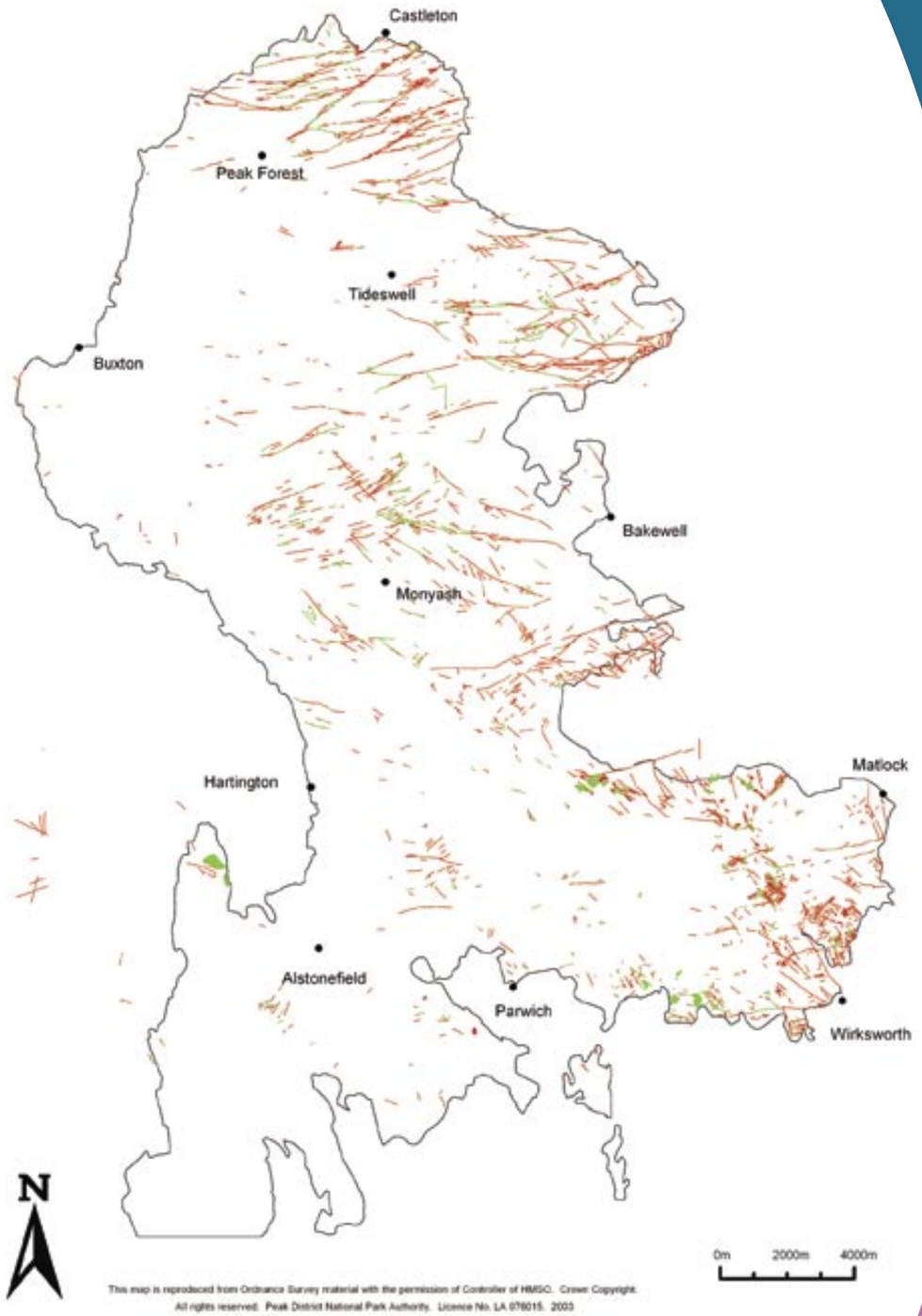

The distribution of lead mining surface remains in the Peak District orefield (limestone plateau - black line), showing those surviving in reasonable condition (green), and those removed or badly damaged over the last hundred years (red).

the **lead** legacy

The Prospects for the Peak District's Lead Mining Heritage

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the **lead** legacy

The Prospects for the Peak District's Lead Mining Heritage

John Barnatt and Rebecca Penny

ENGLISH HERITAGE
PEAK DISTRICT NATIONAL PARK AUTHORITY
ENGLISH NATURE

Cover: There are many surviving lead mining sites in the Peak District of important and multi-faceted conservation interest, as here at Oxlow Rake near Peak Forest (main image right - National Monuments Record/English Heritage). Many have waste hillocks, as at a typical example at the Dunnington Mines near Elton (bottom left - photographer Rebecca Penny, PDNPA). They include nationally important archaeological features, as at Magpie Mine near Sheldon (bottom middle - photographer Jon Humble, English Heritage), and specialist plant communities of international significance that include rare metal-tolerant species such as spring sandwort known locally as leadwort (middle left - English Nature) and the attractive mountain pansy (top middle - photographer Rhodri Thomas, PDNPA). However, these mining sites have been lost at alarming rates in recent decades and this process continues. Some early reworking has left interesting 20th century relics (top left - photographer John Barnatt, PDNPA), but removal of historic mine sites is sometimes total (middle - photographer Ray Manley, PDNPA).

Title Page: The extensive lead mining remains on Bonsall Moor are in many ways typical of the high-priority conservation resource surviving in the Peak District orefield. Careful examination of this photograph shows areas which have been damaged or removed. Some of the well-preserved areas here are protected as both a Scheduled Monument and a Site of Special Scientific Interest, while others currently have no statutory protection (2004 National Monuments Record/ English Heritage).

Report prepared by the Peak District National Park Authority for the Peak District National Park Authority Lead Rakes Project in partnership with English Heritage and English Nature.

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the **lead** legacy

The Prospects for the Peak District's Lead Mining Heritage

John Barnatt and Rebecca Penny

Peak District National Park Authority Lead Rakes Project
In partnership with English Heritage and English Nature, 2004

ENGLISH HERITAGE

PEAK DISTRICT NATIONAL PARK AUTHORITY

ENGLISH NATURE

Contents

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Foreword

The surviving lead mining remains of the Peak District are nationally and in some cases internationally significant. This was one of the largest, richest and longest-worked orefields in Britain and this country in turn was Europe's main supplier of lead for many centuries. Today the vestiges of this once-vital industry have great landscape, cultural, archaeological, ecological and geological merit. Centuries of mining have helped shape what we now value in the Peak District today, one of Britain's best-loved landscapes - a special place where its importance has been recognised by designating it a National Park, the top tier of landscape designation in Britain.

However, many of the surface remains of the lead mining industry in the Peak District have been lost in the last hundred years. Only about a quarter of what once existed now survives in reasonable condition and degradation continues, mainly through mineral operations and agricultural activity.

There is an urgent need to act now to safeguard the remaining lead mining sites and landscapes of high conservation value. A minority of features are protected as Scheduled Monuments, candidate Special Areas of Conservation and Sites of Special Scientific Interest or are currently conserved within agri-environment scheme agreements. However, these measures currently do not provide the necessary safeguards for the majority of the high-priority sites. At the same time, there is no adequate mechanism to protect landscape character at mining sites.

English Heritage, English Nature and the Peak District National Park Authority have worked in partnership to produce this report, at a critical time for this important resource, to raise awareness of the loss of lead mining heritage at a national and regional level. They are working together to secure the conservation of the lead legacy in the Peak District. There is also a need to work with local communities to promote understanding of the strong links with the past and the importance of safeguarding these unique features for future generations.

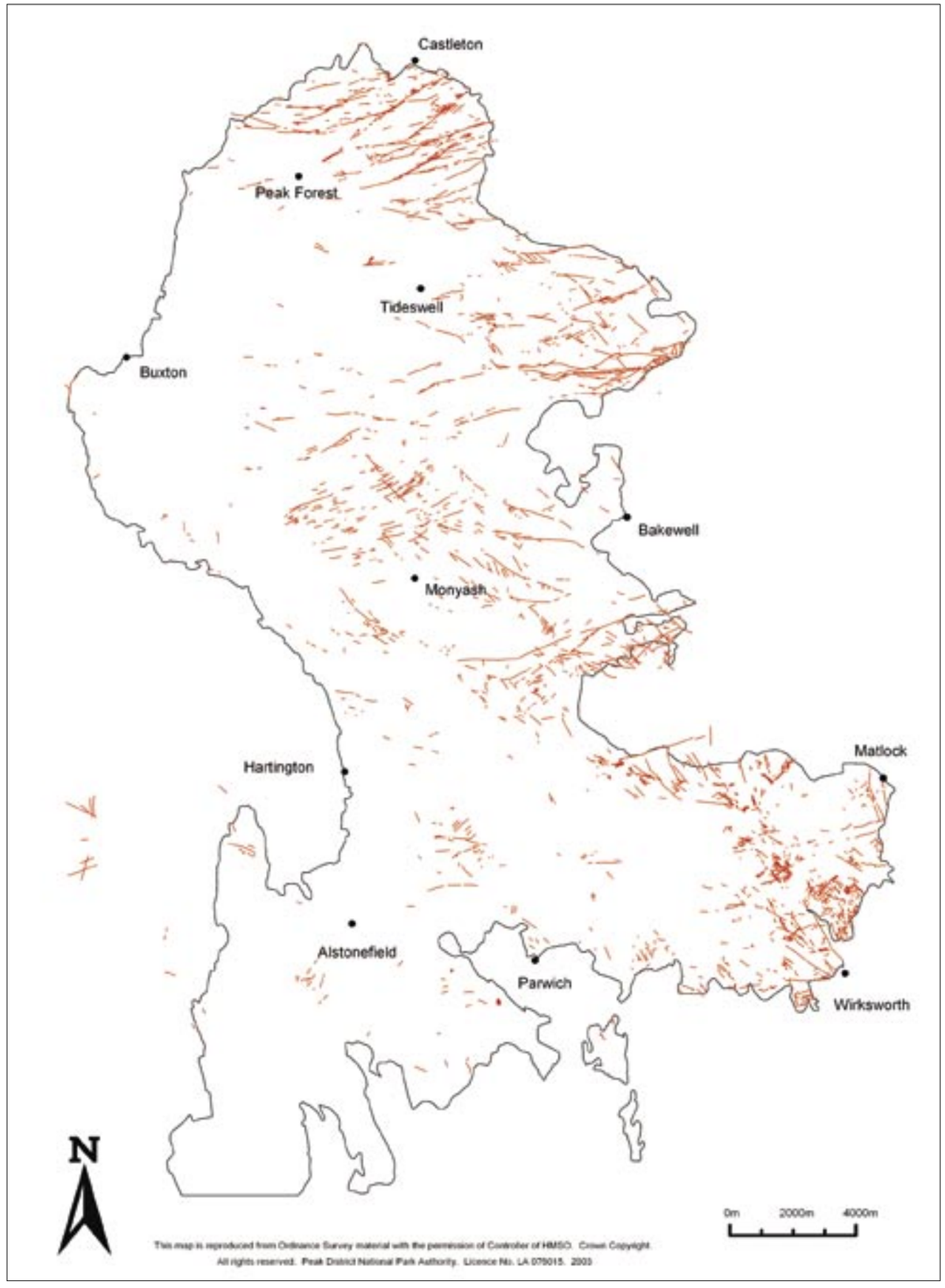
All of us must now work together to achieve sustainable, integrated management that reflects the interests of all parties.

Action must be taken now, so that this unique and irreplaceable heritage is not lost forever.

Martin Doughty
Chair of English Nature

Tony Hams
Chair of the National Park Authority

Sir Neil Cussons
Chair of English Heritage



The distribution of lead mining remains in the Peak District orefield which have been lost or badly damaged (red; limestone plateau - black line).

Summary

This report highlights the ongoing losses of important historic lead mining remains in the Peak District and sets out the urgent action that is necessary to safeguard this valuable and multi-faceted part of our heritage.

About three-quarters of these important features have been removed or are in significantly damaged condition. Only a small percentage of identified high-priority examples are protected, some through statutory designation and others conserved short-term by agri-environment schemes - these measures, as they stand, do not provide the wide ranging protection so urgently required.

Losses have reached a critical point where action to conserve further vital elements of the lead mining heritage is essential now if irreplaceable examples of sites and landscapes are not to disappear.

Acting on these concerns, the Peak District National Park Authority launched the Lead Rakes Project in 1996. This takes an integrated approach to implementing safeguards for the wide-ranging variety of lead mining features.

One outcome of the Project has been the completion of this report, produced as a partnership between the National Park Authority, English Heritage and English Nature.

Its main aims are to:

- Present Inventories of high-priority 'Regionally and Nationally Important Lead Mining Sites' known to date and 'Lead Mining Landscapes' that should be conserved.
- Highlight conservation challenges and opportunities and explore ways of achieving sustainable management for the future. Only then will it be possible to retain all high-priority sites and landscapes.

To place these primary aims in context, this report also:

- Summarises the geological origins and the history of lead mining in the Peak.
- Reviews the many interests found at lead mining sites and landscapes today.
- Summarises the survey findings of the Lead Rakes Project to date and the current degree to which high-priority sites are protected.
- Illustrates the conservation successes and challenges encountered.

In reviewing the way forward, the report highlights the need to:

- Win hearts and minds by promoting understanding and acting as advocates for the importance of the lead mining resource and by disseminating information widely.
- Continue to implement the Lead Rakes Biodiversity Action Plan and meet archaeological and geological conservation targets.
- Undertake further data collection and research over the whole orefield.
- Generate resources to make all the above possible.

It also stresses the necessity of:

- Reviewing further statutory designation of important sites and encouraging enhanced positive management of designated sites in an integrated way.
- Identifying and implementing appropriate mechanisms for the protection of historic landscape character.
- Ensuring that future agri-environment schemes recognise and target all the important facets of the lead mining resource, and introduce enhanced measures to make this possible.
- Making the conservation and enhancement of lead mining sites an economic asset to landowners.
- Seeking changes to Environmental Impact Assessment and Waste Management regulations to facilitate their ability to protect all important lead mining sites and landscapes.
- Seeking changes to Minerals Planning Guidance legislation to prevent unwarranted removal of the historic and wildlife resource.
- Developing policies to ensure the Inventories of 'Lead Mining Sites' and 'Landscapes' of special importance are adequately incorporated into the review of the National Park Management Plan and preparation of the Local Development Framework.

Fully effective lead mine heritage conservation will only be possible if all these measures are addressed. If these challenges are met then the resource can be safeguarded for the future.

About three-quarters of lead mining sites in the Peak District have been lost in the last 100 years. Those that survive, as here at Hurdlow End near Peak Forest, are often of great archaeological and ecological interest (National Monuments Record/English Heritage). In contrast, modern removal is sometimes total, as here at Longstone Edge where the workings are so large that you have to look carefully to see the large machines on site (National Monuments Record/ English Heritage).

A Vision for the Future - Sustainable Conservation of the Lead Mining Heritage

Centuries of lead mining within the Peak District have left a legacy of some of the most significant and visible features within the landscape. Many features in this nationally important and highly unusual landscape are worthy of conservation but the resource is at high risk through removal for minerals and agricultural 'improvement'. Many lead mining remains are of international, national or regional importance for their landscape, cultural, archaeological, ecological and geological interest.

Having entered a new century, following one that has seen an unprecedented loss in our wildlife and historic fabric, how do we address the future of what remains of the Peak District's mining heritage?

Legally protected archaeological, botanical and geological sites must be retained and managed well. But our vision must surely extend beyond this minimum, identifying further sites and landscapes of national and regional significance and working towards safeguarding them.

The starting point for the future should be a presumption in favour of conservation of all sites of significant value.

Our vision for the future is that it will be exceptional rather than normal to see features of conservation interest lost, although this is not to say that every mining site will survive; there may be overriding reasons for development in some cases. We need to work together, establishing a shared commitment, to use existing protective measures and to develop new ones that safeguard irreplaceable examples of our lead mining heritage. These will be incorporated in a living landscape of the future, not one that fossilises a landscape from a previous age. The aim is to see the lead mining heritage fully accepted as an integral part of the environmental, historical and cultural value of the Peak District.

To achieve adequate safeguards for this highly significant resource the following actions have been, and continue to be, needed:

- Reach a fuller understanding of the resource and its many types of interest.
- Identify high-priority sites and landscapes that cover the full range of interests where conservation efforts should be focused.
- Take urgent action, where possible, to safeguard these places of high conservation interest before irreplaceable examples of the very varied resource are lost forever.
- Identify, and find solutions to, the conservation challenges that stand in the way of achieving this.
- Take further action, once implementation measures are in place, to secure the future of all high-priority sites and landscapes.

Many fine lead mining sites survive today and hopefully can be saved for future generations to appreciate. A good example is at Black Rakes west of Middleton by Wirksworth where there are extensive mining hillocks and numerous capped shafts hidden by impenetrable bracken in summer. This site currently is not protected by statutory designation (photographer John Barnatt, PDNPA).

In addition, we need to:

- Promote the value of the lead mining heritage so that owners, managers and the public will better appreciate the importance of lead mining remains and will be enthusiastic advocates for their protection.
- Continue to take action at sites of lesser priority to secure survival where possible or, where future development is permitted, to minimise its impact on the existing resource.
- Encourage more-sustainable development so that, as far as possible, this can contribute positively to the conservation value of the lead mining resource in the Peak District.

Management of high-priority sites needs to be well-informed, learning from archaeological, historical, ecological and geological studies. It should include care for physical features, where necessary consolidating them, as well as tailoring grazing regimes or other habitat management to maximise the ecological value. Where features are to be lost, they should be thoroughly recorded beforehand. A representative selection of the best sites should be considered, with landowners' help, for public access where high quality interpretation and other learning opportunities would be provided. Communities with a lead mining history have a part to play in celebrating their ties with their past and being active participants in its conservation for future generations.

1: Lead Mining in the Peak - An Introduction

'Travel with me through this howling wilderness... and I will show you all that is wonderful about it... to a valley on the side of a rising hill, where there were several grooves, so they call the mouth of the shaft or pit by which they go down into a lead mine,... we were agreeably surprised with seeing a hand, and then an arm, and quickly after a head, thrust up out of the groove we were looking at... the man was a most uncouth spectacle; he was clothed all in leather, had a cap of the same without a brim, some tools in a little basket which he drew up with him... This person was as lean as a skeleton, pale as a dead corpse, his hair and beard a deep black, his flesh lank, and, as we thought something of the colour of the lead itself… he looked like an inhabitant of the dark regions below, and who was just ascending into the world of light.'

Daniel Defoe [26]*

A typical lead mining site in the Peak District orefield, on Bonsall Moor, with extensive waste hillocks and hollows at the sites of surface workings and shafts to depth (photographer Rebecca Penny, PDNPA).

The 'howling wilderness' noted by Defoe in the 18th century was a very different Peak District to the one we see today. Many upland parts of the White Peak were open commons and the lead mines were extensive and in full production. Much of the countryside had been 'polluted' by centuries of lead mining. This industrial landscape was widely regarded for much of the 20th century as 'derelict land'.

Oxlow Rake, with Cop Rake to the left, are highly visible ancient mining sites crossing the landscape near Peak Forest (National Monuments Record/English Heritage).

The Importance of Lead Mining Sites

Today lead rakes** are considered to be of high conservation importance, contributing to the nationally important landscape of the Peak District, which is enhanced by its rich wildlife and many historic features.

This once-important industry has left its mark on the landscape. Centuries of delving for the minerals of the White Peak, the central/southern area of the Peak District, have resulted in distinctive networks of hillocks and hollows of great historical importance, often stretching in lines across this limestone plateau and its dales. These hillocks and ruined mining structures survive as a testament to the hard work of generations of local people.

Since last worked the lead mining hillocks have been colonised with mosaics of flourishing plant communities, many of which support rare and interesting plants painting the landscape with colour and scent.

Notes

* *Throughout the report further reading material is indicated by numbers in square brackets within the text, which correspond with those used in Further Reading.*

Readers should consult the Glossary for explanations of specialist terms used.

** *The term 'lead rake' was used specifically by the miners for the main mineral veins, worked from surface to great depth. This report concentrates on the surface remains and uses the term 'lead rake' here as a shorthand for all surface mining remains, including hollows and hillocks following a variety of types of mineralisation, not just those at large veins.*

The National Context - Lead mining was for centuries a key social and economic factor in the development of the Peak District and its landscape. Lead vied with iron for second place as Britain's major export behind wool. Britain was Europe's main producer of lead until resources elsewhere in the world were discovered in the 19th century; the Peak District orefield was one of the main sources. Thus, lead mining was vital for both the Peak District and the national economy.

Metal mining has only taken place in a small number of areas of Britain, often in upland contexts, and the surviving remains are thus a nationally-rare conservation resource. The lead mining sites in the Peak are particularly important because of their exceptionally extensive surface remains of archaeological and ecological value. This results from the unusual mineralisation here, commonly present at surface, where there is a multitude of outcropping veins. Thus, there are high numbers of surface hillocks, mostly derived from over 25,000 shafts that once dropped to underground workings. Other orefields have different but important characteristics, as for example in Cornwall which is well known for its 19th and 20th century engine houses, now viewed as icons within the county, or the Northern Pennines where there is a variety of impressive but very different 19th century mine complexes. In contrast, lead production in the Derbyshire orefield peaked at an earlier date and thus there is a wide variety of important features that are relatively uncommon elsewhere.

The lead rakes in the Peak support rare metallophyte-rich grasslands, with metal-tolerant species, that are of international importance. Sites of archaeological, biological and geological interest are designated as nationally important.

The assessments of the mining resource presented in this report have great relevance to other regions, pointing the way to integrated and detailed conservation actions that could be adopted elsewhere. The methodologies applied to aerial photographic, archaeological and ecological assessments have the potential for national application at other orefields.

The conservation value of mining remains across Britain has often been undervalued in the past and it is vital that action is taken now to prevent sometimes unique and often important sites and landscapes being lost. The surviving resource is at a critical point where if high-priority features are not assessed in detail at national and regional levels, then rare and particularly informative sites will be lost forever.

Origins and History - Lead ore occurs in veins and other deposits within the Carboniferous Limestone of the Peak District as a result of mineralising fluids migrating into the faults and fissures about 270 million years ago. Lead ores have been extensively mined in this important orefield for upwards of 2000 years and the lead produced was an important part of the national as well as the local economy. From the 20th century fluorspar, barytes and calcite, not lead, have been the main commodities to be mined from lead rakes, although lead ore has continued to be recovered as a by-product.

A horse-drawn ore crusher of 19th century type in use in 1912 at Windy Mine on Moss Rake near Bradwell. This site has now been reworked for gangue minerals and is now levelled (PDNPA collection).

The Remains Today - While much of the lead mining took place underground, for many people today what they see and value is at surface. The interest is multi-faceted:

- **Landscape Character** - The surface remains of the lead mining industry are a key element in the landscape character of the Peak District. This has been recognised as a key character element of the White Peak by the Countryside Agency [25], English Heritage [4] and English Nature [30].
- **Geology** - There are many important sites, at surface and underground, where the mineralisation and its formation can be studied. Some are protected by statutory designation as Sites of Special Scientific Interest (SSSIs) for their mineralogical value, or are listed as Regionally Important Geological and Geomorphological Sites (RIGS).

The mid-19th century mine buildings at Magpie Mine near Sheldon are amongst the most complete survivals in Britain. The site is dominated by the large Cornish pumping engine house and other buildings. However, there are also far less obvious but important features, such as the two gin circles beyond the buildings to left and right (National Monuments Record/English Heritage).

Many lead rake hillocks have exceptionally rich plant communities. For example, at Bonsall Moor the plants include a mass of harebell and bird's-foot-trefoil (left), fragrant orchid, autumn gentian, thyme, fairy flax and hawkweed (right). The example near Elton has the metallophyte spring sandwort (leadwort) and kidney vetch (centre) (photographer Rebecca Penny, PDNPA).

- **Archaeology** - The surface and underground remains of lead mining are very varied and include hillocks and such features as shafts, coes, gin circles, stopes, engine houses, crushing circles, ponds and buddles, which tell us much about the history of the mining and the processes used. Some sites are protected by statutory designation as Scheduled Monuments (SMs) and Listed Buildings.
- **Ecology** - Important mosaics of metalliferous, calcareous, neutral and acidic grasslands are highly characteristic of lead mining remains in the Peak District. Part of their ecological interest is the rare 'metallophyte' plant communities which tolerate metal-polluted ground. These metallophyte-rich grasslands are of international importance and some sites have been designated as candidate Special Areas of Conservation (cSACs) and Sites of Special Scientific Interest (SSSIs). They are also recognised as an important component of the Peak District Biodiversity Action Plan (BAP).
- **Cultural, Social and Industrial History** - The surface remains are a visible manifestation of this once-important industry and are far more than just archaeological or ecological features. They provide important tangible evidence of the social, economic and industrial past of the region and its communities.

Derbyshire lead miners, photographed at a reckoning day in 1867 at Rake Head Mine near Bradwell. Many of their names are known and some have descendants who still live in the region (PDNPA collection).

The lead rakes of the Peak District are a conservation resource of national importance, with a multitude of types of interest, including landscape character, geology, archaeology, ecology and cultural, social and industrial history.

A Resource at Risk

Many of the lead mining remains of the Peak District are currently at serious risk of damage or removal. There are two main causes:

- The re-working of the mineral resource.
- Removal or degradation by agricultural activity.

In the 20th century the Peak District became Britain's main source of fluorspar, contained within the waste minerals left behind by the lead miners. Other minerals such as calcite and barytes are also worked. While previous mining activity has left a diverse and valued resource, modern working methods and their often extensive nature have the capacity to obliterate the historic lead legacy and the unique ecological habitats which have developed here.

At many important sites hillocks have been removed for their minerals, as here at Cop Rake near Peak Forest (photographer Ray Manley, PDNPA).

In the latter part of the 20th century a large number of lead mining surface remains were removed or damaged by agricultural activity, often as part of general farming trends linked to increased productivity; this continues today. Sometimes removal by landowners and farmers has also been as a result of real or perceived potential problems of lead poisoning in their livestock.

If positive conservation action is not taken now then a wide range of important ecological and archaeological sites will be lost forever.

Changing Attitudes

The mines started life because of people's desire to acquire mineral wealth, following what would be termed today the development prerogative. They then went through a time of 'abandonment' and were commonly seen as industrial wasteland. In recent years lead mining sites have been recognised as an integral part of the environmental, historical and cultural assets of the Peak District. Thus, historic mining remains have changed in value as our perceptions of them have altered. This is not to say that every example should be conserved, there may be overriding reasons for developing some of them. However, as a minimum, for those sites and landscapes of high-priority conservation value the desirable starting point for the future is a presumption in favour of conservation rather than allowing them to be damaged or removed.

Lead rakes may lack the obvious romance of moorland and hay meadows. However, one goal of the Lead Rakes Project is to enhance people's understanding and appreciation of the fascinating complexities of lead rakes and the many elements of interest they contain, from insects and flowers to geological and historic features. The Project aims to inspire the conservation of these national treasures for the benefit of current and future generations.

There is a need to raise the conservation profile of lead rakes, now recognised as an integral and valued part of the environmental, historical and cultural assets of the Peak District.

The Lead Rakes Project

In 1996 officers of the Peak District National Park Authority formed the Lead Rakes Project to co-ordinate opportunities for lead rake conservation within the National Park, and identify and implement ways to achieve this. Subsequently, both English Heritage and English Nature have become partners in the Project.

The Project's aim is to ensure that current and future generations can continue to experience and enjoy the Peak District's important lead mining heritage.

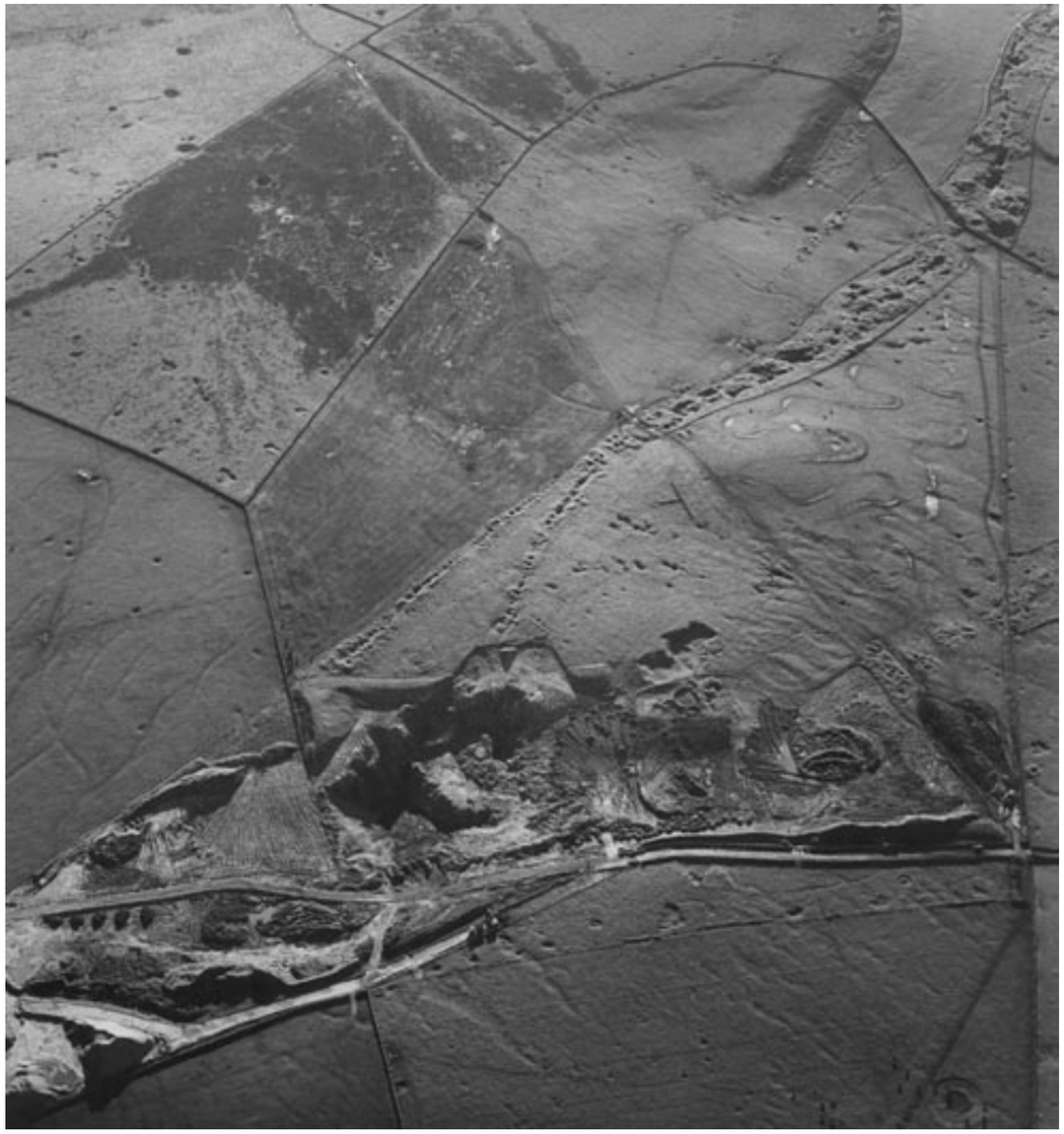
Our primary objective has been to survey in detail the remaining lead rakes in the Peak District orefield to enable conservation priorities to be identified.

Using this information, we have worked together to:

- Raise awareness amongst local communities and the general public of the important contribution lead mining remains make to the historic landscape and its biodiversity.
- Forge partnerships with national and local conservation organisations, and others, to promote conservation of lead rakes.
- Safeguard important sites by negotiating conservation agreements with farmers and landowners.
- Carry out appropriate assessments of sites in relation to planning and development proposals.
- Raise awareness of the current conservation opportunities and challenges.

Much day-to-day conservation of the lead mining resource has traditionally taken place through the normal casework of the Authority's officers, both in the context of Minerals Planning and as a key broker of agri-environment schemes. However, since the formation of the Lead Rakes Project a more focused and integrated approach to the problems of the conservation of lead rakes has been possible.

Many mining sites are potentially at risk and conservation initiatives are needed. Here, high above Castleton, Hazard Mine in the foreground was largely removed by opencasting for mineral a few years ago and the opencuts were being backfilled when this photograph was taken in 1998. The walled out parts of Daisy Rake and Oxlow Rake beyond survive and are now parts of a Scheduled Monument and SSSI. However, the unwalled parts of the veins here were recently levelled when paper pulp was spread (National Monuments Record/English Heritage).



In summary, the main achievements to date have been:

General

- Completion of an aerial photographic assessment of the extent of the orefield's surviving surface remains (Chapter 4) [5].

Archaeology

- Commissioning of reports to quantify the loss of significant lead mining features (Chapter 4) [54] and to give the historical background to specific mining areas [55, 57, 59-63].
- Extensive fieldwork and desk-based assessment to produce Inventories of 'Lead Mining Sites' and 'Landscapes' of special importance (Chapter 5) [7].

Ecology

- Detailed botanical survey of seven selected areas within the National Park, totalling about two-thirds of the overall resource (Chapter 4) [15-20].

Conservation Action and Promotion

- Forging partnerships with national and local organisations, land managers and individuals to promote conservation initiatives for lead rakes.
- Pro-active work to secure the short-term futures of priority sites, by brokering conservation agreements through agri-environment schemes and by the promotion of voluntary sympathetic management (Chapter 5).
- Promoting the value of the resource to local communities, land managers, minerals operators, organisations and government at local, regional and national levels.
- Completion of this report.

For more details of these outputs see Appendix A.

This Report

An early result of the increased focus on lead mining remains has been confirmation that statutory designation, the planning system and agri-environment schemes, all of which are key elements of increased protection and improved conservation, are not enough in their current form to ensure a sustainable future for the remaining resource.

The work of the Lead Rakes Project highlights the need to:

- Promote greater awareness and interest in lead rakes locally and nationally.
- Forge new, and consolidate existing, partnerships to further lead rake conservation.
- Work with the minerals industry and landowners to promote the retention of sites of conservation interest.
- Secure additional resources for conservation and research.
- Promote changes in legislation, agri-environment schemes and the planning system at national, regional and local levels.

This report, prepared in partnership with English Heritage and English Nature, and funded by the Aggregates Levy Sustainability Fund through Defra and English Heritage, addresses these issues (Chapters 7 and 8).

As a preliminary to this, the report introduces the conservation interests and what survives today (Chapters 2 and 4), presents Inventories of Lead Mining Sites and Landscapes of known high conservation priority (Chapter 5 and The Inventories), and gives examples of recent conservation initiatives (Chapter 6).

2: The Origins and History of Lead Rakes

Natural processes initially formed the lead veins about 270 million years ago. Over the last 2000 years they have been mined by people who depended on them as a source of income and sometimes wealth.

Geology and Minerals

The Bedrock - The formation of the rocks of the central Peak District is described succinctly by Ford and Rieuwerts [35]:

"The limestones of the White Peak were formed as sediment on the floor of a tropical sea in the Carboniferous period of geological time, some 310-330 million years ago, when Britain lay close to the equator. The shallow sea was warm and clear and inhabited by a multitude of shellfish, corals, sea lilies (crinoids) and various microscopic forms of life. When these died their remains accumulated as layer upon layer of shell debris which hardened with time to form limestone."

Lead Ore - The common lead ore of the Peak District is galena (lead sulphide). It occurs most commonly in veins in the Carboniferous Limestone, present as a result of mineralising fluids migrating into the faults and fissures several million years after the limestone was formed [1, 21, 24, 34-36, 46, 71]. The lead miners' term 'rake' applies to a major vertical or near-vertical mineralised vein. 'Scrins' are smaller veins. Other mineral deposits include 'flats' which are near horizontal deposits in the bedding planes between layers of limestone. 'Pipes' are irregular cavities that have been mineralised, with this often extending beyond the cavity to replace the surrounding limestone.

Small veins containing gangue minerals but not much lead ore cut through the limestone in this part of Coalpit Rake at Matlock Bath. A richer vein to the left was mined away several hundred years ago (© Paul Deakin).

In the past lead has had a wide range of important uses, including roofing, guttering, plumbing, pewter, musket balls and lead shot, and the manufacture of pigments and paints. Today, while most of these uses have gone, it is still of some importance for the manufacture of batteries, alloys such as leaded-bronze, lead-solder, leaded petrol and as an insulator against radiation.

Other Minerals - Galena forms only a small percentage of the minerals present in the Peak District orebodies. Although lead was the most economically important in the past, several once discarded minerals have been exploited over the last 100 years. The most common of these useful minerals are:

- **Fluorspar** (Calcium fluoride) - Common uses include making hydrofluoric acid and other chemicals, anaesthetics, the fluorination of water supplies and toothpaste, refrigerant gasses, linings for non-stick pans and processing iron and steel slags. It was formerly very important as a flux in steel making.
- **Barytes** (Barium sulphate) - The main use is in heavy drilling mud for oil wells. Other uses include paint manufacture, glossy paper, barium meals and as a source of barium for the chemical industry.
- **Calcite** (Calcium carbonate) - Used for terrazzo flooring, pebbledash wall coverings and grave ornamentation.

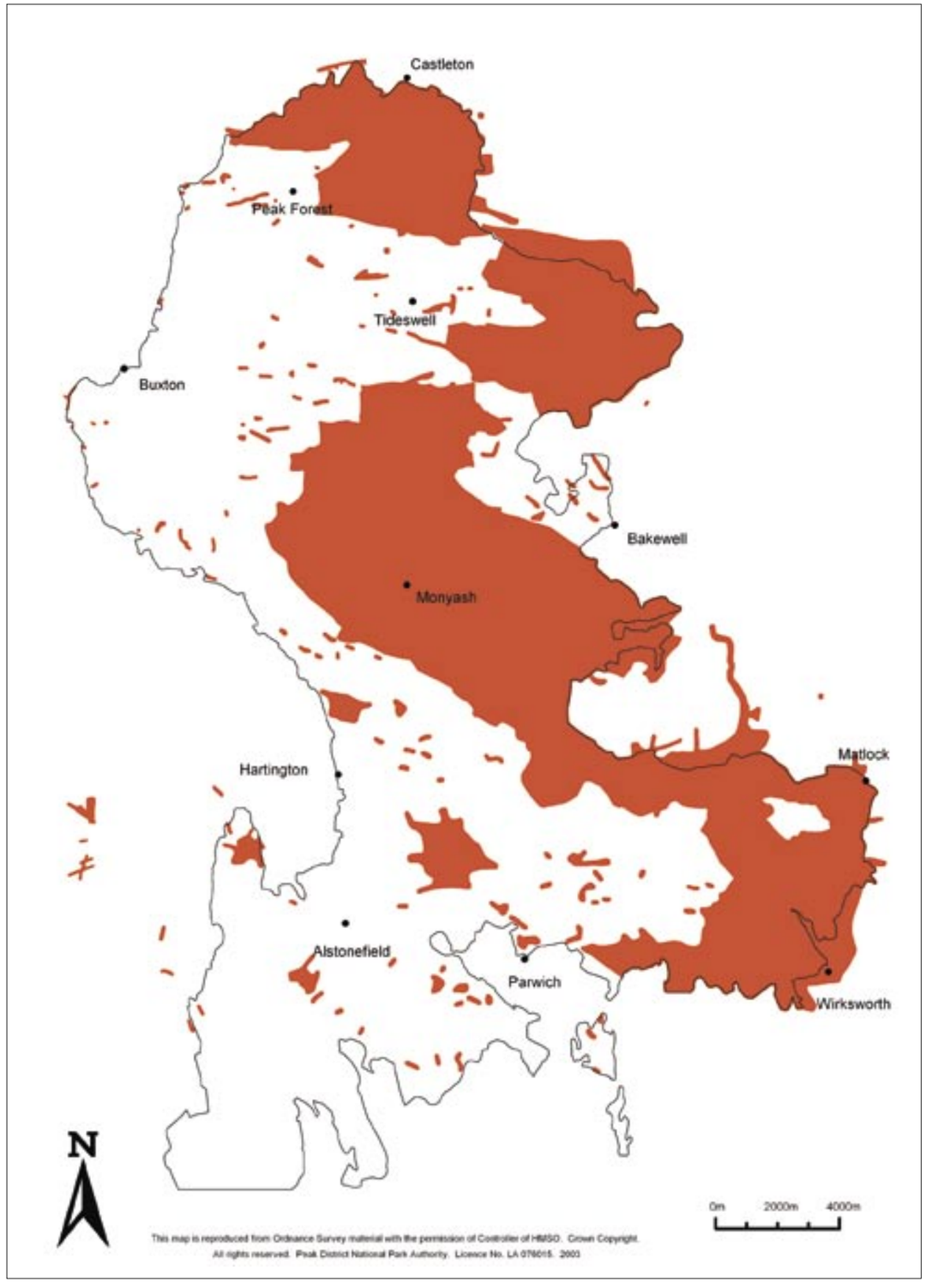
Mining History

Lead mining has been an extremely important industry in the Peak District since the Roman period. Mining was extensive in the medieval period and later reached a peak in the 17th and 18th centuries, before the industry all but collapsed in the late 19th century. In post-medieval times production was often on an industrial scale, the ore removed from deep underground with the aid of engines, and using pumps and drainage levels to de-water the mines. Mining was also commonly undertaken by miner/farmers across the orefield, who continued using simple methods to produce small quantities of ore to supplement other income [3, 7, 8, 11, 42, 44, 56, 74-76]. The lead produced from the mines was a vital part of the economy of the Peak District and was important nationally, lead being one of Britain's major exports.

Early Mining - Lead has been used in very small quantities for ornaments and ritual objects since Bronze Age times. Copper, one of the main constituents of bronze, was certainly mined at Ecton near Warslow, Staffordshire in the Bronze Age, sometime between 2000 and 1500 BC, as indicated by the recent discovery of a mining tool there which has been radio-carbon dated [12].

The main direct evidence for Roman mining in the Peak is the discovery of several inscribed lead ingots, known as pigs, found locally and as far away as Normandy. One of the main interests in lead ore for the Romans (and in later times) was that it is the main source of silver, often a small but significant component of the ore. In the Peak orefield they may have been disappointed, for the ores produced in post-medieval times were usually particularly poor in silver.

Documentary evidence for mining in Anglo-Saxon and medieval times is sparse, but enough is known to indicate lead mining was widespread and well established in the Peak. From at least the early 8th century through to the late 9th century mines at Wirksworth were controlled by the important Mercian abbey at Repton in the Trent Valley. After the collapse of the Danelaw in the early 10th century, many of the mines in the Peak were controlled by the English kings who owned large estates here. Domesday



The location of the orefield (red), centred on the limestone plateau (black line) at the heart of the Peak District.

Book of 1086 recorded significant lead production based at royal manors at Ashford, Bakewell, Matlock, Wirksworth and Crich, with a mention of further pre-Conquest production at Hope. Later medieval documentation gives a similar picture. Lead was in great demand in the 11th to 13th centuries to provide roofs and plumbing for the many cathedrals and abbeys built throughout England at this time; a significant proportion came from the Peak District.

From the medieval period onwards, and probably at earlier dates, much small-scale mining was carried out by miner/farmers, while larger ventures were worked by full-time miners. In medieval times all mines are likely to have been either surface opencasts into vein outcrops and/or underground workings that were rarely more than 30-50m deep, dug using simple methods and tools. In exceptional circumstances, as at the easily worked pipe deposits on Masson Hill at Matlock Bath, extensive underground mines existed and these are some of the largest identified metal mines of this date in Britain [10].

Distinctive small pickwork on all the visible rock surfaces indicates ancient working at the Nestus Pipes on Masson Hill at Matlock Bath. Here there are several hundred metres of pipeworkings, which were largely worked out by the 1480s, and today this is one of largest known medieval mines in Britain (© Paul Deakin).

Post-Medieval Mining - By the end of the medieval period most workable rich deposits were becoming exhausted above the water table. From the 17th century onwards, deeper and much larger mines were developed. This required investment capital for drainage and haulage, thus such mines were often controlled by the landed gentry and an emerging group of wealthy industrialists. Alongside the larger ventures, miner/farmers continued to supplement their income from agriculture by mining smaller veins at slack times in the farming year. Such mining continued to use the simplest of extraction techniques and underground workings were usually relatively shallow, entered by small shafts. Similarly, miners often had smallholdings to supplement income from mining.

By the 17th century, larger mines had become so deep that flooding of workings was a severe problem and drainage levels known as soughs began to be driven to lower local water tables [48]. In a few instances waterwheels, both at surface and underground, were also employed for pumping. Another approach adopted at large mines in the 18th and 19th centuries was the installation of steam-powered pumping engines. Similar but less powerful engines were also used for winding ore up engine shafts at the largest and deepest mines. Other, and sometimes somewhat shallower, mines used less expensive horse-powered gin engines, which had been employed from the 17th century. Engines were essential at all mines where winding shafts were over 50-75m deep.

Some of the larger 18th and 19th century mines in the orefield needed high capital investment and had large buildings, as here at New Engine Mine above Eyam, where survivals include the 19th century horizontal engine house, now converted to a field barn, and remains of the adjacent boiler house (photographer Rebecca Penny, PDNPA).

One technological advance, which was eventually adopted by mines of all sizes, was the use of gunpowder for blasting. In the Peak District this was first used in the 1660s [9, 58], and had become common by the mid 18th century at latest. The use of gunpowder allowed ore to be extracted more efficiently, and shafts and levels to be driven through hard limestone far more easily.

These developments led to a great increase in lead output in the 17th and 18th centuries in the Peak District orefield. This was also linked to advances in smelting technology and changes in attitudes towards industrialisation that went hand in hand with a demand for the mined product. However, in the 19th century remaining sources of ore to be obtained at a profit became scarce and competition from other orefields such as in the Northern Pennines led to a decline in the importance of the Peak District mines. All mines in Britain found it increasingly difficult to compete in the second half of the 19th century as rich reserves were exploited elsewhere in the world, flooding the market and lowering the price that local lead could be sold for.

Lead mining in the Peak went into terminal decline in the second half of the 19th century. With the exception of the rich Millclose Mine at Darley Bridge, which worked until 1939, little profitable work was done from the beginning of the 20th century onwards. From the early 20th century to the present, lead mining sites have been extensively reworked for minerals thrown away by the lead miners, known by them as gangue. Those of economic worth are primarily fluorspar, barytes and calcite, while lead ore is still a valuable by-product.

Miners and Society - The formal organisation of the lead mining industry included a complex series of mining laws and customs, which directed how mining was to be carried out [7, 35, 56]. As with any industry, many local traditional terms evolved associated with Peak District mining. These include such strange terms, picked here at random, as bing (high grade ore), bouse (undressed ore), cackle mackle (inferior ore), foudenheads (small picks), knocking (breaking ore) and woughs (the walls of a vein).

The laws and customs were first codified and set down on paper in the Quo Warrento of 1288 [47]. By this date they were obviously ancient and may well have evolved in late Anglo-Saxon times if not before. The region was divided into areas of mining activity known as Liberties. On royal estates, which were extensive, the Crown has now held the lead mining rights and royalties for over a thousand years. Over recent centuries these royalties due to the Crown have often been leased out. Outside these areas there were a number of private Liberties where somewhat different mining customs often applied.

Lead mining in Derbyshire has been overseen by the miners' Barmote Courts since medieval times. Traditionally lead miners have been allowed to mine anywhere without hindrance from landowners except under churchyards, gardens, orchards and highways. Payments were made of 'lot' and 'cope'. In addition, tithe was often paid to the church on the basis of the traditional belief that lead was alive in the sense that it grew again in old workings. The majority of income was retained by the individual miners or by the companies for which they worked, although any profit was often taken up by the costs of purchase of equipment and materials necessary to continue mining. The mineral rights for Staffordshire were all in private hands in post-medieval times and traditional miners' law had ceased to operate.

