates resource area. It is interpreted as an extractive pit. The feature was verified on the ground by the 2016-2019 Foresters' Forest Lidar Validation Survey. A description of it, is "Extraction pit. Circular hollow on side of the path in a mixture of young larch and more mature beech planting". It is 4m in diameter.	
17676	Drainage ditches running SSE from New Roads Coal Mine tramway (HER5845), Barnhill Plantation, West Dean. Identified during 2006 GCC Forest of Dean Archaeological Survey, verified on the ground by 2016-19 Foresters' Forest Lidar Validation Survey.	In 2006, one of 56 earthwork systems features was located during the 2006 Forest of Dean LIDAR Survey. The ditches were verified on the ground by the 2016-2019 Foresters' Forest Lidar Validation Survey. A description of it, "Drainage ditches. The bank runs north to south on the western edge of the polygon, forming the tramway leading from the New Roads Coal level towards the road. The banks running SSE are drainage ditches, likely added when the surrounding trees were planted".	Undated
17936	Two extraction pits approx. 30m south of Speech House Road, Barnhill Plantation, West Dean. Identified during 2006 GCC Forest of Dean Archaeological Survey, verified on the ground by 2016-19 Foresters' Forest Lidar Validation Survey.	In 2006, small negative discrete hollows were identified through LiDAR. Titled - Forest of Dean, Gloucestershire: LiDAR Survey of selected areas of woodland and the aggregates resource area. It is interpreted as an extractive pit. The feature was verified on the ground by the 2016-2019 Foresters' Forest Lidar Validation Survey. A description of it, is " Extraction Pit. Two small parallel extraction pits for stone". It is 4m in diameter	Undated
17977	Extraction pit approx. 15m north of Speech House Road, Barnhill Plantation, West Dean. Identified during 2016-19 Foresters' Forest Lidar Validation Survey.	The feature was identified during the 2016-19 Foresters' Forest Lidar Validation Survey. A description of it, " Extraction Pit. Subcircular hollow with spoil to one side" It is 10m in length and 6.5m in width.	Undated
18430	Post-medieval or modern drift mine, driven into the hill slope above the east bank of the Cannop Brook, Fairmoor Green	A disused, grassed-over drift mine above the east bank of Cannop Brook and driven into the hill slope. The depression measures 30 metres long and increases in depth to a maximum of 4.5 metres at the east end with a width of 7 metres. A spoil heap extends to the	Post-Medieval to Modern

HER no.	Name	Description	Period
		riverbank. Mr Turley of Dean Caravans Ltd, Parkend, remembers another drift mine in the forest above in use up to some 60 years ago but this appears to be older.	
18432	Undated area of coal pits and bell pits extending c.200 metres east-west along a stream in Russell's Inclosure.	Area of coal pits and bell pits extending some 200 metres east-west along a stream and spreading some 70 metres across. The pits lie over the outcrops of the Starkey, Parkend, Twenty and Dogcoal seams which dip east into the gentle west-facing slope. Coal pits = 2-3 metres across and up to 0.3 metres deep. The bell pits are small, the craters of the collapsed or filled-in shafts being up to 4 metres across and 0.5 metres deep. There are small spoil heaps around some. Medieval or post-medieval date. Under bracken and long grass and within the woodland.	Medieval to Post-Medieval
18433	Scatter of undated ironstone pits and bell pits along the wooded crest of a ridge in Nagshead Plantation	A scatter of pits and bell pits along the wooded crest of a ridge at the edge of steep east facing slopes. Pieces of ironstone are much in evidence whilst, apart from the waste from a drift mine set on the east facing slope, there is no coal waste around the pits. The pits, which are 3-6 metres across and up to 0.7 metres deep are almost certainly ironstone pits rather than simple stone pits. Below the eastern slopes, there is the site of a probable iron ore crushing mill which probably supplied the King's Furnace (1624-1644) at Parkend.	Undated
18435	Undated charcoal burning sites, located on steep wooded east facing slopes in Nagshead Plantation	Upon steep wooded east facing slopes are 5+ charcoal burning sites. Average 9m in diameter, and are cut back into the hill slope, with the waste building out a level platform to a height of up to 1.5m. Small levelled areas may indicate the site of the temporary habitations of the charcoal burners and their families. The platforms are sites where updraughts of wind would best be obtained.	Undated
18437	Undated charcoal burning sites, located on the banks of a stream, Lower Whitelea Green, Russell's Inclosure	Five charcoal-burning sites on both banks of a stream on a gentle west facing slope. Circular banks of waste 7-9 metres across.	Undated
18439	Dense scatter of coal and ironstone bell pits, charcoal burning platforms and water features	A dense scatter of coal and ironstone bellpits extends southwards for 1050m. The belt of pits varies in width from 80m to 200m and lies upon the lower, east facing slopes of a ridge within the Nagshead Plantation. The pits exploited coal and ironstone seams thrown up by the	Post-Medieval

HER no.	Name	Description	Period
		Parkend Fault Belt down the centre of which runs the Cannop Brook towards Parkend. The collapsed and filled-in shaft craters of the bellpits measure from 1.5 to 7m in diameter and are from 0.1 to 0.5m in depth. Most have small, lunar shaped spoil heaps of coal and ironstone waste on the downhill side. Scattered amongst the pits are some 20 or more charcoal-burning platforms. There are a few in the northern half of the area but most are concentrated towards the southern end. They average 11m in diameter, the encircling bank where they stand on level ground is 2m wide and up to 0.2m high, but generally, they are upon sloping ground cut back into the hillslope to a depth of about 0.3m and platformed out along the slope up to 0.5m in height. The platform is composed of waste charcoal and black earth. The early platforms and ironstone pits probably supplied the King's Forge at Parkend, which is of an early 17th century date. The coal workings are probably of 18th/19th century date, coming in after the ban on the production of charcoal and falling into disuse when the deep pits came into production around Parkend in the early 19th century. There is a network of drainage channels throughout the area, many are seen to be draining particular or several bell pits.	
18440	Post-medieval shaft and associated spoil heap, located in woodland c.40 metres east of a leat, Lower Whitelea Green, Russell's Inclosure	In woodland, 40m east of a leat to a furnace site is a filled-in circular shaft constructed of stone rubble 1.7m in diameter and 0.5m deep to the point to which it has been filled in. Around the top is a bank of spoil 1.1m high internally from the top of the wall, 0.6m high above ground level externally and in diameter overall, 7.8m north/south by 9m east/west. Probably a coal mine ventilation shaft, perhaps associated with the Bixlade coal mine, 1000m to the northwest, though it may be a well. Soil within the shaft is damp and in winter holds water. Spoil heap is under grass and vegetation.	Post-Medieval
19825	Site of post-medieval Cannop Stone Works, located between the Cannop Brook and a disused railway line, in the north-west of Russells Inclosure	One of a number of stone enterprises in the Dean acquired by The United Stone Firms Co. Ltd. in 1910 and pictured in the 1914 edition of the company's "A Treatise Of Forest Of Dean Stone".	Post-Medieval, Modern

HER no.	Name	Description	Period
19826	Site of post-medieval Old Furnace Coal Level, located at Cannop Bottom	The level consists of a sandstone rubble built tunnel. The entrance opening has a roughly cut stone facing. The floor, new covered as a result of recent works, was paved with sandstone. Works has undertaken in 1994 to the level in connection with the opening of Hopewell Colliery. The works consist of the laying of a plastic pipe along the floor, in a bed of stone chippings, to drain water from the tunnel.	Post-Medieval
19834	Site of 19th century Cannop Chemical Works, located on the north side of the B4234 near Cannop Bridge.	