In smaller mines, the miners usually worked for themselves, often part-time, frequently in small groups. In many cases there were also non-working partners who contributed the investment necessary for materials and tools to make the mining possible. At larger mines in post-medieval times, companies of mining 'adventurers' were formed to provide the high levels of capital to develop deep mining. Here, miners were employees in all but name, although they frequently moved from mine to mine depending upon where the most money was likely to be made. Commonly pre-arranged bargains were struck, either as a price for the amount of dressed ore produced or for a specific non-ore producing task, each lasting a period of several weeks. Prior to the 19th century investors in mine companies were

Mr Eagle, the King's Barmaster, handing over a disused lead mine on Moss Rake at Bradwell to a new group of miners in 1906. They stand next to a small shaft entrance with hand windlass (PDNPA collection).

usually people in the lead trade or local landowners, who were well placed to calculate the risks involved. However, in the 19th century several speculative ventures were set up that relied on advertising for shareholders, many of whom lost their money as these mines never had any realistic chance of success. It was generally the lead merchants who bought, transported and smelted the ore who made the most money, for they did not take the risk that a mine would prove poor in ore.

At all mining ventures there was a social hierarchy. At the top were owners or lessees of the mineral rights, followed by mine owners and lead merchants together with the Barmote Court officials. Miners were held in relatively high regard and the more experienced and successful often served as jurymen at the Barmote Courts. Bottom of the list were the general labourers underground and the surface workforce.

Normally it was men who worked down the mines doing the heavy work, with boys carrying out lighter tasks. At many mines woman and children did much of the surface ore-dressing. However, men sometimes carried out the heavier work here, winding the ore from underground, helping sieve the ore and emptying buddles.

Women did much of the surface work at lead mines. At Gildereye Mine above Matlock Bath in about 1770, a woman sieves ore in a vat of water, while the men gaze into the distance (Lynne Willies collection).

Mining has always been a hazardous industry and it was inevitable that fatalities occurred. For example, men falling, drowning and being buried by roof falls were recorded in the Peak Forest Liberty where, perhaps surprisingly, only seven deaths were recorded between 1752 and 1856 [38].

Lead Production - In 1700 Britain was Europe's largest lead producer and the Peak District orefield made a significant contribution [74]. At the end of the 18th century the price of British lead did not recover from a fall and the steep decline of the industry began as rich ore sources were developed in other parts of the world.

The fortunes of any lead miner or mine owner were very dependent upon the world price of lead, which fluctuated significantly over the decades. In some years the mines wouldn't make a penny. If the miners were lucky and rich ore deposits were found, large sums of money could be made quickly. However, this was very much the exception. It was the chance of making a fortune that prompted continued work and investment. However, if all investment and labour is accounted for over the last 500 years, it is debatable whether the Peak District orefield made an overall profit.

Many small-scale mines existed, often worked only spasmodically as a supplementary income to farming. It appears that small-scale mining was commonly little more than an informal form of poor relief, or a way of supplementing income to provide beer money or small sums to purchase other inessentials. In other cases full-time miners supplemented their income with smallholdings. In the parishes of Elton, Winster and Bonsall, which had many mines, this farming connection is still clear for many of the small fields surrounding the mines contain ruined smallholding field barns built for the shelter of stock and the storage of hay.

While the last large lead mine closed in 1939, the Barmote Courts still meet annually to administer any lead production as a by-product of the mining of gangue minerals. This extraction continues to be undertaken by local people working for themselves as 'tributers' or more commonly directly for larger companies. Some people working in the industry carry on the tradition of being part-time farmers or having other second incomes.

3: The Special Character of Lead Rakes Today

Landscape Character

The surface remains left by lead miners are a key element in the character of the Peak District's historic landscape inherited from past generations [4]. There are still some parts of the region's limestone plateau where swathes of prominent hillocks add significantly to that character at a landscape scale. Here one can still walk and view the evidence of past mining running as far as the eye can see. In some places there are distinctive discrete lines of hillocks following veins running across the land, in others field after field has hollows and hillocks in profusion where there are swarms of veins and pipe workings. The hillocks amongst the walled fields give this limestone landscape a unique character that tells of the many generations of farmers and miners who gained a livelihood from these two major traditional sources of income in this upland region. The Peak District is far more than a place of pretty scenery for visitors to enjoy: it is also a place of great time-depth, imbued with physical remains that tell the story of how our forebears shaped and used this land. It is much the richer, with the potential for deeper understanding and appreciation, as the result of these features surviving in the landscape.

The mining remains at the Slitherstones and Linacre Mines above Peak Forest, with others in the background around Eldon Hill where a motorcycle track has damaged the hillocks, are part of the largest surviving area of the limestone plateau where hillocks make a significant contribution to historic landscape character (National Monuments Record/ English Heritage).

The physical remains of the lead mining industry, in the form of the surface hillocks and the features associated with them such as engine houses, gin circles and coes, provide a valued link with the past for many of today's inhabitants of the Peak District. Some of the remains were created by the forebears of local families who were miners. These are a tangible asset that reminds them, and us, of the hardships and dangers the miners endured to scrape a living from this often-inhospitable landscape into which they delved.

Geology

In the Peak District orefield the special geological character revolves around the way in which mineralisation has occurred in the faults and cavities of the limestone bedrock. Of particular interest is the process and science of mineralisation, the structures associated with mineralisation such as pipes and veins, and the minerals themselves.

At surface, vein exposures are important sites for the study of faults in the rock and their mineralisation; the hillocks contain mineral specimens. Occasionally mineralised 'pipe' entrances also occur. Underground, there are many fine examples of the same types of interest and these are of great scientific value. In some cases these are associated with caves developed along the same lines of weakness as the mineralisation.

Sites of geological interest at surface include worked veins where the mismatched beds of limestone rock sides are the result of fault movement. The impressive opencut on the side of Pindale near Castleton illustrates the general character of such features (photographer John Barnatt, PDNPA). ▶

The minerals of interest commonly include fluorspar, calcite, barytes and galena, and sometimes iron, zinc and copper ores. These often occur in complex combinations resulting from sequences of mineralisation and are usually found as banded layers of different minerals. Fine examples of crystallisation occur lining voids in the mineralisation. There are also some rare lead minerals such as matlockite and cromfordite. As their names suggest these complex chlorites of lead were first identified in the Peak District, from Bage Mine. Perhaps best known of these rare minerals is the banded fluorite known as Blue John found around Castleton.

Archaeology

The most common and readily-visible surface remains of lead mining comprise hillocks of waste material brought to the surface with the ore. These hillocks are associated with features such as mine shafts, opencuts, coes, gin circles, engine houses, crushing circles, ponds and buddles, which tell us much about the history of the mining and the processes used.

Inevitably, any description of mining features includes many technical terms: explanations are given in the Glossary. Representative examples of the 101 types of surviving archaeological features that require conservation have been identified (Appendices B-D). What follows is a brief overview of the most important.

The production of lead was a complex process that involved mining the ore-bearing veins, pipes and flats, getting the mineralised material to the surface and then dressing it. This included washing, breaking it down and sorting in order to retrieve the lead ore from the gangue minerals with which it was mixed, before the concentrate was sent to the smelters. All stages of this work involved episodically improving methods [6, 7, 35, 56, 72, 73]. For example, early miners used only picks and firesetting to break away the minerals from the surrounding limestone, while later they used gunpowder. Similarly, various types of hand-pumps to de-water the workings were first used, while later miners drove drainage soughs and used pumps driven by waterwheels. Later still they erected large steam-driven pumping engines that allowed still deeper mines to be developed.

Old Ash Mine near Wensley has some of the most extensive evidence in Britain for the ancient practice of firesetting. The low workings have soot-covered roofs, while the stacked deads are of distinctive shape and small size (© Paul Deakin).

Surface Features - The most common surface evidence for lead mining comprises opencuts, shaft tops and waste hillocks, often situated along large rake veins that run for long distances across the landscape. Smaller veins, known locally as scrins, also have similar but less massive remains. Elsewhere shafts drop to pipe and flat workings, and to veins that were found deep under overlying shales, that do not outcrop at surface.

The waste hillocks are important archaeological features in their own right. They hold valuable information on re-working resulting from advances in smelting technology that allowed poorer grades of ore to be processed long after they had first been discarded. Some hillocks are also likely to bury evidence of the earlier phases of mining; opencuts from surface were worked first, with later spoil from depth burying the signs of previous activity left to either side of the vein.

The mining has left a legacy of fascinating archaeological features amongst the hillocks and opencuts, which illustrate how the various mining tasks and dressing processes were carried out and how these changed over the centuries.

Above ground, the many shafts for access, winding and pumping, as well as rare engine houses and other large mine buildings, are the most easily recognised features to be found. However, some of the commonest surviving remains, such as coes, gin circles and water management features, are not as obvious to the uninitiated eye.

Early ways of removing the ore from the mine included simply carrying it underground in a wooden basket or dragging it on a sled. Some later mines used tramways with wagons. Most ore was brought up drawing-shafts in a 'kibble'. Shallow examples of these shafts had hand-wound 'stowes' where one or more men turned the wooden windlass; deeper shafts had winding engines. At many larger mines there are both small-diameter climbing-shafts for human access and deep and relatively large-diameter engine-shafts used for winding or pumping and sometimes both. At some mines, particularly where sited on steep slopes, there were access and haulage levels.

From the early 18th century onwards, large beam-arm and horizontal steam engines were installed at larger mines where finances allowed. These pumped water out of the mine and wound ore to surface. A number of ruined engine houses still exist, together with boiler houses, chimneys and reservoirs.

Magpie Mine near Sheldon has an exceptional surviving suite of buildings, including a 19th century Cornish engine house and chimney (centre/right) and a mid-20th century headgear (left) (photographer Jon Humble, English Heritage).

At large mines, which were relatively uncommon, there were further buildings, such as reckoning houses, offices, smithies, overseers' and agents' dwellings and powder houses.

'Coes' were small sheds built around or adjacent to a shaft to provide shelter and a 'lock up' for the miners' tools and ore. Often they were the only building at smaller mines. All that remains today of most coes are their stone footings and ruined walls.

Beehive cap (photographer John Barnatt, PDNPA).

Coe (photographer John Barnatt, PDNPA).

Sough tail (photographer John Barnatt, PDNPA).

Stone-lined buddle (photographer Rebecca Penny, PDNPA).

Ore-crushing stone and crushing circle (photographer John Barnatt, PDNPA).

A 'gin' was commonly used for bringing out ore and water at deeper shafts. This was a form of winding engine of 17th to 19th century date. It normally comprised a large wooden drum for the shaft winding rope, set horizontally, adjacent to the shaft and headgear. Gin circles, where a horse walked while turning the gin, can still be found at some mines today. The gins themselves and the wooden headgear have long since gone, removed to other shafts, salvaged for other uses, or rotted away.

Lead mining sites have many varied archaeological features. Many shafts were traditionally sealed by drystone beehive caps, as here near Bonsall, but these are now rare. Small mine buildings known as coes are common but usually ruined, as here at Rantor Mine near Middleton by Wirksworth. Away from the mines there are drainage sough tails, as at the low bolt of Oden Sough just outside Castleton. At some mines stone-lined buddles can still be found, as here at Bonsall Lees. Occasionally ore-crushing stones survive, as here at Boggart Hole Vein, where the overgrown crushing circle can also be just about made out.

Ore was often brought up shafts from underground using a gin engine, as here at Snake Mine at Hopton Wood photographed in the early 20th century (top) (PDNPA collection). None survive, but sometimes the circular tracks where the drawing-horse walked can be found, as here at Magpie Mine near Sheldon, with the engine shaft and adjacent climbing shaft in the foreground (above) (photographer John Barnatt, PDNPA).

Another distinctive and once-common feature in the Peak District was the mine drainage 'sough' and these were driven from the 17th century onwards. Entrances were normally away from the mines themselves at the bases of nearby valleys. In some cases the sough tails were not designed for entry after completion and all that can be seen is a low bolt issuing water. When being driven, getting good air to the forefield was often problematic and ventilation shafts from surface were sunk along the sough.

Dressing of ore was usually carried out at the mine before the resulting concentrate was removed to smelters. Some dressing was done underground as this meant less haulage to surface, and this was particularly the case where water was relatively abundant at depth. At surface, water was normally scarce and thus a valuable commodity as it was essential for washing and dressing the ore. Special provision had to be made and storage ponds, leats and dressing pits are found at many mines. Surface dressing floors are common, usually sited by the shaft top, and there are associated waste hillocks of broken and crushed material nearby. Much initial ore-dressing was traditionally done by hand-breakage with hammers, and simple processes such as sieving and buddling were also normally employed once large pieces of ore had been hand picked. 'Buddle dams' are relatively common and comprise flat-topped hillocks where water with fines, known as 'smitham', was slowly run across the top; the heavy ore was deposited first and recovered for reprocessing. In the 19th century, at some mines in the northern part of the orefield, the mineral brought to surface was broken down with the aid of a horse-drawn crushing stone which was pulled round a circular crushing bed.

Lead smelting was normally carried out away from the mines, often in the Hope and Derwent valleys, on the flanking gritstone moorlands, or in the foothills east of the region. These important sites are not considered in this report.

Underground Features - When venturing underground today, historic extraction techniques become evident; pick marks and gunpowder shotholes are the most common features, found in vein stopes, pipeworkings, levels and shafts. In a few mines there is evidence for early firesetting. Often waste material, known as deads, was stacked and retained by drystone walling at passage sides or in worked-out cavities above, where it was placed on stone or wooden stemples. A noteworthy feature found underground is the coffin level, often with fine sweeping pickwork, illustrating the high levels of skill possessed by the miners. Rare features included engine chambers, boat levels, workshops, pumps, sieving or buddling troughs, hotching tanks, leats and miners' graffiti. In a few mines there are tools, candle stumps, remains of clogs and clay pipes still to be found where the miners left them. All these create a vivid picture of what it was like to work underground.

Underground workings are now of variable stability and exploration should only be attempted with specialist equipment and in the company of those with the experience to assess the safety of the workings.

Mining Remains and People Today - For many of today's Peak District residents, past lead mining is a valued part of their cultural identity. Many still remember family members who worked as miners, and villages such as Winster and Bradwell have long historic links with the industry. While some people achieved wealth from lead mining, others invested fortunes and lost them. Others lost much more, killed in accidents at the mines. Many of the distinctive stone houses and outbuildings still in use in local villages were built with the profits from mining. The rich lexicon of mining terms, many specific to the Peak District and commonly still in use as place-names, also add to this cultural identity.

The mining remains bear witness to local people's underground endeavour over centuries, often in dangerous conditions, endured in order to win valuable mineral.

Biodiversity

Lead rakes are important for the plant communities that have established themselves since the mines were abandoned [2, 13, 22, 37, 40, 41, 43, 45, 70]. They support complex mosaics of metalliferous, calcareous, neutral and acidic grasslands. Some contain rare 'heavy metal tolerant' plants known as metallophytes that flourish because of their tolerance of lead-polluted ground. There are also other important and locally rare plant species and highly specialised lichen communities found on lead rakes.

The hillocks and hollows also provide a refuge for many once-common Peak District wild flowers and some rare or declining mammals, birds and invertebrates. In recent years modern farming practices have led to the loss of many unimproved grasslands and traditional hay meadows [14]. The lead hillocks with their rich plant communities have suffered less agricultural intensification and are therefore an important resource for biodiversity. In spring and summer there is a rich mixture of colours and textures, the wild flowers transforming the hillocks into places of great beauty.

Sometimes the hillocks are made up of rock, principally limestone but occasionally shale. More often it is a varied mix of fluorspar, calcite, barytes and clay, all materials that were of no use to the lead miners and thus cast aside as waste. Lead mining sites also have a wide topographic range and individual hillocks have different aspects. As a result of all this variation, many different species with contrasting environmental requirements grow in close proximity to each other, making lead rakes ecologically very exciting.

Calaminarian Grasslands - Habitats characteristic of lead rakes in the Peak District include specialised metallophyte (metal tolerant) vegetation, due to the toxic nature of some of the hillocks, where there are residual quantities of galena and other metals. These calaminarian grasslands are of very restricted occurrence throughout Europe and are considered to be of international conservation importance, listed in The European Union Habitats and Species Directive 1992 and the Habitats Regulations 1994, as well as many sites being notified as SSSIs under national legislation. In many ways it is this grassland community which makes lead rakes unique in nature-conservation terms. Only small quantities of this grassland were identified during survey, which highlights its rarity and importance (Chapter 4 and Appendix F). Indeed, it is estimated that only about 20 hectares of this internationally important type of habitat still remain in the Peak District, one of its UK strongholds.

Two types of calaminarian grassland have been identified by the project, the classic open spoil community (OV37 - following the National Vegetation Classification [23, 69]), and a dense fescue-dominated grassland with alpine penny-cress [15].

Other Lead Rake Grassland Communities - Assessment of lowland grassland interest in a national context by Natural Areas classifies the White Peak Natural Area as 'outstanding' [41]. A range of different communities can be found at lead rakes in the Peak District, in addition to the classic calaminarian grassland (Chapter 4 and Appendix F). Again following the National Vegetation Classification (in brackets), these include:

- Calcareous grassland communities. The lead rakes have been found to be an important refuge for these and particularly the community comprising sheep's fescue/meadow oat-grass (CG2d), which is normally a classic daleside grassland. Others include sheep's fescue/mouse ear hawkweed/thyme grassland (CG7) and sheep's fescue/common bent/thyme grassland (CG10).
- Neutral grassland communities are also found on lead rakes, the most frequent being the crested dogs tail/common knapweed grassland (MG5).
- The acid grasslands on lead rakes are often of sheep's fescue/common bent grass/heath bedstraw type (U4). In the best examples of this community on lead rakes, mountain pansy is frequent. Other acid communities include mat grass/heath bedstraw grassland (U5) and wavy hair grass grassland (U2).
- In very rare cases, lead rakes also support patches of heath (H9/H12).

Metallophytes - There are four key metallophyte species on lead rakes in the Peak. Here large populations of the nationally scarce spring sandwort (known locally as leadwort) are found, and alpine penny-cress, pyrenean scurvy grass and mountain pansy also occur (Chapter 4 and Appendix F).

- **Spring sandwort** is a low-growing cushion-forming species with an abundance of small white flowers in the summer. Locally known as leadwort, the species has the capacity to uptake and store quite high concentrations of heavy metals without any severe impairment of growth (it has been shown to absorb as much as 7500 ppm zinc and 500 ppm of lead). In the Peak District, spring sandwort is almost entirely restricted to spoil heaps of lead workings. Nationally the plant has a restricted distribution and is 'Nationally Scarce', with the Peak District supporting a significant part of the national population. As a result of the demand for fluorspar there has been a significant decline in the national population of this species. It is a poor competitor and is normally only present where the stresses of its environment prevent the establishment of, or retard the growth of, more robust herbs and grasses. Many of the sites where spring sandwort occurs are also characteristically rich in calcareous species such as kidney vetch, fairy flax, limestone bedstraw and thyme. This abundance of calcicoles is indicative that the substrate is lime rich, which over time may sometimes ameliorate the effects of the toxic soil.
- **Alpine penny-cress** is a perennial, rosette-forming plant with clusters of white to pink flowers. Again it is a 'Nationally Scarce' plant, being found in less than 100 one-kilometre squares in the country. Though this plant also occurs in the mountains of Europe, the British population represents the north-western limit of its geographical range. In Britain it is generally confined to spoil heaps of mine workings, being tolerant of heavy metals such as lead and zinc which it absorbs and stores in its leaves. Within the Peak District it is mainly found in the south-eastern part of the orefield, in a circle of about ten kilometres in diameter centred on Matlock. It is largely absent from other parts of the orefield, with only one known site near Eyam where it is rare. Reproduction is largely by seed, but these are heavy and tend to remain close to the parent plant. They also are not able to survive in the soil for long periods. Thus, once lost from a site it is unlikely to return.

Rare metallophyte plants are an important characteristic of lead rake hillocks. Two of these are spring sandwort (leadwort) (left) and alpine penny-cress (right) (photographer Rhodri Thomas, PDNPA).

- **Mountain pansy** is an attractive brightly coloured

Maps showing the national distributions of spring sandwort (leadwort) (left) and alpine penny-cress (right) with the location of the Peak District National Park indicated in dark grey. (© Crown copyright material is reproduced with permission of the Controller of HMSO and Queen's Printer for Scotland (Licence No. 20040004). Source: New Atlas of the British Flora (Oxford University Press).)

miniature pansy, confined to the uplands of Britain. The Peak District has a significant part of the national population of this species and is its most southerly location. Nationally the flowers of the mountain pansy show a range of colour from blue to yellow. In the Peak District the yellow form predominates with the blue being uncommon, while in the northern Pennines and Scotland the blue form is dominant.

- **Pyrenean scurvy grass** is an uncommon metallophyte in the Peak District, confined to the grassland on spoil heaps that maintain a high heavy metal content; it is particularly noteworthy in the Castleton area. Nationally, it is a variety of scurvy grass only found in the uplands at normally damp and open locations, including cliffs, wet gullies, bryophyte-dominated flushes and spoil heaps at old lead and zinc mines.

Other Important Plant Species - Other important and locally-rare species found on lead rakes include dark mullein, maiden pink, frog orchid, fragrant orchid, kidney vetch, moonwort, autumn gentian, meadow oat-grass, grass of parnassus, carline thistle, stemless thistle, mossy saxifrage, heather, bilberry and restharrow. Nationally, the range and size of populations of such species has declined in recent decades. Lead rakes have provided refuges where these sometimes rare and fascinating plants can survive modern agricultural practices.

Other Wildlife Interest - Lead rakes are also significant for a range of other wildlife associated with flower rich grasslands. The profusion of different plant species provides a wealth of nectar for insects and seed for birds and small mammals. The sparsely vegetated areas of spoil are important for lichens, including specialised metal-tolerant species and provide 'hot spots' for invertebrates, such as the local robber fly Leptarthrus brevirostris and the 'Nationally Scarce' ground beetle Carabus monilis. These aspects of the resource need further assessment and may be of greater importance than currently recognised. In addition, features such as old mine shafts can provide roosts for bats and the stony waste heaps offer hibernation sites for amphibians. A range of nationally-scarce lichens and invertebrates, as well as plants, is associated with lead rakes (Appendix G).

Complexity and the Problems of Restoration - Each lead rake site is unique, a complex amalgam of mineralogical, environmental, historical and management factors. The ecological interest of lead rakes has often developed over the many decades, or even centuries, since individual mine workings were abandoned and the hillocks were left to be recolonised by the plants that surrounded them.

In recent decades attempts have been made to restore lead rake habitats after minerals have been removed. However, survey during the Lead Rakes Project has shown that the ecological interest here is dependent on complex factors

The main active minerals processing plant in the Peak District today is at Cavendish Mill above Stoney Middleton (photographer Ray Manley, PDNPA).

such as its chemistry, substrate, topography, aspect, age and proximity to seed source. Thus, it is considered that once a lead rake is lost its unique complexity, inherent interest and importance as a resource for recolonisation of adjacent areas, will be lost forever. The best that can be hoped for is partial restoration, leaving suitable minerals on site and re-creating sufficient variation in aspect and slope, in the hope that the intricacies of the plant communities will develop in the long term.

The Modern Mining Industry

Mining hillocks and the opencuts leading underground can be of significant socio-economic value today for their non-metallic compounds previously rejected by lead miners. Thus, they are actively being removed for processing, as many already have been throughout much of the 20th century. The Peak District is the main production area in Britain for fluorspar for the chemical industry. Barytes and, to a lesser extent, calcite are also produced; lead is now recovered as a by-product.

In the early years of fluorspar extraction, there were particularly rich localised concentrations of mineral that were easily re-worked by removing specific hillocks. While this led to damage of earlier mining surface features, the work was commonly selective and much was left in-situ where hillocks were relatively fluorspar-poor. The early fluorspar sites are themselves now of historical and archaeological interest and some are naturally regenerating with important plant communities.

In more recent decades the risk to the lead rake surface remains has increased for the following reasons:

- As particularly rich fluorspar deposits have been worked-out, poorer but more-extensive deposits have become increasingly economically viable and removal has often been wholesale. The impact of this trend has been accentuated by greater mechanisation.
- The relative expense of mining underground, and commercial competition in the global market, has often led mining companies to focus on opencast working and hillock removal as the most cost-efficient and viable method for the extraction of fluorspar.
- The pressure from landowners to reinstate what is sometimes perceived as 'derelict land' in order to create levelled 'agriculturally-improved' land.
- Modern processing is far more efficient than in the past, so that the soils used in restoration are generally only capable of supporting widespread homogenous grassland habitats rather than the rich and varied mosaic of habitats, including the specialist metal-tolerant communities, associated with the older workings.

Dramatic losses have taken place in the 20th century, as made evident by the research undertaken by the Lead Rakes Project discussed in Chapter 4.

4: Survival and Loss of the Lead Mining Resource

Reasons for Loss

There are two main reasons why lead rakes are currently being removed or damaged:

Mineral Removal - Loss of surface and underground lead mining features has been extensive in recent decades and takes two basic forms:

- Underground/opencast extraction.
- Removal of surface deposits (hillocks).

Currently there are several sites with extant planning permission for the removal of vein mineral, although these in total only cover a small proportion of the surviving lead mining resource. While the cumulative damage to hillocks by mineral removal has been significant, assessment of the degree to which the surviving resource is still at risk is impossible, as there is no way of accurately predicting what grades of mineral will be economically viable for removal in the future. Similarly, the number, scale and location of new sites that may potentially be given planning consent cannot be assessed in advance, as material considerations vary from site to site and may change through time.

Extraction of minerals today is often on a grand scale when compared with previous centuries, as here on Longstone Edge (photographer Ray Manley, PDNPA).

Agricultural Activity - Many lead mining hillocks have been removed over the years as part of agricultural activity. In some cases, particularly where the hillocks are small, they have been levelled by pushing heaps into hollows, and/or by ploughing them out, thus removing most or all ecological and/or archaeological interest. This usually results from a farmer's general desire to 'tidy' the farm, to modernise and improve the agricultural return from the land, or from a desire to remove a source of contamination to stock, especially young calves and lambs.

Gradual degradation also puts lead rakes at risk. The tipping of farm waste and other rubbish into the hollows and gradual encroachment of agricultural operations such as adjacent-ploughing, reseeding, inappropriate grazing levels, supplementary feeding on hillocks and the spreading of farmyard manure, paper pulp, herbicides and fertiliser, can all damage or remove the biodiversity and/or historical interest.

In some cases, removal happens as the result of sale of mineral to mineral operators, who 'restore' the land afterwards. However, in a significant number of instances the land manager does not benefit directly from the sale of mineral, as the mineral rights do not go with land ownership. In these instances, the landowner or farmer may have little control over removal of hillocks.

Despite the losses incurred through mineral removal and agricultural activity, surveys by the Lead Rakes Project have found that there is still a wide range of important sites remaining throughout the orefield. As these sites have very varied plant communities and because there are many different types of mining remains that reflect changing mining techniques through time, each site often represents a valuable and rare survival. Removal of these special sites would result in irrevocable loss of the legacy left by lead miners in the Peak District and an increasingly fragmented resource.

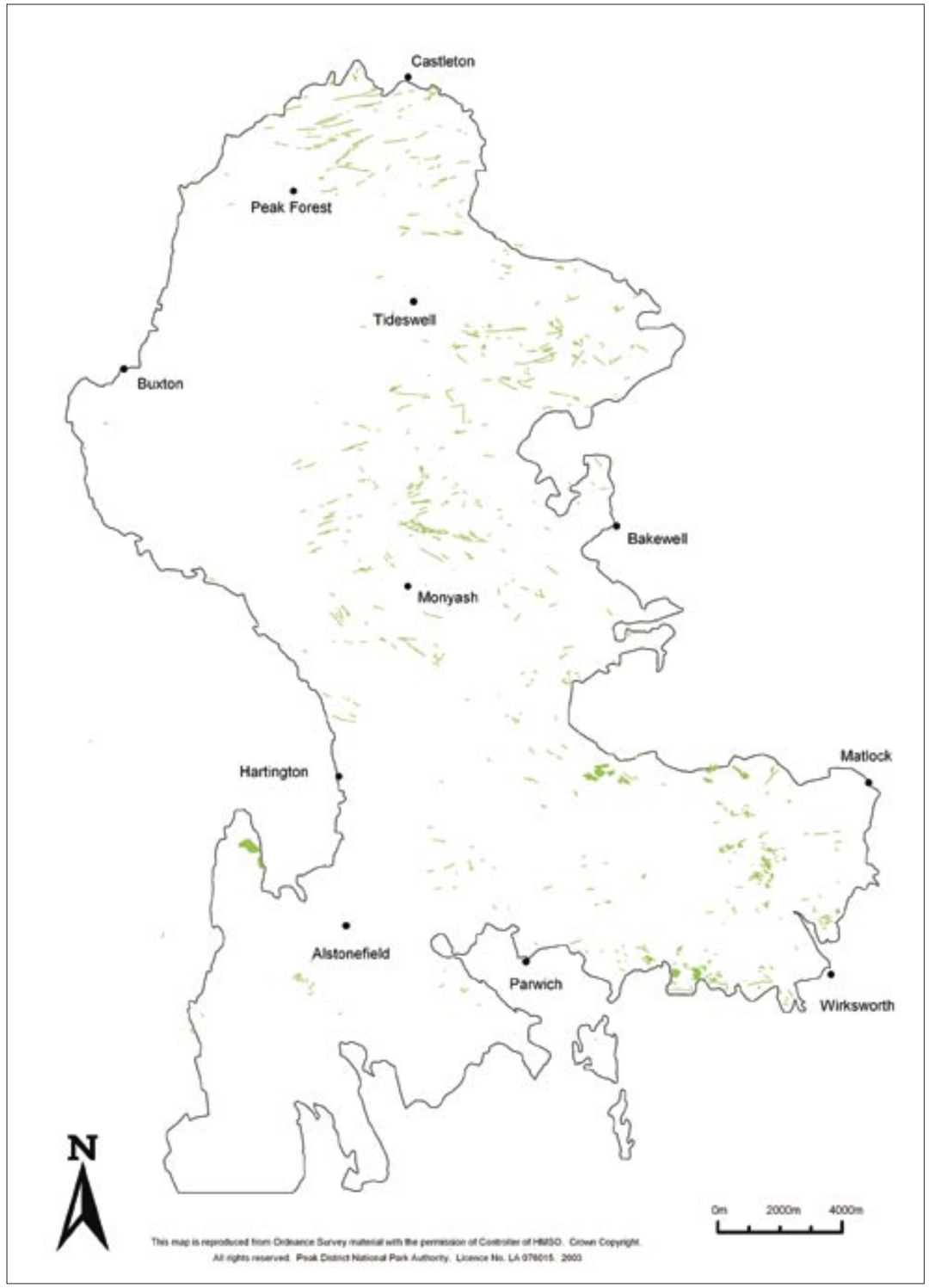
Aerial Photograph Assessment

As part of the Lead Rakes Project a report was produced in 2000, with financial support from English Heritage, which reviewed what remained of the lead rake resource [5]. The work comprised a rapid but detailed assessment using recent vertical aerial photographs to gauge the degree of survival and loss of hillocks across the orefield as a whole. This was achieved by comparing what remains with Geological Survey maps first compiled from then-extant surface remains before the extensive removal of hillocks for their gangue minerals. Three categories of survival were identified:

- **Present** (in reasonable condition).
- **Intermittent** (hillocks with significant damage) or **Uncertain** (usually because of tree cover).
- **Removed**.

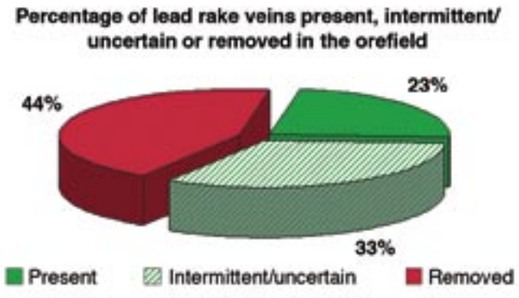
This assessment has provided an overview of the lead mining resource and was a critical initial step in the work of the Project. It has some limitations, for example where vegetation obscured the surface remains in a few cases and the availability of aerial photographs only up to 1995. However, the results are sufficiently accurate to give a valid overall picture.

The survival of lead mining hillocks is often patchy, as here at the Whitelow Mines on Bonsall Moor. Those in the foreground have largely been reworked and were in use as an informal bike track at the time the photograph was taken. To either side the sites of a few individual veins can just be made out from slight changes in tone on the photograph. The hillocks in the middle distance are in good condition (National Monuments Record/English Heritage).



The distribution of lead mining remains in the Peak District orefield which survive in reasonably good condition (green; limestone plateau - black line).

The Results - Of the 583km of worked mineral veins shown by the Geological Survey across the orefield as a whole, only 136km have hillocks that survive in reasonable condition; this is 23% of the total.



For expediency, the assessment of the majority of the lead mining surface remains, at veins, was by linear extent. However, this was not appropriate for the much rarer pipe/ flat hillocks and their extent was assessed by area. Of the 106ha of these, 83ha survive in reasonable condition - this is 79% of the total. These hillocks have probably survived in significantly higher numbers because the individual mounds are often small and not particularly attractive to mineral operators, and because they are extensive and closely-spaced and thus hard to improve agriculturally.

- Only about a quarter of lead mining hillocks survive in reasonable physical condition.
- A further quarter has been significantly damaged but something remains.
- Half have now been wholly removed.

Archaeological Assessment

Many mining sites retain valuable evidence on the character and development of the lead mining which has taken place over the centuries. To date archaeological assessment has concentrated on survey and very little archaeological excavation has been undertaken, but the potential here for learning much about the history of the industry is great.

The evaluation of archaeological survival and loss has involved two main tasks:

- The aerial photograph analysis described above.
- The compilation of the archaeological component of the 'Inventory of Regionally and Nationally Important Lead Mining Sites' (Chapter 5).

The first serviced both archaeological and ecological assessment. The second involved extensive archaeological data-collection and assessment of sites. This included fieldwork (much of which took place in the context of routine survey work carried out to facilitate agri-environment schemes), the search of published and archive sources, and extensive consultation with local lead mining historians and underground explorers.

When compiling the Inventory [7], sites have been carefully assessed so that the list includes a representative sample of all hillock types and the wide range of surviving individual mining features (Appendix B). While the Inventory includes a large number of sites, many specific features are only found at a small number of locations. There are 136 sites in the Inventory with important archaeological interest at surface and a further 40 where significant interest is confined to underground features.

Hillocks - Interpretation of remaining hillocks has been achieved through analysis of differences in their geological and historic character. Variation in hillock form is partially determined by the nature of the mineralisation. Linear hillocks can be very different from each other, depending upon the size of the veins they follow and the depth to which they were worked. In the rare instances where mineralised pipes outcropped the hillocks are distinctive, as they spread widely across the outcrop. Where the pipes occur below ground, or where veins are buried beneath shale, hillocks tend to be intermittent rather than continuous because there was no mineralisation to follow at surface.

Variation in hillock character is also influenced by the date and scale of workings. For example, where large post-medieval mines worked deep underground, there are often large waste hillocks at intervals along veins where ore was brought to surface up engine shafts. Between these there are continuous smaller hillocks from shallower mining. Similarly, there are spaced hillocks associated with airshafts to drainage soughs, but here there are no intervening surface features. A distinctive type of hillock, known as a buddle dam, is associated with the reprocessing of finely crushed waste and these are found wherever suitable material was worked in the 19th century. Surviving good examples of all these variations in form have been listed in the 'Inventory of Regionally and Nationally Important Lead Mining Sites' and Appendix B.

The hillocks at the Old Ash Mines above Northern Dale near Wensley are a classic example following parallel veins, which take on added importance because of their relationship to ancient agricultural earthworks. Unfortunately, some of those at the upper centre of the photograph have been badly damaged since this was taken. Further hillocks are hidden in the woodland of Northern Dale to the left, which are associated with archaeologically important ancient pipe workings (Derrick Riley collection).

Surface Features - A report assessing the levels of loss of specific lead mining features (where known) was prepared for the National Park Authority at an early stage in assessment of the resource [54]. This detailed sites known to survive in 1996 in comparison with 1950 and estimated the original frequency of features based on documentary evidence. This report indicated high levels of loss consistent with the results for hillocks assessed by aerial photograph analysis. Fieldwork and consultation has led to the subsequent identification of further surviving examples of specific feature-types and has also documented recent losses [7]. A summary of the updated results is given in the table below (detailed in Appendix D).

Common Surface Features

Feature Type	Original Number	Surviving Examples listed as Category A in the Inventory
Opencuts	Many	36
Shafts	Many (thousands)	Common but usually capped
Access levels	Relatively common	12
Coes	Many (hundreds)	46
Dressing floors and associated ponds and ore-dressing pits	Many (thousands)	44
Belland yards	Many (hundreds)	37

Rare/Special Surface Features (minor feature-types excluded)

Feature Type	Original Number	Surviving Examples	Surviving Examples in Good Condition
Engine houses and associated buildings	91	29	10
Other mine buildings (excluding coes)	Uncommon	42	25
Sough entrances and goits	About 350-400	32	29
Waterwheel pits and other associated features	24+	5	3
Water blasts and associated features	Probably uncommon	1	1
Gin circles	250+	69	49
Large haulage levels	Relatively rare	6	6
Crushing circles/wheels	34+	15	7
Bouse teems	Rare	6	3
Buddles	Probably common	[28]	[24]
Slime ponds	Relatively rare	6	6
Buddle dams	Relatively common	[20]	[18]
Late 19th and earlier 20th century lead/gangue mine buildings and headgear	Uncommon	10	4

Note: Those in brackets are the numbers of sites with these features rather than the individual numbers present.

The assessment of common features shows that although a high proportion of the resource has been lost by the extensive removal of hillocks in the 20th century, there are sufficient examples surviving to provide a representative sample for the 'Inventory of Regionally and Nationally Important Lead Mining Sites' (Appendix B). With rare or special features this is not always the case. In some instances where features were once relatively common, as with gin circles, sough entrances and buddles, a representative selection of relatively well-preserved sites again still exists. However, in many other cases, often where particular types of structures were never common, the only extant remains are now very rare or in some cases ruinous or non-existent.

These impressive mine buildings at High Rake Mine near Great Hucklow were reduced to ground level in the 1920s. Their foundations are currently being excavated archaeologically by the Peak District Mines Historical Society conservation team (John Barnatt collection).

Underground Features - Assessment of survival rates for this important aspect of the resource often has inherent problems with access and safety. It is known that much of great interest remains, although many workings have undoubtedly been removed or backfilled, have collapsed or are inaccessible. It is vital to conserve mine entrances that lead to important underground workings which are known to survive, to ensure they can be accessed for future study; these entrances are included in the 'Inventory of Regionally and Nationally Important Lead Mining Sites' (see this and Appendix B).

This fine arched level at the Ecton Mines near Warslow leads to the heart of one of the most exciting survivals underground, where there are engine chambers and many other features. In the late 18th century it was one of the richest mines in Britain (© Paul Deakin).

Future Archaeological Survey - While the whole orefield has been assessed rapidly, detailed recording at each identified important site has often been minimal. Detailed survey and analysis of features is essential to further our understanding and provide a base-line to monitor their condition, vulnerability and sites at risk in the future.

Many fine archaeological sites still survive, and these demonstrate significant changes in mining practice and scales of extraction over 2000 years of mining. However, there have been high levels of loss of lead mining features in the 20th century and there are many aspects of this very varied resource that are now rare.

Ecological Assessment

Survey to Date - A high priority for the Lead Rakes Project was to gather information on the ecological interest of the lead rakes in the orefield. Detailed survey was required to identify and assess sites of greatest interest and to learn more about the vegetation communities here. This process is ongoing and therefore it is not possible at this stage to produce overall results. However, from information gathered so far, comment can be made and some provisional conclusions drawn.

Survey has been carried out by area [15-20], prioritised according to the degree of perceived risk, the presence of lead rakes that were known to be of interest, and land with high concentrations of lead rakes. Survey was directed to sites that do not lie within candidate Special Areas of Conservation and Sites of Special Scientific Interest notified for their biological interest, as these were regarded as being protected from ecological damage.

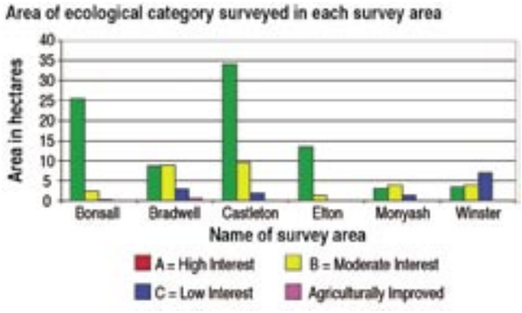
The Lead Rakes Project survey areas to date are:

- Bonsall Moor
- Castleton/Peak Forest
- Bradwell
- Winster
- Elton
- Monyash
- Sheldon/Taddington/Flagg (assessment ongoing)

The total area of lead rakes surveyed by the Project (including the ongoing work), following methods detailed in Appendix E, currently amounts to 175ha. It has been estimated by the Biodiversity Action Plan audit for the Peak District [43] that there are about 260ha of lead rake hillocks remaining in the orefield, thus the survey is about two-thirds completed (by winter 2003).

In addition, substantial parts of the Longstone Moor/ Longstone Edge area have recently been surveyed to a similar standard as part of other Authority work.

Current Results - Of the 175ha of lead rakes assessed by the Lead Rakes Project, 118ha were of significant ecological interest (i.e. Category A or B - see Appendix E for definitions). Those of the highest interest were examples that were the most diverse, with several of the metallophyte species being found at least 'occasionally' and a variety of other plants carpeting lead rakes in a rich mosaic of colours and textures. These are summarised here (see Appendix F for further detail).



This chart clearly shows the importance of the Bonsall and Castleton areas for high quality ecological lead rake sites.

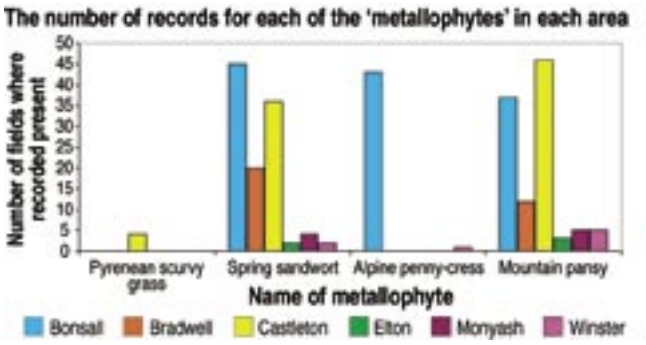
In addition to the categorisation just noted, the lead rakes were classified using the National Vegetation Classification, a nationally recognised system of describing vegetation communities (Appendix G). The most significant result was that the classic metalliferous vegetation type, calaminarian grassland, has only been identified in a total of about six hectares of ground, emphasising the rarity and importance of this internationally important community. Other

communities included species-rich calcareous grasslands with much species-diversity, neutral grasslands that are sometimes again species-rich, and species-poor acidic grassland.

The only true metallophytes in the Peak District are spring sandwort and alpine penny-cress [23]. However, for the purposes of the survey two 'local metallophytes' (species normally closely linked with lead rakes but found elsewhere) were recorded, pyrenean scurvy grass which is inextricably linked to mineral waste in the Peak District and mountain pansy which has often found a refuge on lead rakes within the orefield.

Other species, including moonwort, frog orchid, dark mullein and maiden pink are often, although less exclusively, associated with lead rakes. However, it was considered that they were not specifically associated with mineral spoil to a significant degree, as they occur away from lead rakes. They were recorded as 'notable species' for the purposes of the survey (Appendix I).

The metallophytes spring sandwort and mountain pansy are found throughout the orefield. Prior to the survey there were only three records within the National Park database for alpine penny-cress in the Bonsall area, yet a further 40 sites were found during the survey. This admirably illustrates the importance of survey for increasing our knowledge of the relative importance of key species and communities on lead rakes. Survey to date has indicated the importance of the Bonsall area in particular for both spring sandwort and alpine penny-cress. However, the current results have also revealed the general rarity of metallophytes. The following chart illustrates the presence and absence of the four key species:



At a glance the total number of fields containing these indicator species looks good (in three out of four cases). However, in many cases the species may be restricted to a single or only a few plants in any one field.

Future Ecological and Geological Survey - The areas surveyed for their botanical interest so far account for approximately two-thirds of the extant lead rakes in the orefield. If survey rates continue as before, it will take at least three years to complete the picture for that part of the orefield within the National Park. Here there are several key areas that have not yet been comprehensively surveyed, including Youlgreave, Hurdlow, Ecton and Eyam. Outside of the National Park there is a need for a comprehensive survey of all lead rakes in this part of the orefield, since there are several important and extensive areas of mining hillocks that have not yet been recorded in detail, in addition to the very significant cSAC site at Gang Mine.

The botanical survey will continue to add to our knowledge of these complex and fascinating plants and plant communities. Upon completion, there will be a baseline for the future monitoring of species and plant communities. Importantly, the data will provide more-consistent and comprehensive information for prioritising sites for conservation and informing responses to proposals for the removal of hillocks.

When the botanical survey is complete, the data will be combined with that from SSSIs and cSACs and presented in a further report. In addition, further elements will be reported on, including other aspects of the ecology, such as bats, invertebrates, lichens and mosses, all of which again require further detailed assessment.

Similarly, the geological interest awaits systematic assessment. Information is available for sites designated as geological SSSIs and as RIGS, and there has been much detailed academic study as well as assessment of the economic potential of the mineral resource. However, no attempt has as yet been made to create an inventory of all sites of conservation value: this needs to be addressed.

The ecological surveys undertaken to date have identified the complexity of the mosaics of plant communities on lead rakes. Because of this inherent complexity, it is now apparent that if lost they cannot be re-created.

The mountain pansy is one of the most attractive 'metallophyte' plants found on lead rakes in the Peak District. They are relatively common on mining sites here, particularly in the Castleton and Bonsall areas. Those illustrated are at Magpie Mine near Sheldon (photographer Ray Manley, PDNPA).

5: Towards Conservation of Important Lead Mining Sites and Landscapes

The Lead Rakes Project set out to establish the extent and quality of the surviving lead rakes within the National Park, by carrying out the ecological and archaeological assessments summarised in Chapter 4. These have led to the compilation of two Inventories, one of known 'Regionally and Nationally Important Lead Mining Sites' and the other of 'Lead Mining Landscapes'.

The Inventories are essential to bring together the known-sites and landscapes of high ecological and archaeological importance that reflect the priorities for conservation for the future. Existing protection for lead rakes is limited and new initiatives are required that prioritise conservation of lead rakes, before further important sites are lost.

Existing Formal Mechanisms for Protecting Lead Mining Sites

Well under half of the remaining lead mining hillocks, in themselves only a quarter of what once existed, have any degree of archaeological and ecological protection through statutory designation and agri-environment schemes. The level of protection offered by these varies, as does the types of interest covered. In summary, the types of protection are:

Scheduled Monuments (SMs) - Good archaeological protection is provided for the 36 lead mining sites in the Peak District which are currently scheduled (Appendix H).

From a geological and biological perspective Scheduled Monuments offer varied levels of protection. Physical protection of the archaeological interest will cover most geological interest by default, but plant communities are not protected from the application of fertilisers and grazing regimes that may have a negative impact on surviving high-priority plant communities.

Some nationally important mining sites are protected as Scheduled Monuments, as here at Tideslow Rake north of Tideswell, a site which also has statutory designation as a Site of Special Scientific Interest (photographer John Barnatt, PDNPA).

Candidate Special Areas of Conservation (cSACs) - This is the highest nature conservation designation, protecting lead rake vegetation which is recognised as being of international importance, via the EU Habitats and Species Directive (1992) and the Habitats Regulations 1994. There are currently two candidate Special Areas of Conservation covering lead mining sites in the Peak District, both are also SSSIs. Gang Mine is recognised specifically for its lead rake vegetation. Within the Peak District Dales cSAC, which includes nine limestone dales, calaminarian grassland is listed as part of the reason for inclusion (Appendix I).

Sites of Special Scientific Interest (SSSIs) - Whilst only four of the orefield's SSSIs have been notified specifically for their lead rake habitats, a further twelve include lead rake habitats as part of their reason for statutory designation. In addition, there are nine SSSIs where lead rakes are present but are not part of the notified interest; however, they are afforded protection due to other notified grassland interests being present (Appendix I).

A further seven geological SSSIs are notified (or part-notified) for their mineralisation interest (two of which are also notified for their biological interest, and a further one of which overlaps with a biological SSSI - Appendix I). These SSSIs give the lead rake remains physical protection insofar as they have geological special interest.

From an archaeological perspective, hillocks are often given physical protection within cSACs and SSSIs, but only where the ecological or geological interest exists. Buildings and other associated structures are often not protected.