Cannop Chemical Works was established at Cannop Crossroads in c.1835 and it produced, among other items, lead acetate, wood tar, wood pitch, lampblack, naphtha, acetic and sulphuric acid. Works closed in c.1902 and buildings gradually allowed to deteriorate until demolition in 1966. Foundations and remains of walls still exist. Course of tramway branch which served the works can be recognised where it crosses the Cannop brook by a small arched bridge with an Iron railing. In March 1841, the works had 'eight retorts distilling wood for pyroligneous acid; also steam engines, buildings in an extensive yard, and two workmen's houses'. Lead acetate was being manufactured. In 1870 a patent was licensed to be used at Cannop, being 'an invention of improved means of and apparatus for reducing charcoal and other friable substances to a fine or impalpable powder, particularly applicable to the manufacture of a substance for lamp black'. After the works closed some of the abandoned buildings were used to house sheep and horses; and a small office was used occasionally as a chapel. Although the old processing at Cannop had ended, in 1913-14 a large wood distillation plant was built about 50 yards away to the south and is still making immense quantities of charcoal. The buildings of the old plant were demolished in 1966.	Post-Medieval
20331	Undated leat running south-east from Cannop Ponds to Mount Pleasant, West Dean	An undated leat c.2 metres wide with stone-arched bridges at intervals carrying tracks and footpaths. The	Undated

HER no.	Name	Description	Period
		earthwork remains of the pear-shaped pool and part of its associated leat are visible on aerial photographs. The leat may have served the Parkend Iron Works to the south (HER 5616).	
20624	Area of quarrying and possible spoil heaps located approx. 440m NE of Howlers Hill Quarry, Perch Enclosure West Dean. Identified during 2006 GCC Forest of Dean Archaeological Survey, verified on the ground by 2016-19 Foresters' Forest Lidar Validation Survey	Polygon of mixed use for charcoal burning and quarrying. Clear area of quarrying in the northwest, and possible quarrying in the south. Some mounds on the western edge near the forest track maybe spoil heaps. There are a number of charcoal platforms, some quite large and still in existence	Post-Medieval
20694	C-shaped trench located approx. 300m ENE of Howlers Hill Quarry, Perch Enclosure, West Dean. Identified during 2006 GCC Forest of Dean Archaeological Survey, verified on the ground by 2016-19 Foresters' Forest Lidar Validation Survey.	2006 - One of 66 features with no clear interpretation located during the 2006 Forest of Dean LIDAR Survey. {Source Work 9630.} 2020 - Feature identified during 2006 GCC Forest of Dean Archaeological Survey, verified on the ground by 2016-19 Foresters' Forest Lidar Validation Survey. SO6011_07 Hollow. "Two possible hollows downslope of forest creating a C-shaped trench, more visible on north-east lidar than north-west, and not easily seen, if at all, on the ground. The vegetation is scrub and some newly planted fir trees. It is likely that forestry activities have destroyed the hollows of the two 'arms' of the C shape. The body of the C shape is more clearly defined by a split in the paths surrounding the feature"{Source Work 17155.}	Undated
21819	Probable post-medieval mineshaft in the southeastern part of Sallow Vallets Enclosure, east of Broadwell	Roughly circular mineshaft recorded during a site visit by Jon Hoyle of Gloucestershire County Council Archaeology Service to Sallow Vallets Enclosure in October 2002. The shaft was c.3m across and was visible as a depression c.1.5m deep. No masonry was visibly associated with the structure.	Post-Medieval
22003	Site of an old quarry of unknown date at Howlers Slade, on the south side of the Speech House Road	It was recorded on OS 1st-3rd edition 25" maps of c.1880, c.1900 and c.1925.	Post-Medieval
22004	Site of a post-medieval coal level at Howlers Slade, on the south side of the Speech House Road	'Old Coal Level' recorded on OS 2nd-3rd edition 25" maps of c.1900 and c.1925.	Post-Medieval

HER no.	Name	Description	Period
22005	Site of a post-medieval coal shaft at Howlers Slade, on the south side of the Speech House Road	It was recorded on OS 1st-3rd edition 25" maps of c.1880, c.1900 and c.1925.	Post-Medieval
22006	Site of post-medieval Foundry Coal Levels and associated tramway at Howlers Slade, on the south side of the Speech House Road	The tramroad branch survives partly as a gravelled trackway and partly as a grassed trackway. A row of stone blocks is visible forming an edge to part of the gravelled track. To the east the tramroad route ran underneath the access road and car park, beyond which a grassed slope marks the tramroad route. At the area visited, just parallel to and north of the tramroad route lie drainage ditches	Post-Medieval