The ecological and/or geological interest at some mining sites is protected as candidate Special Areas of Conservation and Sites of Special Scientific Interest, as here at Cressbrook Dale near Litton which is designated for its biological interest (photographer Rebecca Penny, PDNPA).

Agri-Environment Scheme Agreements - Many lead mining features are recognised and protected for their archaeological and ecological interest, either directly or through cross-compliance. However, this is only the case where the interest has been identified, either by the landowner/tenant or by those who draw up and/or monitor the agreements. In the Peak District, agreements brokered by the National Park Authority commonly have been made after detailed assessment by archaeologists and ecologists working for the Park Authority. Only a small minority of agreements have been formulated on the basis of conservation audits that may not have identified all of the archaeological and ecological interests.

National Park Status - Much of the orefield lies within the Peak District National Park. This status is the top tier of landscape protection in Britain and the National Park Authority has planning powers that are designed to give added protection to conserve its special character.

The Planning Process - The National Park Authority is the local Planning and Minerals Planning Authority; those areas of the orefield outside the National Park fall under the remit of Derbyshire's County and District Councils. Lead mining sites of conservation interest can sometimes be safeguarded from development via the planning process, as their presence can be considered as a material consideration in determining planning applications. In some cases the planning application will need to be accompanied by an Environmental Impact Assessment (EIA). A number of proposals considered by Minerals Planning involve lead mining remains, either as planning applications or under General Permitted Development Orders (GPDOs) (Appendix J). Other types of proposed development occasionally impact on lead mining sites and are considered through the general planning process.

Hillocks in Reasonable Condition	Veins	Pipes/Flats
Within a SM	13%	21%
Within a cSAC/SSSI giving protection to the biological interest	18%	10%
Within a SSSI giving protection to the geological interest	8%	27%
No formal long-term protection	77%	52%

Levels of Protection

Summary totals for sites that are either protected by statutory designation (Appendices H and I) or in contrast have no long-term current protection are drawn together in the table above. These totals cover the orefield as a whole and are given as percentages of the total number of hillocks surviving in reasonable condition.

The table lists vein hillocks separately from those of the much rarer pipes and flats because the figures were calculated in different ways, the former by length of vein and the latter by area covered: these cannot be combined to give overall totals. Some sites are within more than one statutory designation type and therefore the totals exceed 100%.

Calculation of the exact proportion of hillocks that are not designated but which are protected within agri-environment scheme agreements has not been attempted. While some sites are continually being brought into agreements, others are lost because the agreements have expired and are not renewed. It is estimated that currently less than 10% of undesignated hillocks in reasonable condition are in agreement. Whilst statutory designation affords the lead rakes permanent protection, it must be remembered that agri-environment agreements are usually limited to between five and ten years and therefore only provide temporary protection.

While these figures can be taken superficially to perhaps suggest that an acceptably high proportion of surviving hillocks and associated features are protected by statutory designation, this is not the case: the figures need to be interpreted. There is not necessarily any protection afforded by archaeological designations to biological/geological interests, or vice versa. Similarly, only a proportion of hillocks given in the table above for cSACs/SSSIs are automatically protected by these statutory designations, for it is only those with biological and/or geological interest that are covered. More fundamentally, detailed assessment of the character of lead rakes shows that many important aspects of this very varied resource are currently offered little or no long-term protection (Chapter 4 and Appendices B-D). When the 195 special sites listed in the 'Inventory of Regionally and Nationally Important Lead Mining Sites' are assessed (table below), only a minority have statutory designation or part-designation.

Statutory Designation Type	Number of Inventory Sites		
	Fully within a designated area	Partially within a designated area	Not within a designated area
SM or Listed Building	12	26	157
Biological cSAC or SSSI	8	22	165
Geological cSAC or SSSI	11	9	175
None	-	-	120

A proposal that more sites need conservation, in addition to those currently protected by statutory designation, would undoubtedly place a significant proportion of the surviving resource 'beyond reach' of further development if adequate safeguards are put in place. However, this is offset by numerous sites where the surface remains have already been severely damaged, as these are therefore not considered in the figures given above. At these sites there may well be further viable mineral resources that can be recovered by opencast working or by underground mining (subject to obtaining planning permission).

Currently, there is no satisfactory mechanism for landscape protection being used in the orefield that ensures that lead mining landscape character is adequately conserved.

Many important surviving lead mining sites and landscapes do not have adequate long-term protection. While not all surviving sites and landscapes are of high conservation priority, there are significant shortcomings in the degree of protection currently afforded to lead rakes.

Proactive Conservation of Lead Mining Sites

Forging Partnerships - The formation of the Lead Rakes Project has enabled officers of the National Park Authority to work towards lead rake conservation in a more integrated way. Partnerships have now been entered into with English Heritage and English Nature to work towards this end. Close working relationships also exist with The National Trust, Derbyshire Wildlife Trust and the Peak District Mines Historical Society, all of which have lead rakes on land they manage. The Peak District Mines Historical Society conservation team also works in close co-operation in practical conservation projects at other sites across the orefield.

Working with Farmers and Landowners - From the outset it was recognised that an important element of the Lead Rakes Project's role was to provide feedback to farmers and encourage them to enter into agri-environment schemes to conserve their lead rakes. For logistical reasons, this was usually undertaken following the ongoing ecological survey. Wherever possible, surveys were followed up with a brief report for the land manager and discussions entered into regarding conservation agreements.

The main voluntary conservation schemes that have been available in the National Park are the Countryside Stewardship Scheme, the North Peak and South-West Peak Environmentally Sensitive Areas Schemes (ESAs), the National Park Authority's Farm Conservation Scheme and English Nature's White Peak Wildlife Enhancement Scheme (applicable only to sites designated as Sites of Special Scientific Interest).

During the seven years of the Lead Rakes Project, 19 Farm Conservation Scheme Agreements and 12 agreements within Countryside Stewardship have been successfully negotiated as part of pro-active work within the six survey areas where detailed ecological work has been completed to date.

These agreements include a total of about 62ha of lead rakes in 136 fields. The lead rakes entered into the agreements comprise:

- 51ha (93 fields) of high (Category A) quality for their ecological interest.
- 9ha (34 fields) of some (Category B) value for their ecological interest.
- 57ha (104 fields) of high quality for their archaeological interest.
- 3ha (32 fields) of some value for their archaeological interest.

In many of these cases the ecological and archaeological interests overlap.

Some sites are protected within Agri-Environment Scheme agreements, as here on Bonsall Moor (photographer Rebecca Penny, PDNPA).

Very few farmers have refused permission to survey. Nevertheless, the degree of success in negotiating conservation agreements has only been moderate. Negotiations with land managers, owners and mineral owners have more often than not been challenging. This is because:

- Many wish either to realise the mineral value of their lead rakes or to retain this option.
- Many wish to leave the door open to agricultural improvement of the lead rakes, either now or at sometime in the future.
- Some wish to consider removal of hillocks where there has been stock poisoning or where the farmer considers there are potential problems.

The focused approach has also enabled personal feedback from the farmers and led to a greater understanding of the issues they face when managing lead rakes. This has cemented relationships and enabled continued emphasis on conservation issues, whether the farmer has entered a conservation agreement or not. The additional information provided by the Project in terms of brief ecological and archaeological reports has helped to inform the farmers of the interest they have on the holding, and on occasion has provided a talking point amongst farmers, for example as to who has the most orchids or leadwort! Even where sites are not protected by statutory designation or agri-environment scheme, the positive contact with the Project will in many cases lead to mining sites being managed more sympathetically for conservation. This sense of possession and pride needs to be nurtured as the long-term future management of lead rakes is largely in the hands of the farming community.

A voluntary approach is of high importance. Such agreements foster positive attitudes to conservation by farmers. However, the lack of adequate recompense for forgoing realisation of the value of the minerals in hillocks and restrictions on altering short-term farm management, makes the negotiation of agreements for lead rakes challenging. Another limitation for sustained conservation is the short-term nature of such agreements.

Working with the Minerals Industry - Discussions with the local minerals industry has raised awareness and understanding of the conservation issues. The compilation and dissemination of the 'Inventories of Mining Sites' and 'Landscapes' of special importance (below), gives a clear guide as to where strong opposition to proposals for mineral removal on conservation grounds might be anticipated.

The National Park Authority, as Minerals Planning Authority, works with the minerals industry where applications for mineral removal do not conflict with National Park purposes. When planning permissions are granted, the National Park Authority's aim is to work pro-actively to ensure each site is worked and restored in a phased manner, to achieve a beneficial afteruse.

The National Park Authority will control mineral development so that lead mining sites of high conservation value are retained other than where exceptional circumstances exist and can be fully justified.

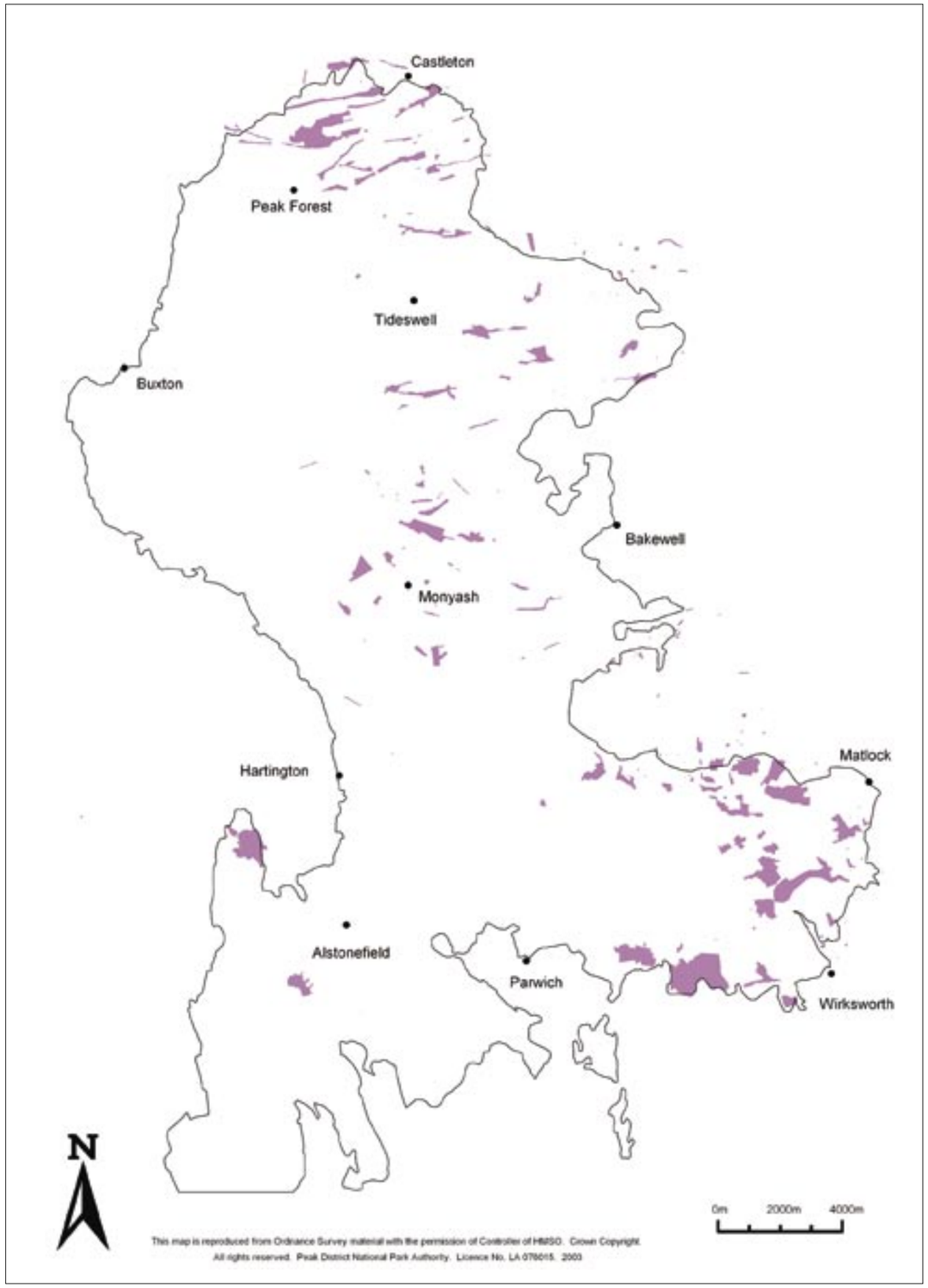
This large extraction site on Longstone Edge has been reworked for gangue minerals several times over the decades. Some of the deep modern opencuts are still active, while others have been backfilled (National Monuments Record/ English Heritage).

Inventories of Regionally and Nationally Important Lead Mining Sites and Landscapes

Because the conservation of lead mining hillocks can impact on the minerals industry and on agricultural income, it is vital that conservation efforts are carefully focussed on the mining sites and mining landscapes that are of the greatest importance. It is unrealistic to attempt to conserve all remaining surface and underground lead mining sites: fossilisation of the landscape is not a desirable option. With this in mind, a primary objective of the Lead Rakes Project has been to compile a detailed audit of the resource and use this to prioritise conservation effort.

At an early stage, in 1996, the Lead Rakes Project compiled a provisional working list of important sites within the National Park based on readily available pre-existing databases and knowledge. This included just over 50 sites and was based on then-known surface remains of archaeological and/or ecological importance. However, because this information was very limited in its scope and detail, it was decided to survey systematically the whole of the orefield. By 2000, a significant number of further sites had been identified as the consequence of fieldwork and consultation [5]. After further intensive fieldwork, the list has now been thoroughly reviewed and a formal Inventory

There are a significant number of lead mining sites of high quality conservation interest in the Peak District landscape, each one different, and often offered no statutory protection. The Ash Plantation Mines near Wensley have a wide variety of features and much of the area visible is not currently protected, the exception being a small area at the centre where an exceptional buddling complex is designated as a Scheduled Monument (Derrick Riley collection).



The overall distribution of sites in the Inventory of Regionally and Nationally Important Lead Mining Sites (pink; limestone plateau - black line) - for details see the maps in The Inventories section.

There are currently 195 sites in the Inventory of Regionally and Nationally Important Lead Mining Sites in the Peak District. Dale Mine near Warslow has a bank of 'kilns' recently identified as a rare example of zinc ore calciners (below). This site has no current statutory protection for its archaeological interest, but it is on land owned by the National Park Authority (photographer John Barnatt, PDNPA). The diverse botanical interest at Whalfe Pipe near Monyash, including the harebell and bird's-foot-trefoil shown (right), has no current statutory protection (photographer Rebecca Penny, PDNPA).

produced which is discussed below and presented in detail in 'The Inventories' [7]. This is the product of increased knowledge, a review of the criteria employed for site inclusion and the loss of several sites identified in the earlier lists. A second Inventory, of important 'Lead Mining Landscapes', was compiled in 1999/2000 [5] and is also presented here in modified form.

Important Lead Mining Sites - This Inventory contains all currently-known lead mining sites that are regarded as being of national and/or regional importance for their archaeological and/or ecological interest, both within the Peak District National Park and in those areas of the orefield outside its boundary.

All sites in the Inventory are known to be of high conservation importance, having been carefully assessed for their archaeological and/or ecological quality. However, it is anticipated that a significant number of new ecological and geological sites, together with some archaeological sites, will be added as ongoing detailed field assessment continues in different parts of the orefield. The Inventory therefore has definitive entries reflecting knowledge up to the end of 2003, but it is not complete.

At present this Inventory includes 121 key sites (110 within the National Park) that are of national and regional importance. In addition there are 74 sites (53 within the Park) in two subsidiary lists, which are equally important, but for specific structures or for their underground interest. All sites with rare or special archaeological features and a representative selection of more common features are included. All known ecological Category A sites, which comprise rich and diverse natural habitats, are included.

A summary of the relative importance and rarity of each aspect of the archaeological interest is appended to this report, as is a description of the features of note at each site, in support of its importance for inclusion in the Inventory on archaeological grounds (Appendices B and C). A more-detailed account of this assessment is presented in a technical report [7]. Similar details of the ecological prioritisation are deferred until completion of survey. This said, only Category A ecological sites (Appendix E) are considered and thus all are certain inclusions in the Inventory, as these contain species-rich habitats of diverse interest and sites for the key metallophytes.

Every effort should be made to ensure sustained conservation of all the 195 known 'Regionally and Nationally Important Lead Mining Sites' (and any identified subsequently). Taken together, these include a wide range of types of mining remains and ecological habitats, each often only represented in small numbers. The removal of any would be a significant loss to the overall resource.

Important Lead Mining Landscapes - The purpose of this Inventory is to identify those parts of the Peak District orefield where there are still sufficient surface lead mining remains to make a significant visual contribution to historic landscape character. Assessment shows that no part of the orefield is entirely intact [5]. However, in the identified areas there remain sufficient features to appreciate the extensive nature of mining and the impact it had on the land. Here hillocks are visible not just in the foreground but disappearing into the distance.

There are eleven landscapes in the Inventory of Regionally and Nationally Important Lead Mining Landscapes in the Peak District. The example shown, at Cop Rake and Moss Rake West End near Peak Forest, is a small part of the large Castleton/Peak Forest Inventory landscape (National Monuments Record/English Heritage).

Eleven 'Regionally and Nationally Important Lead Mining Landscapes' have been identified (nine within the National Park). In each the remains have strong landscape impact and between them they include a range of variations in mining character. However, in some cases these landscapes are already small, because what would have been the best and most-representative samples have already been lost or have been reduced to their present size. When the Inventory was first compiled in 1999/2000 it included a twelfth landscape, to the west of Flagg; this has now suffered much from agricultural 'improvement' and has lost its integrity as an historic lead mining landscape.

Every effort should be made to ensure that landscape character is retained within these eleven 'Regionally and Nationally Important Lead Mining Landscapes'. There are no remaining alternatives.

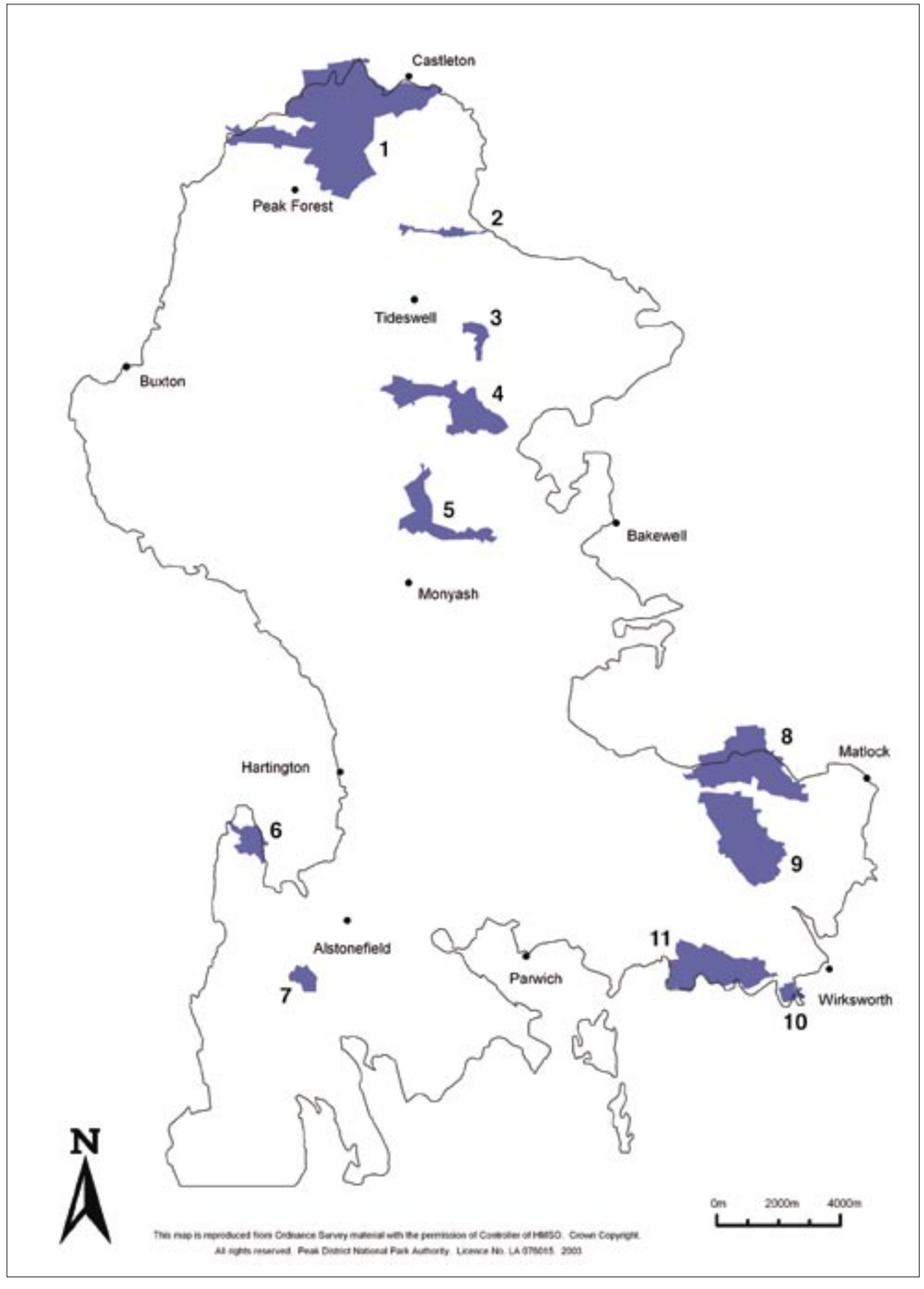
Using the Inventories - These Inventories are presented to help inform people of the significant interest that is currently recognised.

The Inventories are important in highlighting the best of the known resource. Although the site-specific Inventory is incomplete, it is an invaluable indicator of the high importance of those sites identified to date.

Both Inventories are essential if the National Park Authority and others are to make more informed planning decisions and develop appropriate strategic policies, whether for minerals extraction, general development or countryside and conservation management.

With this knowledge, conservation efforts can be directed towards retaining the finest examples. However, this is still hindered by the scope of our current knowledge: more ecological, geological and archaeological survey work is essential. In addition, current conservation mechanisms need to be strengthened to ensure the survival of all important 'Lead Mining Sites' and 'Landscapes'; these issues will be illustrated and discussed in Chapters 6-8.

The Lead Mining Sites and Landscapes Inventories enable conservation action to focus on those sites and landscapes currently identified as being of the greatest importance.



The overall distribution of landscapes in the Inventory of Regionally and Nationally Important Lead Mining Landscapes (blue - numbered following the Inventory; limestone plateau - black line); elsewhere the remains are now so degraded that they have lost significant impact at a landscape scale, see the previous page.

6: Conservation Opportunities and Challenges: Case Studies

This chapter provides examples of the range of recent individual conservation initiatives undertaken within the orefield. It illustrates both successes and some of the problems that have been encountered.

Beans and Bacon Mine - A Site of High Ecological Interest

Several previously undiscovered lead rake 'gems' were identified in 1997 during the ecological survey of the Bonsall Moor area [15]. The area around Beans and Bacon Mine was one of the most exciting. This is of outstanding ecological interest and is covered in old lead workings that date back to at least 1740 and probably to medieval times. The range of grasslands, the variety of plants and the significant populations of notable species here make this one of the most valuable sites on Bonsall Moor. It is also of high archaeological interest.

The fields contain extensive areas of species-rich calcareous grassland with areas of acidic and metallophyte vegetation. A large number of important plants occur, including mountain pansy, alpine penny-cress, spring sandwort, fragrant orchid, common twayblade, common spotted orchid, frog orchid, autumn gentian, carline thistle, moonwort, adders tongue fern and kidney vetch.

There appears to have been relatively little surface disturbance since much of the mining became inactive in the 19th century. This factor, and the highly complex character of the hillocks, has enabled a unique range of grasslands to develop over time. The rich diversity of wildlife has been maintained by generations of environmentally-sensitive farming.

In 1998 the owner and tenant of the land signed a joint agreement for ten years with the National Park Authority, which goes with the land should it be sold, to conserve the ecological and archaeological interest. Since this agreement was reached the site has been designated as a Scheduled Monument.

Part of Beans and Bacon Mine, showing the multi-coloured species-rich grassland at the site (photographer Rebecca Penny, PDNPA).

How Grove, High Rake Mine and Bateman's House - Archaeological Excavations and Conservation

In recent years three opportunities have arisen to carry out excavations and consolidation work at lead mining sites, which have cast new light on the resource and restored sites for public enjoyment. In the first two instances this was made possible through one of the authors (JB) working with the Peak District Mines Historical Society conservation team, who provided free expertise and labour. The Society and the National Park Authority have provided small financial grants to facilitate this work. The third project, at Bateman's House, was managed by English Nature with professional contractors carrying out the work, with grants from the Heritage Lottery Fund, English Nature and English Heritage.

How Grove - At this site, on a small island of surviving hillocks on Dirtlow Rake above Castleton, excavations uncovered an exciting suite of ore-processing features that have led to a radical revision of our understanding of aspects of the resource. They include the best-preserved ore-crushing circle in the region, a coe with floor setts, and a locally-rare circular buddle adjacent to an unusual D-shaped example, both previously buried and unexpected discoveries. The excavations have recently been published in Mining History [6].

Part of How Grove during archaeological excavation. The coe in the foreground has setts near the entrance, placed here to accommodate muddy feet. The crushing circle behind, previously buried, is the best preserved in the orefield (photographer John Barnatt, PDNPA).

High Rake Mine - More ambitious excavations are currently underway next to a well-used footpath, on land owned by the National Park Authority, at High Rake Mine near Great Hucklow. Here a large 19th century mine complex, rivalling Magpie Mine in size, had been largely demolished in the 1920s to provide stone for council houses. The site was later partially re-worked for fluorspar and then used as a council tip. Before the project began little was visible. A large concrete cap over the deep engine shaft was obvious, while an ore-crushing stone and a few other large blocks of gritstone peeped through the rank vegetation; overgrown hollows marked the sites of some of the buildings. To date, the lower walls of two

Cornish engine houses with boiler houses and chimneys, a cobbled coal yard, an ore-crushing circle and a gin circle have been revealed by excavation. The promotion of interest in lead mining is furthered by giving site tours to visitors. When archaeological excavation and consolidation are complete, on-site interpretation will be provided as this site now provides a valuable opportunity to raise public awareness and appreciation of the lead mining resource.

The 19th century mine site at High Rake is currently being archaeologically excavated and conserved. The upper photograph shows the base of a chimney, visible to the left in the old photograph of the site in Chapter 4 (photographer John Barnatt, PDNPA). In some parts of the site 20th century overburden had to be removed by machine (photographer Rebecca Penny, PDNPA).

Bateman's House - This highly unusual 19th century house built in Lathkill Dale for a mine agent, is directly over a mineshaft which had a rare type of underground pumping engine at its base. It lies within a Scheduled Monument, a candidate Special Area of Conservation, a Site of Special Scientific Interest, a National Nature Reserve and the National Park. A consolidation project commenced in 2001. Rubble that had collapsed into the building as it decayed was removed. The surviving parts of the building were recorded archaeologically, and the ruins and shaft have now been made good. The work has revealed clear evidence that the structures were altered and added to over time, the earliest phase being purely industrial. This previously unrecognised complexity has added greatly to our understanding of this unusual site. Public access and interpretation, with a bridge over the river to the site and a staircase down into the shaft, have been provided as part of the project.

The ruins of Bateman's House, a 19th century mine agent's house built over an impressive shaft, entered via the hole in the foreground, photographed towards the end of the conservation project here (© Richard Sheppard, Trent & Peak Archaeological Unit, Nottingham University).

Elton - The Loss of a Site through Mineral Removal and Agricultural Improvement

In June 1999 an isolated hillock and associated shaft at Elton became the subject of a notification for removal of mineral under Part 23(B) of the Town and Country Planning (General Permitted Development) Order 1995 (GPDO) (Appendix J). Following assessment it was considered that the hillock was a significant remnant of the Derbyshire lead industry and an important landscape feature in its own right. An Article 7 Direction was issued by the Authority to prevent the removal of the mineral in the hillock from the agricultural holding under the permitted development rights. Thus, in order to remove the hillock for its mineral content, the developer would first need to apply for and obtain planning permission. On receipt of an application the merits of the proposal could then be assessed against the Authority's Development Plan policies.

Meetings were held with the landowner to discuss the proposal and the Authority's concerns, and a grant was offered for the retention of the hillock and stock proof fencing to address management of the land, including any toxicity issues. Nevertheless, the landowner was keen to pursue the removal of the hillock with or without any income from minerals.

Following the meeting an Article 4 Direction was prepared to prevent any regrading of the hillock for agricultural purposes under Part 6 of the GPDO. Unfortunately before the Article 4 Direction could be served the hillock was levelled resulting in the irreversible loss of the feature. The Article 7 Direction did not come into effect as the mineral was not taken off the holding.

An impressive mining hillock at Elton (top) was recently removed after attempts to save it failed; all that remained afterwards were concrete sleepers sealing the mine shaft (PDNPA collection).

Rowland - Mineral Extraction and Habitat Enhancement

In June 1997 an application was submitted for opencast fluorspar extraction to the north of Rowland. The area covered 2.5ha of mainly species-poor grassland and scrub, with occasional trees and patches of species-rich turf. The site was not of high archaeological importance.

It was considered that the ecological interest and landscape importance of the area could be improved by increasing the range of habitats and enhancing the interest of the existing vegetation. This would best be achieved by creating a site, followed-up by positive long-term management, which would have the potential to develop vegetation of ecological interest. Discussions took place with the applicant/mineral operator, the landowner and the tenant farmer over the creation of a small metalliferous habitat at the site. Restoration proposals and location plans were submitted and agreed.

The site was subsequently worked under several successive planning consents. The restoration of the site has included the formation of a metalliferous area from low-grade spar. A varied topography has been sought and the intention is to monitor this area to assess the establishment of species over time. A five-year aftercare provision allows for management of this area and the vein mineral processing company has offered to contribute to this research. Following the aftercare period, it is the intention that an agri-environment scheme agreement be pursued with the landowners to provide safeguard over the longer term. It remains to be seen what level of species diversity will develop and what time-scale will be required.

Fiery Dragon Mine - Agri-Environment Schemes: Challenges and Opportunities

Fiery Dragon Mine, Bonsall, was surveyed in 1997 and the high lead rake interest warranted prompt conservation action [15]. The farmer was initially reluctant to allow survey, having previously experienced what he considered to be less than positive contact with national agencies and the National Park Authority. However, after discussing the advantages and disadvantages of conservation agreements, he agreed to the survey. A discussion of the Countryside Stewardship Scheme highlighted typical issues encountered elsewhere:

- The annual payment would have been in the region of £220 per annum for ten years. The farmer considered this was an inadequate incentive when compared with the possible income from fluorspar, as a mining company was undertaking exploration drilling in the hillocks at the time of survey.
- The existing management regime on the lead rakes was considered to be entirely appropriate by the National Park Authority Senior Ecologist, as the plant interest needed relatively high levels of grazing. However, the Countryside Stewardship Scheme at the time required a grazing rate of 0.75 livestock units per hectare. This was a considerably lower level than existed on the farm. Therefore, it was considered that the Countryside Stewardship Scheme was not appropriate as it would be detrimental to the high ecological interest on the lead rakes. In addition, the landowner, who was running a

dairy enterprise, could not afford to reduce stocking levels to this degree on his mostly-improved block of grassland around the lead rakes.

Part of Fiery Dragon Mine, showing the species-rich sward, with fragrant orchids in the foreground (photographer Rebecca Penny, PDNPA).

An agreement within the National Park Authority's Farm Conservation Scheme was therefore discussed that allowed for the current ideal management and gave a more realistic economic return to the farmer. This Scheme allows for enhanced annual payment for the ecological and archaeological interest at small sites such as lead rakes.

Thus, the farmer was much happier to enter an agreement with the National Park Authority, which goes with the land should it be sold, because:

- The annual payment offered over ten years would be guaranteed income for the farming activity forgone.
- The existing management of the lead rakes was acceptable to both the farmer and the National Park Authority.
- Grant would be available for rebuilding walls in the agreement area at 80% of the cost or a £14 per metre fixed rate payment.

A ten-year agreement was successfully completed in the autumn of 1998. Without the ability to use the Authority's Farm Conservation Scheme this important site may have been lost to fluorspar extraction or agricultural improvement, and possibly both.

Summary

These examples have been chosen to illustrate something of the character of high quality sites that still survive and the challenges and opportunities that exist for their conservation. In order to allow this to happen effectively across the orefield, several issues must be addressed and these are the subjects of Chapter 7.

7: Future Conservation - Challenges and Opportunities

The Framework

Since 1996 the Lead Rakes Project has made significant progress in collecting data, identifying conservation priorities, liaising and negotiating with farmers, landowners and mineral operators to secure conservation. However, even within a National Park, an area of the highest landscape designation, losses continue.

The safeguards for lead mining remains are currently only partial: the majority of identified regionally and nationally important sites are not protected. While statutory designation, the planning process and voluntary co-operation through conservation agreements play an important part in conservation, there are constraints to their successful implementation. The current framework needs addressing and additional safeguards considering.

Key issues relating to the Peak District Biodiversity Action Plan, statutory designation, future data collection and research, agri-environment schemes, regulation and minerals planning are discussed below. In summary there is an urgent need to:

- Continue to implement the Peak District Lead Rakes Biodiversity Action Plan and meet archaeological and geological conservation targets.
- Recognise metalliferous communities as a National Biodiversity Action Plan priority habitat.
- Undertake further data collection and research over the whole orefield.
- Generate resources to continue the Lead Rakes Project and the promotion of the understanding and appreciation of lead mining remains.
- Review further statutory designation of important sites and encourage enhanced positive management of designated sites in an integrated way.
- Identify and implement appropriate mechanisms for the protection of historic landscape character.
- Ensure that future agri-environment schemes target all the important facets of the lead mining resource and introduce enhanced measures to make this possible.
- Seek changes to Environmental Impact Assessment and Waste Management regulations to facilitate their ability to protect all important lead mining sites and landscapes.
- Seek changes to Minerals Planning Guidance legislation to prevent unwarranted removal of the historic and wildlife resource.
- Develop policies to ensure the Inventories of 'Lead Mining Sites' and 'Landscapes' of special importance are adequately incorporated into the review of the National Park Management Plan and preparation of the Local Development Framework.

However, underlying these objectives for good conservation is the need to raise awareness of the importance and community ownership of the cultural heritage and local biodiversity of lead mining remains.

Promoting Understanding - Winning Hearts and Minds

A vital part of the sustainable conservation of the remains of the lead mining industry is the raising of awareness of the importance of this aspect of our heritage. The aim therefore is to encourage Peak District landowners, residents and visitors to value the tangible reminders of how mining helped shape local communities and the character of the land.

Sustainable conservation of lead mining remains will only be possible if people understand their value and treasure these important links with the past and appreciate the fascinating multi-faceted interest present today. Here, on Bonsall Moor, the mine historian Jim Rieuwerts passes on to fellow enthusiasts the intricacies of how buddles worked (photographer John Barnatt, PDNPA).

Many people are proud of their roots and the place where they live; this can be fostered and developed through further information. For many, the more they understand, the more they value what they see around them. In the recent-past lead mining sites have often been perceived as 'derelict land', unsightly relics of past industry that play no part in what is valued within the 'scenically beautiful' Peak District National Park. The National Park Authority itself once regarded such sites in this way, encouraging 'land restoration' rather than pursuing our current aim, which is their retention as a valuable part of landscape character.

While understandably farmers take pride in what is sometimes considered to be good farming practice, there is a need to encourage a different attitude towards lead mining remains - 'neatness' is not necessarily a virtue. What is vital is the conservation of the character of the landscape, including those all-embracing aspects that reflect the shaping of the land by people over several millennia.

Some farmers, land managers and mineral operators appreciate lead mining remains for their historic and ecological interest as well as for their family and community links to forebears in the industry. It is hoped that many others will also wish to retain lead mining features if their understanding of the importance of the mining sites is enhanced. Much can be achieved through promoting general interpretation of the resource and making this widely available. However, an important consideration

for landowners is also that conservation should be an economically viable, and ideally attractive, option.

In some instances on-site public interpretation of the remains may also have positive conservation value, both in terms of raising general interest and in prevention of damage. Ideally, a strategic approach to such interpretation should be adopted. In many instances health and safety issues need careful consideration before it is decided that site-specific promotion is appropriate.

People are naturally curious! They often have the urge to look down mine shafts, although this practice is not to be encouraged except in those instances where the shafts have been made safe (photographer Rebecca Penny, PDNPA).

Currently there is insufficient generally available information on the importance of lead mining sites for their contribution to the landscape character, cultural, social and industrial history, archaeology, ecology and geology of the region. The following actions need to be undertaken as a priority:

- ***Improve dissemination of information to generate positive conservation benefits.***

  Pride in place and the links between local communities and their industrial past are already part of the ethos of many of the villages in the orefield: this should be enhanced, both with local people and the broader community. Lead mining remains represent a living tradition and landscape that goes back 2000 years. The Lead Rakes Project seeks to disseminate information to as wide an audience as possible.

  The Lead Rakes Project has produced a leaflet to explain the importance of the lead mining remains to farmers. However, further media coverage of the issues, wider public and community engagement through creating display materials, talks, walks and the production of a range of publications should be pursued. Recent funding by the Aggregates Levy Sustainability Fund through Defra and English Heritage has enabled this report to be produced and the provision of further educational and interpretative material. Promoting appreciation and awareness of lead mining remains is seen as a high priority now and for the future.

- ***Organisations (and others) interested in the conservation of lead mining sites should act as advocates.***

  Contact with, and the co-operation of, other organisations has been fundamental in furthering the cause of lead mining heritage conservation. English Nature, English Heritage, Defra and its Rural Development Service, and the National Trust have all been involved in the progress of the Lead Rakes Project to date. Additionally, one of the most important factors in the success of the project to date is the personal contact with landowners, farmers, land managers and the minerals industry. These contacts must continue and be enhanced.

- ***Generate resources to facilitate further pro-active conservation of lead mining remains and to enable greater dissemination of interpretative and promotional information.***

  Further resources will need to be identified to achieve many of the future objectives for the conservation and promotion of the lead mining resource. These objectives would be facilitated by the continuance of the Lead Rakes Project and the expansion of its work both within and outside the National Park. The personal contact between the project and landowners, land managers and mineral operators in the survey areas has been mostly positive. Increasingly, farmers and other land managers appear to value the lead mining sites as part of their cultural history and for their wildlife value and do not wish to see them removed. This pro-active approach must continue.

- ***Continue to report to farmers and landowners on the ecological and archaeological interest of the lead mining remains surveyed.***

  Another part of the important contact between the Lead Rakes Project and the landowners and land managers has been the production of written reports outlining the interest found during the survey. It is essential to continue this positive method of feedback.

- ***Ensure important sites are highlighted to potential purchasers when land comes up for sale through the land charge process.***

  It is important that potential purchasers of land with sites in the 'Inventory of Sites' of special importance are made aware of these and the implications of any relevant designation or legislation. Information on statutory designation should be revealed in searches, but the full implication of other legislation such as the Environmental Impact Assessment (Agriculture) and Minerals Planning Guidance will help to inform the potential purchaser of the restrictions these will have on the land. It will also be useful to advise on the potential for positive environmental payments from agri-environment and other grant schemes.

- ***Continued liaison with the minerals industry is important to safeguard lead mining sites and landscapes of high conservation value.***

  There should be enhanced recognition of the conservation interest at lead mining sites and the constraints this places on working areas. Good practice in retaining areas of interest is a positive public relations exercise on the part of the minerals industry. Consultation should continue to take place with the minerals industry regarding conservation of important areas of lead mining interest.

- ***Continue to promote the sustainable economic benefits of conserving lead mining sites to landowners.***

  Conservation payments are an increasingly important part of land management economics, hence, features of conservation importance have a potential value to landowners which is lost if a site is destroyed. Furthermore, a diverse landscape rich in historic and wildlife interest is one that attracts income to the local economy through tourism. Specific opportunities may also arise through marketing opportunities linked to tourism, such as farm trails of 'conservation quality product' schemes.

Biodiversity Action Plans

The UK Biodiversity Action Plan (BAP) was published in 1994 and a Steering Group was set up to produce a series of national Habitat and Species Action Plans for priority habitats and species. It also recommended the production of Local Biodiversity Action Plans that have two main objectives:

1. To reflect and help to implement the national priorities identified in the national plan.
2. To identify and address local priorities and distinctiveness.

BAP National Targets - The metallophyte plant communities at lead mining sites are of recognised international importance in the European Union Habitats and Species Directive 1992 and the Habitats Regulations 1994. Therefore, it is regretted that the National Biodiversity Action Plan does not cover lead mining habitats specifically, although a number of Habitat Action Plans relate to these, notably those for lowland meadows, lowland acid grassland and lowland calcareous grassland.

Acting Locally - The Peak District Biodiversity Action Plan was produced in 2001 and the Peak District Biodiversity Partnership now guides its implementation and monitoring.

A separate action plan (Appendix G) for Lead Rakes was developed because of their significance in the Peak District, particularly for their metallophyte communities (termed 'calaminarian' grasslands) which are of very restricted distribution in Europe.

The Peak District Biodiversity Action Plan Vision Statement for Lead Rakes in the Peak District is:

"Perhaps more than any other habitat they are a vivid reflection of the rich resources provided by the geology of the Peak District, its use by mankind over the centuries and nature's response to the harsh environment of the abandoned mines. Today, less than 260ha of lead rakes remain. This is all that remains of not just the complex vegetation communities and their important plants but of the surface representation of the history of lead mining in the Peak District. A willingness by those responsible for their future to work together is fundamental: the farmers and landowners, the mineral companies and the Biodiversity partnership. With comprehensive knowledge as a basis, solutions can be found. These may at times involve compromise and understanding for all involved but with a shared vision to cherish the special history and wildlife of lead rakes these targets can surely be achieved."

The three objectives for the Lead Rakes Action Plan are to:

1. Bring all important 'lead rakes' in the Peak District into favourable condition.
2. Restore ecologically poor quality, overgrazed or neglected 'lead rakes' to favourable condition.
3. Create open metallophyte vegetation and species-rich grasslands on 'lead rakes' that are being re-worked for their mineral, to reverse the decline in these community types.

The Lead Rakes Action Plan has a set of 38 different 'actions'. A number of these actions are reiterated in this report (Chapter 8).

It is important to ensure the long-term conservation of the internationally and nationally important habitats at lead mining sites, as here at the species-rich hillocks at Whalfe Mine near Monyash, with the flowers of lady's bedstraw, burnet saxifrage and field scabious clearly visible in this photograph. The biological interest at this site is currently not protected by statutory designation (photographer Rebecca Penny, PDNPA).

One other important recommended action resulting from the work of the Lead Rakes Project is that:

- ***Consideration is given to including metalliferous communities as a National BAP Priority Habitat.***

  Although many of the habitats associated with lead mining sites are Priority Habitats under the National Biodiversity Action Plan, the metalliferous calaminarian grasslands are not. Given their recognised international importance under the EU Habitats Directive, their inclusion as a UK BAP Priority Habitat would help ensure adequate priority is given nationally to their conservation and recognise their importance for the purpose of implementing the EIA Regulations (see below).

Further Data Collection and Research

There is still insufficient information on lead mining sites and their contribution to the archaeology, ecology and geology of the region. All aspects of the resource need further research after data collection, to give a deeper understanding of the complex ecological habitats and the interpretation of archaeological and geological features. This will ensure that previously unrecognised high-priority elements of the resource have been identified. The following actions are priorities:

- ***Completion of the detailed ecological survey of the whole orefield.***

  Experience to date of mostly positive contact with farmers and landowners has shown few blockages to achieving the completed survey other than time and resources. A complete picture of the whole of the orefield is essential to provide further information of the relative ecological importance of lead mining remains in the Peak District. The information produced is essential to prioritise conservation action in the orefield.

- ***Specialist surveys of other nature conservation interests.***

  The wider potential interests of the lead mining remains need to be explored. In particular those for which there is little or no existing information, including lichens, invertebrates, bryophytes and fungi at surface and bats underground.

- ***Detailed archaeological survey of sites listed in the Inventory.***

  This is required to create a detailed record of sites in the Inventory and to enhance understanding. This is essential in order to prioritise conservation action within the orefield and to monitor the condition of the lead mining remains in the future.

- ***A geological/mineralogical survey.***

  To date the geological/mineralogical interest across the orefield as a whole has not been systematically explored. A specialist assessment of this interest would enable further understanding of the resource and inform prioritisation for conservation.

- ***Review the Inventory of Regionally and Nationally Important Lead Mining Sites as and when new data becomes available.***

  As new data collection and research are completed there will be a need to update the Inventory to incorporate newly identified high-priority sites.

- ***Information and guidance needs to be made available to landowners/managers and conservation organisation staff on lead mining features and communities together with their conservation/ restoration.***

  It is essential to share all lessons learnt from research and data collection with all interested bodies. This will help to inform and provide a consistent approach to the conservation-management and restoration of lead mining features.

Statutory Designation

As shown in Chapter 5 some lead mining sites are already afforded varying degrees of permanent protection as candidate Special Areas of Conservation (cSACs), Sites of Special Scientific Interest (SSSIs), Scheduled Monuments (SMs) and Listed Buildings, reflecting their national and international importance (Appendices H and I). Although some sites are protected by designation, there are also many other lead mining sites and landscapes of high conservation importance that are not protected in this way. These need some form of protection to ensure that a fully representative sample of the remaining ecological, geological and archaeological resource is safeguarded and managed sustainably for the future; in some cases this could be addressed by statutory designation. There is also a need to improve how currently designated sites are protected. The following actions need to be considered:

- ***New statutory designations.***

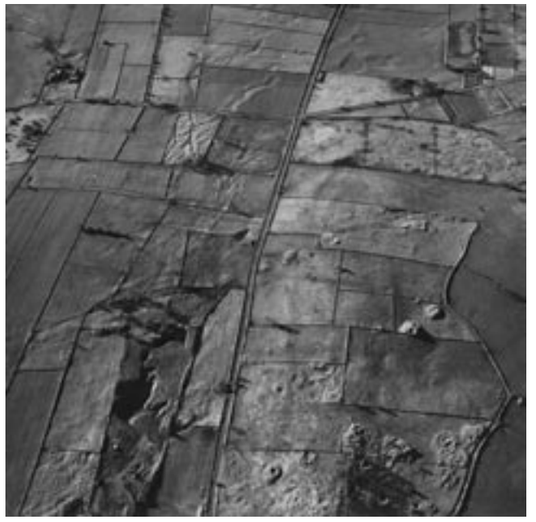
  Agri-environment schemes only protect lead mining sites for a finite period of time. Thus, statutory designation is the only long-term guarantee of protection for these. Further potential cSACs, SSSIs and SMs should be identified and designation considered. In addition, certain SSSIs should be considered for re-notification if important lead mining habitats are present but are not part of the declared interest of the site. Also, important lead mining habitats should be added as 'interest features' to appropriate SSSIs if they are not already listed.

- ***Appropriate mechanisms for conserving the character of historic landscapes need to be developed and implemented.***

  English Heritage has recognised that statutory designation does not lend itself adequately to conserving the character of historic landscapes [25, 31, 32]. This issue is currently being considered as part of the Department for Culture, Media and Sport's consultation "Protecting our Historic Environment: Making the System Work Better" [29]. The specific question is asked of consultees whether they consider powers at national level to designate areas of historic importance are necessary and what might it add to the present conservation area designation. Although the National Park Authority already has powers to use the Planning (Listed Buildings and Conservation Areas) Act 1990 to designate rural Conservation Areas, it has not yet implemented this as a measure to conserve historic landscapes. However, a precedent has been set in other parts of Derbyshire where there are currently three Conservation Areas that are not focused on settlements.

This fine lead mining landscape is at Hard and Glead Rakes between Sheldon and Monyash. That part in the background was purchased by the National Park Authority when the opportunity arose, to ensure the survival of the mining remains and their important ecological interest. The central area currently has no formal protection, while unfortunately some of the hillocks in the foreground have recently been lost (Derrick Riley collection).

In contrast with the last photograph, some mining landscapes have suffered significant losses, as here above Winster. To the left there is a modern opencast working while behind the sites of near-removed hillocks can be traced. To the right there is a small area of well-preserved remains in the foreground, while behind only intermittent hillocks survive of once much more extensive remains (National Monuments Record/English Heritage).



- ***Positive attitudes to statutory designation need to be fostered and sustained amongst land managers.***

  Many land managers view statutory designation negatively; better links and mutual understanding with land managers should be fostered. Many land managers think that all archaeological and ecological sites may be designated. This perception is often a hindrance to positive conservation initiatives: ways of addressing this mistaken belief should be explored. Understanding needs to be established that it is only the nationally important sites that are eligible for statutory designation.

- ***The National Park Authority, English Nature and English Heritage need to review their various financial incentives for the conservation management of designated sites, and to identify opportunities for a more integrated approach to the delivery of incentives.***

  Payments by English Nature for the management of some candidate Special Areas of Conservation and Sites of Special Scientific Interest on the lead mining remains have helped to foster a better relationship with land managers, as well as providing the opportunity to enhance the management of the sites to meet conservation objectives. However, there is a need for all three organisations to review their financial incentives for the conservation management of designated sites to foster a more integrated approach.

- ***Where appropriate, the statutory designation of subterranean mining remains of national archaeological importance needs to be progressed.***

  Mining sites that have been designated as Scheduled Monuments because of the archaeological importance of the surface workings do not necessarily include all of the related below-ground interest; only the land immediately beneath the designated surface area is included. There is also a significant number of sites that are of great archaeological importance because of the underground components rather than the surface remains. These have yet to be formally assessed for

Underground archaeological mining features are often of great significance, as here at the Ecton Mines near Warslow, where there is a massive gin engine chamber. In most instances these are offered no protection by statutory designation, the exceptions being by default, where the surface above happens to be scheduled for above-ground features (© Paul Deakin).

designation. Protection in this way would facilitate the general recognition of historic underground workings as a valuable part of our heritage.

Agri-Environment Schemes

Critical to the successful management and retention of lead mining remains is the future of agriculture and the agri-environment schemes that enable land managers to achieve conservation. The intended reform of the Common Agricultural Policy (CAP) is designed to promote and support integrated rural development [13]. Following the reform of the CAP, the new Single Payment Scheme will be introduced in 2005. This will be explicitly linked to compliance with European Union standards covering the environment, public and animal health, animal welfare and maintaining land in 'good agricultural and environmental condition'.

There are two key measures that can contribute to the sustainable management and conservation of lead mining remains:

1. Agri-environment schemes, including the proposed Environmental Stewardship Scheme (consisting of an Entry Level Scheme and a Higher Level Scheme) [27].
2. The reform of CAP to include greater environmental cross-compliance attached to subsidies and payments.

Most lead rake surface remains are on actively used agricultural land, as here on Bonsall Moor. More effective ways to help farmers manage these sites sympathetically need to be explored (photographer Sarah Frith, PDNPA).

As these new schemes and regulations are developed and introduced, continued lobbying will be essential to seek the changes that are needed to enable farmers and landowners to conserve lead mining sites in a sustainable manner. There is a need to:

- ***Target the importance of lead mining remains within agri-environment schemes locally and regionally, and highlight their significance at a national level.***

  Lead mining remains are currently a priority for conservation within the White Peak target area for the Countryside Stewardship Scheme. It is essential that they continue as a priority target in any new agri-environment schemes.

- ***Provide resources for comprehensive environmental audits, by suitably trained professionals, that recognise specific lead mining features and habitats.***

  Agri-environment schemes may not provide adequate protection for specific lead mining features if they are not recorded in the environmental audit for the agreement; some of the rarest and most valuable are not immediately obvious and are difficult to recognise without professional knowledge. If the landowner or manager is not aware of these important features they cannot be adequately safeguarded even within an agri-environment scheme.

- ***Consider compulsory protection and positive management within the schemes for areas of identified interest such as lead mining remains.***

  Within the existing Countryside Stewardship Scheme there are two levels of environmental protection. The first is an annual management payment to the land manager for areas managed to a set of specific prescriptions, such as a traditional hay meadow. The second is the cross-compliance, which is contained within the legal part of the agreement covering the protection of historic and natural features identified on the farm but for which there is no annual payment. Currently, areas of ecological interest not entered into the land management annual payment part of the scheme are not specifically protected by the cross-compliance and thus could still be lost. It is therefore essential that new agri-environment schemes take a whole farm approach to the conservation of environmental features.

- ***Consider special payments for lead mining remains which would encourage a higher uptake for these within any agri-environment scheme.***

  Lead mining sites are often small but very important for their ecological and archaeological interest. The area payment rates for Countryside Stewardship have not provided enough incentive in the past for land managers with lead mining remains to join the scheme. For the proposed Higher Level Environmental Stewardship Scheme the Government is considering allowing each region to be able to use a proportion of its budget to 'top-up' or enhance payments on certain items viewed as a regional priority. This extra new regional flexibility would enable the schemes to better reflect local environmental priorities such as lead mining sites.

- ***Review prescriptions to give flexible site-specific measures.***

  Currently the national 'prescription-sets' within the Countryside Stewardship Scheme are often not ideal for the continued positive management of lead mining remains. If local flexibility is introduced into the new schemes this will allow site-specific measures to be negotiated to the benefit of such features. This approach should be supported.

- ***Highlight the archaeological importance of lead mining features within any agri-environment scheme.***

  The archaeological interest of lead mining sites in the current Countryside Stewardship Scheme is normally only protected by the terms of cross-compliance. These measures mean that archaeological interest can be undervalued because there is not a linked annual payment. Under the current agri-environment review Defra has acknowledged that a higher profile must be given to the historic environment in the new schemes. This development is welcomed and should help resolve this issue.

  However, the European Union's Rural Development Regulation (RDR) requirement for calculating payments is still based on income forgone and thus archaeological interests cannot be properly reflected, as the best management of this aspect of the resource is normally to make no change to the farming regime. Therefore, reform of the RDR would be needed to fully resolve this issue.

- ***Continue to negotiate appropriate agreements with landowners/managers for all important lead mining sites.***

  Work will continue to prioritise and negotiate agri-environment agreements on lead mining sites at risk and those on holdings where survey has been undertaken.

- ***Review existing agri-environment agreements that include unprotected lead mining remains and consider the opportunities for amending the agreement to include them.***

Environmental Impact Assessment (Agriculture) and Waste Management Regulations

Agricultural damage or removal of lead mining remains often takes place before conservation bodies are aware that such work is intended. Ways of improving communication and regulations, which will minimise losses and facilitate negotiation of a greater number of conservation agreements, needs to be investigated.

Environmental Impact (Uncultivated land and Semi-natural areas) (England) Regulations 2001 - Introduced in 2002, the Environmental Impact Assessment Regulations (EIA) [28] gives the opportunity for Defra to assess the environmental impact of agricultural improvement projects that may cause damage to environmental features and habitats. In principle, this should safeguard many lead mining remains from being 'improved' for perceived agricultural advantages. However, the regulation safeguards only apply to those areas that support existing unimproved grassland/semi-improved grassland with less than 25% rye grass/white clover. They do not protect those areas with semi-improved grassland with more than 25% rye grass/white clover or only an archaeological interest. Therefore, in many cases the EIA Regulations do not apply and lead mining sites can be removed or levelled without any notification to interested parties such as the National Park Authority.

The following changes to the EIA Regulations and their implementation are recommended to overcome this:

- ***Uncultivated land and semi-natural areas should be re-defined within the regulations to include archaeological and historical features where floristic interest is not present.***

  The EIA process is designed to ensure that the effects of a project on land with particular environmental importance are taken into account before work can begin. The procedures that involve 'environmental statements' only apply where a proposed operation to bring uncultivated land or semi-natural areas into intensive agricultural use would be likely to have significant effects on the environment. Currently this does not take into account sites where there is only an historic/archaeological interest or where the grassland is considered agriculturally improved. It is essential that the historic environment is given equal weighting to the natural environment.

- ***Communication between all interested conservation bodies, farmers and Defra needs to be improved to forge better links and understanding of the regulations.***

  There continues to be a risk of loss of, or damage to, lead mining remains because of agricultural improvement done in ignorance of the EIA regulations. The National Park Authority has been working in conjunction with Defra to inform land managers and raise general awareness of these new regulations.

- ***Ensure that the importance of specific lead mining remains is recognised by Defra when assessing the significance of sites for EIA purposes.***

  Liaison must continue to ensure that information is exchanged with Defra on a case-by-case basis.

Waste Management Licensing Regulations 1994 - The following change is recommended:

- ***Seek reform of the regulations to improve control over the spreading of waste material, such as paper pulp, as a soil conditioner within National Parks.***

  Currently waste material that is considered to be a soil conditioner can be spread on agricultural land with few restrictions. The only requirement is that the land manager notifies the Environment Agency of the amount and location of spreading. In the Peak District this relatively uncontrolled spreading of paper pulp has led to the loss of at least one lead mining site of importance. Tighter control in the form of a formal notification and approval would enable sites of importance to be identified that must be avoided by such spreading. At the time of writing the National Park Authority has a voluntary notification arrangement with the Environment Agency and the contractors who undertake the spreading. This could end at any time and further sites could be lost to the spreading of paper waste. To make any new regulation enforceable it should bring

with it penalties for damaging any sites of importance. Amendments to the Waste Management Regulations are proposed by Defra which seek to improve and tighten the current regulatory controls.

Waste Management Regulations 2004 (Agriculture): Consultation Document - An estimated 300,000 tonnes of non-natural wastes are created on farms in England and Wales each year. These include a wide range of waste packaging, silage bags, metal, tyres, plastics and building waste. Until now farmers have been able to dispose of such waste at lead mining sites without regulation.

- ***Tipping of farm waste at lead mining sites has long been an issue. In 2004 new regulations are to be introduced that will extend waste management controls to agriculture, and this should help to reduce the problem.***

  A Government consultation paper is to be produced in early 2004. Lead Rakes Project partners will comment on the draft consultation, as well as make farmers and landowners aware of the consultation paper and remind them of their right to comment.

Unfortunately lead mining opencuts and hollows amongst hillocks are sometimes still seen as convenient dumping places for farm rubbish (photographer Jon Humble, English Heritage).

Minerals Planning Legislation and Planning Guidance

The mining industry is one of the oldest in the National Park second only to farming. The removal of lead mining remains for their mineral content can be dealt with in the planning process in two ways:

1. Opencast and underground extraction is development requiring planning permission under the Town and Country Planning Act 1990.
2. Exploration works or removal of surface hillocks is covered by the Town and Country Planning (General Permitted Development) Order 1995 (hereafter GPDO).

A planning application allows proper assessment and consultation and if permission is granted it is implemented with conditions. A prior notification under the GPDO procedure just for mineral removal need be made only 28 days before work is due to commence.

If the National Park Authority considers that a GPDO proposal would be damaging to the acknowledged interests of the National Park, it can serve Directions which require the submission of a planning application (Appendix J). An Article 7 Direction takes effect immediately although the Secretary of State has up to 28 days to disallow it. Under Article 7, whilst the mineral cannot be taken off site, it does not prevent the hillocks being disturbed or levelled for agricultural purposes. An Article 4 Direction deals with disturbance for agricultural purposes but this does not come into effect until confirmed by the Secretary of State by which time the hillocks may have been lost, as happened in the Elton case (Chapter 6).

If the subsequent planning application is refused or is subject to conditions, then the Authority may be liable to pay compensation based on the estimated loss of the value of the mineral or improvements to the agricultural value of the land; this cost to the Authority could be prohibitive in most of, if not all, proposals involving the removal of lead mining hillocks.

For development that is considered to have a significant environmental effect which would require an Environmental Impact Assessment under the Town & Country Planning (Environmental Impact Assessment) (England and Wales) Regulations (1999), permitted development rights under the GPDO, under Part 23 (covering removal of material from a mineral working deposit), are effectively withdrawn.

As a result of the cases such as those discussed in Chapter 6, consideration should be given to the following changes to planning legislation affecting mineral removal and planning to help ensure the future of lead mining sites:

- ***Restrict the removal of historic mineral-working remains within sensitive areas such as National Parks under Part 23 of the GPDO.***

  This change to legislation in 'sensitive areas' would safeguard historical deposits such as lead mining sites, including those where working occurred sufficiently long ago that it has become a feature of interest. The Government is currently reviewing the GPDO.

- ***Within National Parks, remove the requirement for Secretary of State approval for Article 4 Directions where a rapid response is needed, together with the possible removal of the right to compensation when permission is refused for development following the issuing of an Article 4 Direction.***

  Important lead mining sites could be destroyed before the Article 4 Directions come into effect. These remains will be at continued risk of working wherever and whenever there is a risk of compensation being payable. However, the right of appeal against the decision should be maintained.

- ***Identify funding to allow Minerals Planning Authorities to pay any necessary compensation that would result from refusal of planning applications after Article 7 Directions have been served.***

  Currently Minerals Planning Authorities would have potential difficulties finding the funds to pay compensation, particularly for large sites where this would be prohibitive.

- ***Wherever possible, restoration following minerals working should include re-establishment of appropriate vegetation communities.***

  Planning conditions would require the land to be reinstated to a former use if appropriate. This may include the re-establishment of metalliferous habitats. However, as discussed in Chapter 3, there are problems with restoring the full complexity and richness of former communities.

- ***Further research and experimentation is required into the techniques for re-creation of the plant communities on lead mining sites where these have been damaged. There is a need to clarify the relationships between the vegetation and the physical and chemical characteristics of the lead mining hillocks.***

  Current research suggests that once an historic lead mining site is lost to either agricultural improvement or to re-working for the mineral content, the unique complexity and resource for recolonisation is lost forever. Re-creation is only partially possible. The intricacies of the plant communities need time and a local seed source to develop. Future experimentation and research may identify ways that will enable the ecological intricacies of lead mining hillocks to be re-created and expanded more effectively.

  It is important to note here that from the archaeological perspective once a site has been damaged or removed the interest cannot be re-created or restored.

- ***Requirement for long-term management beyond the aftercare period for habitat re-creation.***

  The aftercare period under current Minerals Planning Guidance covers the five years following completion of restoration to allow for replanting, reseeding etc. Restoration for nature conservation and in particular habitat re-creation has ongoing management requirements and a period of significantly more than five years would be appropriate. Whilst voluntary agreements to extend the five-year period might be considered, these need to be encouraged by management guidelines.

- ***Prior 28 day notification to be required under Part 6 of the GPDO engineering operations and excavations within the National Park.***

  This would help tackle the problem of unregulated tipping, levelling and filling of lead mining sites where often the damage has occurred before action can be taken to conserve a site. These suggested prior notifications should also be subject to a nominal fee and accompanied by a plan and description of the proposal with accompanying documentation demonstrating that these works are reasonably necessary for the purposes of agriculture. The notifications would not be valid until all this relevant information has been submitted and would have a six-month time limit to encourage completion.

- ***A review is needed of the Permitted Development Rights (PDR) that currently allow potentially damaging activities, such as motor-sport, for 14 days a year.***

  Currently, some areas of lead mining sites are used as motorcycle and 4x4 motor-sport tracks, leading to damage to the hillocks, their vegetation and a visual eyesore. This is allowed as part of the PDR up to 14 days a year, during which time a great deal of damage can occur to the landscape and the archaeological and ecological interest of lead mining sites. Greater control of such uses is essential to conserve sites of importance and only allow this type of activity where no such damage could occur.

- ***Where lead mining sites are the subject of applications that require planning permission the National Park Authority will continue, where appropriate, to require pre-determination archaeological evaluation of the resource. Methods of recording underground lead mining remains will also be explored.***

  It is assumed that for parts of the orefield outside the National Park similar arrangements will also continue. No attempt has been made to date in the Peak District to make adequate record of underground workings at risk; health and safety considerations are paramount here and ways of assessing these in safety, using people with necessary specialist skills, need to be explored.

- ***Where it is considered that a GPDO proposal will require the submission of a planning application, the Minerals Planning Authority should not be liable to pay compensation for the cost to the operator of any necessary archaeological recording that may be required as a condition of permission.***

  With general planning applications the cost of evaluation of the archaeological resource is met by the developer; Minerals Planning Guidance should be changed to be consistent with this general principle.

- ***During the review of the National Park Management Plan and the preparation of the Local Development Framework consideration should be given to enhancing the existing policy guidance for the regional and local protection of lead mining remains.***

  Landscape features, archaeological sites and sites of nature conservation interest within the National Park are already covered by Structure Plan policies C2, C8, C10, C11 and C13, as well as by the Local Plan policies LC16, LC17, LC19 and LC20. The Inventories of 'Important Lead Mining Sites' and 'Lead Mining Landscapes' will provide the relevant information and justification for presumption against development of those sites. However, during the review of the Management Plan and the preparation of the Local Development Framework over the next three years we need to consider enhancing policy for the protection of lead mining remains.

All of the above issues which need resolution are brought together in an Action Plan presented in the next chapter. This clarifies and prioritises future action to conserve lead mining remains in the Peak District.

8: Lead Rakes for the Future - The Way Ahead

The Importance of the Lead Mining Resource - Action Before it is Too Late

Lead mining remains in the Peak District are a nationally and indeed for some aspects an internationally important resource and make a significant contribution to the historic landscape character of the region. They contain many important archaeological and historical features that provide physical evidence of 2000 years of mining. They also support a range of unique plant communities that have developed a complexity that is not seen in other grasslands. All these interests are in danger of being lost if they are not protected further.

This report highlights that lead mining remains are the category of archaeological feature most at risk within the region. Similarly, the ecological interest would often be lost if mining hillocks were removed. Only a quarter of lead mining surface remains once present now survive in reasonable condition and of those, the majority are currently unprotected. The Inventory of Regionally and Nationally Important Lead Mining Sites lists just those sites of high conservation importance; even with these only a minority are protected by statutory designation.

One result of the work undertaken through the Lead Rakes Project has been recognition that without changes to the way some agri-environment schemes are structured, and changes to the ways in which the planning system can be implemented more effectively, neither are adequate conservation mechanisms for safeguarding lead mining features.

Thus, there is an identified need for changes in perspective and legislation, at national, regional and local levels, to make possible the effective sustainable management of this important facet of the Peak District's character. Positive action must be taken now or a wide range of unique ecological and archaeological sites could be lost forever.

This report shows that the principal reasons for the losses are agricultural improvement and mineral extraction. Despite efforts to highlight the conservation importance of lead mining remains, the Lead Rakes Project has only made some gains in negotiating conservation agreements to date. Positive contacts with farmers, landowners and the minerals industry have been achieved and links with local communities have been fostered. However, statutory designation and voluntary conservation agreements have so far failed to halt the decline in condition and the continued losses of these nationally and internationally important habitats and regionally and nationally important historic features. There is an urgent need to do more before it is too late.

The long-term conservation of lead mining remains needs to be sustainable. There is a strong need to promote understanding and co-operation between all those involved in their management. The landscape should not be fossilised, sustainability is about acknowledging both conservation and the livelihoods of those who live off the land, as well as providing a living landscape for people to visit and enjoy (which itself contributes economic benefits). The continued active management of lead mining remains by the local farming community is vital to the survival of these special features.

Planning for Future Sustainable Conservation - Recommendations for Further Action

The key to any successful and well-formulated conservation strategy is an adequate audit of the resource and the identification of priority sites for conservation. 'Lead Mining Landscapes' important to landscape character have been identified. The whole orefield has been assessed archaeologically and it is believed that the majority of important sites have been identified and included in the 'Inventory of Sites' presented in this report. As yet only two-thirds of the ecological assessment of the orefield has been carried out. Where currently known, ecological Category A sites have been added to the Inventory and thus this is also a strong indicator of known ecological importance. This Inventory will be reviewed and updated as the ecological survey of the orefield continues, when geological survey is undertaken and as more archaeological discoveries occur. Every effort will be made to ensure the sustained conservation at all the 195 currently identified 'Regionally and Nationally Important Lead Mining Sites' (and at other sites added after further assessment) and the eleven 'Lead Mining Landscapes'. Action is being prioritised through the Inventories, which target those sites of greatest known interest.

In recent years the conservation of some lead mining remains has been assured or facilitated by the work of national agencies and other organisations. However, there is a great need for further conservation of these in the Peak District. While some of the lead mining remains within the Inventories of 'Important Lead Mining Sites' and 'Landscapes' are protected by statutory designation, a significant proportion is not. As part of a desire to redress this, some progress has been made over the last seven years, through pro-active work by the National Park Authority, resulting in some mining sites being placed in agri-environment schemes. However, in some respects this has been an uphill struggle. This is due, as has been shown in Chapter 7, to a series of specific issues, the resolution of which would offer greatly enhanced opportunities for sustained conservation of the resource.

Many lead rake sites are of high conservation interest but have no formal long-term protection, as here at White Rake near Wardlow where the ecologically important swathe contrasts with the improved grassland immediately to either side. Conservation initiatives are vital if such sites are to be conserved for future generations (photographer John Barnatt, PDNPA).

Conservation Action Plan for Lead Mining Remains

This report has focused on the plight of lead mining remains in the early 21st century; they will continue to be lost, damaged or neglected if nothing is done. To this end a list of 'Action Points' has been compiled to help achieve a focused approach and as a way of measuring progress. These actions have all arisen from the experiences of the Lead Rakes Project as detailed in Chapters 4 to 7 of this report. Acting to resolve the issues raised will support the goals and initiatives set out in the Peak District Biodiversity Action Plan and the priorities for historic landscape character and archaeological conservation. We hope this report will influence the local, regional and national bodies responsible for the implementation of legislation, regulation and agri-environment schemes relating to the sustainable conservation of lead mining remains, leading to introduction of changes to facilitate our aims.

The following abbreviations apply to the Action Plan table:

BAP	Biodiversity Action Plan
CoAg	Countryside Agency
DCA	Derbyshire Caving Association
DCC	Derbyshire County Council
Defra	Department for Environment, Food and Rural Affairs
DWT	Derbyshire Wildlife Trust
EA	Environment Agency
EH	English Heritage
EN	English Nature
EU	European Union
FWAG	Farming and Wildlife Advisory Group
LAs	Local Authorities
LRP	Lead Rakes Project, a partnership of the Peak District National Park Authority, English Heritage and English Nature
ODPM	Office of the Deputy Prime Minister
PDMHS	Peak District Mines Historical Society
PDNPA	Peak District National Park Authority
RIGGSG	Regionally Important Geological and Geomorphological Sites Group

The identified lead agencies and potential partners include those working within the National Park and also those for the parts of the orefield beyond its boundary.

Where organisations are referred to in parentheses in the table they have a potential role advocating these proposed changes in conjunction with the lead agencies.

The code beginning 'LR' in parentheses after some of the actions is a cross reference to the Action Plan number in the Peak District Lead Rakes BAP [43].

Actions	Timescale	
	Short 0-2 years Medium 3-5 years Long 6 plus years	Lead Agency and Potential Partners
1. Promoting Understanding - Winning Hearts and Minds		
• Improve dissemination of information to generate positive conservation benefits. (LR14)	Continuing	LRP CoAg, DCA, Defra, DWT, EA, LAs, PDMHS, RIGGSG
• Organisations (and others) interested in the conservation of lead mining sites should act as advocates.	Continuing	LRP CoAg, DCA, Defra, DWT, EA, LAs, PDMHS, RIGGSG
• Generate resources to facilitate further proactive conservation of lead mining remains and to enable greater dissemination of interpretative and promotional information. (LR15)	Short/Medium	LRP CoAg, Defra, DWT, EA, LAs
• Continue to report to farmers and landowners on the ecological and archaeological interest of the lead mining remains surveyed. (LR17)	Short/Medium	LRP DCC, Defra, DWT
• Ensure important sites are highlighted to potential purchasers when land comes up for sale through the land charge process.	Continuing	LRP LAs
• Continued liaison with the minerals industry is important to safeguard lead mining sites and landscapes of high conservation value.	Continuing	LRP DCC
• Continue to promote the sustainable economic benefits of conserving lead mining sites to landowners.	Continuing	LRP Defra

Actions	Timescale Short 0-2 years Medium 3-5 years Long 6 plus years	Lead Agency and Potential Partners
2. Biodiversity Action Plans (BAPs)		
• Consideration is given to including metalliferous communities as a National BAP Priority Habitat.	Short/Medium	Defra (LRP)
3. Further Data Collection and Research		
• Completion of the detailed ecological survey of the whole orefield. (LR4)	Short/Medium	LRP DWT
• Specialist surveys of other nature conservation interests.	Medium	LRP DWT
• Detailed archaeological survey of sites listed in the Inventory.	Medium	LRP
• A geological/mineralogical survey.	Medium	LRP
• Review the Inventory of Regionally and Nationally Important Lead Mining Sites as and when new data becomes available.	Medium/Long	LRP DWT, PDMHS, RIGGSG
• Information and guidance needs to be made available to landowners/managers and conservation organisation staff on lead mining features and communities together with their conservation/restoration. (LR16)	Continuing	LRP DWT
4. Statutory Designation		
• New statutory designations. For SMs: For cSACs/SSSIs on completion of the ecological assessment of the orefield by 2007:	Short/Medium Medium	EH (LRP) EN (LRP)
• Appropriate mechanisms for conserving the character of historic landscapes need to be developed and implemented.	Medium	CoAg, EH, PDNPA, LAs (LRP)
• Positive attitudes to statutory designation need to be fostered and sustained amongst land managers.	Continuing	LRP
• The National Park Authority, English Nature and English Heritage need to review their various financial incentives for the conservation management of designated sites, and to identify opportunities for a more integrated approach to the delivery of incentives.	Short	EH, EN, PDNPA EU (LRP)
• Where appropriate, the statutory designation of subterranean mining remains of national archaeological importance needs to be progressed.	Medium	EH (LRP, PDMHS, DCA)
5. Agri-Environment Schemes		
• Target the importance of lead mining remains within agri-environment schemes locally and regionally, and highlight their significance at a national level. (LR21)	Short	Defra
• Provide resources for comprehensive environmental audits, by suitably trained professionals, that recognise specific lead mining features and habitats. ▲	Short	Defra, FWAG, PDNPA (LRP)

Actions	Timescale Short 0-2 years Medium 3-5 years Long 6 plus years	Lead Agency and Potential Partners
• Consider compulsory protection and positive management within the schemes for areas of identified interest such as lead mining remains. ▲	Short	Defra, EU (LRP)
• Consider special payments for lead mining remains which would encourage a higher uptake for these within any agri-environment scheme. (LR21)	Short	Defra, EU (LRP)
• Review prescriptions to give flexible site-specific measures. (LR21) ▲	Short	Defra, EU (LRP)
• Highlight the archaeological importance of lead mining features within any agri-environment scheme.	Short	Defra, EU (LRP)
• Continue to negotiate appropriate agreements with landowners/managers for all important lead mining sites. (LR23)	Continuing	LRP Defra, FWAG
• Review existing agri-environment agreements that include unprotected lead mining remains and consider the opportunities for amending the agreement to include them. (LR25)	Continuing	LRP Defra, FWAG

▲ *These actions may already have been addressed by the proposed Environmental Stewardship Scheme by the time this report is published.*

6. Environmental Impact Assessment (Agriculture) and Waste Management Regulations

Environmental Impact (Uncultivated land and Semi-natural areas) (England) Regulations 2001 (EIA)

• Uncultivated land and semi-natural areas should be re-defined within the regulations to include archaeological and historical features where floristic interest is not present.	Short	Defra (LRP)
• Communication between all interested conservation bodies, farmers and Defra needs to be improved to forge better links and understanding of the regulations.	Medium	LRP Defra
• Ensure that the importance of specific lead mining remains is recognised by Defra when assessing the significance of sites for EIA purposes.	Short	LRP Defra
Waste Management Licensing Regulations 1994		
• Seek reform of the regulations to improve control over the spreading of waste material, such as paper pulp, as an agricultural soil conditioner within National Parks.	Short	Defra, EA (LRP)
Waste Management Regulations 2004 (Agriculture)		
• Tipping of farm waste at lead mining sites has long been an issue. In 2004 new regulations are to be introduced that will extend waste management controls to agriculture and this should help to reduce the problem.	Short	Defra (LRP)

7. Minerals Planning Legislation and Planning Guidance

• Restrict the removal of historic mineral-working remains within sensitive areas such as National Parks under Part 23 of the GPDO.	Short	ODPM (PDNPA, LAs)
• Within National Parks, remove the requirement for Secretary of State approval for Article 4 Directions where a rapid response is needed, together with the possible removal of the right to compensation when permission is refused for development following the issuing of an Article 4 Direction.	Short	ODPM (PDNPA, LAs)

Actions	Timescale	
	Short 0-2 years Medium 3-5 years Long 6 plus years	Lead Agency and Potential Partners
• Identify funding to allow Minerals Planning Authorities to pay any necessary compensation that would result from refusal of planning applications after Article 7 Directions have been served.	Short	ODPM (PDNPA, LAs)
• Wherever possible, restoration following minerals working should include re-establishment of appropriate vegetation communities.	Short	PDNPA, LAs ODPM
• Further research and experimentation is required into the techniques for re-creation of the plant communities on lead mining sites where these have been damaged. There is a need to clarify the relationships between the vegetation and the physical and chemical characteristics of the lead mining hillocks.	Long	LRP
• Requirement for long-term management beyond the aftercare period for habitat re-creation.	Short	ODPM (PDNPA, LAs)
• Prior 28 day notification to be required under Part 6 of the GPDO engineering operations and excavations within the National Park.	Short	ODPM (PDNPA, LAs)
• A review is needed of the Permitted Development Rights that currently allow potentially damaging activities, such as motor-sport, for 14 days a year.	Medium	ODPM (PDNPA, LAs)
• Where lead mining sites are the subject of applications that require planning permission the Authority will continue, where appropriate, to request pre-determination archaeological evaluation of the resource. Methods of recording underground lead mining remains will also be explored.	Continuing	PDNPA, LAs
• Where it is considered that a GPDO proposal will require the submission of a planning application, the Authority should not be liable to pay compensation for the cost to the operator of any necessary archaeological recording that may be required as a condition of permission.	Continuing	ODPM (PDNPA, LAs)
• During the review of the National Park Management Plan and the preparation of the Local Development Framework consideration should be given to enhancing the existing policy guidance for the regional and local protection of lead mining remains.	Medium	PDNPA

The Lead Legacy

This report has endeavoured to highlight the special role of lead mining in the history of the Peak District and the significant legacy this once important industry has left on the Peak District of today. It is impossible to look across the Peak District landscape without being reminded of the centuries of mining activity, reflected in settlements such as Bradwell and Winster, in features such as engine houses and gin circles, in traditions such as the Barmote Courts and most of all in the characteristic evidence of old workings that criss-cross the landscape.

The lead mining remains support intricate and complex grassland communities. 'Nature's response' to the harsh environment of the abandoned mines is in itself a rich resource for biodiversity.

These features of high conservation value are irreplaceable. If we do not act now and sites continue to be lost, then a significant element of the historic landscape and the biodiversity of the Peak District will have been lost forever. We hope that this report will play a part in ensuring that what remains will be present for future generations to appreciate.

A positive change in attitude and conservation practice, which recognises and supports our aims, is already under way but needs developing further and this report raises awareness of the challenges for the future. We must continue to work with organisations and local communities to ensure that prospects for the Peak District's lead mining heritage are assured.

'The gunpowder shotholes were this long'
a guided party visiting the opencuts at Dirtlow Rake near Castleton. It is important that people are informed and enthused about the importance of lead rakes and the many aspects of interest here (photographer Rebecca Penny, PDNPA).

the **lead** legacy

The Prospects for the Peak District's Lead Mining Heritage

THE INVENTORIES

An Inventory of Regionally and Nationally Important Lead Mining Sites in the Peak District Orefield

This Inventory lists all currently identified sites that are considered to be of high conservation value within the orefield. It is anticipated that further important sites will be added after completion of ecological survey across the orefield (presently only about two-thirds surveyed), after geological assessment, and after further assessment of archaeological sites. Furthermore, omission from this list does not imply lack of conservation interest at a local level. The assessment of sites with underground interest is currently confined to archaeological features; it does not yet contain an assessment of bats and other biological interest.

For the sake of brevity the Inventory is presented here in tabular form. This should be used in conjunction with the location maps to identify the boundaries of each entry. The list of sites is of necessity long in order to cover the wide range of archaeological features and ecological communities of high conservation interest that are present. The justification for inclusion of all sites with archaeological interest, either as representative examples of common features, or as rare/special features, is summarised in Appendix B and listed on a site-by-site basis in Appendix C. The general character of ecological interest is summarised in Appendix F, but detailed listings of ecological communities will be presented at a future date once survey work is completed.

KEY

A: Inventory Number.

B: Site Name (using traditional mine names where known - where a site is large and there are many known names the most important mines are named here).

C: Location - approximate centre.

D: Area of site to the nearest hectare (very small sites are listed as 1ha even when they are less than 0.5ha in area). It should be noted that these stated areas include wide buffer zones and the actual extent of lead mining remains.

E: Significant Interest - Archaeology (Appendix B) - Categorisation:

First Entry - Hillocks.

A: Exceptional condition or good/average condition but extensive, and also including smaller but good examples of unusual hillocks and various representative examples of more typical types of hillock found in the orefield.

B: Good/average condition but of moderate or small extent.

C: Poor or unknown condition.

Second Entry - Relatively Common Features at Surface (including opencuts, shafts, access levels, coes, dressing floors, water storage and ore-dressing ponds, dressing pits, and belland yards).

A: Relatively common features in reasonably good condition, including common (and rare) features that collectively comprise relatively intact mine complexes.

B: Relatively common features of limited interest, including entrances to important underground sites.

C: Poor or unknown condition, or uncertain interpretation.

Third Entry - Rare or Special Features at Surface (including engine houses and their reservoirs, other mine buildings, smelters at mine sites, powder houses, an ore house, waterwheel pits, drains, water blast features, ventilation fire houses, gin circles, entrances to haulage levels and pipe caverns, crushing circles/wheels, knockstones, bouse teems, ore storage bins, trunk buddles and leats to ponds, buddles and buddle dams, large ore washing ponds, stone-lined buddles, circular buddles, slime ponds, buddle dams, extensive opencut pickwork, beehive caps, barrow-runs, launders, water diversion leats, mine roads, tramways, limekilns and quarries for mine buildings, meerstones and sough marker stones, entrances to soughs, and 20th century lead and gangue-processing buildings and other structures).

A: All extant examples, including rare features that collectively comprise relatively intact mine complexes.

B: Ruined or removed examples.

Fourth Entry - Underground Features.

A: Accessible workings of extensive or special character.

B: Accessible workings of only limited interest or unknown extent.

C: Workings not accessible due to blocked or flooded shafts/levels.

NOTE: Any site that scores an 'A' is classified as of high priority - those with more than one A are no more important than those with only one.

F: Significant Interest - Ecology (Appendix E) - Categorisation:

A: Grassland of high ecological value.

B: Grassland of moderate ecological value.

C: Grassland of limited ecological value.

I: Improved.

U: Unsurveyed.

G: Statutory designation - Scheduled Monument or Listed Building for archaeological, historical and/or architectural interest (Appendix H).

S: Scheduled Monument.

L: Listed Building.

H: Statutory designation - candidate Special Area of Conservation and/or Site of Special Scientific Interest for biological or geological interest (Appendix I).

CS: Candidate Special Area of Conservation.

B: Biological SSSI.

G: Geological SSSI.

O: Other SSSI not giving protection to lead mining interest.

G/H: Symbols Used:

X: Whole of 'Important Lead Mining Site' within designated area.

(X): Only part of 'Important Lead Mining Site' within designated area.

((X)): Only small part of 'Important Lead Mining Site' within designated area.

*: Site, or part of site, known to be currently under consideration for scheduling.

Main Sites - Within the National Park

A	B	C	D	E	F	G	H
1	Odin Mine, Knowlesgate and Engine Soughs, and Blue John Mine	SK 131833	25	A/A/A/A	A	(S)	(B/G)
2	Peakshill Sough	SK 117829	2	A/C/-/C	C	S	((B/G))
3	Oden Sough	SK 145832	4	A/C/A/B	U	-	-
4	Faucet, Slack Hole and Longcliff Rakes, Rowter, Oxlow and Maskhill Mines	SK 127821	36	A/A/A/A	A	(S)	B/G
5	New Rake	SK 137820	8	A/A/A/A	A	(S)	B/G
6	Dirtlow Rake, Pindale Side and Red Seats Veins, and How Grove and Siggate Head Mines	SK 155820	27	B/A/A/B	A	(S)	((B/G)) (G)
7	Hazard Mine	SK 137812	1	C/A/A/B	A	-	-
8	Wham and Wrangling Rakes, and Penny Mine	SK 132811	11	B/B/-/B	A	-	((G))
9	Linacre, Slitherstones, Eldon Bent, Burning Drake, Wrangling Rake, Portaway, Eldon Vein, Jowle Grove, Watts Grove, Smiler, White Rakes and Hurdlow End Mines	SK 120811	108	A/A/A/A	A	(S)	(B/G)
10	Coalpithole Rake	SK 099811	8	A/A/A/A	C	-	(B/G)
11	Gautries Rake	SK 102808	6	A/A/A/B	C	-	-
12	Oxlow and Daisy Rakes	SK 130804	15	A/A/A/B	A	(S)	(B)
13	Boggart Hole Vein, Hills Venture and Royal Oak Mines	SK 127794	9	B/A/A/B	A	(S)	-
14	Cop Rake and Starvehouse Mines	SK 132800	9	A/A/B/B	A	(S)	-
15	Moss Rake West End	SK 136796	9	A/A/A/B	A	(S)	-
16	Moss Rake, Raddlepits, Hugh Grove and Rakehead Mines, and New Rake Bottom	SK 148802	23	C/A/A/A	A	-	-
17	New Venture West End	SK 147809	4	A/A/-/B	A	-	-
18	New Venture Mine	SK 154810	1	B/A/A/A	B/C	-	-
19	Long Rake Founder and Shack Pit	SK 153808	1	C/B/-/A	A	-	-
20	Smalldale Mines	SK 166815	2	C/C/-/C	A	-	-
21	Moss Rake - Southfield Mines	SK 169809	1	C/-/-/C	A	-	O
22	Lambpart Vein	SK 153799	1	C/B/-/C	A	-	-
23	Berrystall and Scrin Rakes, and Chance Mine	SK 158800	8	C/B/-/C	A	-	-
24	Lambpart Mines	SK 159804	2	B/B/-/C	A	-	-

A	B	C	D	E	F	G	H
25	Earl and Hill Rakes, and Nall Hole Mine	SK 169802	5	B/A/A/C	A	-	O
26	Intake Dale Mine and Shuttle Rake	SK 162797	4	C/C/B/C	A	-	-
27	Edge Rake Mine	SK 134765	1	B/A/A/B	U	-	-
28	Maiden Rake - Heath Bush Mine	SK 143784	1	B/B/A/C	U	-	-
29	Maiden Rake	SK 150785	1	C/B/-/C	A	-	-
30	Tideslow, High and Washers Rakes	SK 159779	24	A/A/A/A	A	(S)	(B)
31	Old Grove Sough	SK 190776	8	A/C/-/C	U	-	-
32	Little Pasture Mine	SK 207772	1	B/A/A/B	U	-	-
33	New Engine Mine	SK 224774	1	C/A/A/C	A	(L)	-
34	Magclough Sough and Engine	SK 235776	4	A/C/A/B	U	-	-
35	Glebe Mine	SK 219765	2	B/A/B/A	A	-	-
36	Little Brookhead Mine	SK 222766	1	A/A/A/B	U	-	-
37	Stoke Old Engines	SK 229768	1	A/A/A/B	U	-	-
38	Stoke Sough	SK 239766	1	A/C/A/A	U	-	-
39	Watergrove Mine	SK 191758	9	A/A/A/C	A	(L)	-
40	Arbourseats Veins and Sough, Wardlow Sough, and Nay Green Mine and Washing Floors	SK 173747	2	A/A/A/A	A	-	B
41	White Rake (west)	SK 178747	3	A/A/-/C	A	-	-
42	White Rake (east) and Old Seedlow Mine	SK 186748	5	B/A/A/B	A	-	-
43	Mootlow and Robinwash Veins	SK 181732	2	A/A/A/C	A	-	-
44	Cackle Mackle Mine, Blakeden Great Vein and Stadford Hollow	SK 193740	28	A/A/A/A	A	S	(B)
45	Silver Hillocks Mine	SK 213731	1	C/A/A/C	U	S	-
46	Enterprise and Shepherds Mines, Sallet Hole, Unwin Vein and Talbot Holes	SK 221742	14	A/A/A/A	A	-	(B)
47	Cat Rake	SK 235738	1	C/A/-/B	U	-	-
48	Red Rake Mine and Newburgh Level	SK 239740	1	C/C/A/B	U	(S)	-
49	Brightside and Harrybecca Mines	SK 224732	16	C/A/A/A	A	((S))(*)	-
50	Putwell Hill Mine	SK 174717	4	A/A/A/A	A	-	(B)
51	Lees and Dove Rakes, Booth Lee Pipes, and Sterndale Sough	SK 156727	23	A/A/A/A	A	-	(B)
52	Maury Mine and Sough	SK 146729	10	A/A/A/A	A	-	(B)
53	Bulltor Veins	SK 149723	2	B/B/-/C	A	-	B
54	Grove Rake	SK 118704	1	A/A/-/C	A	-	-
55	Upper Hubbadale Pipe - Water Engine Shaft	SK 137702	1	B/C/A/C	A	-	-
56	Hubbadale Pipe - Fidler's Shaft	SK 140698	1	A/B/A/B	C	-	-
57	Sheaths Pipe	SK 155703	2	A/A/-/C	A	-	-
58	Crotie Rake	SK 155698	4	A/B/-/B	A	-	-
59	Whale Rake	SK 154693	4	A/B/B/B	A	-	-
60	Whale Sough	SK 160694	1	A/A/-/A	A	-	-
61	Shake Rope and Sun Veins	SK 159690	12	A/B/-/B	A	-	((B))
62	Fieldgrove Vein	SK 167697	2	B/A/A/B	A	-	((B))
63	Hard and Glead Rakes, and High Low Mines	SK 156684	42	A/A/A/B	A	-	-
64	Magpie and Dirty Redsoil Mines, and Talbot Holes	SK 171681	15	A/A/A/B	A	(S)	-

A	B	C	D	E	F	G	H
65	Trueblue Mine	SK 178680	1	B/A/A/B	A	S	-
66	Great Greensward Mine	SK 164672	1	C/A/A/A	A	-	-
67	Bagshaw Dale Mines	SK 156666	2	B/C/-/C	A	-	-
68	Brecks Mine	SK 149677	1	C/B/-/C	A	-	G
69	Crimbo and Whalf Pipe Mines	SK 144674	7	B/A/A/A	A	-	G
70	Hutmoor Butts Mines	SK 135670	26	A/A/-/B	A	-	-
71	Ferndale Mines	SK 159659	1	C/C/-/C	A	-	-
72	Pasture/Hole Rake	SK 158656	2	B/B/-/C	A	-	-
73	Tagg Lane Mines	SK 140661	4	B/B/-/B	A	-	-
74	Sparklow Mines	SK 130658	7	A/B/-/C	A	-	-
75	Cotesfield Mine	SK 136647	1	C/B/A/C	I	-	-
76	Carder Low Mines	SK 133628	2	A/A/A/B	B	-	-
77	Mandale Rake	SK 186665	4	B/B/A/C	U	-	-
78	Mandale and Lathkill Dale Mines and Soughs	SK 193658	9	C/A/A/A	A	(S)	B
79	Summerhill Mines	SK 154644	5	B/B/B/B	A	-	-
80	One Ash Moor Mines and Water Icicle Close Mine	SK 159643	16	B/B/A/A	A	-	((B))
81	Long Rake Opencuts	SK 196646	2	C/A/-/A	U	-	-
82	Bradford Dale Mines	SK 216641	2	B/B/B/C	A	-	-
83	Blith Forefield Mine	SK 225643	1	C/B/B/B	A	-	-
84	Thornhill's Sough and Bowers Rake	SK 237649	1	A/C/-/C	U	-	-
85	Hillcarr Sough	SK 259637	1	A/B/A/A	U	S	-
86	Mouldridge Mine	SK 194595	3	A/A/-/A	A	-	CS/B
87	Dunnington and Hardbeat Mines, Rath and Cowlica Rakes, and Rath Rake Sough	SK 211605	25	A/A/A/A	A	(S)	-
88	Rainslow Scrins	SK 220603	14	B/A/A/B	A	(S)	-
89	Portaway Mine	SK 230611	1	C/B/-/A	A	-	-
90	Yatestoop Mine	SK 244614	5	A/A/B/A	U	-	-
91	Brown Edge, White Great Rake and Lickpenny Mines	SK 234601	6	A/B/A/B	B/C	-	-
92	Hadland and Delf Veins	SK 241603	1	B/B/B/B	A	-	O
93	Winster Pitts, Drummers Venture, Horsebuttocks and Burning Drake Mines	SK 247603	6	A/A/A/A	A	(S)	-
94	Longtor Mines	SK 248600	8	C/A/A/B	A	-	-
95	Limekiln Veins	SK 244608	1	B/B/A/B	U	-	-
96	Bithoms Veins, Innocent Mines, and Weet Sough	SK 249607	12	A/B/A/A	A	-	-
97	Waterings Close and Shakersdale Mines	SK 254603	2	A/A/A/B	U	-	-
98	Davis and Mount Pleasant Mines, and Basrobin Sough	SK 259607	35	A/A/A/A	A	(S)	-
99	Old Ash, Lords and Ladies, Hit and Miss, and Tearsall Mines, and Snitterton Park Fire Engine	SK 268605	30	A/A/A/A	A	(S)	-
100	Oxclose, Lee Wood, Lee Close, Ash Plantation and Noon Nick Mines, Crowholt Level and Lee Close/White Hillocks Sough	SK 272598	63	A/A/A/A	U	((S))	((B/G))
101	Old Kennill Grove	SK 252597	1	C/C/-/C	A	-	-
102	Gorseydale, Hangworm, Beans and Bacon, Slack Breaks and Fiery Dragon Mines	SK 255592	35	A/A/A/A	A	(S)	-

A	B	C	D	E	F	G	H
103	Whitelow Mines (west)	SK 252581	7	A/A/A/B	A	-	-
104	Whitelow Mines (east)	SK 257583	10	C/A/-/B	A	-	-
105	Horsedale Mines (north-west)	SK 264585	4	B/B/B/B	A	-	-
106	Horsedale Mines (south-east) and Horsedale Sough	SK 267581	10	A/A/A/B	A	-	-
107	Bonsall Lees Mines	SK 267573	55	A/A/A/B	A	(S)	(B) ((CS/B))
108	Dale Mine	SK 094586	7	B/A/A/A	A	-	G
109	Ecton Mines and Soughs	SK 099582	76	A/A/A/A	A	(*)	(B/G)
110	Bincliff, Oversetts and Highfields Mines	SK 116537	30	A/A/A/A	U	-	(B)

Main Sites - Outside the National Park

A	B	C	D	E	F	G	H
111	High Tor Mines	SK 297589	2	C/A/-/A	U	(S)	((CS/B))
112	Via Gellia Mines and Soughs	SK 278572	89	A/A/A/A	U	-	(CS/B)
113	Black Rakes, Welshmans Venture and Bondog Hole Mines, and Merry Tom and Thumper Sitch Levels	SK 265562	32	A/A/A/A	U	-	(CS/B)
114	Snake Mine	SK 261555	1	A/A/A/A	U	S	-
115	Gang Mine	SK 286557	7	A/A/-/B	A	-	CS/B
116	Ratchwood and Rantor Mines	SK 284549	1	A/A/A/B	U	S	-
117	Dream Hole, Fox Holes and Sand Hole Mines	SK 273531	14	A/A/B/A	U	-	-
118	Yokecliffe Rake, and Quickset, Old Gells, Shining Cloud and Nile Mines	SK 265539	24	A/A/-/A	U	-	-
119	Carsington Pasture, Great Rake, Nickalum and Perseverance Mines	SK 244542	170	A/A/A/A	U	-	-
120	Roundlow Mine	SK 238548	3	A/B/A/B	A	-	-
121	Rainster Rocks and Suckstone Mines	SK 223547	61	A/A/-/B	U	-	-

Buildings, Soughs and Other Individual Structures - Within the National Park

A	B	C	D	E	F	G	H
B1	Ashton's Mine	SK 163826	1	B/B/A/C	U	(L)	-
B2	Co-op Sough	SK 174811	1	-/-/A/B	-	-	-
B3	Hartledale Mine	SK 159805	1	C/B/A/B	U	-	-
B4	Windy Knoll Mine	SK 152796	1	C/C/A/C	U	-	-
B5	Milldam Mine	SK 176780	2	C/C/A/C	U	-	-
B6	Old Twelve Meers Mine	SK 204775	1	C/B/A/B	C	-	-
B7	Ladywash Mine	SK 219775	1	C/B/A/B	U	-	-
B8	Ash Nursery Mine	SK 197728	1	C/B/A/B	C	-	-
B9	Muse Mine	SK 230739	1	B/B/A/B	U	-	-
B10	Brightside Sough	SK 242744	1	-/-/A/C	-	-	-
B11	Magpie Sough	SK 179696	1	-/-/A/A	-	-	-
B12	Hubbadale Pipe - Two Gins Shaft	SK 142694	1	B/C/A/C	C	-	-
B13	Hubbadale Pipe - Crotie Gin Shaft	SK 147695	1	B/C/A/C	U	-	-
B14	Hubbadale Pipe - White Close Shaft	SK 147693	1	B/C/A/C	U	-	-

A	B	C	D	E	F	G	H
B15	Long Rake Mine	SK 187642	1	C/C/A/C	U	-	-
B16	Wheels Rake Mine and Shining Sough	SK 228648	1	C/B/A/C	U	-	-
B17	Black Sough	SK 241657	1	-/-/A/C	U	-	-
B18	Rainster Sough	SK 238653	1	-/-/A/C	U	-	-
B19	Bowers Rake Goit	SK 236651	1	-/-/A/-	U	-	-
B20	Stanton Sough	SK 250656	1	-/-/A/C	U	-	-
B21	Broadmeadow Mine	SK 224643	1	B/B/A/A	-	L	-
B22	Prospect Mine	SK 223642	1	C/C/A/C	I	-	-
B23	Hillcarr Sough - Brown Bank Shaft	SK 230630	1	C/C/A/C	B	-	-
B24	Winster Ore House	SK 237601	1	-/-/A/-	-	-	-
B25	Old Millclose Mine - Watt's Engine House	SK 258618	1	C/B/A/A	A	S	B

Note: Other mines with buildings (excluding small single coes
35, 36, 38, 39

10, U3, U8, U9, U21, U22, U23, U26).