22046	Undated charcoal burning platform, located to the south of Slade Hill, Nagshead Plantation	A single charcoal platform set against a steep east facing slope. On the west, uphill, side is a drystone riveting wall up to 1.5m high at the centre, falling away to the sides, 8m across from end to end. In the centre of the working area is a low mound of coal and charcoal with a tree growing out of it. 10m east of the centre is a pit 2m in diameter, 0.5m deep, possibly a small coal shaft, filled in.	Undated
22423	The earthwork remains of Post Medieval coal workings are visible on aerial photographs, West Dean	The earthwork remains of Post Medieval coal workings are visible on aerial photographs. The levels are situated within Cannop Bottom. The remains take the form of a sub-circular shaft surrounded by a bank of spoil giving the impression of a crater. The spoil measures approximately 15m across.	Post-Medieval
22810	A group of possible Medieval and Post Medieval coal pits within Barnhill Plantation are visible as earthworks on aerial photographs, West Dean	A group of possible Medieval and Post Medieval coal pits within Barnhill Plantation are visible as earthworks on aerial photographs. The pits are sub-circular and measure approximately 3m across. They are arranged in a band 83m wide which is aligned north/south and can be traced for 251 metres.	Medieval to Post-Medieval
22811	A group of possible Medieval and Post Medieval coal pits at Taylors Green within Barnhill Plantation are visible as earthworks on aerial photographs, West Dean	A group of possible Medieval and Post Medieval coal pits within Barnhill Plantation are visible as earthworks on aerial photographs. The pits are sub-circular and measure approximately 3m across. They are arranged in a band 83m wide which is aligned north/south and can be traced	Medieval to Post-Medieval

HER no.	Name	Description	Period
		for 251 metres. A small amount of coal spoil was found in some of the hollows	
22812	A small Post-Medieval spoil heap is situated near Cannop in the northern end of Russell's Inclosure, West Dean	This spoil heap is visible as an earthwork on aerial photographs. The heap measures up to 60m by 45m and it is likely that the shaft or level was situated on its eastern side. Situated as it is within an area of collieries it is probable that this spoil heap is related to the mining of coal.	Post-Medieval
22813	Whitelea Colliery spoil heap, visible as an earthwork on aerial photographs, West Dean	Whitelea Colliery spoil heap is visible as an earthwork on aerial photographs. No shaft or level could be seen but it was probably situated immediately east of the spoil heap, which extended north west from this point for approximately 100. The colliery was marked as disused on the Ordnance Survey 1st edition 6" map of c. 1880.	Undated
22820	A group of possible Medieval and Post Medieval coal pits within Russell's Inclosure are visible as earthworks on aerial photographs, West Dean	The pits are sub-circular and measure approximately 3m across. With a couple of exceptions they are arranged in a line which is aligned north/south and can be traced for 53m. Two further pits, one surrounded by spoil, which probably exploited the same coal seam as the main group, are situated approximately 80m to the west.	Medieval to Post-Medieval
22829	Newroad Coal Level, Cannop Bottom, West Dean	Newroad Level was situated within Cannop Bottom. The spoil heap is visible as an earthwork on aerial photographs and measures approximately 80m by 30m.	Post-Medieval
22830	The earthwork remains of a coal level are visible on aerial photographs, West Dean	The earthwork remains of a coal level are visible on aerial photographs. The level is situated on the north side of Cannop Bottom and represents small scale coal extraction. The site consists of a narrow cut 11m long and approximately 2.5m wide. Below this is the associated spoil heap, which has formed finger dumps and measures approximately 30m in length. To the east, there is a smaller cut approximately 13m long and 1.5m wide with a small amount of spoil 9m long.	Undated
22835	The earthwork remains of a post medieval quarry on a hillside at Taylors Green within Barnhill Inclosure, visible on aerial photographs, West Dean	The earthwork remains of a post medieval quarry on a hillside at Taylors Green within Barnhill Inclosure were visible on aerial photographs. The quarry consisted of an excavated area	Post-Medieval

HER no.	Name	Description	Period
		which measured 32m by 19m. Associated with this were three small spoil heaps. An "Old Quarry" was marked in this location on the 1st edition 25" Ordnance Survey map of c. 1880.	