Buildings, Soughs and Other Individual Structures - Outside the National Park

A	B	C	D	E	F	G	H
B26	Millclose Mine	SK 258623	1	C/A/A/A	-	-	-
B27	Yatestoop Sough	SK 264626	1	-/-/A/A	-	-	-
B28	Orchard Sough	SK 281608	1	-/-/A/B	-	-	-
B29	Masson Farm Level	SK 292590	1	-/-/A/B	-	-	-
B30	Carnhill Wifes Sough	SK 292573	1	-/-/A/A	-	-	-
B31	Bullestree Sough	SK 303573	1	-/-/A/B	-	-	-
B32	Cromford Sough	SK 295568	1	-/-/A/A	-	S	-
B33	Cromford Moor Mine	SK 290556	1	C/B/A/B	U	-	-
B34	Ratchwood Mine - Founder Shaft	SK 283552	1	B/A/A/B	U	-	-
B35	Meerbrook Sough Mine	SK 288545	1	C/A/A/C	-	L	-
B36	Fritchley Sough	SK 358534	1	-/-/A/B	-	-	-
B37	Meerbrook Sough	SK 326552	1	-/-/A/A	-	S	-

Note:

12, 113, 114, 115, 116, 119, U29, U31, U33).

Sites where the Primary Archaeological Interest is Underground - Within the National Park

A	B	C	D	E	F	G	H
U1	Old Tor Mine	SK 135827	1	C/B/-/A	-	-	G
U2	Speedwell Mine	SK 139827	1	C/B/-/A	-	-	G
U3	Peakshole Sough	SK 148827	1	-/-/B/A	-	-	G
U4	Bird Mine	SK 157812	1	C/B/-/A	-	-	-
U5	Moorfurlong Mine	SK 168812	1	B/B/-/A	-	-	-
U6	Great Cucklet Mine	SK 215759	1	B/B/-/A	-	-	O
U7	Merlins Mine	SK 217759	1	B/B/-/A	-	-	O
U8	Watergrove Sough	SK 209759	1	-/-/B/A	-	-	O
U9	Moorwood Sough	SK 232754	1	-/-/B/A	-	-	-
U10	Greensward Rake	SK 166670	1	B/B/-/A	-	-	-
U11	Broadmeadow Mine - Shale Drift	SK 221644	1	C/B/-/A	-	-	-
U12	Cowclose Mine - Main Drawing Shaft	SK 224606	1	B/B/-/A	-	-	-
U13	Cowclose and Leadnams Mines	SK 226804	1	B/B/-/A	-	-	-

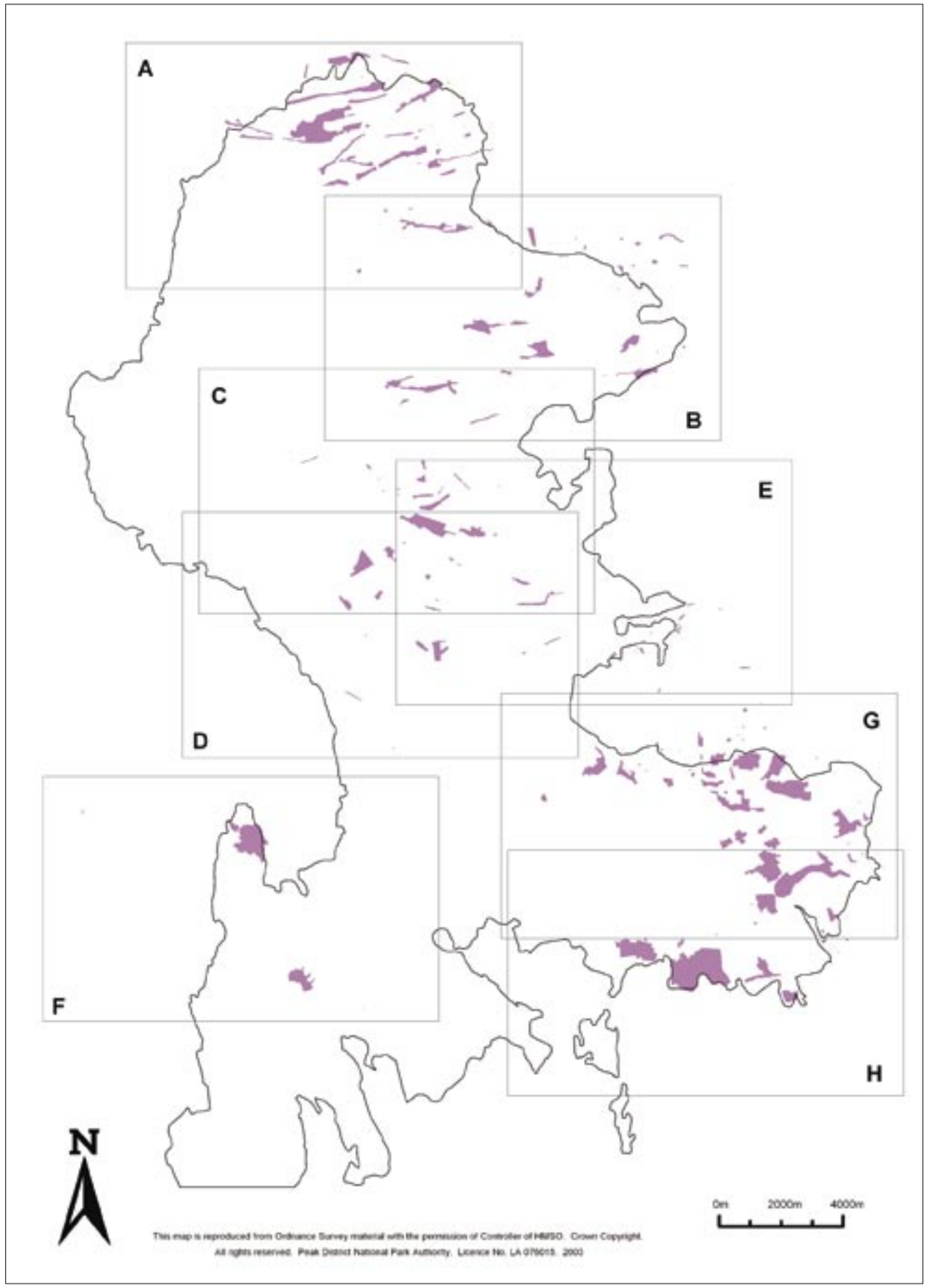
A	B	C	D	E	F	G	H
U14	Portaway Mine - Engine Shaft	SK 230618	1	C/B/-/A	-	-	-
U15	Portaway Mine - Fisher's Shaft	SK 231610	1	C/B/-/A	-	-	-
U16	Wills Founder Shaft	SK 234607	1	B/B/B/A	-	-	-
U17	Placket Mines (north-west)	SK 237611	1	C/B/-/A	-	-	-
U18	Placket Mines (south-east)	SK 239608	1	C/B/-/A	-	-	-
U19	Upper Orchard Mine	SK 241604	1	B/B/-/A	-	-	-
U20	Upper Orchard Mine - Old Weston Shaft	SK 239603	1	C/B/-/A	-	-	-
U21	Millclose Sough	SK 265618	1	-/-/B/A	-	-	-
U22	Millclose Sough - Valley Shaft	SK 253614	1	C/B/-/A	-	-	O
U23	Millclose Sough - Air Shaft	SK 256615	1	C/B/-/A	-	-	O
U24	Old Millclose Mine - Limbreck (Shale) Shaft	SK 257614	1	C/B/-/A	X	-	O
U25	Old Millclose Mine - Hamber Grove (Sleeper) Shaft	SK 260611	1	C/B/-/A	-	-	-
U26	Royledge Mine and Sough	SK 045591	1	-/-/B/A	-	-	-
U27	Hartington Level	SK 145611	1	C/B/B/A	-	-	-
U28	Robin's Shaft Mine	SK 135527	1	C/B/-/A	-	-	-

Note: Other mines with underground interest within the National
81, 85, 86, 87, 89, 90, 93, 96, 98, 99, 100, 102, 108, 109, 110, B11, B21, B25).

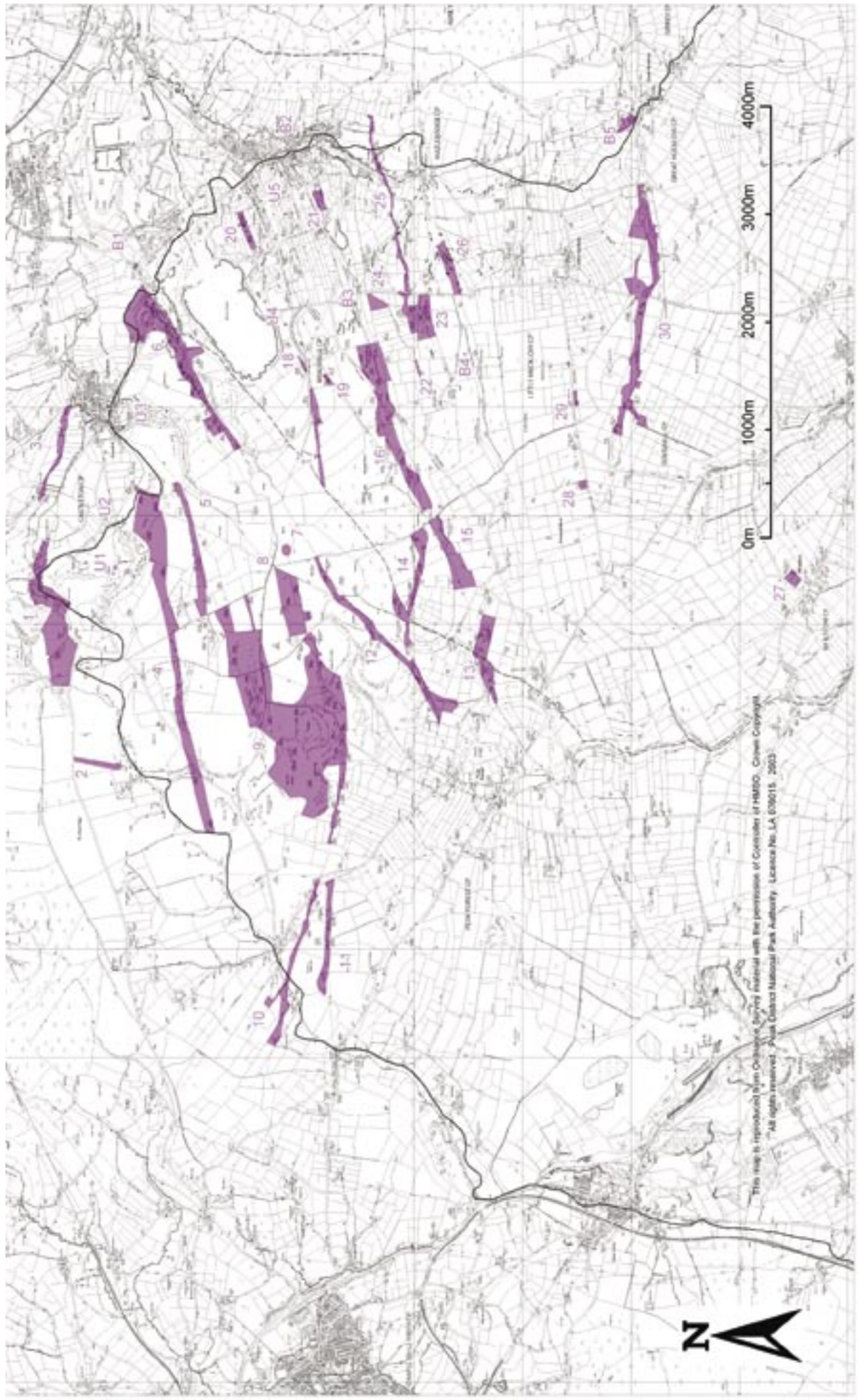
Sites where the Primary Archaeological Interest is Underground - Outside the National Park

A	B	C	D	E	F	G	H
U29	Masson Sough, Old Jants Mine and Gentlewoman's Pipe	SK 295594	1	-/-/C/A	-	-	G
U30	Nestus Pipes, Longtor Mines, and Bacon and Coalpit Rakes	SK 291590	36	B/B/-/A	-	(*)	(G)
U31	Side Mine	SK 296588	1	C/B/-/A	-	-	-
U32	Owlet Hole	SK 291580	1	C/B/B/A	-	-	-
U33	Hagg Mine	SK 296577	1	C/B/-/A	-	-	O
U34	Wapping Mine and Cumberland Cavern	SK 292576	3	C/B/-/A	-	-	G
U35	Bage Mine	SK 291550	1	C/B/-/A	-	-	G
U36	Haslowfield Level	SK 260561	1	C/B/-/A	-	-	O
U37	Golconda Mine	SK 249551	1	C/B/-/A	-	-	-

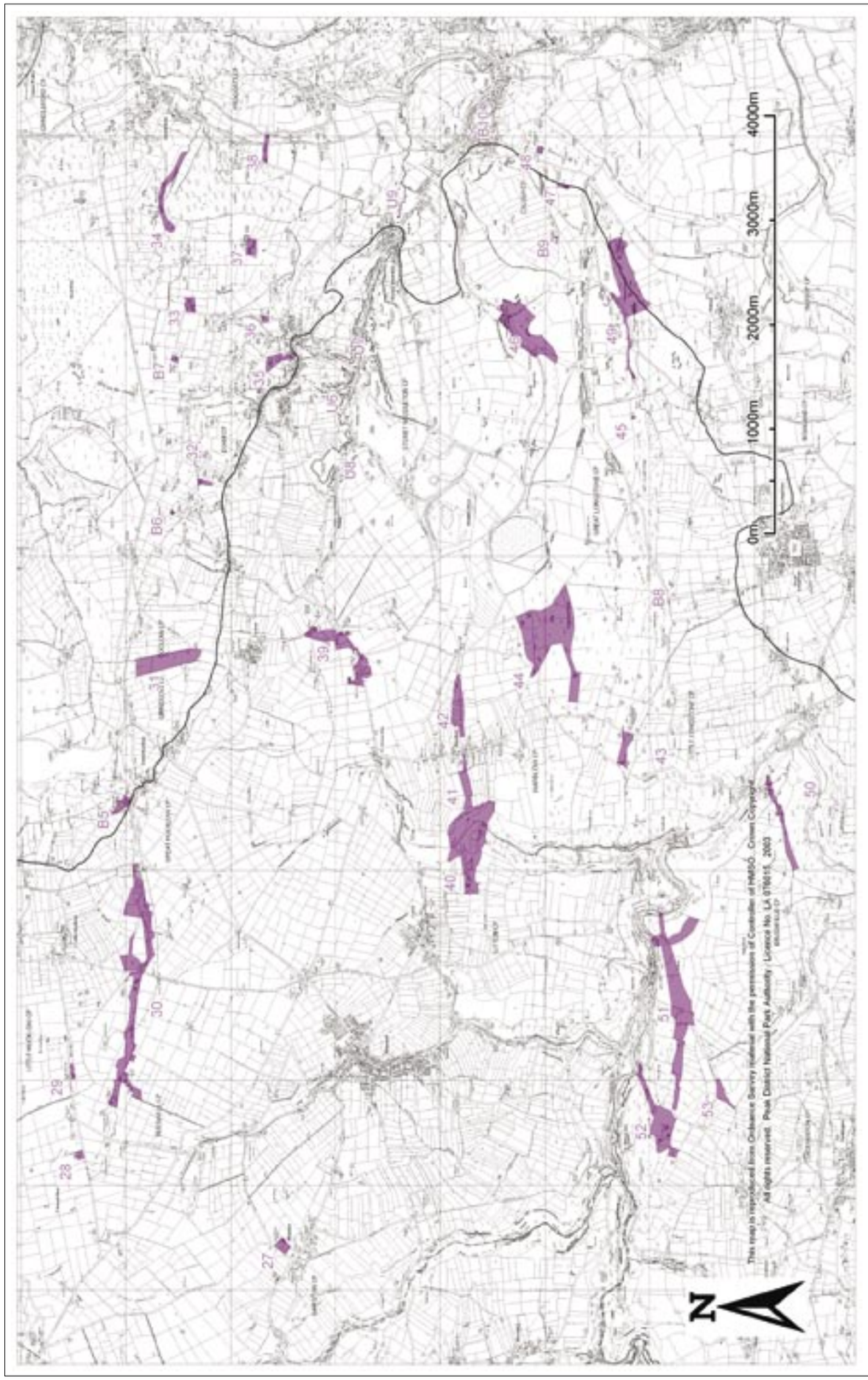
Note: Other mines with underground interest outside the National Park are listed in the previous tables (sites 111, 112, 113, 114, 117, 118, 119, B26, B27, B28, B30, B32, B34, B37).



A
the Peak District orefield (limestone plateau - black line).

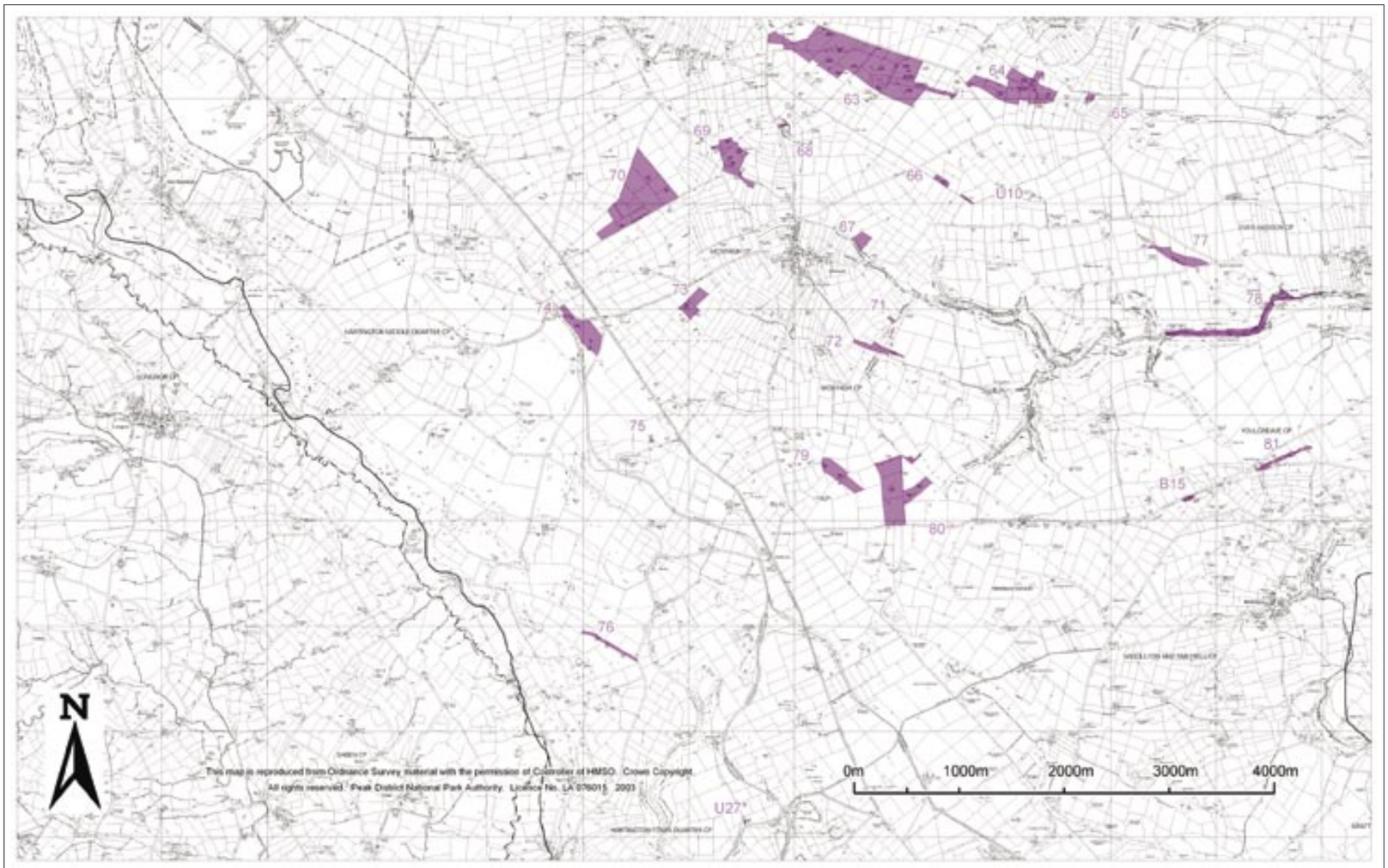


A: The location of Regionally and Nationally Important Lead Mining Sites in the Castleton and Peak Forest area.

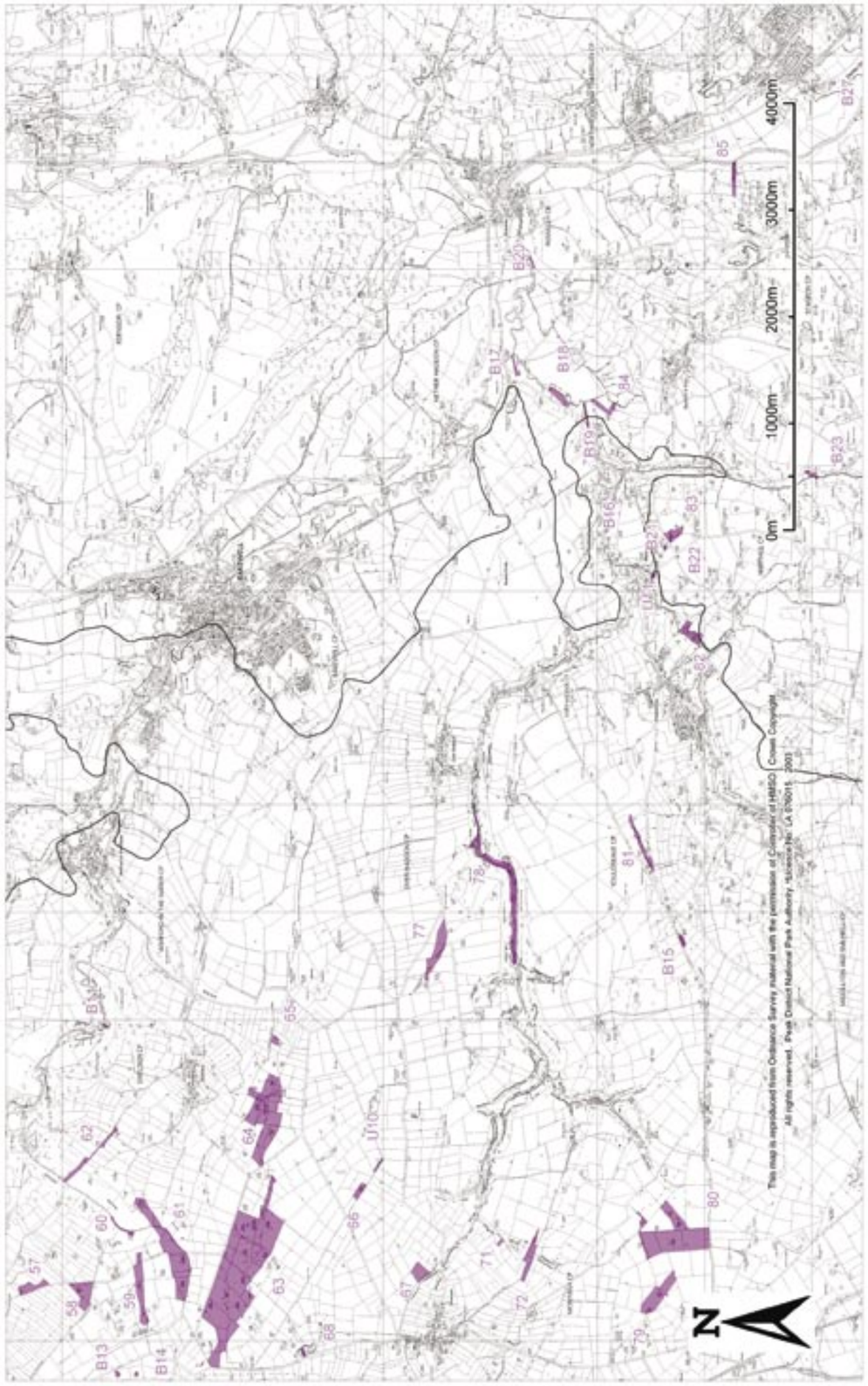


B: The location of Regionally and Nationally Important Lead Mining Sites in the Eyam and Longstone area.

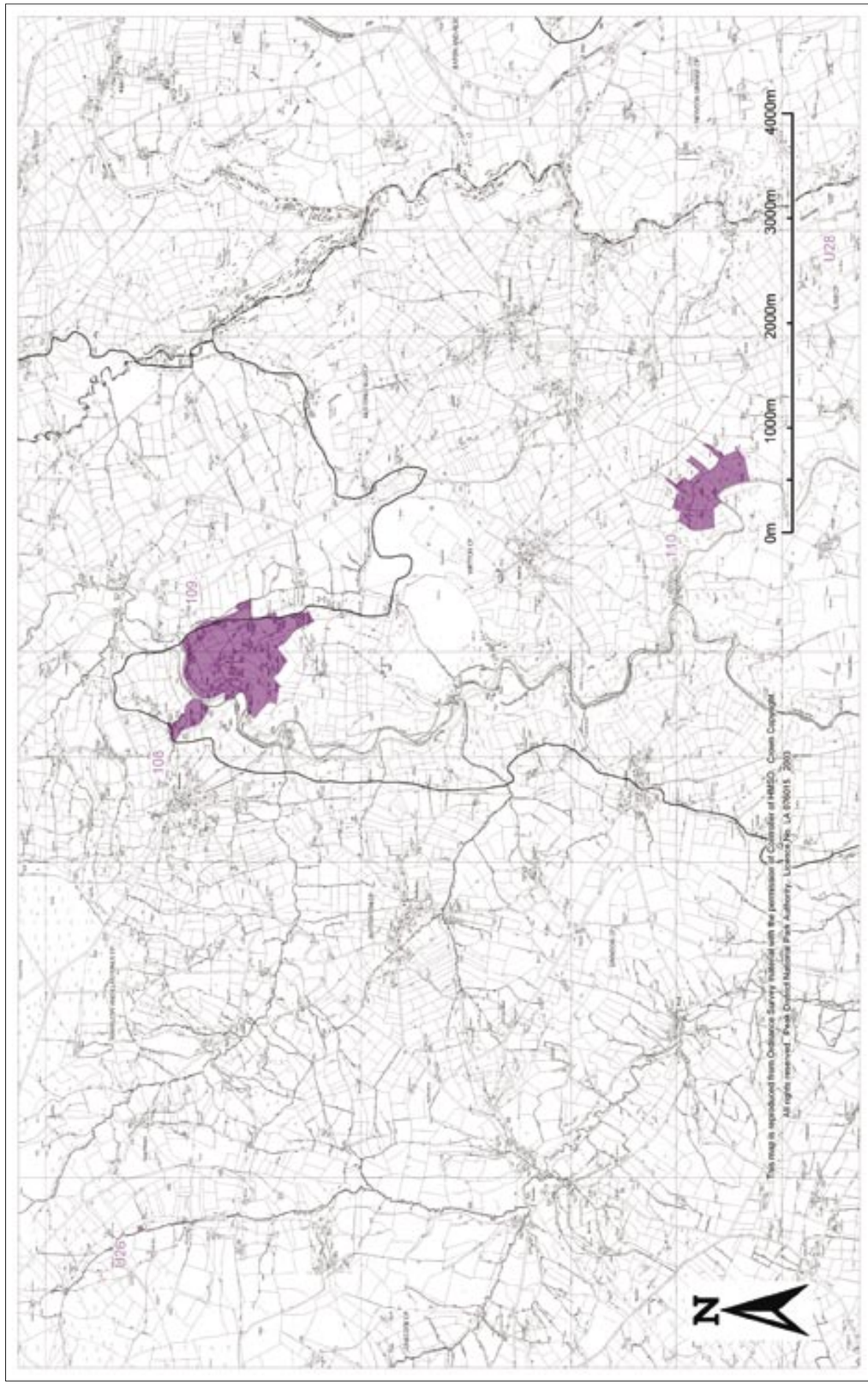
C: The location of Regionally and Nationally Important Lead Mining Sites in the Taddington, Flagg and Sheldon area.



D: The location of Regionally and Nationally Important Lead Mining Sites in the Monyash area.

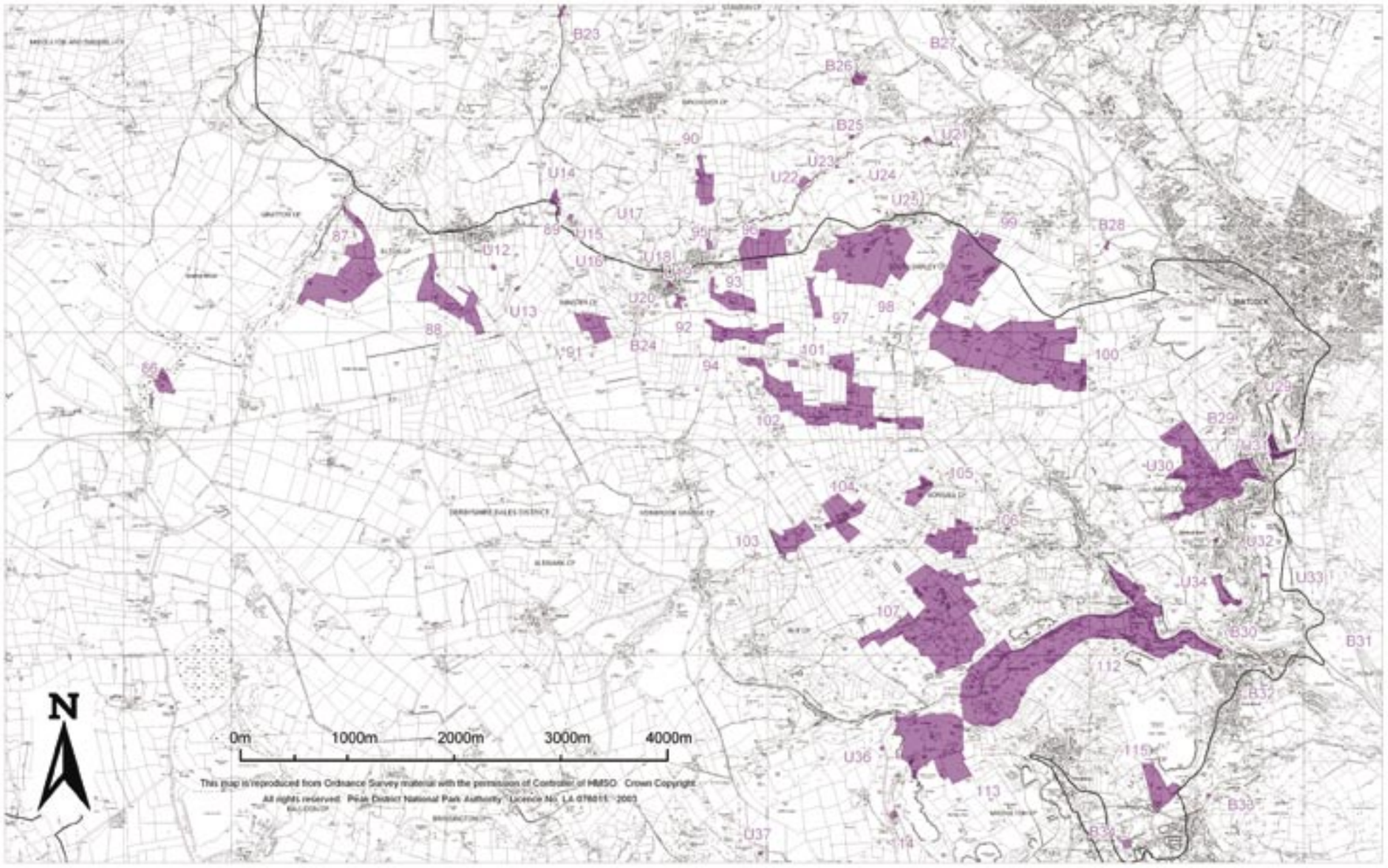


E: The location of Regionally and Nationally Important Lead Mining Sites in the Over Haddon and Youlgreave area.

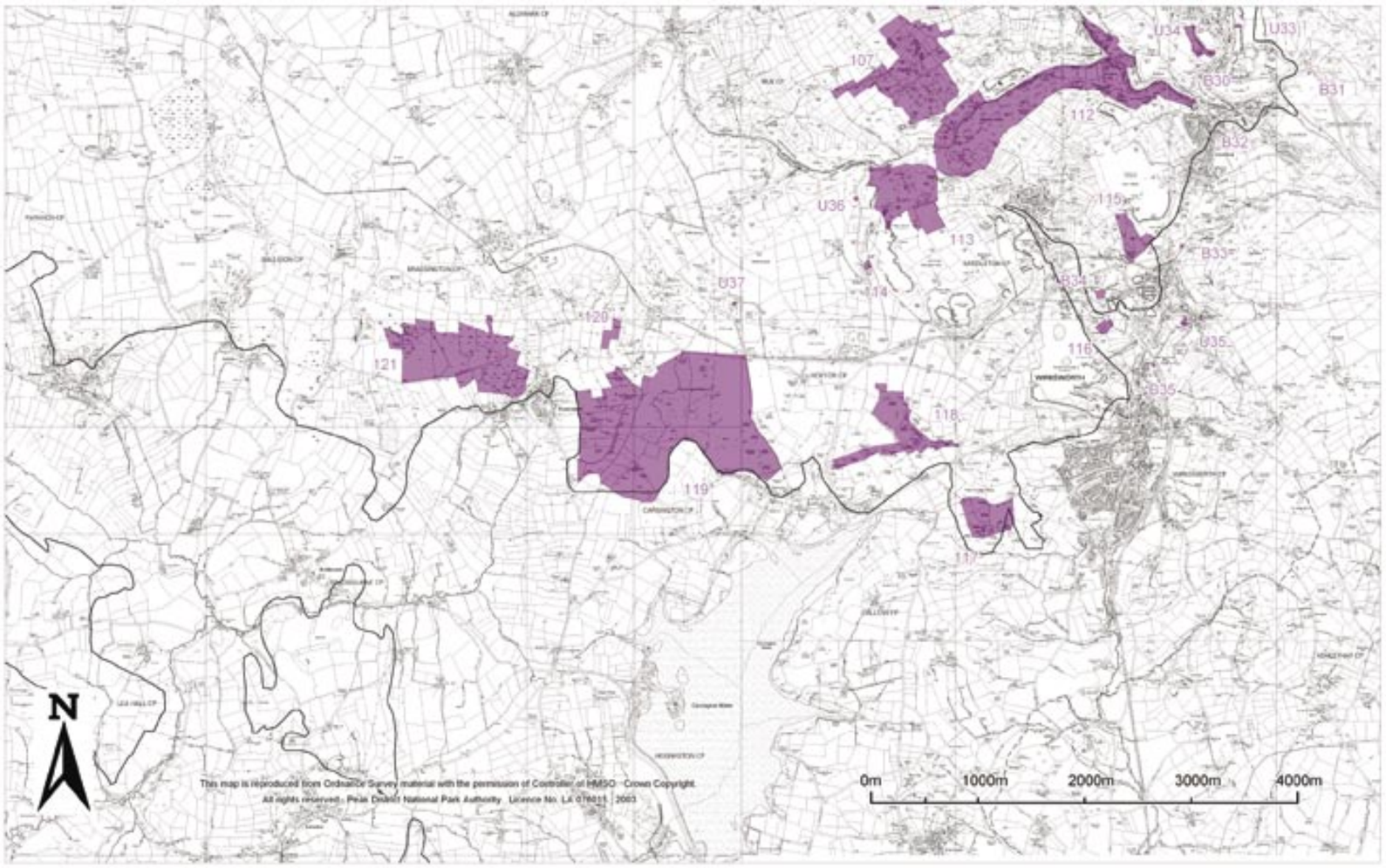


F: The location of Regionally and Nationally Important Lead Mining Sites in the Warslow and Wetton area.

INVENTORY OF SITES



G: The location of Regionally and Nationally Important Lead Mining Sites in the Elton, Winster, Wensley, Bonsall and Matlock area.



H: The location of Regionally and Nationally Important Lead Mining Sites in the Bonsall, Wirksworth, Carsington and Brassington area.

An Inventory of Regionally and Nationally Important Lead Mining Landscapes in the Peak District Orefield

The analysis of aerial photographs (Chapter 4), together with field observation, has allowed assessment of areas of the orefield where extensive hillocks and other mining features are still sufficiently well preserved to make a significant contribution to the visual character of the Peak District landscape. While in extensive parts of the orefield this is no longer the case, eleven areas of relatively good survival have been identified. While some from necessity are small, they are chosen to represent all main types of hillocks present in the orefield, with each type represented by only one to three examples. For the sake of brevity these are listed here in tabular form, with a brief summary of predominant character given below.

Within the National Park

	Name	Location (approx. centre)	Hectares	Character Type
1	Castleton/Peak Forest	SK 129815	1179	Large veins
2	Tideslow Rake/High Rake	SK 162779	44	Large veins
3	Cressbrook Dale	SK 174746	48	Large veins Smaller veins
4	Priestcliffe Lees/Brushfield	SK 165726	310	Large veins
5	Magpie Mine/Hard Rake/Nether Wheal	SK 156684	211	Large veins Smaller veins
6	Ecton Hill	SK 099582	83	Extensive pipe workings
7	Bincliff Mines	SK 117537	53	Smaller veins
8	Winster/Wensley	SK 260607	455	Multiple small veins Extensive pipe workings Workings under shale
9	Bonsall Moor	SK 259583	467	Multiple small veins

Outside the National Park

10	Dream Mine	SK 274533	33	Large veins Smaller veins
11	Carsington Pasture/Yokecliffe Rake	SK 252541	339	Multiple small veins Extensive pipe workings Large veins

Predominant Character

By far the largest Inventory Landscape is in the north-west, centred on Castleton and Peak Forest, where there are prominent lines of large hillocks crossing the land which often stand out as visually-prominent features. Smaller areas where similar features are prominent include Tideslow Rake/High Rake near Great Hucklow, and on the steep southern flank of the Wye Valley at Priestcliffe Lees and Brushfield. Other areas are different in character. At Cressbrook Dale near Tideswell there is a mixture of veins of different sizes crossing this often visited valley, while there are similar examples at the Dream Mine area above Wirksworth. Many of the mines between Monyash and Bakewell found around Hard Rake and Nether Wheal are again similar, but this landscape is unique in that it is dominated by the buildings at Magpie Mine, said to be the best preserved 19th century mine complex in Britain. At the Bincliff Mines on the east flank of the Manifold Valley the veins are all relatively small.

Mining landscapes that are very different in character exist in southern parts of the orefield. Here, as around Winster and Wensley, and further south on Bonsall Lees and Carsington Pasture, there are extensive areas that have a profusion of hillocks. These often cover whole swathes of land where there are many smaller veins and pipeworkings, sometimes interspaced with larger rakes. Around Winster/Wensley the mining extends well under the shale overburden and the hillocks here, where they survive, are often large but widely spaced. The Ecton Mines near Warslow are again atypical in that it is the profusion of buildings and other structures as well as hillocks that stand out in the landscape.

the **lead** legacy

The Prospects for the Peak District's Lead Mining Heritage

APPENDICES

Appendix A:

The Main General, Archaeological and Ecological Outputs of the Lead Rakes Project to Date

General

1. *An aerial photograph assessment of the orefield as a whole, with the aid of English Heritage funding, to quantify levels of survival and loss of surface remains. A technical report was produced on the surviving resource, detailing the results and assessing the level of protection by statutory designation and agri-environment schemes [4]. It also included a provisional Inventory of 'Lead Mining Sites' of special importance and an Inventory of 'Important Lead Mining Landscapes', and made provisional recommendations for changes in conservation practice necessary to further the retention of the lead rake resource. These aspects of the report have been subsequently developed further and are outlined in this report.*

Archaeology

1. *The commissioning of a detailed desktop study, for the orefield as a whole, which quantified the loss of significant lead mining features such as gin circles, engine houses, crushing circles and buddles [54].*
2. *The commissioning of seven reports giving the historical background to the mining areas subject to detailed ecological fieldwork evaluations (see below). These cover Bonsall Moor, Bradwell Moor (including parts of the Castleton and Peak Forest area), Winster, Elton, Wensley, and a large area centred on Monyash and Flagg [55, 57, 59-63]. In the case of the Bonsall Moor and Bradwell Moor reports, these are complemented by several reports previously prepared [49, 50, 52, 53, 64-68] and there is a further report on the Alport area [51].*
3. *The commissioning of detailed aerial photograph surveys by the Royal Commission for the Historic Monuments of England (now English Heritage) of Bradwell Moor in 1998 and of the Bonsall Moor/Elton/Winster/Wensley area in 1999.*
4. *Extensive fieldwork and desk-based assessment to produce refined archaeological Inventories of 'Important Lead Mining Sites' and 'Landscapes'. These are presented in summary here and detailed in a technical report [7].*

Ecology

Work began in 1997 to survey the whole of the lead rake resource within the National Park to a detailed level. The following areas have been surveyed [15-20] and comprise approximately two-thirds of the total area of the resource:

1. *Bonsall Moor*
2. *Castleton/Peak Forest*
3. *Bradwell*
4. *Winster*
5. *Elton*
6. *Monyash*
7. *Sheldon/Taddington/Flagg (assesment ongoing 2003)*

If future funding can be secured it is the intention to complete this important record of the ecological interest to be found on lead rakes to further inform the Peak District Biodiversity Action Plan and the conservation of lead mining sites.

Appendix B:

Archaeological Features with Category A Status in the Inventory of Regionally and Nationally Important Lead Mining Sites in the Peak District Orefield

Overview

The archaeological assessment of lead mining remains has documented the varied character of the resource and identified the locations of a wide range of features which survive. A brief overview is given here, while a catalogue of Category A features by specific feature-type is given in tabular form below and details of each site are given in Appendix C. Further details and analyses are given in a technical report [7].

The type of hillocks found varies according to geological and historical factors as outlined in Chapter 4. Representative examples in good condition of all types have been identified and given Category A status. These include a number of examples of hillocks at rake veins. While many of the very largest of these have been extensively reworked for gangue minerals, two fine examples survive at Tideslow Rake near Great Hucklow and Oxlow Rake above Peak Forest. A sample of hillocks at isolated small veins has also been included as Category A to ensure this once common type of feature is represented. Commonly, extensive but often individually relatively-small hillocks are found where many small veins occur together and/or where there are complex pipeworkings underground. In both cases survival to today has been relatively good because of the difficulty of improving such land for agricultural purposes. These workings are particularly common in the southern half of the orefield. Rarities include small hillocks at outcropping pipes and at mineralisation in limestone joints (known as blockwork). Large but deep pipeworkings, veinworking at depth under shale overburden, and sough airshafts, all result in distinctive, often-large, spaced hillocks. Surviving examples are again relatively rare compared with vein workings at surface.

Some sites are particularly important as they have direct relationships with medieval and earlier agricultural features such as strip lynchets and field banks, and thus give information on the relative age of the mining. While the hillocks often overlie such features, in one case at least on Carsington Pasture, there are strong indications that some of the mining is earlier. Reworking of hillocks for previously discarded ore was very common, particularly in the 16th and 18th centuries with radical improvements in smelting technology, and in the 19th century when rich ore sources underground were becoming scarce. A small number of sites have been highlighted where evidence for such practices are particularly clearly seen. Early fluorspar extraction concentrated on the richest deposits and hillocks were often not fully removed, nor were sites 'restored'. Two examples have been included that represent this activity particularly well.

Of the common surface features found at many mines, a number of sites have opencuts that have not been fully backfilled by lead or gangue miners. In a few cases these are particularly deep with rock walls, as at Odin Mine and Dirtlow Rake, both near Castleton, and at the High Tor Mines above Matlock. The grass-covered opencuts at Tideslow Rake near Great Hucklow are exceptionally large, while there are rare pipeworking opencasts at the Dunnington and Hardbeat Mines at Elton. While there are many shafts remaining, despite the majority having been lost, nearly all are now capped with old railway sleepers or concrete and thus are not easily visible. However, a range of engine and climbing shafts can be viewed in safety at the grilled examples at Magpie Mine. Further good examples of grilled engine shafts exist at Jowle and Watts Groves on Eldon Hill, at Old Seedlow Mine near Wardlow and at the Ecton Mines. Unusual shafts include that for the Dakeyne Engine at Bateman's House in Lathkill Dale and those with climbing stones at Greensward Rake near Monyash. Mine access levels were always less common than shafts and are usually found on steep dalesides, as for example flanking the Via Gellia west of Cromford.

Coes, often at or near shafts and levels, are usually small and ruined, although there are also examples of 18th and 19th century date that are relatively large. Some stand to nearly full height, as at How Grove on Dirtlow Rake, at the Fieldgrove Vein near Sheldon, at the lower Lee Close Mines near Wensley and at Jacobs Dream Mine in the Via Gellia. Virtually all mines once also had dressing floors adjacent to their shaft tops or level entrances. However, many have been disturbed by later mining and hillock reworking. Notable exceptions include small examples on Bonsall Lees, Black Rakes and Snake Mine all above the Via Gellia, and late reworking floors at How Grove on Dirtlow Rake, at Maury Mine near Priestcliffe, and at Great Rake Mine above Carsington. Associated with many dressing floors there are water storage ponds, together with ore-dressing ponds and pits. This aspect of the surface archaeology has previously been little studied, but it is clear after recent fieldwork that these features are relatively common and very varied in type. There are complex suites of such features on Oxlow and Tideslow Rakes and many simpler arrangements elsewhere. In the Winster and Wensley area there are good examples of leats for water that was drawn up shafts from underground. Many mining sites were walled out, in enclosures known as belland yards, to keep stock away from the toxic waste heaps. In some cases these appear to have been created late, when commons were enclosed, in some instances perhaps after the mines were abandoned. Some mine enclosures are integrated with the general field layout, as at Tideslow Rake and at Magpie Mine, while other belland yards lay within larger enclosures, as at the Linacre/Slitherstones/Eldon Hill area above Peak Forest and at the High Low Mines near Sheldon.

Rare and special mining features are too numerous in type to enumerate here. Amongst the highlights are engine houses, with a particularly early example at Ecton and large Cornish engine houses at Magpie Mine near Sheldon, at Mandale Mine in Lathkill Dale and at Old Millclose Mine near Darley Bridge. The simpler horse-gin engines frequently left a footprint in the form of a gin circle. There are a number of well-preserved examples of these, including particularly large ones at Ecton and at High Rake near Great Hucklow. A relatively rare type of gin circle comprises examples terraced into slopes as opposed to being set on hillock tops which is the norm. A further set of distinctive circular features is horse-drawn ore crushers, with surviving horse tracks and/or crushing wheels. These include the well-known atypical example at Odin Mine and an exceptionally well-preserved one at How Grove. Other ore-dressing features include rare banks of bouse teems for ore washing and small, stone-lined buddling troughs. The best survival of the former is at Brightside Mine near Hassop, while there are particularly interesting examples of the latter at Winster Pitts and Bonsall Lees. Atypical buddles have been excavated and conserved at How Grove. Notable examples of sough entrances include those at Magpie Sough by the River Wye, Mandale Sough in Lathkill Dale and Meerbrook Sough by the River Derwent.

The visible surface mining features of all types may well be mostly post-medieval in date, although many hillocks may have earlier origins and/or mask medieval or even Roman features. In a few cases rare documentary evidence allows medieval origins to be confirmed, although, with the current absence of archaeological excavation, identifiable physical evidence at surface remains elusive (in contrast, recent research underground has identified several medieval/early post-medieval mines). One exceptional site is the Ecton Mines where recently identified archaeological evidence has demonstrated prehistoric copper mining dating to about 3500-4000 years ago.

Some mining sites take on additional importance because they include relatively complete complexes of features and thus tell us much about how mining was organised. These range from the exceptionally large and complete site at Magpie Mine to a small walled dressing floor with only a drawing shaft, a climbing shaft, a coe and a stone-lined buddling trough at Black Rakes. Between these two extremes there is a wide variety of sites, including a broad range of features; this makes all these sites valuable as they illustrate the complexity of the archaeological evidence.

Underground features include a wide variety of types, some with rare and special features. Lists of sites and important features accessible to explorers with specialist equipment and training are given in the Inventories and below. There may well be further underground features that await discovery at a significant number of sites where access is currently difficult. This said, the majority of the thousands of miles of mine passages that once existed have now undoubtedly collapsed or their entrances to all intents and purposes are irrevocably sealed.

Types of Category A Archaeological Interest at Sites in the Inventory

The following table lists all Category A examples of the wide variety of features of conservation interest found at Peak District lead rakes. With hillocks and common features only important representative examples are given.

KEY

A: Feature type.

B: Number of listed sites with Category A examples (further minor/damaged examples are given in Appendix C, which are category B and not listed here). With the 'rare/special', 'mine complexes' and 'underground' lists this includes all examples, except where they are marked +, where the number of site entries is counted.

C: Sites (numbered following the Inventory).

Important Surface Remains - Hillocks

A	*B*	*C*
Particularly large rakes	*2*	*12, 30*
Other rakes	*22*	*4, 5, 9, 10, 11, 14, 15, 30, 41, 43, 44, 50, 51, 52, 54, 59, 63, 64, 76, 87, 118, 119*
Smaller veins - multiple, closely-spaced, type	*21*	*9, 40, 58, 63, 70, 74, 96, 97, 98, 99, 103, 106, 107, 110, 112, 113, 115, 117, 118, 119, 121*
Smaller veins - fewer/single type	*6*	*17, 46, 61, 109, 112, 114*
Blockwork	*1*	*103*
Pipes/flats (often with veins) - mined at surface	*5*	*51, 57, 87, 99, 100*

A	B	C
Pipes/flats (often with veins) - mined below ground	14	39, 56, 86, 87, 91, 93, 96, 98, 100, 102, 108, 109, 112, 120
Mining under shale	6	1, 10, 36, 37, 90, 116
Sough hillocks	11	1, 2, 3, 31, 34, 37, 38, 51, 60, 84, 85, 87
Clear relationships with medieval and earlier field and settlement earthworks	7	96, 98, 99, 100, 106, 119, 121
Notable examples of pre-20th century hillock reworking	6	12, 14, 30, 52, 64, 76
Notable examples of early gangue reworking	2	43, 104

Important Surface Remains - Common Features

A	B	C
Opencuts - deep with rock sides	10	1, 6, 16, 18, 40, 47, 49, 50, 81, 111
Opencuts - grass-covered sides but particularly large	2	30, 87
Opencuts - shallow (some with rock sides)	26	4, 6, 9, 10, 11, 12, 14, 15, 17, 41, 42, 43, 46, 50, 51, 52, 54, 63, 64, 81, 88, 94, 98, 104, 107, 115
Sites with shafts visible at surface - engine shafts (notable examples only)	14	7, 9, 10, 30, 33, 35, 37, 42, 63, 64, 78, 94, 109, B26
Sites with shafts visible at surface - climbing/drawing shafts (notable examples only)	4	64, 66, 107, 113
Access level entrances	12	40, 46, 49, 78, 86, 102, 107, 109, 110, 112, 113, 114
Coes	46	4, 9, 6, 12, 13, 14, 15, 16, 17, 27, 30, 40, 42, 43, 44, 45, 46, 51, 52, 62, 64, 65, 69, 76, 87, 90, 93, 94, 97, 99, 100, 102, 106, 107, 110, 112, 113, 114, 115, 116, 117, 118, 119, 121, B34, B35
Dressing floors	34	1, 5, 6, 9, 10, 11, 12, 13, 16, 17, 18, 30, 32, 36, 40, 44, 52, 62, 63, 64, 65, 86, 93, 99, 103, 106, 107, 108, 109, 113, 114, 116, 118, 119
Water storage and ore-dressing ponds, and dressing pits	30	6, 9, 10, 11, 12, 13, 15, 16, 18, 27, 30, 40, 42, 44, 46, 51, 52, 62, 64, 65, 70, 72, 76, 87, 93, 99, 100, 103, 109, 119
Belland yards	37	5, 6, 9, 10, 11, 12, 13, 14, 15, 17, 18, 25, 27, 30, 32, 39, 40, 42, 43, 51, 52, 54, 57, 62, 63, 64, 65, 69, 81, 86, 107, 108, 109, 110, 112, 113, 119

Important Surface Remains - Rare/Special Features

A	B	C
Newcomen and other 18th century engine houses	6	25, 39, 99, 100, 109, B33
19th century Cornish engine houses, miners' drys, boiler houses and chimneys	7	30 (two), 64 (two), 78, B25, B26
19th century horizontal engine houses, boiler houses and chimneys	16	10 (two), 12, 27, 33, 49, 64 (two), 66, 109 (three), B1, B5, B7, B35
Engine house reservoirs	5	30, 39, 64, 108, 109
Mine offices/reckoning houses/overseers' houses/smithies, etc	30	10, 30 (two), 32, 39 (three), 48, 49 (two), 50 (two), 63, 64 (two), 77, 78, 97, 109 (seven), 116, B5 (two), B21, B26
Powder houses	7	64, 78, 109, 113, 119, B1, B22
Smelters at mine sites	2	109 (two)
Possible calciners at mine sites	1	108
Ore houses	1	B24
Soughs - open tails	16	78, 85, 98, 100, 108, 109 (two), 113, B11, B27, B29, B30, B31, B32, B36, B37

A	B	C
Soughs - bolt tails	10	1, 3, 34, 38, 60, 87, 106, B2, B10, B28
Soughs - open tail leats	6	40, 78, 85, B17, B18, B20
Waterwheel pits and other associated features	5	10, 78 (two), B16, B19
Leats for water raised by pumping	2	55, 64
Water blasts and associated features	1	B23
Ventilation fire houses - possible example	1	97
Gin circles - atypically large	2	30, 109
Gin circles - on hillock (or sometimes flat ground)	55	1, 4, 7, 9 (four), 28, 32, 36, 40, 42, 44, 52, 56, 62 (two), 63, 64 (four), 65, 69 (two), 75, 76, 87 (three), 91 (two), 93, 98, 102, 108, 109 (five), 110 (two), 113 (two), 114, 120, B3, B8, B9, B12 (two), B13, B14, B34
Gin circles - contoured into slope	8	4, 49 (two), 95, 109, 119, B6
Gin circles - possible cog and rung type	3	107 (two), 55
Large haulage level entrances	6	48, 49, 109 (four)
Pipe working entrances	4	51, 100, 109 (two)
Crushing circles/wheels	15	1, 6 (three), 9 (two), 12, 13 (two), 15, 30, 32, 109, B3, B4
Knockstones	2	45, 52
Bouse teems	6	12, 46, 49, 51, 109, 116
Ore storage bins	10	4 (five), 5, 9, 16, 18, 52
Trunk buddles/leats from shafts to buddles or buddle dams, or associated with ponds/large ore-washing ponds	16+	6, 12 (several), 30 (several), 40, 42, 46, 51 (several), 64 (several), 76, 87 (two), 88, 91 (two), 93 (several), 98 (several), 100, 109
Buddles - stone-lined rectangular troughs	13+	11, 91, 93 (several), 94, 97 (two or three), 99, 100 (three), 103, 107 (several), 112, 113, 114, 119
Buddles - circular and D-shaped sets	2	6, 109
Slime ponds	6	10, 12, 15, 42, 64, 119
Buddle dams	20+	9 (several), 11 (two), 12 (several), 16, 42, 43, 51, 52 (several), 4, 87 (several), 88 (two), 91 (several), 93 (several), 94 (several), 96 (two), 97 (one or two), 98 (several), 100 (several), 116, 119 (several)
Spaced shaft mounds (notable examples only)	2	4, 87
Extensive opencut pickwork	3	6 (two), 16
Beehive caps	8+	13 (several), 37, 39 (five), 63 (several), 80 (four), 97 (two), 107 (several), 116
Barrow runs (or raised launders)	5	51, 87, 97, 98 (two)
Wooden launders	1	109
Water diversion leats	1	1
Mine roads	4+	9, 11, 108 (two), 109 (several)
Tramways	4	11, 30, 52, 64
Limekilns and quarries used for mine building construction or processing waste rock	4	64 (two), 85, 109
Meerstones	2	49, 51
Sough marker stones	1	B17
20th century lead mine buildings	1	64
Late 19th and earlier 20th century gangue-processing buildings and other structures	7	43, 49, 50, 100, 119, B15, B33
20th century headgear	2	64, B15

Early Mines - Archaeological and Documentary Evidence

A	B	C
Prehistoric copper mining	*1*	*109*
Documented medieval/early post-medieval lead mines	*18*	*1, 6, 14, 30, 47, 75, 77, 78, 99 (two), 100 (two), 103, 104, 107, 112, 115, U30 (two)*

Important Surface Remains - Relatively Complete Mine Complexes

A	B	C
Larger lead mines with several features	*48*	*1, 6, 9, 15, 27, 30, 32, 33, 36, 37, 39, 42, 49 (two), 50, 51 (two), 52 (two), 56, 62 (two), 64 (two), 65, 69, 76, 78 (three), 93 (two), 108, 109 (four), 110, 113 (two), 114, 116, 119 (two), B5, B12, B25, B35*
Smaller lead mines with few features (good examples only)	*18+*	*4, 6, 9 (several), 11 (three), 16, 17 (three), 18, 40, 46, 52, 63 (several), 86, 97, 100, 106, 107 (several), 112 (two), 113*
20th century mines	*7*	*35, 43, 49, 50, 64, 119, B33*

Important Underground Remains - Types of Interest

A	B	C
Vein workings mined for lead	*40+*	*1, 4 (three), 5, 9, 10, 16 (three), 18, 19, 40, 44, 46, 49, 52, 69 (two), 78 (two), 80, 99, 102 (several), 109, 110, 111, 112 (several), 113 (four), 114, 117, 118, 119 (several), B11, U2, U3, U4, U6, U7, U28, U30 (four), U31, U32, U34 (two), U35, U36*
Pipe/flat workings mined for lead and copper (often also with veins)	*34+*	*1, 49, 51, 69, 80, 86, 89/U14/U15, 90, 93, 96, 98, 99 (three), 100 (three), 102, 108, 109 (seven), 112 (three), 117, 118, 119 (several), B25/U24/U25, U1, U3, U5, U12/U13, U16, U17/U18, U19/U20, U24/25, U26, U29, U30 (three), U32, U34, U37*
Shafts (of particular interest)	*14+*	*30, 44, 66, 69 (several), 78, 86 (two), 109 (three), B11, B26 (two), U4, U10, U28, U29, U30 (several)*
Haulage and access levels (some with sledways and tramways)	*23+*	*1, 40, 49, 69 (two), 78 (two), 86, 93, 99, 100 (two), 109 (five), 110, 112 (several), 113 (two), U1, U6, U7, U25, U27, U30 (three), U34 (two), U35, U36*
Packs of deads (of particular quality/interest)	*7+*	*52, 86, 99, 112 (several), U25, U30 (two), U34*
Stone stemples (of particular quality/interest)	*4+*	*1, 112 (several), U31, U36*
Ladderways	*4*	*5, 109 (three)*
Stairways	*2*	*16, U25*
Bundings	*1*	*109*
Striking chambers	*1*	*109*
Engine chambers	*6*	*78, 109 (three), B21, U13*
Underground pumps/pump rods	*4*	*66, B26, U22, U25*
Coffin levels	*6+*	*69 (several), 93 (several), 112 (several), U25 (several), U30, U33*
Boat levels	*4*	*85, 109, B11, U2*
Soughs (including some of coffin level type) and pumpway levels	*29*	*38, 40, 52, 60, 78 (two), 85, 98, 100 (two), 108, 109 (two), 112 (three), B11, B27, B30, B32, B37, U3, U8, U9, U21/22/23, U26, U29, U31, U33*
Engine water ingress levels	*2*	*109, U11*
Lock gates	*1*	*B11*
Dams	*2*	*109, U2*
Plankways	*5*	*B27, 109, U2 (two), U3*

A	B	C
Ventilation control walls/ducts	*2*	*99, U25*
Dressing floors	*6*	*4, 5, 86, 93, U5, U25*
Miners' workshops	*2*	*5, U25*
Water channels, launders, hotches, buddles, etc	*9*	*93, 99, U2, U5, U17/18, U21, U22, U25, U29*
Miners' artefacts (of particular interest)	*2*	*93, U25*
Miners' inscriptions (of particular interest)	*6*	*100 (two), U2, U25, U29, U30*
Pre-powder workings	*13*	*69, 78, 99 (two), 112, 117, 118, U30 (four), U32, U34*
17th century continental-type powder work	*1*	*109*
Other 17th century powder work	*3*	*B32, U30 (two), U34*
20th century workings	*14*	*35, 46, 49, 50, 81, 100 (two), 119, B11, U30 (two), U32, U34, U37*

Appendix C:

Detailed Descriptions of the Archaeological Interest at all Entries within the Inventory of Regionally and Nationally Important Lead Mining Sites in the Peak District Orefield

Main Sites - Within the National Park

1: ***Odin Mine, Knowlesgate and Engine Soughs, and Blue John Mine*** *- Surface features to the east include a fine crushing circle/wheel with rare iron track and 'tyre', a gin circle with associated run-in/filled shafts, a disturbed belland yard wall and disturbed dressing floor/hillocks. Nearby there is the Knowlesgate Sough bolt with a line of sough shaft hillocks between it and the mine. West of the road is an impressive opencut into the hillside, with a small entrance to a side vein to the north side, with a diverted stream in a leat running above and to the side of the main opencut. The opencut gives access to large, extensive, underground stopes, a slab-roofed level and a drystone-arched/slab-roofed cart gate. Further west there are spaced shafts (run-in or capped) and associated hillocks that were sunk to workings under the shale. At one shaft mineral was brought to the surface but these large hillocks have now been largely removed and there is a 20th century tramway bed associated with this latter activity. The other shaft hillocks include two or possibly three mounds along the early Engine Sough and a probable small shaft mound on another shale gate or trial. One shaft has a leat and this may have been used for a water blast. Odin Mine is documented as active in the second half of the 13th century. The Blue John Mine (currently a show cave) contains shafts sunk to natural caverns and historically important Blue John pipe deposits worked from the 18th century onwards.*

2: ***Peakshill Sough*** *- Rare example of 12 or 13 closely-spaced ventilation shaft hillocks along the line of a sough or shale gate. Pairs of hillocks near the tail indicate an undocumented re-driving.*

3: ***Oden Sough*** *- An open low bolt to an historically important sough, with four surviving large, well-spaced, ventilation-shaft mounds allowing its course across relatively flat ground to be traced.*

4: ***Faucet, Slack Hole and Longcliff Rakes, Rowter, Oxlow and Maskhill Mines*** *- Well preserved and in places impressive hillocks with opencuts. Features include a gin circle set into the hillside at Rowtor Mine and another probable example on a hillock at Longcliff Rake. The section of Faucet Rake west of Maskhill Mine has shallow surface workings with a distinctive series of spaced shaft mounds just off the surface line (presumably down to the hading vein). Here there is a series of capped shafts, ruined coes and five small ore storage bins. Underground there are shafts and large stopes (some natural opens) still accessible at Oxlow, Maskhill and Rowter Mines, with underground dressing floors.*

5: ***New Rake*** *- The hillocks are well preserved and there are several capped shafts. Surface features include a small ore storage bin adjacent to a small dressing floor with a small rectangular hollow that may be an ore-dressing pit. Nearby there are possible ponds. This section of the vein lies within a belland yard. Underground a shaft at what is now erroneously known as James Hall Over Engine gives access to extensive stopes, internal shafts, a miners' workshop and underground dressing floor and an impressive natural vertical cavern with miners' ladderway stemples which leads down to the Speedwell Cavern and further workings.*

6: ***Dirtlow Rake, Pindale Side and Red Seats Veins, and How Grove and Siggate Head Mines*** *- Surface interest includes deep opencuts with fine pickwork of early date on Pindale Side and Dirtlow Rake, mostly within large belland yards, with several grilled shafts and stopes in restored ground at the latter. On Red Seats Vein there are hillocks and a shallow opencut. It has been suggested that an adjacent 'field barn' was built for calamine processing, but there is currently no positive confirmation of this. At How Grove there is a fine mine complex, recently restored, with dressing floor, coe, crushing circle and wheel, two atypical buddles, one circular the other D-shaped, leats and a dam. There is a further complex at Siggate Head Mine above Pindale with surviving dressing floor, robbed crushing circle and pond. At Nether Dirtlow Mine on Dirtlow Rake part of the gin circle survives; a crushing circle and wheel here were moved several years ago from Rush Mine at Eldon Hill. The mines at Dirtlow Head are documented as active in 1538 but may well have much earlier origins.*

7: ***Hazard Mine*** *- Mostly removed, but a walled gin circle, a deep engine shaft (now grilled) and a small part of the belland yard wall are extant and there are a few remaining adjacent hillocks.*

8: ***Wham and Wrangling Rakes, and Penny Mine*** *- Some surviving large hillocks and hollows, others completely removed, where the primary interest is ecological. There are also ruined belland yards and a few capped shafts.*

9: ***Linacre, Slitherstones, Eldon Bent, Burning Drake, Wrangling Rake, Portaway, Eldon Vein, Jowle Grove, Watts Grove, Smiler, White Rakes and Hurdlow End Mines*** *- This area has many small and medium-sized veins with hillocks and opencuts, together*

with natural dolines (surface collapses above cave passages) along the veins. At the Linacre/Slitherstones Mines there are a large number of capped shafts as well as good examples of small opencuts, small belland yards and dressing floors, coes, water storage and ore-dressing ponds, and buddle dams. Underground interest includes several deep shafts that give access to unstable stopes. On Eldon Hill there are several small veins. Interest here includes a fine belland yard with crushing circle and wheel, ruined coes, a shaft and ore-dressing ponds and pits on the hilltop at Burning Drake Mine. On the north-east side of Eldon Hill, on Eldon Bent Vein, there is a small gin circle on a low mound, with a large hollow at a run-in shaft. Nearby to the west there is a ruined small belland yard. There is a ruined coe with a small ore storage bin on Wrangling Rake, with other ruined coes and/or walled shafts nearby, while further west there is a possible coe with what may be a small ore storage bin. Still further west along this vein there is a ruined small belland yard with a possible pond and a flat area that may once have been the site of a gin or less probably a crushing circle. At the western end there is a further belland yard with a ruined coe around a shaft. On the large veins to the south, at the easternmost part at Portaway Mine, nearly everything within the belland yard has been removed. There is a small belland yard and capped shafts on the small Eldon Vein to the north. There is a crushing circle and part of the wheel, a ruined coe, a small possible part of a gin circle and a grilled engine shaft at otherwise disturbed ground within the belland yard at Jowle Grove. Well north of the vein there is the dam of a large water storage pond. Immediately further west along the vein within the same belland yard as Jowle Grove, at Watts Grove, the hillocks are better preserved and there are various grilled/capped shafts, a ruined coe or shaft wall, a water storage pond and a gin circle. Going west, to the veins known as White Rakes, there is a belland yard around Smiler Mine with capped adjacent engine and climbing shafts, opencuts, a fine example of walling supporting deads in the vein, water storage/ore-dressing ponds and pits and a probable buddle dam. Further belland yards along White Rakes, now planted with trees, have shafts, a ruined coe, possible ponds and a probable gin circle. Nearby is a probable mine road. Opencuts are associated with early hillock reworking, possibly in the 19th century. There is a fine gin circle at Hurdlow End in a belland yard and further east there are reworked high hillocks at a second mine within a further belland yard.

10: ***Coalpithole Rake*** *- The surface interest to the east includes extensive hillocks, a long opencut, several small dressing floors, two probable gin circles, a set of slime ponds and a probable large water storage pond (or dew pond). Near the eastern end of the vein is a manager's house that is still occupied. The central section of the vein lies within a belland yard. Underground interest includes several deep shafts (rarely entered and now potentially unstable) that give access to unstable stopes. West of the road there are two particularly impressive lined engine shafts sunk through shale (nos. 8 and 10). At shaft 8, adjacent to the road, there are slight traces of the horizontal engine house and/or associated buildings, including large gritstone blocks with securing bolts. Nearby is a large dam and leat which may be the reservoir for 18th century waterwheel pumps or was constructed as a flood-control measure in the 1860s. At shaft 10 (the westernmost) there are traces of the brick foundations and paving of an engine house or boiler house, together with a brick-built flue running up the hillside to a chimney base.*

11: ***Gautries Rake*** *- Surface interest within a long belland yard plantation includes undisturbed hillocks, several capped shafts, opencuts, water storage and ore-dressing ponds, two buddle dams, dressing floors and traces of small buildings. Rarer features include the only known stone-lined buddle in the northern part of the orefield, a 19th century mine road, and a retained tramway with a loading bay at the top end probably associated with relatively early hillock reworking and removal.*

12: ***Oxlow and Daisy Rakes*** *- Here there are fine examples of large hillocks and opencuts. Some of the hillocks are flat-topped and have been used as dressing floors. Adjacent hillocks often comprise dressing waste. The whole is walled out by five large linear belland yards. A series of mines can be identified from the distribution of larger hillocks within the yards. Few shafts and associated features remain visible, with only two or three capped examples of shafts surviving. There are several examples of ruined coes including a large one that may have been part of a larger complex. Associated with the identified mines are water leats, storage and ore-dressing ponds (sometimes clustered together in integral arrangements), and buddle dams including one fine semi-circular example. Rarer features include a fine bouse teem at Nether Oxlow, a circular structure of unknown purpose and slime pond relatively nearby, and footings of a possible small engine house at Oxlow End. There is a crushing circle, mostly buried, at Daisy Rake (Old Moor Mine). Many of the hillocks between those of the larger mines have been disturbed, and these provide clear examples of early reworking of probable 16th or 18th century date.*

13: ***Boggart Hole Vein, Hills Venture and Royal Oak Mines*** *- The hillocks, belland yards, dressing floors, ruined coes, part-collapsed beehive caps, and shafts at Boggart Hole Vein and Hills Venture Mine remain. In contrast, much of Royal Oak Mine within the ruined belland yard wall has been reworked. Interest includes a crushing circle and wheel at Boggart Hole Vein, a water storage (or dew) pond at Hills Venture, and a small part of the gin circle and a re-erected crushing wheel at Royal Oak Mine.*

14: ***Cop Rake and Starvehouse Mines*** *- At Cop Rake there are fine examples of opencuts with associated shafts and unusual drystone walling across the cut, with early reworked hillocks, a retained causeway across the vein, a possible water storage or ore-dressing pond, a possible gin circle and ruined coes. At Starvehouse Mines there are several good undisturbed examples of hillocks and hollows following relatively small veins. Parts of both rakes lie within belland yards. The mines at Cop Rake are documented as active in the first half of the 13th century.*

15: ***Moss Rake West End*** *- Fine examples of hillocks (with partial fluorspar reworking at centre) and opencuts, with shafts and water storage and/or ore-dressing pond, together with a fine slime pond, a robbed crushing circle and a ruined building, presumably a coe. The eastern part of the site lies within two belland yards.*

16: ***Moss Rake, Raddlepits, Hugh Grove and Rakehead Mines, and New Rake Bottom*** *- This section of Moss Rake has been extensively reworked but there are still features of interest. Two large modern opencast quarries are currently open that have exposed vein cheeks that contain fine examples of sweeping pickwork and stemple holes. There is also part of a 20th century inclined level. A small 20th century headgear has recently been moved but is still on site. The Raddlepits engine shaft gives access to a fine example of a rake vein mine with unusual features such as a miners' spiral staircase. Nearby a small side vein still has surviving hillocks and a climbing shaft. Further west the Hugh Grove and Rakehead shafts are currently capped, one with a large boulder, but previous exploration showed they lead to extensive rake workings. On the side vein at New Rake Bottom there is a short surviving stretch of hillocks and fine narrow opencuts, in part very deep, with one section that may be a natural pothole. There is a small walled dressing floor, with an ore storage bin in one corner and a ramp to a dressing or buddling area. There is a water storage pond nearby to the north-east and a ginged climbing shaft (blocked) to the west. Further west there is a ruined coe with internal climbing shaft. Nearby there is a dished hillock that may be a buddle dam.*

17: ***New Venture West End*** *- Good example of a small-sized vein with hillocks and opencuts. In the eastern part there are three distinct small mines, each with a ruined coe. Two have surviving shafts. One has a ruined belland yard with two dressing floor compartments, one presumably for washing and sieving, the other perhaps for buddling.*

18: ***New Venture Mine*** *- A length of damaged hillocks in two adjoining belland yards, with conserved opencuts and grilled shafts. There is also a fine wall of deads across the vein, together with a dressing floor, a possible ore storage bin (restored), water storage and ore-dressing ponds, and a natural pothole on the vein. Shafts and opencuts give access to underground stopes that reach a depth of about 70m.*

19: ***Long Rake Founder and Shack Pit*** *- Hillocks mostly removed but still with ecological interest. A lidded shaft in a disturbed hillock gives access to deep and extensive stopes and natural caverns, which reach a total depth of 150m. Shack Pit, about 30m along the vein to the south-west and now more commonly known as Batham Pot, is an impressive natural 15m deep pothole with mining at one end, once much deeper but used by miners to dump deads.*

20: ***Smalldale Mines*** *- Three isolated hillocks in a largely reworked area where the primary interest is ecological.*

21: ***Moss Rake - Southfield Mines*** *- Modern waste heaps where the primary interest is ecological.*

22: ***Lambpart Vein*** *- Hillocks and one part-filled small shaft within and adjacent to a belland yard, where the primary interest is ecological.*

23: ***Berrystall and Scrin Rakes, and Chance Mine*** *- An area with much reworking, but with some remaining hillocks, where the primary interest is ecological. One vein opencut has a shaft with an adjacent example of walling across the vein and an entrance into the shaft side.*

24: ***Lambpart Mines*** *- Hillocks and two small filled shafts, one with an adjacent small circular platform with drystone retaining and possible ruined coe, where the primary interest is ecological.*

25: ***Earl and Hill Rakes, and Nall Hole Mine*** *- Much of this vein, within a fine series of belland yards, has been reworked and the primary interest is ecological. However, at Nall Hole Mine, worked for calamine, there are large hillocks, small ore-dressing pits and a possible gin circle wall. Elsewhere there are opencuts and ponds. At the east end of Hill Rake there are three large shaft hillocks with three buildings used for agricultural purposes. However, of the two on the central hillock, one may be a converted Newcomen engine house that is known to have stood here or nearby, and the other may have been a coe. The two belland yards to the west end of Hill Rake have recently been largely removed.*

26: ***Intake Dale Mine and Shuttle Rake*** *- Hillocks, mostly disturbed or removed, where the primary interest is ecological. Part of a gin circle survives.*

27: ***Edge Rake Mine*** *- Two large flat-topped hillocks (and others nearby) with several capped and blocked shafts, mostly within a belland yard. Features include two probable damaged gin circles, a possible crushing circle, a water storage pond, foundations of a small horizontal engine/boiler house with the base of a circular chimney, a ruined coe and a possible ore-dressing site with four small rectangular pits.*

28: ***Maiden Rake - Heath Bush Mine*** *- A large flat-topped hillock with a good example of a gin circle and an adjacent capped shaft. Nearby there is a possible large coe (or agricultural building) and a second large hillock.*

29: ***Maiden Rake*** *- Four spaced shaft hillocks (and a further hillock) to the south and a reworked area to the north, all within a belland yard, where the primary interest is ecological.*

30: ***Tideslow, High and Washers Rakes*** *- There are fine examples of hillocks (with early reworking of spoil and buddling waste) within belland yards, and large opencuts on Tideslow Rake. Here there are run-in shafts, damaged dressing floors, water storage and ore-dressing ponds, and leats. The water management features are particularly complex and informative with regard to the use and re-use of surface water. There is also an unusual earth-built coe with internal capped shaft, and elsewhere there is an unusual tramway cutting leading from the vein. On High Rake there are largely reworked but still sometimes high hillocks. Amongst these, at High Rake Mine, there are the footings of two engine houses and attached boiler houses, with flues, chimneys and a reservoir (a Cornish pumping engine and a two storey winder), together with a cobbled coal yard, a crushing wheel and the site of an iron crushing track with ruined side pavement, a capstan/large gin circle, footings of a smithy/carpenters' shop and a mine office, and a large oval engine shaft with gritstone and limestone lining (capped but with viewing window). This site is currently being excavated and conserved. To the north there are good examples of hillocks and hollows on several veins, including Washers Rake, which are of ecological interest. The High Rake shaft, which is 220m deep, is noteworthy for the fine gritstone ashlar lining where it passes through toadstone at depth, which is still visible in the section just above the summer water level (about 100m down). The mines at Tideslow are documented as active from the 13th century onwards.*

31: ***Old Grove Sough*** *- This early 18th century shale gate/pumpway is not accessible and the tail is blocked. However, there is a rare and well-preserved line of eight closely-spaced ventilation shaft mounds leading north to Foolow Edge, where the vein hillocks have been heavily reworked and thus are excluded here.*

32: ***Little Pasture Mine*** *- A relatively intact moderate-sized mine complex within a belland yard. There are two shafts on shale hillocks. The main one has a gin circle and was presumably also a dressing floor. On a lower terrace there is a crushing wheel and a sunken circular crushing area, now only partly defined with no surface sign of the crushing track. Nearby to the east is a well preserved mine reckoning house (used as a field barn). Below the crushing circle there is a further terrace with a short stretch of retaining wall which may be a third ore-dressing area. It is approached from the north-west by a terraced track. Further to the north-west there are 2-4 hollows that may be water storage ponds. Downslope from the mine complex there are remains of a large but heavily reworked waste hillock.*

33: ***New Engine Mine*** *- A horizontal pumping/winding engine house in good condition with a ruined boiler house and chimney base. Very deep capped shaft through shale (333m - the deepest recorded in the orefield). Hillock largely reworked but of ecological interest. This lies within a belland yard built after the site was abandoned.*

34: ***Magclough Sough and Engine*** *- A low sough bolt leading to one of the major soughs of the region. Above there are five ventilation shaft hillocks, including a massive hillock at Magclough Engine to the west.*

35: ***Glebe Mine*** *- While the main surface interest is ecological, on large 20th century buddle dams/waste heaps, below there is a fine grilled 19th century engine shaft, down through shale to 20th century and earlier workings, and extensive concrete platforms at the site of the large 20th century dressing plant.*

36: ***Little Brookhead Mine*** - *An intact small mine complex on a steep shale/gritstone slope. An upper terraced working floor has a capped shaft and a gin circle. A rectangular adjacent area, terraced into the slope, may be the site of a wooden coe and there is an adjacent possible washing pit. Above and to one side is a possible pond. There is also a lower terraced area that must also have been used for dressing. A gully with pit at one end may have been associated with buddling. A large partially-robbed hillock on the slope below contains finely-crushed processed material and shale from shaft sinking.*

37: ***Stoke Old Engines*** - *A large flat-topped hillock with two engine shafts, one covered with a beehive cap, the other walled round. To one side is a semicircular terrace that may well be the site of a gin engine. These deep 18th century shafts were sunk through gritstone and shale to Stoke Sough, which in turn led to the veins in underlying limestone to the west.*

38: ***Stoke Sough*** - *An arched sough entered via a short bolt entrance and leading to one of the major soughs of the region; a long section is open, but contains bad air. Above there are two large ventilation shaft hillocks.*

39: ***Watergrove Mine*** - *Hillocks on the south side of road are well preserved but to the north they have been disturbed. Features to the north include a mine office and smithy, both still roofed, a semi-detached overseer's house and manager's house (still occupied). Across the road are the probable foundations of a Newcomen pumping engine house next to a capped shaft. Nearby, but lower down the slope, there is a large reservoir (uncertain purpose). On the north side of the road is a second smaller reservoir, presumably for the 19th century Cornish engine house that has now been removed. The main engine shaft here is covered and used for a water supply for Cavendish Mill. There are three beehive shaft caps to the east (restored). The large one to the south of the road has a flat adjacent area large enough for a gin and was probably an engine shaft. The other two are adjacent to each other on the other side of the road, comprising a large engine shaft cap and a small climbing shaft cap. All these features lie within a series of belland yards. Beyond to the north-east there are further hillocks, all rather damaged, but there are deep shafts, two with beehive caps, down to the pipeworkings and this area is an integral part of this historically important mine complex.*

40: ***Arbourseats Veins and Sough, Wardlow Sough, and Nay Green Mine and Washing Floors*** - *Good example of small to moderate sized veins with hillocks and opencuts (some deep), with several small belland yards, ruined coes, levels and sleepered shafts. At the top of Tansley Dale there is a gin circle wall adjacent to a run-in shaft, with a coe built later overlying the horse walk. A small belland yard part-way down Tansley Dale has a flat-topped dressing floor hillock with ruined coe, a grilled but blocked shaft, a water storage pond, and a possible small rectangular ore-dressing pit. In the main valley bottom there are rare large Nay Green ore washing ponds fed by a stone-lined goit from Wardlow Sough (currently blocked). Nearby is Nay Green (Neptune) Mine where there is a long accessible level with internal shafts to depth. On the other side of the valley there is a run-in sough tail and opencuts above, leading to the sough, following the main Arbourseats Vein. The spoil from these workings part-blocks the valley bottom and creates a dam for the washing ponds. Near the bottom of Tansley Dale there is a drystone walled channel on the top of a large flat-topped dressing floor hillock. This leads to an underground level (or perhaps sough) with an internal shaft down to unstable workings.*

41: ***White Rake (west)*** - *A good example of large hillocks and hollows. In a possible belland yard to the east the opencut is continuous. To the west a larger hillock has hollows that may well be the sites of engine and climbing shafts.*

42: ***White Rake (east) and Old Seedlow Mine*** - *Interest includes hillocks, opencuts, shafts and a ruined belland yard. At Old Seedlow Mine to the east, within a large belland yard, there is a fine ginged engine shaft, one or possibly two ruined coes, two slime ponds, a water storage pond with leat and a poorly defined possible gin circle. Further east there is a shaft with a walled gin circle. Both these mines had large waste hillocks that have been extensively reworked. Further west the hillocks are largely intact and there is a fine rectangular buddle dam.*

43: ***Mootlow and Robinwash Veins*** - *The eastern part of this area has impressive large hillocks and opencuts. Features include a small mine complex with large hillock, ruined coe, small buddle dam and an access track. At the upslope end of the site is a modern pond (which may be a re-used mine feature) and leat, with two possible mine water storage or ore-dressing ponds nearby. The western part of the area has been extensively reworked for gangue mineral leaving deep opencuts and hillocks that are a good example of remains left by early to mid 20th century working. Surface interest here includes ruined footings of a calcite processing plant with buildings, small dressing floor, loading platform, access tracks and a chimney flue with the base of a small circular chimney. The whole lies within a belland yard.*

44: ***Cackle Mackle Mine, Blakeden Great Vein and Stadford Hollow*** - *Surface interest includes extensive hillocks and hollows along moderate-sized veins, mostly partially robbed, capped shafts and several ruined coes. Features include a well-preserved hillock-top gin circle with robbed surrounding wall at Cackle Mackle Mine, with a possible stone-lined buddle on an adjacent hillock, and a small walled dressing floor, coe and water storage or ore-dressing pond on the vein to the south. Underground, there are good examples at Stadford Hollow of short cross-cuts linking the bases of climbing shafts with the tops of the next in sequence, together forming a ladderway going deep underground.*

45: ***Silver Hillocks Mine*** - *The main interest comprises a coe with a possible large knockstone in the corner (or the top of a crude table/shelf). Nearby are the incomplete footings of one or perhaps two more coes and a small area of intact hillocks and hollows. To the north there is a further coe with a blocked internal shaft. The surrounding hillocks have been extensively reworked.*

46: ***Enterprise and Shepherds Mines, Sallet Hole, Unwin Vein and Talbot Holes*** - *At Enterprise Mine there is a bank of two bouse teems and a water storage pond (probably remodelled) with a feeder leat. Nearby there is an enterable trial level (and the site of a second arched example opposite). Elsewhere in the area the hillocks of relatively small veins are well preserved, with some opencuts and levels, and a ruined coe in the valley bottom at Shepherds Mine. A natural cave on the vein to the west leads to mine workings with a deep internal shaft. At Sallet Hole Mine below, at valley-bottom level, the 20th century level survives and is gated, but the buildings of this now disused fluorspar mine have recently been removed.*

47: ***Cat Rake*** - *A good example of a deep but narrow opencut along a vein; hillocks within the belland yard were largely removed in the 20th century. This site may have been at work in the 1570s, then known as Catsall Rake, when waste material was being reworked using sieves and vats, the earliest documented example of this practice in the orefield.*

48: ***Red Rake Mine and Newburgh Level*** - *The main remaining interest is the fine drystone arched Newburgh Level, with an 1851 datestone, that was used for haulage rather than being a sough despite being commonly called Red Rake Sough. There is also a roofless stone building that was part of the mine complex. Extensive associated hillocks and other features have been reworked/removed.*

49: ***Brightside and Harrybecca Mines*** - *Surface interest includes extensive damaged hillocks, capped shafts and levels. At Brightside Mine there is a rare bank of three bouse teems, an arched haulage level called the Newcastle Road, the footings of a horizontal pumping/winding engine with chimney base, and a ruined sawmill (powered by the engine house). A mine cottage is still inhabited. At Harrybecca Mine there are deep opencuts, an overgrown gin circle and ruined buildings. There is also an interesting small 20th century fluorspar mine plant nearby to the west (Bacon's Mine), associated with one of the deep opencuts, with levels, platforms and ore chute drystone supports, and once with corrugated-iron structures (recently collapsed). The opencuts can be explored underground (but are very unstable in parts) and are a good example of narrow vein workings. A sleepered shaft gives access to a series of pipe-like workings and the main engine shaft. To the east a small level gives access to the side of a large engine shaft. At the latter, above at surface, there is a second gin circle cut into the hillside, now overgrown and boulder strewn. Nearby is the bed of a steep incline which is presumably associated with fluorspar working. Against the northern boundary of Hassop Common there is a series of initialled meerstones marking the boundary between Hassop and Ashford Liberties.*

50: ***Putwell Hill Mine*** - *The vein has been extensively worked for calcite in the late 19th and first half of the 20th century, but was earlier mined for lead. Interest includes ruined 19th and 20th century buildings, the lower half of a chimney and impressive underground stopes. At surface there are ruined buildings on two sites. The lower site has two small buildings, with the chimney between, and stone retained working platforms. Upslope from here there is a wide opencut. The upper site, which is earlier and not certainly a mine complex but more probably agricultural, has two small ranges of buildings set at right angles. Nearby, and running across the hilltop, there are well-preserved hillocks and an opencut.*

51: ***Lees and Dove Rakes, Booth Lee Pipes, and Sterndale Sough*** - *Surface interest includes well-preserved hillocks in a fine setting, capped and run-in shafts, opencuts, water storage and/or ore-dressing ponds and belland yards. Other features include a fine walled ore washing pond, and a run-in high-level sough tail and associated ventilation shaft mounds. There are two belland yards with important associated features. One has a bouse teem and barrow-run, a meerstone, ore-dressing ponds and a ruined building presumably a large coe. Further east, the other yard has water storage and/or ore-dressing ponds and possible buddling troughs, with water channels from a spring high on the hillside above, and buddle dams below in the lower part of the belland yard. Small underground workings are accessible at Booth Lee Pipes, some possibly of considerable age. To the north-east, by the Wye, there is the run in sough tail of Sterndale Sough, with an adjacent coe and flat-topped hillock. To the south-east, on the hilltop, there are hillocks at a rare example of an outcropping flatwork worked in the 17th century.*

52: ***Maury Mine and Sough*** - *Surface interest includes well-preserved hillocks, opencuts, capped shafts, ruined coes, dressing floors, water storage and/or ore-dressing ponds, buddle dams and belland yards. Features south-west of the hilltop include a fine walled gin circle, associated capped shafts, ruined coes and a small ore bin or the surround to a knockstone. Further south-west are capped shafts and ruined coes, some within a belland yard. On the hilltop to the north-east there is an unusual hillock-reprocessing site of probable 19th century date with large waste heaps, buddle dam and a possible buddling trough. On the slope down to the Wye there are further possible ore-dressing pits, opencuts, a water storage and/or ore-dressing pond and a belland yard. Near the base of the slope there is a fine site comprising a run-in haulage level with associated tramway bed, large hillocks, dressing floor, a ruined coe, buddle dams and a ruined belland yard wall. A shaft at the base of the riverside cliff gives access to Maury Sough, which runs up the vein through several stopes with fine packs of deads. At the sough tail below there is a ruined coe.*

53: ***Bulltor Veins*** - *A broad swathe of hillocks and hollows on several veins within a belland yard, where the primary interest is ecological. There has been some reworking, particularly to the east.*

54: ***Grove Rake*** - *Good example of hillocks and opencuts along a relatively large vein in a long belland yard.*

55: ***Upper Hubbadale Pipe - Water Engine Shaft*** - *The hillocks here are in variable condition. The main point of interest is a water leat that may be associated with run-off water from a documented underground 'water engine'. It has been suggested that the shaft had a cog and rung gin engine but the evidence on the ground for this is ambiguous.*

56: ***Hubbadale Pipe - Fidler's Shaft*** - *A large hillock with a ruined belland yard wall contains two capped shafts, one a climbing shaft, the other an engine shaft with a well-preserved gin circle to the side.*

57: ***Sheaths Pipe*** - *A fine example of well-preserved hillocks, within a belland yard, associated with an outcropping pipe rather than a rake. Features include a blocked shaft and a possible ruined coe.*

58: ***Crotie Rake*** - *A fine example of well preserved hillocks related to a swarm of small veins. There are also several small capped shafts.*

59: ***Whale Rake*** - *A good example of rake hillocks of variable size. There is a poorly defined gin circle on a particularly large hillock.*

60: ***Whale Sough*** - *An historically important sough to the Hubbadale Pipes with a good example of a slabbed bolt with six shaft hillocks. Underground the sough is accessible for some distance to a fall, now enterable via a reopened shaft in a hillock near the tail.*

61: ***Shake Rope and Sun Veins*** - *Well-preserved examples of isolated small veins with shallow opencuts and small upcast heaps with occasional shafts.*

62: ***Fieldgrove Vein*** - *The hillocks and shafts are in somewhat variable condition. Features include two mine complexes with large hillocks in belland yards. Both have engine shafts with well-preserved walled gin circles and large coes; the one to the north-west has two storeys with a fireplace and chimney flue. The mine to the south-east also has a flat hillock-top dressing floor, a stone-lined, rectangular, water storage pond and a possible slime pond.*

63: ***Hard and Glead Rakes, and High Low Mines*** - *A fine example of rake and multiple veins with hillocks, opencuts, run-in shafts and small belland yards. In one part there is an exceptional area of seven small belland yards and possible collapsed beehive shaft caps. There was also once a Newcomen engine house and sub-surface evidence may remain. The hillock here contains cinders. Hard Rake Mine, in the plantation, has a capped engine shaft with an adjacent walled gin circle and dressing floor, all on a high flat-topped hillock. Further west there is a ruined building which may have been a mine reckoning house.*

64: ***Magpie and Dirty Redsoil Mines, and Talbot Holes*** - *This exceptional site, with the core area within a belland yard, has fine hillocks and a complex suite of 19th century buildings. These include a Cornish engine house, a miners' dry, a horizontal engine house and boiler house, two chimneys (one from an earlier Cornish winding house) and flues, a reservoir, a small horizontal engine house (used for dressing floor equipment), a manager's house with*

attached smithy, a small building that may have been an ore store, and a powder house. There is also a 20th century headgear and winding house. Elsewhere on site there are also several grilled climbing and engine shafts, four gin circles (one walled, the others embanked on flat-topped dressing floor hillocks), an embanked leat for the water pumped from underground, a raised tramway and slime ponds. There are also shallow re-working opencuts, a dressing floor with ruined wall, a small buddle dam, ruined coes, one or two limekilns and associated quarries for constructing the buildings, and the site of a possible damaged crushing circle (unlikely). Many of the hillocks were partially re-worked in the 19th century and there are associated small ore-dressing pits with a complex series of small leats. The main engine shaft is open to sough level but contains dangerous obstructions. Other shafts give access to short sections of vein workings. To the west, around Talbot Holes, there are good hillocks on several veins.