22836	A group of extraction sites on Slade Hill within Barnhill Inclosure visible on aerial photographs, West Dean	A group of four extraction sites are visible on aerial photographs, on Slade Hill within Barnhill Inclosure. The extraction sites are narrow cuts approximately 1m wide which extend into the hillside for approximately 8m. These features are within an area where stones are quarried, and coal is mined, and these may represent either of these industries or both.	Undated
22837	A group of extraction sites and spoil heaps on Slade Hill within Barnhill Inclosure, West Dean	A group of extraction sites and spoil heaps are visible on aerial photographs on Slade Hill within Barnhill Inclosure. The extraction sites are narrow cuts approximately 1m wide which extend into the hillside for approximately 8m. Two spoil heaps are visible, although none are directly adjacent to the extraction sites. All these features are within an area where stones are quarried and coal is mined and these may represent either of these industries or both.	Post-Medieval
22838	A large number of military storage structures within the northern half of Russell's Inclosure, visible on 1945 aerial photographs, West Dean	A large number of military storage structures were seen on 1945 aerial photographs within the northern half of Russell's Inclosure. The forest of Dean was used as a military depot during the Second World War and these structures were situated within an area of felled woodland and were clearly visible on aerial photographs taken in September 1945. They were quickly removed as they are not visible on photographs taken in 1946. The structures were long and narrow measuring 10m by 1.5m and were positioned between 15 and 20m apart. From the centre point, a group of structures had been laid out northwards for a distance of 360m. Similar groups were laid out to the east for a distance of 450m and to the southwest for 380m.	20th – 21st century
27162	Boundary bank located approx. 235m north of Cannop Cottages, Vallets Wood, West Dean. Identified during 2006 GCC Forest of Dean Archaeological Survey and verified on	In planned forest with modern ditches and banks for planting angling towards this feature which predates them. Feature has both bank and ditch " 240m in length, 1-5m in width	Undated

HER no.	Name	Description	Period
	the ground by 2016-19 Foresters' Forest Lidar Validation Survey		
27892	Charcoal burning platforms located in Barnhill Plantation west of Cannop Ponds, West Dean. Identified during Forest of Dean Archaeological Survey 2006 and the Foresters' Forest Lidar Validation Survey 2016-19	Some of a group of 86 charcoal platforms located during the 2006 Forest of Dean LIDAR Survey. It was verified on the ground during the Foresters' Forest Lidar Validation Survey 2016-19.	Undated
27981	Charcoal burning platforms within Perch Inclosure, between the Cannop Brook and Mile End, West Dean. Identified during Forest of Dean Archaeological Survey 2006 and the Foresters' Forest Lidar Validation Survey 2016-19	Some of a group of 86 charcoal platforms located during the 2006 Forest of Dean LIDAR Survey. It was verified on the ground during the Foresters' Forest Lidar Validation Survey 2016-19.	Undated
28040	Undated stone located near Cannop Ponds, West Dean	It is marked on the 1st and 2nd series OS maps.	Undated
28041	Undated well located near Speech House Road, Coleford	It is marked on the 2nd and 3rd series OS maps	Undated