65: ***Trueblue Mine*** *- This small mine site within a belland yard includes hillocks and hollows across much of the field, a capped shaft, a walled gin circle, ruins of an exceptional group of four to six coes, one with a possible collapsed climbing shaft, a dressing floor, a very large dew or water storage pond, a possible stone-lined buddle and possible ore-dressing ponds and pits. An adjacent two-storey building is presumably a field barn.*

66: ***Great Greensward Mine*** *- The hillocks are mostly removed. A lidded oval engine shaft, at one side of a disturbed platform/hillock, has rare in-situ underground pumps and guide rails for a cage. Nearby at surface there is a raised stone mounting for a horizontal pumping/winding engine, erected outdoors or housed in a wooden/corrugated iron engine house. Behind this there is a ruined stone-built boiler house with attached chimney base with a firebrick lining. In the boiler house wall there is the site of a drawing door with in-situ iron guide rails. Nearby there is a grilled climbing shaft with a fine example of stone climbing stemples. At the south-east end of the field there is a second engine shaft and a climbing shaft.*

67: ***Bagshaw Dale Mines*** *- Small length of vein hillocks, and ploughed-out hillocks on a second possible vein, where the primary interest is ecological.*

68: ***Brecks Mine*** *- Two small opencuts above and below the quarry, where the primary interest is ecological.*

69: ***Crimbo and Whalf Pipe Mines*** *- At surface there are several intermittent pipeworking hillocks, mostly damaged, some with capped/lidded shafts, and outcropping pipe and vein workings. The south-western end lies within a belland yard. There are two surviving gin circles and the poorly defined remains of a third with a ruined protecting wall. There are also one or possibly two ruined coes, one with a lidded climbing shaft. At one shaft hillock there is the base of a chimney and stonework/brickwork at the site of two demolished horizontal steam engine houses. The extensive underground features (now often known as Hillocks and Knotlow Mines) include pipe and vein workings, hand picked climbing shafts and larger engine shafts, and several fine examples of coffin levels and later access levels. Hillocks Mine has evidence for firesetting in its upper workings.*

70: ***Hutmoor Butts Mines*** *- A rare survival of a number of intact workings on several small closely-spaced veins with capped small shafts, one or two ruined coes, and what may well be a rectangular ore washing pond with a semicircular end.*

71: ***Ferndale Mines*** *- Small length of vein hillocks where the primary interest is ecological.*

72: ***Pasture/Hole Rake*** *- Vein hillocks and a water storage or ore-dressing pond, where the primary interest is ecological.*

73: ***Tagg Lane Mines*** *- Hillocks on small veins, with two capped shafts, where the primary interest is ecological.*

74: ***Sparklow Mines*** *- A good example of well-preserved hillocks on four small veins where the primary interest is ecological.*

75: ***Cotesfield Mine*** *- A part-removed belland yard wall contains a gin circle with adjacent capped engine shaft. Adjacent mining within the vein took place as least as early as the 12th century as this vein is mentioned as an 'old mine' in a charter of this date.*

76: ***Carder Low Mines*** *- A well preserved line of vein hillocks, except at the centre where there is a mine complex on a hillock, with the vein hillocks removed to either side for reprocessing at this site. Here there is a sleepered shaft with an adjacent gin circle with a ruined surrounding wall. The circle is partly overlain by the ruined walls of a large rectangular building, presumably a coe. A short water channel, with small adjacent platform, leads to two ore-dressing ponds at the downslope end of the hillock.*

77: ***Mandale Rake*** *- This is the only surviving stretch of large hillocks and hollows on this historically important rake. There is also a well-preserved 1820s mine reckoning house. Mandale Rake is documented as active in the 1280s and the late 16th century.*

78: ***Mandale and Lathkill Dale Mines and Soughs*** *- The surface features at Mandale Mine include a ruined Cornish pumping engine house, flue and chimney. Nearby there is the goit and entrance to Mandale Sough, a waterwheel pit, blocked shafts and a gated entrance to an inclined level into the mine. Further up the valley there is a long waterwheel leat, the pillars of an aqueduct over the river, and the wall of a second waterwheel pit with launder breast wall at Lathkill Dale Mine. Other features here include capped shafts and the ruins of Bateman's House (a manager's house with large accessible shaft beneath it, with a chamber at the base which one had a rare Dakeyne disc engine), and a ruined powder house. Elsewhere there are level entrances. Underground features include Mandale Sough that in part is arched or slabbed-over, together with stopes and a chamber at the base of an engine shaft. A gated side vein has evidence for firesetting. Sideway Level, with stopes and shaft, is also accessible further up the valley. Part of Lathkill Dale Sough is accessible in drought conditions via the shaft at Bateman's House. Mandale Mine is documented as active in the 1280s and the late 16th century; most of the surface features are 19th century in date.*

79: ***Summerhill Mines*** *- Hillocks on veins, with capped shafts, a belland yard and dressing floor (with a flat area that possibly once had a gin), where the primary interest is ecological.*

80: ***One Ash Moor Mines and Water Icicle Close Mine*** *- Hillocks on veins, with several capped shafts, where the primary interest is ecological. At the northern edge of the area is a rare survival of a line of four beehive caps over small shafts. The shaft at Water Icicle Close Mine leads to natural passages where miners have removed stalagmites (thought to be for incorporation into a grotto at Chatsworth) and to a good example of narrow vein workings.*

81: ***Long Rake Opencuts*** *- Wide opencuts and disturbed hillocks within a long belland yard. One deep opencut leads to extensive underground stopes worked for calcite in the 19th and 20th centuries. Here unstable workings include large stopes, ring-arched levels with tramways, timber ore chutes, and an engine shaft with fittings and ladderways. There are also reworked hillocks and two temporarily open shafts (which in spring 2003 appeared to be being prepared for backfilling). Recent infilling of the western opencuts has necessitated exclusion of this part of the site, which was included when the Inventory was formulated in 1999/2000.*

82: ***Bradford Dale Mines*** *- Hillocks along veins where the primary interest is ecological. In the valley bottom is a large hillock with capped shaft and probable slime ponds. There are also two trial workings in the cliffs on natural joints.*

83: ***Blith Forefield Mine*** *- Reworked and largely removed hillocks and a capped shaft, within a belland yard, where the primary interest is ecological. A ruined two-storey building may be a mine building, perhaps a mine office or reckoning house.*

84: ***Thornhill's Sough and Bowers Rake*** *- A good example of five closely-spaced ventilation shaft hillocks following a short sough to Bowers Rake.*

85: ***Hillcarr Sough*** *- Fine arched entrance tunnel to one of the longest soughs in the orefield. There is also a jetty where material from the sough was unloaded from boats and placed in nearby waste heaps. A goit leads via two ponds to the River Derwent. Nearby there is a limekiln that may be associated with the sough. In the other direction, a paved track leads upslope to three ventilation shaft hillocks. The uppermost has a capped shaft with an adjacent platform (possibly for a gin) and a nearby enclosed yard.*

86: ***Mouldridge Mine*** *- Surface features include well-preserved pipe-working hillocks, capped shafts, a dressing floor and a belland yard. A level leads to a good example of a complex series of underground pipe workings with shafts to surface, two of which are unusually close together, a dressing floor, fine walled packs of deads and an internal shaft.*

87: ***Dunnington and Hardbeat Mines, Rath and Cowlica Rakes, and Rath Rake Sough*** *- Extensive well-preserved pipe and vein working hillocks and opencuts, with a number of capped shafts. In places there are large opencast-type workings, presumably in pipes or flats, and one area has a large number of near-contiguous shaft hillocks, which suggest flat or pipe works were mined below surface in 'bell-pit' fashion; exploration of one open shaft here supports this interpretation. Surface features include several buddle dams (some large) associated with 19th century hillock reworking, one with two barrow runs, several ore-dressing pits, a possible pond, two water leats or trunk buddles, three probable/possible gin circles, a ruined circular coe or walled shaft and two mine (or agricultural) buildings on Rath Rake which are presumably large coes. A line of hillocks follows a vein on the line of Rath Rake Sough; some of these hillocks may well also be the sites of ventilation shafts. The sough tail is a low slabbed sough tail bolt, the oldest of its type still open. There has been no recorded underground exploration of the main part of the historically important and extensive Dunnington pipe workings.*

88: ***Rainslow Scrins*** *- Extensive opencuts on closely-spaced veins but with many areas reworked and the hillocks disturbed or removed, with several capped shafts, three buddle dams (one very large), a trunk buddle or water leat, a walled shaft and possible ruined coes.*

89: ***Portaway Mine*** *- Disturbed hillocks where the primary interest is ecological. A capped engine shaft in a large hillock may give access to the known extensive pipe and vein workings (see U14, U15).*

90: ***Yatestoop Mine*** *- A series of exceptionally large hillocks with engine shafts to Yatestoop Pipe, two of which are still open. Surface interest includes two possible gin circles (one suggested only on the basis of a large flat-topped hillock at the top shaft where a steam engine was installed underground), and ruins of a small building that may be a mine coe or an agricultural building. Exceptionally, there were five or six Newcomen pumping engines at surface, including the earliest in the orefield. No surface traces of their engine houses have been recognised but in most cases the sites look relatively undisturbed and excavation may reveal footings, etc. Documented extensive underground pipe workings may well be of great interest but large parts are not accessible (character of accessible workings currently poorly documented).*

91: ***Brown Edge, White Great Rake and Lickpenny Mines*** *- Extensive hillocks on pipes and veins, with many ploughed-over or removed, but with intact examples and several shafts. The remains include six fine examples of buddle dams, a water leat from a shaft to buddle dams, a well-preserved stone-lined water channel from shaft to stone-lined buddle, and two or possibly three gin circles including a good example on a flat-topped hillock.*

92: ***Hadland and Delf Veins*** *- A small number of hillocks where the primary interest is ecological. A part-robbed hillock to the south-west with capped shaft has an adjacent platform that has a possible poorly defined gin circle.*

93: ***Winster Pitts, Drummers Venture, Horsebuttocks and Burning Drake Mines*** *- Well preserved hillocks and dressing floors at a series of adjacent mines. Surface features at Winster Pitts and Drummers Venture include exceptional survival of various types of buddles, including leats or trunk buddles, stone lined buddles, ore-dressing pits, ponds and buddle dams. There is also a gin circle and ruined coe. Shafts lead to underground workings at Winster Pitts, Horsebuttocks/Burning Drake Mines; the latter are extensive and include important pipe workings and drainage levels which extend well to the north of the main access shaft (where there were further access shafts). Taken together, in these mines there are underground mine artefacts, inscriptions, a coffin level, railed levels, dressing floors with a buddle, a hotch and clay-lined leats.*

94: ***Longtor Mines*** *- Broad area of hillocks and opencuts on closely spaced veins, much reworked in the past, with several important features. These include small capped shafts and opencuts, and three large engine shafts, two of which are visible through grills and are fine examples of oval ginged shafts. One has a possible leat leading from it. A large hillock at the north-western end of the defined area has a possible gin circle. There is also a stone-lined buddle, a ruined coe and several large buddle dams.*

95: ***Limekiln Veins*** *- Relatively small hillocks, one with an adjacent gin circle cut into the slope.*

96: ***Bithoms Veins, Innocent Mines, and Weet Sough*** *- An extensive area of surviving hillocks, associated with a series of pipe and vein workings, overlying medieval strip lynchets. There are a small number of capped shafts, several buddle dams, two possible ruined coes and ventilation shaft mounds on the line of Weet Sough. Stone beehive caps on a large number of shafts have been removed in recent years. The underground workings are known to have been extensive but there has been no known modern exploration.*

97: ***Waterings Close and Shakersdale Mines*** *- Surviving hillocks on several close parallel veins, with several capped shafts, including two with beehive caps, at least one ruined coe, two or possibly three stone-lined buddles, one or possibly two buddle dams, a barrow-run or raised launder, the foundations of a reckoning house, and the footings of what may have been a ventilation fire house (the only known surviving example in the orefield).*

98: ***Davis and Mount Pleasant Mines, and Basrobin Sough*** *- Surface remains comprising hillocks along numerous small pipe and vein workings, many still relatively intact within the area defined. There are many capped shafts, opencuts (some from 19th century reworking), a small hillock-top gin circle with visible slots for the gin engine supports, two barrow-runs or raised launders, stone-lined leats or trunk buddles, and buddle dams (some very large and including two fine banked sets). One long leat links a shaft to buddle dams. Basrobin Sough has a walled 'well' enclosure at*

the entrance to the slabbed level. The Mount Pleasant and Davis Mines are not documented as having been explored in recent times but may well be important. Basrobin Sough can be followed for some distance underground. The site as a whole has extensive surface evidence for the relative age of mining, medieval strip lynchets/ridge and furrow and Romano-British settlements.

99: ***Old Ash, Lords and Ladies, Hit and Miss, and Tearsall Mines, and Snitterton Park Fire Engine*** *- Surface remains comprising fine examples of hillocks along numerous small veins and pipe/flat workings, many still relatively intact. There are many capped shafts, some with dressing floors. The Tearsall engine shaft remains with an adjacent coe, while at the nearby Hit and Miss Mine there are ore-dressing features, including small pits on a series of flat platforms, a ruined rectangular coe nearby, and a circular example above. The gin circle at Dalefield Mine has recently been removed. Above Northern Dale at the Old Ash Mines there is a stone-lined buddle, with another further north, and the probable foundations of a Newcomen pumping engine house, with cinders, etc, known as the Snitterton Park Fire Engine. In waste tips at the base of the hillside there are hillocks associated with at least two soughs that sometimes still issue water. The underground workings in Northern Dale, at Old Ash Mine and the adjacent Lords and Ladies Mine, are particularly important as rare examples of demonstrably early workings with evidence for firesetting with coal and 'woodpecker' pickwork, and also with fine packs of deads, sledways, water channels and ventilation walls. The flattings mined at Lords and Ladies Mine outcrop on the dale side and have been mined at surface to the south. The Hit and Miss Mine (Tearsall Pipe Caverns no. 2) pipe workings are also important as examples of complex small workings, some probably early, with a large number of small shafts from surface. Mines somewhere at Northern Dale and Tearsall are documented as active in the 1530s and 1540s respectively. The site as a whole has extensive surface evidence for the relative age of mining and medieval strip lynchets/ridge and furrow.*

100: ***Oxclose, Lee Wood, Lee Close, Ash Plantation and Noon Nick Mines, Crowholt Level and Lee Close/White Hillocks Sough*** *- Many scattered hillocks with shafts, mostly to pipe workings, some partially reworked others intact. Surface features at Ash Plantation include a buddling complex, with a long leat from a shaft above, a stone-lined buddle at the base with adjacent ruined walls of a possible coe and/or small yards, and a high hillock and buddle dam below. Below there is another stone-lined buddle and a small buddle dam. Further east there is a ruined coe with a cupboard in one wall. At the Lee Close Mines there is a ruined coe and a water storage or ore-dressing pond with an associated tramway and buddle dam. Below the Lee Close Mines there is the open tail of Lee Close/White Hillocks Sough and a possible lower collapsed sough and/or haulage level tail, associated with a fine large coe with wall cupboard, and a large partially reworked hillock with associated buddle dams below. At the Oxclose Mines there are the lower walls of a Newcomen engine house and a nearby cinder heap. At the Lee Wood Mines and nearby veins there is a stone-lined buddle, a possible gin circle and a ruined coe. At Noon Nick (Jug Holes) there is an impressive open pipe-cavern entrance. At surface there is a water storage pond, a tramway-cutting to a 19th century level entrance (now altered), and platforms associated with a 20th century inclined tramway. Underground features at Oxclose Mine include extensive pipe workings, a fine coffin level sough known as the Crowholt Level, and a 20th century inclined tramway. There are many inscriptions, the earliest dating to 1623. The Lee Wood pipe workings are also known to be potentially of great interest but are currently poorly documented. Noon Nick also has a 19th century arched level and a 20th century fluorspar-extraction tramway and tubs. It also has a 17th century inscription in the roof of one chamber, next to a small shaft to surface, made before the chamber deposits were removed. Lee Close/White Hillocks Sough can still be followed for some distance underground and may be the earliest accessible hand-picked level in the orefield. It links with workings above and both have a variety of tramway rails. The Lee Wood Pipes are known to be accessible (character of workings is currently poorly documented). Both the Oxclose and Noon Nick Mines are documented as working in the 1530s. Noon Nick Mine has a 17th century miner's inscription in the roof of one of the chambers. The site as a whole has extensive surface evidence for the relative age of mining and medieval strip lynchets/ridge and furrow.*

101: ***Old Kennill Grove*** *- A small area of disturbed and part removed hillocks where the primary interest is ecological.*

102: ***Gorseydale, Hangworm, Beans and Bacon, Slack Breaks and Fiery Dragon Mines*** *- Extensive area of mostly well-preserved hillocks on a series of small veins and pipe workings, with many capped shafts. Surface features include several coes, including a double example, and a gin circle at Hangworm Mine and a dilapidated level entrance at Beans and Bacon Mine. Many shafts give access to good examples of small underground workings and are important for the understanding of this type of mining. A deep shaft at the northern end of Slack Breaks leads to extensive pipe workings. A western section of the Gorseydale Mines had its hillocks levelled at the time of scheduling notification (now excluded from the defined area). The eastern part of the defined area also has mostly disturbed hillocks but is still of ecological interest.*

103: ***Whitelow Mines (west)*** *- Well-preserved hillocks on a series of small veins with many capped shafts. In parts small workings are continuous and the lines of veins not obvious; here the mining developed on rare mineralised cellular blockwork joints in the limestone. One shaft lies on a small hillock-top dressing floor with a shelter wall and possible rectangular ore-dressing pit. A nearby hillock has a small stone-lined buddle. Another shaft has a shelter wall and a further example is walled round. There is also a possible pond. The area east of the lane has been extensively reworked but has ecological interest. The Whitelow Mines are documented as active in the 1540s.*

104: ***Whitelow Mines (east)*** *- This site has been extensively reworked for gangue mineral in the mid 20th century leaving large opencuts, new hillocks and access tracks. While the lead mine interest has largely been removed, the exceptions being a few small hillocks and two capped shafts, the site is one of the best surviving examples of gangue working where the site has not been subsequently landscaped. There are two abandoned cranes on site which date from this period of extraction. The Whitelow Mines are documented as active in the 1540s.*

105: ***Horsedale Mines (north-west)*** *- Hillocks on a series of veins where the primary interest is ecological, with capped shafts, shallow opencuts, a possible stone-lined buddle, and probable water storage and/or ore-dressing ponds.*

106: ***Horsedale Mines (south-east) and Horsedale Sough*** *- Well-preserved small hillocks on a series of small veins, combined with shafts on higher hillocks, some with walls to provide shelter to the small dressing floors on their flat tops. There are several capped shafts and ruined coes. There is a fine example of a small mine complex comprising a high but small hillock, with coe with internal shaft, a dressing floor embanked at its edge, and a hollow to one side that may be an ore-dressing pit. Some of the mine hillocks overlie large medieval strip lynchets. In the valley to the north-east there is a low sough bolt with strong water flow. Capped shafts nearby could potentially give access to the sough.*

107: ***Bonsall Lees Mines*** *- An extensive area of hillocks and hollows on many small veins and occasional pipe workings, sometimes partially reworked, occasionally leaving opencuts. There are many capped shafts, some retaining fine beehives, and ruined coes, mostly rectangular but including circular examples, sometimes associated with small dressing floors on flat hillock tops, some walled, and/or small belland yards. Two walls are circular and may have contained cog and rung gin engines. One area retains fine and densely packed examples of all these features. Other surface features include several stone-lined buddles, including one well-known restored example on the side of a hillock, the entrance to a slabbed haulage level on the valley side, and the entrance to a very small level nearby. The Bonsall Lees Mines are documented as active in the 1540s.*

108: ***Dale Mine*** *- Surface features above this rich pipeworking include a belland yard, approached by a mine road, containing a dressing floor, blocked shafts, a well-preserved gin circle, a range of six small rectangular 'kilns' probably for calcining zinc ore, the possible buried footings of two Cornish engine houses, a smithy and possibly an earlier Newcomen-type engine house later converted to an ore house, an adjacent quarry for their construction, and two small reservoir ponds above, presumably dug for one or more of the engines. A large waste heap in the lower part of the belland yard is mostly of limestone from shaft sinking and driving an underground pumpway level; material from dressing appears to have been removed. Below the belland yard there is a walled-round but blocked climbing shaft. In the general area there are also other shaft sites and further east a blocked upper level approached by a mine road. A low entrance near the river gives access to the long pumpway level through the upper workings. There is little to see at a second set of dressing floors, built in the 1860s on the hilltop, but the buried footings of a Cornish engine house may remain. Both dressing floors and their engines were supplied with water by a long leat from the north.*

109: ***Ecton Mines and Soughs*** *- This exceptional site was one of the richest copper mines in Britain in the second half of the 18th century. There are extensive hillocks, some of which are well-preserved, many capped shafts and several levels and pipe entrances. Some of the hilltop workings are of Bronze Age date and prehistoric hammer stones and a radio-carbon dated antler pick have been found. Later surface features of particular importance include a late 18th century Boulton and Watt engine house with chimney base; nearby there is the exceptionally deep engine shaft, a balance shaft on a conical stone-retained mound, an exceptionally large gin circle, a crushing wheel (moved), and a small reservoir. There are other ruined mine buildings on various sites, including those at Dutchman Level where there are the ruins of a 19th century horizontal engine house, smithy and carpenters' shop, and also a bouse teem. At Waterbank Mine there are also the ruins of a 19th century horizontal engine house, smithy and carpenters' shop. There are footings of smelters in the valley bottom. On the hillside above Deep Ecton Level there is a large dressing floor with two circular buddles, a launder, the footings of a horizontal engine house, a jigs shed and work shed. Further north, there is the Mine office and saleroom, while below is the agent's house, all now used as dwellings. Elsewhere there are also belland yards, six gin circles, including a fine example cut into a cliff at Apes Tor, level/sough portals, a large dressing-water reservoir and long covered leat, mine roads, a powder house and a limekiln for burning mine waste-rock. The extensive accessible underground pipe workings are of exceptional interest. Features include shotholes for rare 17th century continental-type powder work, 17th to 19th century shafts and various soughs and levels. These include Deep Ecton Sough, that may have operated as a boat level with notches for a later plankway, and another at Apes Tor to bring water to an underground engine in Deep Ecton Mine. Here there are engine chambers for a flop-jack engine, a large gin engine/capstan and a waterwheel. There are also stone and timber dams, tramways, ladderways, striking chambers and bundings here and in other workings. Clayton Level, with a fine portal, leads to a chamber that had a steam engine with a surviving underground engine chimney. Clayton Pipe can be entered, via an ore chute, with an impressive vertical pipe entrance at surface.*

110: ***Bincliff, Oversetts and Highfields Mines*** *- There are extensive surface workings above the steep daleside, mostly comprising limestone hillocks with infilled shafts, some with associated ruined coes and small walled belland yards. Highfields Mine to the south-east lies within a belland yard. Here there is an oval shaft with a well-preserved walled gin circle. A second probable gin circle within the belland yard lies next to a large ruined coe and a second smaller circular area that may be the site of a crusher. A number of underground levels are accessible, with entrances at various points down the steep heavily-overgrown valley-side, some of which enter unstable stopes that originally linked to surface. Those just above river level are 19th century in date and have large spoil heaps. One has an arched entrance (part collapsed). Three levels higher up the slope have flat-topped waste hillocks, one with two ruined coes, the others with one.*

Main Sites - Outside the National Park

111: ***High Tor Mines*** *- A complex series of spectacular deep opencuts (Roman and Fern Caves), mostly open to surface. This is a good example of this type of working that may be of some antiquity. There are also accessible workings of limited extent at the base of the cliff to the west and north.*

112: ***Via Gellia Mines and Soughs*** *- The steep slopes of the Via Gellia contain a large number of small mines. At surface the evidence largely comprises a scattering of shafts and levels with associated hillocks, some with belland yards, coes and stone-lined buddles, including a fine large coe at Jacobs Dream Mine and restored coes at Goodluck Mine. Underground workings include important pipe workings at Ball Eye Mine and Houghton Pipe (the upper Ball Eye workings from Ruggs Hall are now partly removed by quarrying). There are also small pipe workings at Hollow Phinnis to the west, and on the south side of the valley at Cow Hole. There are also important and extensive workings in small veins at Spencer's Level, Henstocks, Goodluck, Silver Eye, Cawder Slack Levels, Old Gells, Jacobs Dream, Hallicar Wood (Groaning Tor) Level, Goodluck Sough Level, Owlet Hole Gate, Slingtor Level, Yulecheese (Dunsley Springs) Level, Slaley Sough Level, Bonsall Lees Level, and Brogdale or Bald Pie (Clatterway) Mine and Sough, all of which are particularly instructive with regard to this type of mine. Features include levels, coffin levels, stopes, shafts, winzes, sledways, tramways, stone stemples and miners' inscriptions. Fountrabby Sough within the Ball Eye Mines includes fine coffin level pickwork. The Hollow Phinnis pipes and vein workings have evidence for firesetting. The Ball Eye Mines are documented as active in 1550 and are reputedly unusual for the high level of silver in the ore.*

113: ***Black Rakes, Welshmans Venture and Bondog Hole Mines, and Merry Tom and Thumper Sitch Levels*** *- Here there are a large number of small mines on many small veins that have survived because the hillocks are largely of limestone rather than gangue mineral. At surface there are a large number of shafts with associated hillocks, small dressing floors and ruined coes. Some shafts occur in clusters and are unusually close together. One particularly fine example of a small mine complex comprises a mound-top dressing floor with a small drawing shaft upslope, a coe with an attached circular wall that presumably contains a blocked*

climbing shaft to one side, and a stone-lined buddle downslope. Elsewhere, there are two ponds that may be associated with water storage or ore-dressing. On the upper parts of the slope the mines become larger with large flat-topped hillocks/dressing floors. There are several engine/climbing shafts, some walled out, ruined coes and an arched level or high level sough. One hillock has a walled gin circle on an embanked hillock and several others have flat areas large enough to have contained further examples. Another hillock lies within a small belland yard. At Welshmans Venture Mine there is a well-preserved large coe, an engine shaft and the overgrown site of a gin. At Bondog Hole Mine there is a terraced and walled belland yard and dressing floor, with room for the documented gin circle and a ruined powder house (or simply a coe), all on top of a large hillock. Workings extending to the east have a further two ruined coes. On the slopes of the Via Gellia below the main complex, some workings continue and include two levels with coes at Merry Tom, and two levels at Thumper Sitch, the upper one with a coe. At all there are underground workings similar to those lower down the Via Gellia, including recently discovered wooden rails at Merry Tom.

114: **Snake Mine** - *An intact small mine complex upon a large revetted hillock, on the top of which is a small walled dressing floor with a gin circle and shaft. On a terrace to one side there is a coe containing a horizontal level to the shaft, a dressing floor and a stone lined buddle. The shaft gives access to informative underground workings.*

115: **Gang Mine** - *Hillocks and opencuts cover virtually the whole area and provide a very good example of this type of multiple-vein mining. There are also several capped shafts, two ruined coes and the site of an early reckoning/'engine' house that may repay excavation. These mines are known to have been working in the 16th century and had a large output in the 17th century and are historically very important.*

116: **Ratchwood and Rantor Mines** - *A site with large hillocks with flat-topped dressing floors, ruined coes and other buildings (one a ruined mine office and reckoning house), and capped shafts, one with a beehive capping. There is also a poorly defined gin circle, slight remains of a line of rectangular bouse teems, a pond and a small buddle dam. The two mines lie within ruined possible belland yards.*

117: **Dream Hole, Fox Holes and Sand Hole Mines** - *An area with extensive surviving large hillocks and a number of capped shafts on several veins. Other features include a ruined coe and elsewhere a possible damaged gin circle. Underground workings include Dream Hole with important Quaternary deposits and vein workings, including evidence for firesetting, and Fox Holes where a large chamber was mined for ochre.*

118: **Yokecliffe Rake, and Quickset, Old Gells, Shining Cloud and Nile Mines** - *An area with surviving hillocks and many capped shafts. The remains on Yokecliffe Rake comprise very large hillocks spaced at frequent intervals, with smaller hillocks between, each of the former the site of an underground mine. Several of these have ruined coes on the hillock tops and that at Quickset Mine also has a small walled mound-top dressing floor. There are also ruined coes elsewhere in the defined area. Old Gells Mine on Yokecliffe Rake provides an exceptionally interesting but small example of easily accessible underground vein and pipe workings. This mine includes evidence for early firesetting work.*

119: **Carsington Pasture, Great Rake, Nickalum and Perseverance Mines** - *Extensive hillocks and shafts survive, although some upper areas have been reworked. There is a variety of mines, including larger ones at Great Rake and Nickalum Mines. The former had an early 20th century horizontal winding engine house of corrugated tin but concrete mounting beds survive for the engine and various other ore processing equipment. There is also a concrete hutch, a displaced crushing wheel, the winch and earthworks of an inclined tramway, and a possible ruined powder house. The main features are within an earlier flat dressing floor with surrounding wall, with ruined coes and other buildings, and a probable poorly-defined gin circle. Nickalum Mine has a walled belland yard; however, the remains of a stone horizontal-winding house, a ruined coe, a probable gin circle and a possible water storage pond have recently been levelled. Nearby there are large buddle dams. Another interesting mine is Perseverance Mine which has shafts, a gin circle set into the slope, a large coe, a smaller coe, a stone-lined buddle, a water storage pond, slime ponds and a buddle dam. Most of the other mines were also small in scale and a variety of features are associated with these. They include small belland yards, hillock-top dressing floors, coes (some large and one with a remaining chimney), and water storage and/or ore-dressing ponds (an arched level entrance appears to have recently been removed or buried). Capped shafts across the area give access to a variety of underground vein and pipe workings, some apparently of great interest (currently poorly documented). Rare direct relationships with relict boundaries exist that suggest the mining here started at a medieval or earlier date in at least two cases.*

120: **Roundlow Mine** - *A well-preserved area of hillocks and shafts onto pipe/vein workings, with several capped shafts, with an engine shaft on a flat-topped hillock with poorly-defined small gin circle but a rare intact limestone bearing block with central iron bearing socket.*

121: **Rainster Rocks and Suckstone Mines** - *An extensive area with surviving hillocks and some shafts. There is also a ruined coe. In its eastern half the hillocks of small mines are very extensive, in some areas with continuous cover (including parts not indicated on the geological map). In the west the veins are less common and also usually small. However, these are important because of their stratigraphic relationships with both the Rainster Rocks Iron Age/ Romano-British settlement and extensive medieval strip lynchets and ridge and furrow.*

Buildings, Soughs and Other Individual Structures - Within the National Park

B1: **Ashton's Mine** - *Well-preserved two-storey horizontal engine house and chimney. Little remains of the boiler house. The shaft has been sealed but the surrounding hillock remains with retaining walls in parts. A powder house is set behind to the east.*

B2: **Co-op Sough** - *An intact slabbed sough bolt at the brook side. Two other slabbed drains running under the road on the other side of the brook may well also be from sough tails (Bradwell Sough and probably Southfield North Vein Level).*

B3: **Hartledale Mine** - *An intact walled hillock-top gin circle with adjacent shaft in an area that has been otherwise heavily disturbed. A crushing wheel has recently been placed next to the gin circle after its original site nearby to the south was removed.*

B4: **Windy Knoll Mine** - *A crushing stone moved from adjacent hillocks when reworked, and set upright. It is inscribed 'B & Co 1842'.*

B5: **Milldam Mine** - *Surviving interest includes a small one-storey horizontal-winding engine house and a one-storey mine smithy (now used as outbuildings) and a two-storey mine house (occupied). A Cornish pumping engine house has been demolished and the north-western part of the site has been developed as a modern mine.*

B6: **Old Twelve Meers Mine** - *A gin circle platform cut into the steep hillside, with horse track and a central hollow where the bearing block has been removed, with an adjacent open shaft on the downslope side.*

B7: **Ladywash Mine** - *The main surviving feature of interest is the chimney from a demolished horizontal pumping and winding engine house. The engine shaft gives access to an extensive 20th century disused mine; it is not clear how much historic interest remains underground.*

B8: **Ash Nursery Mine** - *Walled gin circle, now overgrown, and capped engine shaft. The adjacent mineral hillocks have been removed.*

B9: **Muse Mine** - *A walled gin circle on flat-topped hillock and adjacent engine shaft. The adjacent mineral hillocks have been removed and the wall largely removed with the exception of one short section.*

B10: **Brightside Sough** - *A well-preserved, arched but silted, sough bolt leading to a restored water trough with well steps.*

B11: **Magpie Sough** - *The arched entrance to the last major sough driven in the region. The grilled entrance leads to a fine sough and extensive Magpie Mine (and other) vein workings of 19th and 20th century date. The sough was used by boats and has the remains of wooden lock gates. Several 20th century tramways on false floors also exist in the workings above.*

B12: **Hubbadale Pipe - Two Gins Shaft** - *Large overgrown hillock with a run-in shaft and presumed remains of two gin circles.*

B13: **Hubbadale Pipe - Crotie Gin Shaft** - *Large overgrown hillock with a run-in shaft and presumed remains of a gin circle.*

B14: **Hubbadale Pipe - White Close Shaft** - *Large overgrown hillock with a run-in shaft and presumed remains of a gin circle.*

B15: **Long Rake Mine** - *The 20th century headgear and one-storey horizontal-winding engine house (engine recently moved) of the calcite mine. The main engine shaft is no longer safely accessible from surface (see 81: Long Rake Opencuts).*

B16: **Wheels Rake Mine and Shining Sough** - *The main feature of interest is a well-preserved sunken wheel pit with arched roof, which once housed a waterwheel for mine pumping and winding. Adjacent is a scrin working that gives access to Shining Sough (currently flooded).*

B17: **Black Sough** - *A sough leat from the sough tail to the river comprising a silted gully across flat land. Nearby there is a unique upright marker stone that marked the line of the sough, now re-erected out of line.*

B18: **Rainster Sough** - *A sough leat from the sough tail to the river comprising a silted gully across flat land.*

B19: **Bowers Rake Goit** - *A long straight open leat, probably dug to take water from a waterwheel pumping engine on Bowers Rake further west erected about 1700.*

B20: **Stanton Sough** - *A sough leat from the sough tail to the river, comprising a broad silted gully across flat land.*

B21: **Broadmeadow Mine** - *This occupied building, now a row of cottages built in three phases, is documented as the offices of the Alport Mining Company. It lies adjacent to a vein and it is thought the building lies over a shaft. A deep shaft (and hillock) nearby leads to a hydraulic engine chamber.*

B22: **Prospect Mine** - *A rectangular one-storey 19th century powder house in good condition, with stone flag roof above a barrel vault. The mine lay nearby to the south.*

B23: **Hillcarr Sough - Brown Bank Shaft** - *The main interest is a dam, with dressed stone abutments, and an overflow race. These were built for water blast ventilation to Hillcarr Sough; they are the only such remains in the orefield. There is also a ruined possible coe nearby. The capped ventilation shaft itself is no longer visible, but there is a flat working area cut into the hillside immediately above.*

B24: **Winster Ore House** - *A restored one-storey ore house.*

B25: **Old Millclose Mine - Watt's Engine House** - *Surface features include the ruins of the Watt's Shaft Cornish pumping engine house, the foundations of a winding house possibly also incorporating a boiler for this to the north, and a larger boiler house between with three short flues to a chimney base. There are also foundations of another building, slope-retaining walls, and the site of a capstan. The shaft gives access to one small section of extensive and important pipe workings (see B26). Very extensive hillocks have been largely removed/reworked and thus are not included in the defined area of interest.*

Buildings, Soughs and Other Individual Structures - Outside the National Park

B26: **Millclose Mine** - *Surface interest at this once historically very important mine includes the lower parts of a Cornish pumping engine house and chimney, and a mine office/reckoning house, all within a modern industrial complex. Two exceptionally large shafts exist, one accessible and leading down to a level branching off Yatestoop Sough (see B27).*

B27: **Yatestoop Sough** - *An arched and paved sough tail leads to a long accessible section of this major sough, including a branch level, with remains of a plankway above the water. This leads to two exceptionally large shafts, both open to surface at Millclose Mine, one with in-situ pump rods, the other with timber guides for cages.*

B28: **Orchard Sough -** *A low slabbed sough bolt.*

B29: **Masson Farm Level** - *A narrow accessible level, probably a high level sough, with a walled and slabbed entrance.*

B30: **Carnhill Wifes Sough** - *A narrow slabbed sough level.*

B31: **Bullestree Sough** - *An open sough tail next to the river, leading to an historically important sough.*

B32: **Cromford Sough** - *A walled enclosure with the present entrance to the sough. A long section of this major sough is still accessible, the first part arched, with shafts to surface and including a side branch that has evidence of very early gunpowder work.*

B33: **Cromford Moor Mine** - *Ruined walls and the base of a stone chimney may be the remains of a documented Newcomen-type winding engine house (built 1818). At the same site there is a capped shaft, concrete foundations and a tank built in association with a 1920s calcite mine. There are extensive hillocks to west, north and east, but these have been landscaped to provide car parking, or they are suffering badly from erosion (at Black Rocks).*

B34: **Ratchwood Mine - Founder Shaft** - *Large flat-topped hillock with lidded shaft, overgrown gin circle with footings of wall to one side and a small ruined coe in the hillock side.*

B35: **Meerbrook Sough Mine** - *The main surviving features of interest are a one-storey horizontal winding engine and boiler house, and an adjacent dilapidated coe.*

B36: **Fritchley Sough** - *A small arched sough tail with a dated (1753) keystone.*

B37: **Meerbrook Sough** - *An arched sough tail that leads to a long but very wet accessible section of this major sough.*

Sites where the Primary Archaeological Interest is Underground - Within the National Park

U1: **Old Tor Mine** - *A gated level leads to a rare example of a pipeworking, with blocked holes to surface, mined for Blue John (and lead).*

U2: **Speedwell Mine** - *This show 'cave' includes a fine example of an underground boat level, entered by a well-made incline, the upper part arched. At the end of the show 'cave' there is a massive retaining wall that allowed the canal to pass across a high cavern part-way up its side. Beyond this the level continues, with the remains of an original boat surviving at a wider section where boats could pass. It ends in a natural streamway where there are notches for a large plankway running upstream to workings above. Further upstream there is the well-known 18th century 'miner's toast' inscription, now marred by modern graffiti. A branch passage (Whirlpool Passage) also has notches for a small plankway and there are small accessible workings at the end. Downstream the streamway also has small areas of mine workings. One has a clay lined leat. Another has a stone-paved walkway over the stream. At the junction with the boat level there is a dam wall with a large wooden bung below an arch, originally used for draining the level for maintenance.*

U3: **Peakshole Sough** - *A gated sough with small vein and pipe workings above. At the inner end of the sough are the rare remains of an intact timber plankway above the level of the water.*

U4: **Bird Mine** - *An oval engine shaft of large diameter, with fine limestone ginging, down to rake workings; surrounding hillocks removed.*

U5: **Moorfurlong Mine** - *A shaft in a hillock leads to extensive pipe workings with an underground dressing floor with what appear to be stone-lined sieving or buddling troughs.*

U6: **Great Cucklet Mine** - *A good example of a small mine level (often known as Nickergrove Mine). There are also two shaft entrances nearby and hillocks below. The level intersects natural passages, and exploited small veins and there are cross-cuts, small stopes and internal shafts. Recent digging found wooden rails of an unusual type.*

U7: **Merlins Mine** - *A good example of a small mine level (with shaft entrance nearby and hillocks below). The level intersects natural passages and exploited small veins, and there are cross-cuts, small stopes and an internal shaft. One of the cross-cuts has wear marks from the use of ore sleds.*

U8: **Watergrove Sough** - *An historically important sough to Watergrove Mine, the tail now blocked but with a section accessible via a nearby short shaft.*

U9: **Moorwood Sough** - *An historically important sough (gated) with impressive stone stempling within, leading to Glebe Mine and beyond.*

U10: **Greensward Rake** - *A fine example of an oval climbing/winding shaft with climbing stones in the ginging and rope-wear grooves below. This is now capped and there is a ruined coe nearby. There are two further small capped shafts in the same plantation. The accessible workings from all three are only limited in extent.*

U11: **Broadmeadow Mine - Shale Drift** - *A drift entrance, with a further section beyond a collapse entered via a nearby shaft, which took water from the river via raised launders, through the drift to Broadmeadow Shaft where there is a hydraulic engine chamber deep underground (see B21).*

U12: **Cowclose Mine - Main Drawing Shaft** - *A shaft with a large hillock gives access to extensive underground pipe and vein workings that may well be of great interest (character of accessible workings currently poorly documented).*

U13: **Cowclose and Leadnams Mines** - *Shafts on a large hillock here give access to extensive underground pipe and vein workings that may well be of great interest (character of accessible workings currently poorly documented).*

U14: **Portaway Mine - Engine Shaft** - *A gritstone-lined engine shaft gives access to extensive underground pipe workings that may well be of great interest (character of accessible workings currently poorly documented).*

U15: **Portaway Mine - Fisher's Shaft** - *A shaft gives access to extensive pipe workings (character of accessible workings currently poorly documented). The large surface hillocks are still high in parts but are much disturbed.*

U16: **Wills Founder Mine** - *A sleepered shaft on a flat-topped hillock that once had a gin, that leads to interesting underground workings, including the site of a pumping engine that is now in the Mining Museum at Matlock Bath.*

U17: **Placket Mines (north-west)** - *A deep engine shaft that give access to very extensive pipe and vein workings of great potential interest. Little detail of the character is yet recorded, but a long underground buddle has been noted.*

U18: **Placket Mines (south-east)** - *A deep engine shaft that gives access to the same workings as U17.*

U19: **Upper Orchard Mine** - *A deep engine shaft, at the top end of a large hillock, that leads to extensive pipe and vein workings (character of accessible workings currently poorly documented).*

U20: **Upper Orchard Mine - Old Weston Shaft** - *A deep engine shaft, at a disturbed hillock, that leads to extensive pipe and vein workings (character of accessible workings currently poorly documented).*

U21: **Millclose Sough** - *A large sough bolt leading to the outer part of an historically important sough (also see U4, U20). The outer cut and cover section, which can be entered a short distance from the tail, has a slabbed floor and roof, with notched gritstone uprights between. There are two short sections within with sweeping pickwork, a wooden launder at one point and various capped air shafts to surface.*

U22: **Millclose Sough - Valley Shaft** - *A re-opened shaft with fixed ladders gives access to a long inner section of the sough (also see S9, U4), with surviving wooden launders in the sough, and pump pipes at Boltwood Shaft. This shaft in Clough Wood is also open to surface, as is Deer Shaft further east.*

U23: **Millclose Sough - Air Shaft** - *This shaft, with fixed ladders, gives access to a long central section of this historically important sough (also see 72, U20). There are no surface hillocks. It is also possible to enter extensive workings of Old Millclose Mine from here (see U24, U25).*

U24: **Old Millclose Mine - Limbreck (Shale) Shaft** - *This shaft gives access to lower parts of particularly extensive and important pipe and vein workings (for details of the underground workings see U25). The hillocks in the vicinity have been disturbed. The two shafts listed are the two most commonly used today, but there are several other open shafts to the workings.*

U25: **Old Millclose Mine - Hamber Grove (Sleeper) Shaft** - *This shaft gives access to the upper parts of particularly extensive and important pipe and vein workings. The underground workings contain many mine artefacts and inscriptions, clay fairy rings, coffin levels, an arched level, a railed level, a paved level, barrow ways, stairways, ore chutes, ventilation walls sealed with clay, a walled fang or air duct, dressing floors, buddles, wooden launders, stone-built and clay-lined leats, a wooden pump barrel and an underground forge. The two shafts listed are the two most commonly used today, but there are several other open shafts to the workings.*

U26: **Royledge Mine and Sough** - *A recently re-opened sough leads to extensive copper mine pipe workings above (artefacts now placed in the Peak District Mining Museum).*

U27: **Hartington Level** - *A good example of a long mid-19th century haulage level where lead and ironstone were mined.*

U28: **Robin's Shaft Mine** - *An unusual steeply inclined shaft at a small but deep copper mine with various levels, stopes and natural chambers to a depth of 90m.*

Sites where the Primary Archaeological Interest is Underground - Outside the National Park

U29: **Masson Sough, Old Jants Mine and Gentlewoman's Pipe** - *A sough level, now entered via a manhole cover near the river, leads to the longest accessible coffin level sough in the orefield, and then to extensive pipe workings. There are shafts to surface, fine examples of pickwork including garlands, various miners' inscriptions, a wooden hotching trough, miners' tools, etc.*

U30: **Nestus Pipes, Longtor Mines, and Bacon and Coalpit Rakes** - *At surface the remains comprise either hillocks and opencuts along veins, only some of which are still intact, or shafts down to pipe workings, many of which have now been sealed. The extensive underground workings at Nestus Pipes and Bacon Rake (Masson and Rutland Caverns) and Coalpit Rake (Devonshire Cavern), all with adit entrances, are exceptionally important for their evidence of early mining. At the Nestus Pipes there are labyrinthine medieval (or earlier) pipe workings primarily identified from their distinctive 'woodpecker' pickwork. Documentation shows that there was extensive working here (and on Bacon Rake) by 1470. At the complex vein workings at Coalpit Rake there is extensive evidence for firesetting using coal; documentation shows this mine was active by 1595. At the Nestus Pipes and Coalpit Rake there is a large number of hand picked shafts from surface. The former site has coffin levels, much underground evidence for later mining dating from the late 17th century to the 20th century, and there are two fine picked sets of dated initials from around 1700. The Nestus Pipes also have large packs of deads in the area around the main point of 20th century mining access. There are further accessible important underground rake and pipe workings at Longtor Mine (with good examples of 18th-20th century work), Long Tor Top Mine (with firesetting with coal and later powder work) and Dark Hole Mine on Bacon Rake (with firesetting with wood and coal, and later powder work).*

U31: **Side Mine** - *A good example of a pumpway level that contained flat rods, with stopes containing fine examples of stone stemples, an underground pumping chamber and flooded winzes.*

U32: **Owlet Hole** - *A small mine with both vein and pipe workings, the latter worked for fluorspar in the 20th century. Older workings include powder work in small levels and stopes, and a fine example of a small level driven by firesetting with coal.*

U33: **Hagg Mine** - *A pumpway level that contained flat rods, with mineral workings and a coffin level that are now mostly flooded.*

U34: **Wapping Mine and Cumberland Cavern** - *Wapping Mine is an impressive example of 20th century fluorspar rake and pipe working, with large stopes and high packs of deads, with evidence of earlier small-scale lead working, including evidence for firesetting and early powder work. Cumberland Cavern, entered via Wapping Mine, is a good example of a small mine in largely natural caverns. Various surface shafts and the blocked adit entrance to Cumberland Cavern once gave access to the workings.*

U35: **Bage Mine** - *A deep shaft gives access to extensive vein workings and cross-cuts below the shale (character of accessible workings currently poorly documented).*

U36: **Haslowfield Level** - *A level, often known as Spinney Level, with in-situ wooden rails, leads to workings on a vein with fine stone stemples.*

U37: **Golconda Mine** - *A deep shaft gives access to extensive pipe workings of great interest (character of accessible workings currently poorly documented). All surface features have been removed, including a coe that survived until recently.*

Appendix D:

Archaeological Lead Mining Features - Known Levels of Loss

KEY

A: *Feature type.*

B: *Original number.*

C: *Number surviving in 1950.*

D: *Number surviving in 2003 (common features - giving all Category A listed sites in the Inventory of Sites; rare features - giving all known examples (sometimes with more than one per site) - except Trunk buddles/leats, Buddles, Buddle dams, Beehive caps, and Mine roads, which are listed by the number of sites where they are present rather than their individual numbers (these are listed in brackets).*

E: *Number surviving in 2003 of Inventory sites with notable examples (common features list) or all examples (sometimes with more than one per site) in relatively good condition (rare features list), those marked + are sites of exceptional interest and 'typical' examples are significantly more frequent. For those listed in brackets see column D.*

Common Surface Features

A	B	C	D	E
Opencuts	Many	?	36	13
Engine shafts	Many (hundreds)	?	Relatively common but usually capped	14+
Climbing/drawing shafts	Many (thousands)	?	Common but usually capped	4+
Access levels	Relatively common	?	12	5
Coes	Many (hundreds)	?	46	13
Dressing floors	Many (thousands)	?	34	10
Water storage and ore-dressing ponds, and dressing pits	Many	?	30	13
Belland yards	Many (hundreds)	?	37	10

Rare/Special Surface Features

A	B	C	D	E
Newcomen and other 18th century engine houses	34	7	6	1
19th century Cornish engine houses, miners' drys, boiler houses and chimneys	25	9	7	3
19th century horizontal engine houses, boiler houses and chimneys	32	19	16	6
Mine offices/reckoning houses/overseers' houses/smithies, etc	Uncommon	30	30	19
Powder houses	Uncommon	7	7	4
Smelters at mine sites	Rare	2	2	0
Possible calciners at mine sites	Very rare	1	1	1
Ore houses	Rare	2	1	1
Soughs - entrances/goits	About 350-400	34	32	29
Waterwheel pits and other associated features	24+	5	5	3
Leats for water raised by pumping	Probably relatively common	?	2	1
Water blasts and other associated features	Probably uncommon	1	1	1
Ventilation fire houses	13+	1	1	0
Gin circles	250+	171	69	49
Large haulage levels	Relatively rare	?	6	6
Crushing circles/wheels	34+	26	15	7
Knockstones	Many (but usually portable)	?	1	1
Bouse teems	Rare	?	6	3
Ore storage bins	Probably relatively common	?	10	0
Trunk buddles/leats	Probably relatively common	?	[16]	[10]
Buddles - stone-lined rectangular troughs	Probably common	?	[13]	[12]
Buddles - circular and D-shaped sets	4+	2	2	2
Slime ponds	Relatively rare	?	6	6
Buddle dams	Relatively common	?	[20]	[18]
Beehive caps	Many	?	[8]	[6]

A	B	C	D	E
Barrow runs (or raised launders)	Probably relatively common	?	5	5
Water diversion leats	Probably rare	?	1	1
Mine roads	Probably rare	?	[4]	[3]
Tramways	Probably relatively uncommon	?	4	4
Limekilns and quarries used for mine building construction or processing waste rock	Rare	?	4	4
Meerstones	Possibly relatively uncommon	?	2	2
Sough marker stones	Probably very rare	?	1	1
Late 19th and earlier 20th century lead/gangue mine buildings (including headgear and other structures)	Uncommon	?	10	4

Appendix E:

Ecological Survey Methodology Used to Survey Lead Rake Sites and Ground-Truthing of the Aerial Photograph Analysis

Ecological Survey

Since initial survey in 1997 the survey methodology has been gradually refined. Records are completed on a field-by-field basis. Currently, for each lead rake within a field, a Lead Rakes General Record Card is completed giving the following: a description of the sward, a description of the different communities and an estimate of the percentage of the total rake area occupied by each National Vegetation Classification (NVC) community [23, 69].