28046	Post medieval coal shaft and undated earthworks known as Bixslade Low Level located south east of Spion Kop Quarry in Nagshead Plantation	The coal shaft is marked on the 1st, 2nd and 3rd series OS maps with the undated earthworks being marked on the 1st and 2nd series and less extensively on the 3rd series OS map.	Post-Medieval
28048	Post medieval placename of 'Upper Whitelea Green' located to the east of Cannop Ponds	Post medieval placename 'Upper Whitelea Green' located to the east of Cannop Ponds. It is marked on the 2nd and 3rd series OS maps.	Post-Medieval
28085	Post medieval coal shaft known as Miles Level located south of Cannop Ponds, north of Parkend	It is marked on the 1st and 2nd series OS map as a coal shaft and as earthworks on the 3rd series OS map	Post-Medieval
28086	Post medieval trial level located south of Cannop Ponds, north of Parkend	It is marked on the 1st, 2nd and 3rd series OS maps	Post-Medieval
28554	Late Neolithic flint side and end scraper retrieved from Bixslade, West Dean	It is identified by Dave Mullin of Gloucestershire County Council Archaeology Service. The flake, which measured 4.1cm x 2.6 cm, consisted of dark grey flint with cortex along one side and at both ends. It was retouched at both ends and along one edge	Prehistoric
37922	A palaeoenvironmental assessment of an area centred on the Cannop Brook valley, Forest of Dean	GIS mapping identified a small number of undated features of medium to high potential including Cannop Ponds and marsh, a small number of other ponds, a palaeochannel and an osier bed. Auguring and pollen assessment did not indicate any deposits pre-dating 19th-century industrial activity, although at present no deposits have been radiocarbon dated and the possibility	Undated

HER no.	Name	Description	Period
		that they are earlier cannot be ruled out.	
47935	Gale stones recorded in the Forest of Dean	It is recorded to demarcate the boundaries of gales which are the areas allotted to free miners.	Undated
48848	Probable route of the 1796 Forest of Dean Turnpike	Probable route of the 1796 Forest of Dean Turnpike	Post-Medieval
49082	Well shown on the 1st Edition OS to the west of Cannop Chemical Works, West Dean	It is shown on the 1st Edition OS to the west of Cannop Chemical Works, West Dean.	Undated
49102	HER record for milestones, enclosure stones, gale stones and boundary stones recorded on the historic OS maps by the Forest of Dean project and supplied to the HER in 2006	HER record for milestones, enclosure stones, gale stones and boundary stones recorded on the historic OS maps by the Forest of Dean project and supplied to the HER in 2006	Undated
49141	Elephant tooth from Cannop Ponds, West Dean	A lower molar (left side) of an Indian elephant from a fairly young adult animal and clearly modern. The enamel is typically thick and wrinkled and the plates have a 'step-like' appearance that is not found in mammoths.	Undated
49331	Notable Oak tree, Oak on the South side of speech house road, Howlers slade	A tall maiden with limb fracture that has created a long, barkless cleft below.	Undated
51415	Hopewell drift mine, opened in 1976, West Dean	Hopewell drift mine, opened in 1976, worked the Coleford High Delph Seam. The seam was between 4 and 8 ft thick and produced coal of a high calorific value. A bothy housed a compressor which provided compressed air for drills and jackhammers and an electric winch for hauling the coal tubs or 'drams' to the surface. Communication between bothy and coal face was by a field telephone. The majority of coal raised was sold to British Coal, who added it to imported coal to produce a blend which had a high calorific value sufficiently high for use at power stations.	20th – 21st century