A Lead Rake Communities Record Card is also completed (based on a combination of the English Nature condition assessment cards for acid, neutral and calcareous grasslands). The frequency of favourable and negative indicator species are recorded based on 20 stops made at random during a structured walk through the unimproved communities on the rake. For each rake a particular note is made of the presence of key species. The condition of each unimproved community type (acid, neutral, calcareous) occurring on the rake is assessed by the frequency of indicator species and physical characteristics of the sward. Where a particular community is under represented in the structured walk (due to small area) a Peak District National Park Authority (PDNPA) Grassland Record Card is also completed for this community. If the area of unimproved grassland is too small to justify a structured walk, only a PDNPA Grassland Record Card is completed.

Following the species survey, lead rakes are graded into Categories A, B or C for ecological interest. The ecological value of lead rakes is based on the representation of unimproved grasslands, the presence of metallophyte communities and the complexity of sites.

Category A:

- *Lead rakes of high ecological value which support good examples of unimproved neutral, calcareous and/or acid grasslands - evaluated as unimproved pasture evaluation.*
- *And lead rakes that are complex, supporting a mosaic of different community types.*
- *And/or lead rakes that support areas of metallophyte communities in which the metallophyte species are greater than 'rare', except for alpine penny-cress where its presence will suffice rather than being greater than 'rare'.*

Category B:

- *Lead rakes of moderate ecological value, but which still support unimproved but less diverse grasslands.*
- *And/or lead rakes that support metallophyte communities in which the metallophyte species are rare.*
- *And lead rakes that may exhibit a mosaic but include areas of semi-improved species-poor sward.*

Category C:

- *Lead rakes of limited ecological value that support only very small patches of unimproved swards with no metallophyte vegetation.*
- *Generally dominated by grassy swards.*

Improved:

- *No or negligible remaining ecological interest.*

Essentially this grading reflects the frequency of species of ecological interest set against the extent of any semi-improved or improved vegetation on the rake. Where several lead rakes exist in one field a combined grade was given; this was generally that of the highest-graded lead rake in the field. The exception was for fields that contained only very small areas of rakes of ecological interest and much larger areas of lead rakes with more agriculturally improved rake vegetation. The combined lead rake grade for such sites generally reflected the vegetation on the less ecologically interesting lead rakes.

The vegetation and communities surrounding the rakes was also noted. If the off-rake vegetation included unimproved grassland, then the communities were mapped and surveyed using the appropriate (acid, neutral or calcareous) Grassland Monitoring and Survey Card wherever possible.

Ground-Truthing

The lead rakes and their condition had already been digitised onto a base map as part of the aerial photograph analysis of the orefield summarised in Chapter 4 [5]. These were checked on the ground to confirm the condition of hillocks and that their location had been mapped accurately. Following the conventions used in the aerial photograph analysis, the hillocks were categorised as follows:

1. *Hillocks wholly or largely undisturbed.*
2. *Intermittent remains (partly removed or damaged).*
3. *Hillocks wholly or largely removed or ploughed out.*

Where remains were present these were recorded on the site sketch map, and this included examples where hillocks had been 'wholly or largely removed or ploughed out' but isolated hillocks remained. Where necessary the digitised database was amended.

Appendix F:

The Ecological Survey - Results to Date

The ecological survey carried out by the Lead Rakes Project has concentrated on sites that do not lie within biological cSACs and SSSIs, primarily because these are already identified and documented (if sometimes not in detail) and are not at risk. At present, survey work, which is being carried out on a prioritised area by area basis, is only about two-thirds complete; thus the results presented will be updated as more work is carried out. The brief review given below concentrates on the Category A highlights (Appendix E). Totals for every important community are given in the table below which summarises the survey of 131.56ha of lead rake surveyed to date by the Project (i.e. 50.8% of the estimated total resource of 260ha).

All known Category A sites, including those outside the areas already surveyed where data exists, are listed in the Inventory. This includes those within cSACs and SSSIs.

Lead Rake Plant Communities

This section describes the most diverse and interesting lead rake communities found to date, following the National Vegetation Classification (Appendix G) [23, 69], which is shown in brackets.

A total of 6.37ha of lead rake within the rakes surveyed to date by the Lead Rakes Project support a metallophyte community comprising a spring sandwort/alpine penny-cress/pyrenean scurvy grass open vegetation with harebell, fescue and sorrel and often lichens and mosses (OV37). Typically this community is sparsely vegetated with much open ground and is usually confined to toxic spoil heaps and areas from where the hillocks have been stripped leaving ground which is contaminated with heavy metals. The area with most of this community is Castleton/ Peak Forest. A further total of 2.51ha of a fescue and alpine penny-cress metallophyte community have been found, all in the Bonsall Moor area.

The lead rakes have also been found to be an important refuge for calcareous grassland and particularly a community comprising sheep's fescue/meadow oat grass (CG2d), which is normally a classic daleside grassland. This tends to be a very species-rich and diverse grassland, often with frequent quaking grass, glaucous sedge, crested hair grass, fairy flax, thyme, salad burnet, hoary plantain and eyebright. In the best examples with autumn gentian, limestone bedstraw, rock rose, kidney vetch, early purple orchid and frog orchid. 8.80ha of this type of grassland have been found, with the largest amount so far occurring in the Bonsall Moor area. The topography and substrate from which the hillocks are made are characteristic of the steep daleside slopes on which this community is more commonly found in the Peak District. This community has been most often found on the south facing slopes of the hillocks that comprised of limestone and mineral spoil. Spring sandwort is also found as a component of this community and it appears that given time the first habitat described (OV37) may develop into this classic daleside grassland community (CG2d) on lead rakes. The survey work on Bonsall Moor suggested that this latter type of vegetation is confined to hillocks that have not been disturbed for a long period of time.

Of all the calcareous species found in this grassland (CG2d), meadow oat-grass appears to be the species most restricted to older hillocks. The Unit of Comparative Plant Ecology at Sheffield University [37] found that this species is confined to infertile and undisturbed sites. It is a slow-growing grass with no persistent seed bank, low mobility and thus is restricted to grasslands of some antiquity.

A total of 10.39ha other calcareous communities as described in Appendix G were also found (CG7/CG10), as well as 14.50ha of other calcareous grassland communities; survey results are available in the survey reports [15-20].

One of the most attractive of the neutral grassland communities found on lead rakes is the lady's bedstraw sub-community (MG5b) of the crested dogs tail/common knapweed grassland (MG5). This community is usually species-rich and diverse with frequent lady's bedstraw, common knapweed and bird's-foot-trefoil. Species associated with lime rich soils are also an important and attractive part of this community and often include fairy flax, salad burnet, rough hawkbit, hoary plantain and cowslips. 19.23ha of this sub-community have been surveyed as part of the Lead Rakes Project. A total of 10.40ha other neutral communities as described in Appendix G were also found (MG5a/MG5c), as well as 4.71ha of MG9; survey results are available in the survey reports [15-20].

The acid grasslands on lead rakes are typically sheep's fescue/common bent grass/heath bedstraw grassland (U4). 16.09ha of this community have been surveyed as part of the Lead Rakes Project. A total of 0.82ha of other acid communities, as described in Appendix G, were also found (U2/U5); survey results are available in the survey reports [15-20]. The acidic communities are naturally poor in species and are characterised by an abundance of sheep's fescue and mosses with occasional bent grass, sweet vernal grass, field woodrush, common violet, harebell, common sorrel, lady's bedstraw, crested hair grass and tormentil. In the best examples of the U4 community on lead rakes mountain pansy is frequent.

The Metallophytes

Four metallophyte species were chosen as key metallophytes for the purposes of the survey and database production.

Spring sandwort has been found in all survey areas but is only common in the Bonsall Moor and Castleton/Peak Forest areas and at certain sites in the Bradwell area.

Alpine penny-cress has only been found in large numbers during the Lead Rakes Project survey at Bonsall Moor and even then is restricted in its distribution. Only one plant was found in the Elton area. Clearly it is important to safeguard any site that has alpine penny-cress.

Mountain pansy is normally restricted to the acidic communities and therefore the Castleton/Peak Forest area, which is generally at a high altitude where these are common, is particularly important for this species.

Pyrenean scurvy grass is restricted to the Castleton/Peak Forest area and survives in areas that ironically are normally regularly disturbed, as for example by motor bike scrambling, or on sites that are hostile to competitive plants as on steep slopes of toxic mineral spoil. Such areas are rare and account for only 7% of the surveyed area of lead rakes in the Castleton/Peak Forest area.

Localised Distinctions and Characteristics

The surveys undertaken so far highlight the rarity of the metallophyte species and the need to prioritise sites that support these species as well as the communities that contain them. The detailed surveys which have been carried out as part of the Lead Rakes Project have also highlighted distinct differences and special characteristics of different parts of the orefield [15-20].

- *Bonsall Moor is significant for its populations of alpine penny-cress and large areas of metallophyte and calcareous grassland with associated species such as frog orchid.*
- *Castleton/Peak Forest is important for its large areas of acid and upland calcareous grassland. It also supports good populations of mountain pansy and, more locally, pyrenean scurvy grass.*
- *The Bradwell survey highlighted how limited the resource now is in this area, with a lack of sites for metallophytes and metallophyte communities in the area. This is a reflection of the losses of lead rakes in the area with over half having been removed by intensive reworking of the hillocks for fluorspar and by agricultural improvement in the area.*
- *Winster and Elton were also notable for the absence of metallophytes and metallophyte communities. The resource in this area is limited in extent and the areas with key communities are small when compared with Castleton, Bradwell and Bonsall survey areas. Like Bradwell, Winster has seen intense reworking of hillocks for fluorspar and agricultural improvement. In the Winster/Elton area in particular, some workings lie under shale and the hillocks here contain this material making them more neutral in character. Similarly, many of the deposits worked in the Winster/ Elton area contained much clay that has been brought to surface and this has had a similar effect.*
- *The Monyash area was disappointing for metallophytes and metallophyte communities. However, it does support some very interesting and diverse lead rake grassland communities. Unlike the other areas, the ground-truthing led to a significant revision of our knowledge as to what survives when compared with the aerial photograph assessment. A significant number of hillocks on small veins were found that were previously undocumented.*

The survey data from Sheldon/Taddington/Flagg area has still to be fully assessed.

Area of Important Plant Communities Associated with Lead Rakes (to nearest 0.01ha)

		Bonsall Moor	Castleton/ Peak Forest	Bradwell	Winster	Elton	Monyash	Totals
Total Area of Rake Surveyed		***27.87***	***45.50***	***21.11***	***14.13***	***14.84***	***8.11***	***131.56***
Calaminarian Grassland	*OV37*	*1.80*	*3.41*	*1.12*	*0.02*	*0.01*	*0.01*	*6.37*
	Fescue/Alpine Penny-cress	*2.51*	*-*	*-*	*-*	*-*	*-*	*2.51*
Calcareous Grassland	*CG2d*	*5.02*	*2.19*	*0.38*	*1.03*	*0.11*	*0.07*	*8.80*
	CG7	*0.24*	*2.71*	*0.77*	*0.01*	*-*	*0.01*	*3.74*
	CG10	*-*	*5.92*	*0.73*	*-*	*-*	*-*	*6.65*
	Other Calcareous Grasslands	*5.44*	*5.90*	*1.76*	*0.07*	*0.93*	*0.40*	*14.50*
Neutral Grassland	*MG5a*	*2.02*	*0.62*	*1.25*	*1.40*	*4.47*	*0.17*	*9.93*
	MG5b	*7.38*	*0.83*	*3.21*	*2.01*	*3.56*	*2.24*	*19.23*
	MG5c	*0.40*	*-*	*0.05*	*0.02*	*-*	*-*	*0.47*
	MG9	*-*	*4.67*	*0.03*	*0.01*	*-*	*-*	*4.71*
Acid Grassland	*U2*	*0.13*	*0.10*	*0.03*	*-*	*-*	*-*	*0.26*
	U4	*2.45*	*11.77*	*0.95*	*0.19*	*0.07*	*0.66*	*16.09*
	U5	*-*	*0.55*	*0.01*	*-*	*-*	*-*	*0.56*

Appendix G:

Extracts from the Peak District Biodiversity Action Plan Audit that are Relevant to Lead Rakes

The Peak District Biodiversity Action Plan [43] provides an audit of habitats listed in the UK Biodiversity Steering Group Report [39] as Key Habitats.

Vegetation Types

Lead rakes are an extremely rich resource of vegetation types including calcareous, neutral and acidic grassland, limestone heath and sparse open swards. The grasslands fall into one of four main groups:

1. Metallophyte Vegetation - There are two distinct true metallophyte communities in the Peak District:

- *Open, sparse - National Vegetation Community (NVC) OV37, sheep's fescue, spring sandwort vegetation.*
- *Fescue dominated sward with alpine penny-cress (a possible variant of OV37).*

The OV37 community with spring sandwort is characterised by limited vegetation cover (as little as 10%). Species commonly associated with this community include sheep's fescue, thyme and eyebright. In contrast, the typical fescue-dominated sward with alpine penny-cress is characterised by an abundance of fescue in a closed, species-poor sward. Associated species only occur as occasionals, the most common being common sorrel, harebell and crested hair grass.

2. Calcareous Grasslands - The lead rakes of the Peak District are a rich resource of calcareous grasslands, which dominates the areas of lime rich spoil. NVC types include:

- *CG2d - Sheep's fescue - meadow oat-grass, heath moss sub-community.*

  This classic daleside community is characterised by an abundance of sheep's fescue, meadow oat-grass, thyme, fairy flax, glaucous sedge, salad burnet and rock rose. The best examples of calcareous grasslands are very attractive with a rich mix of herbs, grasses and sedges with up to 40 species per metre square. A number of uncommon species are often found such as frog orchid, fragrant orchid and autumn gentian.

- **CG7** - *Sheep's fescue - mouse ear hawkweed - thyme grassland.*

  This community is characterised by an abundance of thyme and mouse ear hawkweed. These species often dominate whilst other calcareous species though present are often only scattered in the sward including autumn gentian, fairy flax, bird's-foot-trefoil and eyebright.

- **CG10** - *Sheep's fescue - common bent - thyme grassland.*

  This community represents a transition between true calcareous grassland and acidic grassland. The sward is characterised by a mix of calcareous species such as thyme and limestone bedstraw and species indicative of acidic grassland such as heath bedstraw and tormentil. Grasses, particularly sweet vernal and common bent, tend to be more prominent here whereas herbs and sedges tend to dominate the other calcareous swards. Calcareous species are less prominent in this community than in the other calcareous grasslands and generally the examples are poor in species. Notably, spring sandwort was often found as a component of CG10 grasslands.

3. Neutral Grasslands - *Neutral grasslands can also be important on lead rakes, the most frequent being common MG5a - crested dogs tail - common knapweed grasslands. All three sub-communities are found:*

- **MG5a** - *Meadow vetchling sub-community.*
- **MG5b** - *Lady's bedstraw sub-community.*
- **MG5c** - *Heath grass sub-community.*

  The richest examples include an abundance of species which are confined to unimproved, traditionally managed grasslands, such as cowslips, devils bit scabious, field scabious, hoary plantain, bird's-foot-trefoil, common knapweed and quaking grass.

4. Acid Grasslands and Heaths - *There are three distinct types of acid grassland associated with the lead rakes of the Peak District:*

- **U2** - *Wavy hair grass grassland.*

  The U2 community is dominated by wavy hair grass with occasional common sorrel, tormentil and heath bedstraw. Occasionally bilberry will be found in the sward.

- **U4** - *Sheep's fescue, common bent grass, heath bedstraw grassland with mountain pansy.*

  This acidic community is naturally poor in species characterised by an abundance of sheep's fescue and mosses with occasional bent grass, harebell, common sorrel, lady's bedstraw, crested hair grass and tormentil. In the best examples mountain pansy is frequent and even locally abundant.

- **U5** - *Mat grass, heath bedstraw grassland.*

  This distinctive, very poor acid grassland is dominated by mat grass. Associated species include occasional bilberry, harebell, moss, heath bedstraw and mountain pansy.

Heaths are very rare on lead rakes but occur where dwarf shrubs have re-colonised the hillocks from the surrounding land following the working of the lead vein. In NVC terms they tend to be H9 - heather, wavy hair grass heath with small areas of H12 - heather, bilberry heath.

The detailed surveys which have been carried out as part of the Lead Rakes Project have highlighted distinct differences and special characteristics of different parts of the orefield.

Lead rakes are not only important for plants but for a range of other wildlife associated with flower rich grasslands. The profusion of different species provides a wealth of nectar for insects and seed for birds and small mammals. The sparsely vegetated areas of spoil are important for lichens and provide 'hot spots' for invertebrates. In addition, features such as old mine shafts can provide roosts for bats and the stony heaps provide hibernation sites for amphibians. A range of nationally and locally significant lichens, invertebrates and plants are associated with lead rakes. These include three nationally significant plants, alpine penny-cress, spring sandwort and maiden pink.

Significant Species in a National Context

Plants - *The following plants are identified as Nationally Scarce:*

Minuartia verna	*spring sandwort*
Thlaspi caerulescens	*alpine penny-cress*
Dianthus deltoides	*maiden pink*
Verrucaria murina	*lichen*
Vezdaea retigera	*lichen*
Verrucaria melaenella	*lichen*
Bacidia viridescens	*lichen*
Vezdaea aestivalis	*lichen*

Mammals - *The following mammal is identified as a Priority Species in the UK Biodiversity Steering Group Report - Short List and Middle List [39]:*

Lepus europaeus	*brown hare*

Birds - *The following bird is identified as a Priority Species in the UK Biodiversity Steering Group Report - Short List and Middle List [39]:*

Alauda arvensis	*skylark*

Invertebrates - *The following spider is identified as Nationally Scarce:*

Pirata latitans	*spider*

Significant Species in a Natural Area Context

Plants

Cochlearia pyrenaica	*pyrenean scurvy grass*

Invertebrates

Perizoma albulata	*grass rivulet moth*

Appendix H:

Lead Mining Related Scheduled Monuments

Lead mining remains within Scheduled Monuments are given full protection from any form of ground disturbance without Scheduled Monument Consent; where disturbance would be significant this is normally not granted except in exceptional circumstances. Anyone illicitly damaging the archaeological interest at a Scheduled Monument is liable to prosecution.

The ecological interest of a Scheduled Monument is not always protected in that this can be damaged without ground disturbance, for example by the application of fertiliser, lime, herbicides, slurry or paper pulp.

Current Schedulings

There are 36 mine-related sites in the orefield that are Scheduled Monuments (Winter 2003), listed here in tabular form. Of these the majority include mining waste hillocks as well as specific features of interest, although in a few cases it is only specific features that are scheduled.

KEY

A: Scheduled Monument number.

B: Scheduled Monument name (which in some cases differ from those used in the Inventory).

C: Inventory of Regionally and Nationally Important Lead Mining Sites number. In many cases only part of the area defined in the Inventory is scheduled.

D: Length of vein hillocks within the scheduled area, in kilometres, derived from aerial photograph assessment - present in good/ reasonable condition.

E: Length of vein hillocks within the scheduled area, in kilometres, derived from aerial photograph assessment - present in intermittent condition.

F: Area of pipe/flat hillocks within the scheduled area, in hectares, derived from aerial photograph assessment - present in good/ reasonable condition.

G: Area of pipe/flat hillocks within the scheduled area, in hectares, derived from aerial photograph assessment - present in intermittent condition.

Within the National Park

A	B	C	D	E	F	G
27223	Odin Mine	1	-	0.2	-	-
27224	Engine Sough	1	-	-	-	-
30954	Peakshill or Oden Sough	2	-	-	-	-
29966	Faucet Rake Mines	4	1.2	1.5	-	-
29965	New Rake Mines	5	1.2	0.1	-	-
30956	Pin Dale Side Veins	6	0.7	0.8	-	-
29963	Slitherstone and Linacre Mines	9	1.8	2.6	-	-
29964	Eldon Hill	9	0.1	0.1	-	-
29962	Watt's Grove Rake	9	1.2	1.4	-	-
29961	Oxlow Rake	12	1.2	1.4	-	-
30955	Hills Venture Mine	13	0.3	0.1	-	-
29969	Cop Rake and Moss Rake Mines	14/15	0.9	0.4	-	-
27217	Tideslow Rake	30	1.4	0.6	-	-
30938	Cackle Mackle and Stadford Hollow Mines	44	2.3	0.8	-	-
27219	Longstone Edge Coes	45	-	-	-	-
DR257	Red Rake Mine	48	-	-	-	-
30939	Brightside Mine	49	-	-	-	-
29976	Magpie Mine	64	0.8	0.1	-	-
27220	Trueblue Mine	65	-	0.1	-	-
30944	Lathkill and Mandale Mines	78	-	0.5	-	-
27222	Hillcarr Sough	85	-	-	-	-
29975	Gratton Dale Mines	87	0.5	0.2	14.7	-
30952	Rainslow Scrins	88	0.6	0.7	-	-
27211	Winster Pitts and Drummer's Venture	93	-	0.2	2.7	-
30943	Mount Pleasant Mines	98	-	0.6	-	-

A	B	C	D	E	F	G
30945	Northern Dale Mines	99	0.9	1.2	-	-
30942	Gorseydale Mines	102	0.2	0.4	-	-
29968	Slack, Mount Pleasant and Barmaster Grove Mines	102	0.1	0.1	-	1.7
29967	Beans and Bacon, Old Eye, Fiery Dragon and Cod Beat Mines	102	0.6	0.4	-	3.0
30940	Bonsall Leys Mines	107	1.3	1.2	-	-
30953	Old Millclose Engine House	B25	-	-	-	-
Outside the National Park						
24984	High Tor Mines	111	-	0.5	-	-
27218	Snake Mine	114	-	-	-	-
24986	Nether Ratchwood and Rantor Mines	116	-	-	-	-
27221	Cromford Sough	B32	-	-	-	-
30957	Meerbrook Sough	B37	-	-	-	-

Future Schedulings

At the time of writing (winter 2003), all of the sites recommended for scheduling under the Lead Industry assessment have now been scheduled as part of the Monuments Protection Programme. In addition to the lead mining schedulings, it is known that the extensive and extremely important copper/lead mines at Ecton are being considered under the Non-Ferrous Metals (Tin, Copper, Arsenic and Minor Metals) Industry assessment. A few fluorspar and calcite mining sites are also being considered here. These comprise the High Loft Mine on Masson Hill, Matlock Bath (underground workings only); Long Rake Mine, Youlgreave; Ladywash Mine, Eyam; and Harrybecca (Bacon's) Mine, Hassop. In all cases, firm details of what exactly will eventually be scheduled are not yet available.

Appendix I:

Lead Mining Related Candidate Special Areas of Conservation and Sites of Special Scientific Interest

1. Lead Rake Habitat Special Interest

Candidate Special Areas of Conservation (cSACs) and Sites of Special Scientific Interest (SSSIs) afford full protection to lead rake habitats (notably metallophytes/calaminarian communities) where these habitats are a feature of the special interest of the site as recognised in the site notification. There are two cSACs in the orefield: Gang Mine, a single site; and Peak District Dales, which comprises nine separate valleys.

KEY

A: Name of SSSI.

B: Length of vein hillocks within the designated area identified by aerial photography in good/reasonable condition (in km).

C: Length of vein hillocks within the designated area identified by aerial photography in intermittent condition (in km).

D: Area of pipe/flat hillocks within the designated area identified by aerial photography in good/reasonable condition (in ha).

E: Area of pipe/flat hillocks within the designated area identified by aerial photography in intermittent condition (in ha).

F: Part of a cSAC.

Sites of Special Scientific Interest where Metallophytes/Calaminarian Communities are the Primary Reason for SSSI Notification

Within the National Park

A	B	C	D	E	F
Oxlow Rake	1.6	0.2	-	-	no
Tideslow Rake	1.4	0.6	-	-	no
Bonsall Leys	1.9	1.6	-	-	no
Outside the National Park					
Gang Mine	0.6	0.7	-	-	yes

Sites of Special Scientific Interest where Metallophytes/Calaminarian Communities are Part of the Notified SSSI or cSAC Interest

Within the National Park

A	B	C	D	E	F
Castleton	9.0	11.8	-	-	no
Coombs Dale	0.4	0.9	-	-	yes
Longstone Moor	2.7	1.5	-	-	no
Cressbrook Dale	1.5	3.8	-	-	yes
The Wye Valley (part)	2.7	3.8	-	-	yes
Long Dale and Gratton Dale	0.5	0.9	-	-	yes
Clough Woods (part)	-	-	-	-	no
Masson Hill (part)	-	-	-	-	no
Via Gellia Woodlands	0.2	0.9	-	-	yes
Outside the National Park					
The Wye Valley (part)	-	0.3	-	-	yes
Clough Woods (part)	-	-	-	-	no
Masson Hill (part)	0.4	1.6	-	-	no
Matlock Woods	-	0.8	-	-	yes
Via Gellia Woodlands	0.8	1.1	-	-	yes
Rose End Meadows	0.2	0.3	-	-	no

Sites of Special Scientific Interest where Lead Mining Sites are Present but are Not Part of Notified Interest, but are Afforded Protection due to Other Notified Grassland Interests being Present

Within the National Park

A	B	C	D	E	F
Topley Pike and Deep Dale	-	0.7	-	-	yes
Monk's Dale	-	0.4	-	-	yes
Stoney Middleton Dale	-	0.9	-	-	no
Lathkill Dale	0.5	2.8	-	-	yes
Ballidon Dale	-	0.1	-	-	yes
Parwich Moor	0.1	-	-	-	no
Dove Valley and Biggin Dale	-	0.7	-	-	yes
Hamps and Manifold Valleys*	0.3	1.4	8.5	-	yes**

** The recorded pipe/flat hillocks lie within both the Ecton Copper Mines and Hamps and Manifold Valley SSSIs.*

*** Some of the mining interest lies outside the cSAC boundary.*

Outside the National Park

Hipley Hill	0.1	0.1	-	-	no

2. Geological Special Interest

Geological SSSIs stem from a major initiative to identify and describe the most important geological sites in Britain, which began in 1977 with the launching of the Geological Conservation Review (GCR). The GCR was designed to identify those sites of national and international importance needed to show all the key scientific elements of the Earth heritage of Britain. These sites display sediments, rocks, fossils, and features of the landscape that make a special contribution to our understanding and appreciation of Earth science and the geological history of Britain, which stretches back hundreds of millions of years.

In the Peak District orefield a range of sites have been designated under the GCR to cover the interest of mineralisation in the limestone bedrock. Within these site boundaries physical lead rake remains and natural geological features are protected by the statutory designation insofar as they are of geological special interest.

Within the National Park

A	B	C	D	E	F
Castleton*	9.0	11.8	-	-	no
Dirtlow Rake and Pindale	0.8	1.8	-	-	no
Portway Mine	0.1	-	-	-	no
Upper Lathkill	0.6	0.2	-	-	no
Ecton Copper Mines*	-	1.5	22.6	-	no
Masson Hill (part)*	-	-	-	-	no

Outside the National Park

Masson Hill (part)*	0.4	1.6	-	-	no
Bage Mine	-	-	-	-	no

** The Castleton and Masson Hill SSSIs are designated for both their biological and geological interest. The boundary of the Ecton Copper Mines SSSI overlaps with Hamps and Manifold Valleys SSSI, and here the surface lead mining ecological interest is therefore protected by the latter.*

Appendix J:

General Permitted Development Orders and Minerals Planning

The requirement that planning permission be obtained before some types of development can be undertaken is a regulatory mechanism. Intervention in the development process by the planning authority is justified on the grounds that it is in the public interest.

However, in order to simplify the development process and to make the planning system more manageable, the General Permitted Development Order 1995 (GDPO) exists to modify the general requirement for planning permission when construction works or a change of use of land and buildings are proposed. Some works and some changes to the use of buildings that may have environmental or other implications are excluded from the meaning of development, and hence do not require planning permission. Some activities that are within the meaning of development are excluded from the development control process by the automatic granting of planning permission, as permitted development.

Thus GPDO directs that planning permission is not needed for certain development in certain restricted circumstances, which are listed in Schedule 2 of the GPDO and conditions set out and explained in article 3. The exploration and removal of minerals can sometimes be included (in parts 22 & 23 of Schedule 2 - Mineral exploration and Removal of material from mineral-working deposits), as development not requiring planning permission. However, these circumstances are restricted as detailed below.

Article 4 - Directions Restricting Permitted Development

If the Secretary of State or the appropriate local planning authority is satisfied that it is expedient that development listed anywhere in Schedule 2 of the GPDO (excluding Class B of Part 22 or Class B of Part 23, which will be addressed below), should not be carried out unless permission is granted for an application, he or they may give direction under article 4, that the permission granted by article 3 shall not apply to -

a) All or any development of the Part, Class or paragraph in question in an area specified in the direction; or

b) Any particular development, falling within that Part, Class or paragraph, which is specified in that direction.

The Minerals Planning Authority (MPA) therefore may direct, under article 4 of the GPDO, that an application for planning permission is required for a development that would normally not require planning permission (i.e. in the Schedule 2 list).

Article 7 - Directions Restricting Permitted Development under Class B of Part 22 or Class B of Part 23

If a person informs the MPA that they intend to carry out development such as described in (Schedule 2) Class B of Part 22 & 23 (only), the MPA may, under certain conditions listed in article 7, direct that the permission granted by article 3 of the GPDO shall not apply to this development, or to such part of the development as is specified in the direction.

Effectively if any of the conditions listed in article 7 apply then the MPA must request that planning permission is applied for. Normal allowances of the GPDO under article 3 do not apply.

The aforementioned conditions in article 7 include the condition that if the land on which the development is to be carried out is in a National Park. Therefore article 7 of the GPDO applies to any development within the Peak District National Park described in Class B of Part 22 & 23 of Schedule 2.

the **lead** legacy

The Prospects for the Peak District's Lead Mining Heritage

GLOSSARY, ACKNOWLEDGEMENTS & FURTHER READING

Glossary

Peak District lead mining has many specialist and dialect terms. Texts that describe it inevitably use many of these. Brief explanations of those used here are included below (for further details see [35, 56]).

***Adit** - see Level*

Article 4 and 7 Directions

Parts of Minerals Planning legislation, under General Permitted Development Orders - see Appendix J for details.

Barmote Court

Lead mining in Derbyshire has traditionally been overseen by the miners' Barmote Courts, each with a steward, a barmaster appointed by the Crown or Liberty owners, deputies and jurymen. These courts met regularly and frequent inspections of mines were made to execute routine court business. They commonly presided over ore measurement, the collection of lot and cope, and the freeing of newly found or unworked veins. When necessary they gave verdicts on deaths in mines, disputes over title, payment of mineral debt and forfeiture of shares.

Barrow Run

A raised causeway used to transport ore to a dressing floor or buddle dam using a wheelbarrow.

Barytes (Barite)

A gangue mineral, barium sulphate, abundant in veins and pipes. The main current use is in heavy drilling mud for oil wells. Other uses include paint manufacture, glossy paper, barium meals and as a source of barium for the chemical industry.

Beehive Cap

A traditional method of sealing a shaft at surface was to build a domed drystone cover that resembled a beehive. Most of these have now collapsed and have either been replaced with railway sleepers, concrete caps or metal grills, or the shafts have been backfilled.

Belland Yard

Many mines have a wall around their waste heaps to prevent stock in the surrounding area grazing them and being poisoned. Belland is a dialect term for the finely powdered lead ore, while poisoned stock was said to be bellanded. Archaeologically, belland yard is the area defined by a wall that surrounds a mine.

Blockwork

A rare form of mineralisation, where natural vertical joints in the limestone (as occasionally seen at surface as limestone pavement) have been enlarged by acidic mineralising fluids and filled with minerals.

Boat Level

A few large 18th century mines adapted drainage soughs, or drove purpose-built levels, for removing the ore from mines by underground canal. These were usually referred to by the miners as boat levels.

***Boiler House** - see Engine House*

***Bolt** - see Sough*

Bouse Teem

A stone semi-circular hopper of 19th century date into which undressed ore was tipped when it came out of the mine to await preliminary washing. Very few examples survive in the Peak District and they are more common in the Yorkshire Dales and Northern Pennines.

Buddle

Buddles are wooden or stone-lined troughs of various designs used to concentrate the ore, where water was mixed with finely-crushed ore (also see Ore-Dressing). Lead ore was heavier than the gangue minerals with which it occurred and thus by passing the mixed material through flowing or agitated water the lead ore settled first while lighter material was flushed away. Buddles can sometimes still be easily recognised, comprising rectangular slab-lined pits and channels. Two exceptional sites contain surviving late 19th century circular buddles similar to those more common elsewhere, as for example in Cornwall.

Buddle Dam

Flat-topped hillocks made up predominantly of clay and sometimes of large dimension. Buddle dams were carefully made so that small quantities of ore missed in earlier stages of the dressing process could be recovered by slowly running water mixed with finely-crushed mineral or clay from underground pipeworkings over a near-flat surface. Often the buddle dams have low banks at the mound-top edges to control the speed of run-off. The heavy ore dropped first and was thus concentrated and could be removed from the upslope end of the dam for rebuddling, while the gangue remained in-situ and hence the mound increased in height with use.

Bunding

An underground working platform, often of wood, above floor level within mine workings.

Calaminarian Grassland

The term used by ecologists for vegetation that contains metallophyte species (metal-tolerant plants).

Calcicole

Plants that are lovers of, or tolerant of, lime-rich soil.

Calciner

Zinc ores needed to be roasted before they could be smelted. At one relatively large 19th century mine in the Peak District it appears this was done by drawing hot air over the ore in a purpose-built calciner.

Calcite

A gangue mineral, calcium carbonate, commonly found in veins and pipes. Present uses include terrazzo flooring, pebbledash wall coverings and grave ornamentation.

Candidate Special Areas of Conservation (cSAC)

The highest nature conservation designation, protecting sites of international importance, via the EU Habitats and Species Directive (1992) and the Habitats Regulations 1994.

Climbing Shaft

A small diameter shaft used by miners to enter underground workings. These usually had foot holes or stemples that acted as ladders. Climbing shafts were often no more than about 20m deep. If deeper workings were to be accessed there tended to be a succession of such shafts each slightly offset from the last.

Coe

A small stone shed, either over a climbing shaft or nearby, used to protect the mine entrance, for changing, providing shelter for ore dressers and for storing tools and ore.

Coffin Level

A carefully-made type of level, usually driven through limestone or shale, which was just large enough to pass through in relative comfort. Coffin levels were dressed with sweeping pickwork to create smooth sides with no sharp obstacles. The name derives from their shape in section, with the widest part at shoulder height, narrowing above and below for head and legs.

Cope

A price per load of lead, traditionally collected from lead merchants who purchased the ore from the miners, and paid to the Crown or the lessee in lieu for them having the first right of purchase.

Crushing Circle

In the 19th century some larger mines crushed ore prior to buddling using a large stone wheel (of similar appearance to a large grindstone). Usually this was shod with an iron tyre. The wheel had a long axle timber that, at the centre of the crushing circle, was attached to a pivot on a low post set in the ground. A horse attached to the other end of the axle walked round outside the crushing circle, drawing the wheel over a ring of stone slabs or a cast-iron bed. Lumps of ore were shovelled onto the bed and the crushed material later removed. A few large mines from the 19th century onwards had mechanised crushers of very different design.

Deads

A local term used by lead miners for pieces of mined bedrock or mineral that did not contain enough lead ore for processing. Deads were discarded, either stacked within the workings or placed on the surface hillocks.

Drawing Shaft

A shaft used to remove (draw) ore, stone and water from a mine, using either a hand windlass or an engine.

Dressing Floor

Mines usually had a prepared working area adjacent to the engine shaft where the ore was processed (also see Ore-dressing). Two basic operations took place here in order to prepare an ore concentrate ready for removal to the smelters. These were:

- *Crushing the lumps of ore/gangue brought from the mine, ether by hand or with a mechanised crusher.*
- *Washing, sieving and buddling the ore.*

Archaeological features commonly found associated with dressing floors include engine houses, engine shafts, gin circles, crushing circles, ore-dressing ponds and pits, buddles, slime ponds, buddle dams and water storage features.

In some cases underground dressing floors also existed where sufficient water was available in the mine for this purpose. This was sometimes a preferable option as it reduced the amount of material that had to be drawn to the surface. Sometimes water at surface was in short supply, while it could be more readily obtained below ground.

Engine Chamber

Some large mines had pumping and winding engines underground, placed in purpose-made chambers. These included a variety of water-powered and steam engines.

Engine House

Usually the building surrounding a steam engine. These were usually used at mines for pumping water or winding ore up an engine shaft. They were occasionally also employed to drive mechanised ore-dressing equipment. The earliest steam engines were developed in the 18th century and are commonly known as Newcomen engines. Design improvements were made by Boulton and Watt in the late 18th century and one of their engine houses stands at Ecton. In the 19th century significantly more powerful high-pressure beam-arm engines were developed which were known as Cornish engines. From the mid 19th century onwards less powerful horizontal engines were used for winding. All 19th century engines had attached boiler houses and had flues to tall adjacent chimneys. Some gin engines are also documented as having engine houses; none of these survive and they may well have been timber-built.

Engine Shaft

A shaft used in conjunction with an engine (gin or steam) for haulage and/or pumping. Such shafts are typically of relatively large diameter and deeper than climbing shafts. In some instances large engine shafts were partitioned and also had a climbing way.

Fines

A mining industry term for mineralised material that has been crushed to a fine gravel or sand.

Firesetting

Before the introduction of gunpowder in the second half of the 17th century, the only effective way of mining through hard rock such as limestone was to light fires against it, which fractured its surfaces. It was a slow and difficult process and this often inhibited mining where the ore source was not rich or was difficult to access. Firesetting was also dangerous as the workings would rapidly fill with smoke and thus fires could only be lit at the end of the working day.

Flat

A miners' term for an ore deposit that lies roughly horizontal, following the limestone bedding. Often found underground running from the sides of veins.

Fluorspar

A gangue mineral, calcium fluorite, abundant in veins and pipes. Common current uses include making hydrofluoric acid and other chemicals, anaesthetics, the fluorination of water supplies and toothpaste, refrigerant gasses, linings for non-stick pans and processing iron and steel slags. It was formerly very important as a flux in steel making.

Forefield

The underground working face of a stope or level.

Galena

This mineral, lead sulphide, is by far the commonest lead ore found in the region (also see Lead).

Gangue

The local term for the waste minerals found with lead ore and usually discarded by lead miners, either in surface hillocks or underground. The common gangue minerals are calcite, barytes and fluorspar. In the last 100 years these have become more sought after than the lead.

General Permitted Development Order (GPDO)

In order to simplify the development process and to make the planning system more manageable, the General Permitted Development Order 1995 exists to modify the general requirement for planning permission when construction works or a change of use of land and buildings are proposed. This allows, for instance, some development to mine sites to take place without requiring planning permission. See Appendix J for details.

Gin Circle

The flat circular area round which a horse walked to work a gin engine. A gin was a commonly used form of winding engine of 17th to 19th century date. It normally comprised a large wooden drum for the shaft winding rope, set horizontally, adjacent to the shaft and headgear. This drum was turned by a horse (or horses in larger examples) walking in a circle and pulling the drum around. Gin engines were used to remove both ore and water from the mines in tubs or kibbles.

Ginging

The miners' term for drystone walling that lines the upper parts of shafts where they are sunk through unstable ground.

Goit

An open drain at surface, in a mining context usually taking water from a sough to a stream or river.

Gunpowder *- see Powder*

Hade

The slope of a vein away from the vertical.

Haulage Level *- see Level*

Headgear

A frame above a shaft, traditionally of wood but in the recent times of metal, which supported the pulley (or pulleys) for the winding rope (also see Engine House and Gin Circle).

Horse-Drawn Ore Crusher *- see Crushing Circle*

Horse Gin *- see Gin Circle*

Hotch

A simple semi-mechanised sieve for processing ore introduced in the 19th century. The sieve was usually on a frame within a rectangular tank with a pole to hand-operate it.

Kibble

An iron or iron-hooped wooden bucket or tub used for lifting mineral and stone up a shaft.

Knockstone

A block, usually of stone, upon which ore was hand-dressed with a hammer.

Ladderway

An underground route in a mine that allowed ladder-access to workings, either in a shaft or in a steeply inclined pipe or stope.

Launder

A long wooden trough or pipe for the conveyance of water, used at surface and underground.

Lead

A toxic heavy-metal, the main ore of which, in the Peak District, is Galena. In the past, lead has had a wide range of important uses, including roofing, guttering, plumbing, pewter, musket balls and lead shot, and the manufacture of pigments and paints. Today, while most of these uses have gone, it is still of some importance for the manufacture of batteries, alloys such as leaded-bronze, lead-solder, leaded petrol and as an insulator against radiation.

Leat

An artificial channel for the conveyance of water. In some cases they brought water to ore-dressing sites, either from ponds or from shafts where the water was drawn from underground. Sometimes crushed ore was refined by placing it in the flowing water where the heavy ore fell to the bottom (also see buddle); these are called trunk buddles. In other cases leats were used to convey excess water well away from mines, for if released nearby it would re-enter the mine and flood workings.

Level

A horizontal tunnel through rock, or a horizontal passage driven along a vein, which gave access to workings and allowed ore to be removed on sleds or wagons. Particularly large examples are often referred to as wagon gates or haulage levels. Levels that enter the mine from surface are alternatively known as adits.

Listed Building

A designated building or structure of architectural or historic interest, the character and appearance of which cannot be altered without approval.

Lot

A fraction of the dressed ore traditionally paid by lead miners to the owner of the mineral rights.

Meerstone

In a few instances mine boundaries and Mining Liberty boundaries (the boundaries between different mineral rights areas) were marked by small vertically-set stones known as meerstones.

Metallophyte

Plants that are tolerant of heavy metals such as lead in the soils.

Mine Office *- see Reckoning House*

Mine Road

A metalled track or road built specifically to give access to a mine.

Miners' Dry

At large mines with steam engines there was sometimes an adjacent building with hot pipework where miners' working clothes could be dried (and where miners also, no doubt, congregated in cold and wet weather).

Natural Vegetation Classification (NVC)

Nationally recognised classification of semi-natural plant communities in Britain.

Opencuts

A mined opening that follows the line of a vein or pipeworking downwards from surface, of variable width and depth. Where deep, these often have vertical rock sides.

Ore-Dressing

The process of separating metal ore from the gangue mineral and adhering rock. For much of the history of lead mining in the Peak District this was laboriously done by hand. At surface much work was done by women and children, with men helping with the more strenuous tasks (see Dressing Floor).

Ore-Dressing Pond/Pit

Many mine sites have small ponds and pits that were used for ore-dressing, but it is often unclear, without archaeological excavation, whether they were used for water storage, washing, sieving or buddling. Much ore-dressing was undertaken in above-ground wooden tubs and troughs that have left no obvious archaeological trace.

Ore House

A building used to store ore before removal from larger mines. In one surviving instance at Winster there was an ore house built to hold the proportion of ore given to the owner of the mineral rights and to the church as tithe gathered from all the mines in the area.

Ore Storage Bin

A small container at surface, often built in stone, for the storage of ore at the mine. A few are freestanding while others are found as internal recesses in the walls of coes.

Overseers' House

At several larger mines the overseer or manager lived at the mine in a purpose-built house or cottage. Thus, he was conveniently placed to always be on call and to oversee the security and good-running of the mine.

Pickwork

The distinctive linear scars left in underground passages and in opencuts by the use of a miners' pick.

Pipe

A miners' term for an ore deposit that often lies roughly horizontally and which is also long and narrow. In many cases 'pipes' comprised ancient cave passages that had been filled by mineralised deposits, either at the time of mineralisation or by the redeposition of eroded sediments.

Plankway

Some underground levels were dual purpose, with water flowing at their base and with a raised plank floor allowing miners dry access to workings and for removal of ore.

Powder

The term commonly used by miners for black powder, more commonly known today as gunpowder, which was used underground in the Peak District from the 1660s onwards to remove rock and mineral. From the late 19th century onwards high explosives have also been used.

Powder House

These small buildings, often of 19th century date, are found at larger mines and are usually set aside from other buildings. They were used to store the gunpowder used for blasting. Typically they have stout walls but a flimsy roof, designed so that in the case of accident the blast is directed upwards.

Pumpway

A horizontal level, usually just above the water table (the driving of which may have reduced the water to this level), where water could be removed from the mine in the same way as a sough, but after having been pumped from deeper in the workings. The miners often used the terms sough and pumpway interchangeably.

Rake

A local miners' term for the main type of mineral deposit found in the region. These deposits are found at geological faults in the limestone that have been filled by mineral deposits. They are sometimes several metres wide and run in lines across the landscape, often for several kilometres. Each vein drops near-vertically for hundreds of metres, but often with most of the profitable ore confined to the top 100 to 200 metres.

Lead Rake is used differently in this report, as a shorthand term of convenience, to describe all mineral hillocks and other surface features within the orefield.

Reckoning House

Some larger mines had purpose-built mine offices, often known as reckoning houses. Here accounts were kept of ore produced, payments made to miners for ore, wages and other general mine business.

Scheduled Monument

A site of archaeological and/or historical national importance given statutory protection from damage or destruction.

Scrin

A local miners' term for a minor mineralised fault fracture, often of no great length. While there is no hard and fast limiting dimension to distinguish between a scrin and a rake, the former term was usually used for veins under about half a metre in width; often they are only a few centimetres wide.

Shotholes

The distinctive holes made by miners into which powder was placed in order to remove rock and mineral by blasting.

Site of Special Scientific Interest (SSSI)

A site of national biological or geological importance given statutory protection from damage or destruction.

Slime Pond

At some larger mines the final stage in the dressing process comprised the collection of small amounts of ore missed by placing finely-crushed material in a settling or slime pond.

Smelter

The vast majority of lead smelting was carried out away from mine sites (surviving remains of these smelters are not considered in this report). The one known exception is at Ecton where there were 18th century smelters on site. Across the orefield as a whole early smelting took place in large bonfires known as boles, often placed on hilltops. In the 16th century smelting was radically improved with the introduction of water-powered bellows at smelters known as ore hearths. Further significant changes occurred in the 18th century with the development of the reverberatory furnace or cupola. With each of these improvements, ore previously discarded as unsmeltable could be recovered and this led to extensive reworking of mine hillocks and renewed mining activity underground.

Sough

A miners' term for a horizontal adit driven specifically to drain those parts of a mine below the natural water table. In a significant number of cases these were driven through solid rock as opposed to along a vein. The surface entrance to a sough was known as the tail. In many instances, where the tail was some distance from the nearest stream, the water was conveyed in a low covered drain known as a bolt. Open drains were known as goits.

Stemple

A miners' term for a piece of wood or, less commonly, stone wedged across a working or vein. These were used for supporting stacked deads, as roof and working platform supports, and as rungs in ladder-ways.

Stope

The space left when the vein mineral has been removed, creating a vertical cavern sometimes many metres in length and height. These voids were often filled with 'deads' (waste material) supported on wooden or stone stemples.

Stowe

A wooden windlass, usually hand operated, used to wind materials and water up and down shafts.

Striking Chamber

At the head or foot of underground shafts, small chambers were sometimes made and were known as striking chambers. These created enough room for winding gear and the loading and unloading of ore (known as striking) to and from the kibble.

Tail *- see Sough*

Tramway

An underground level of 18th or 19th century date with rails of wood or iron where ore and waste rock was moved in wheeled wagons. These were usually pushed by hand and were of narrow gauge. Tramways were also occasionally used in the 20th century at surface.

***Trunk Buddle** - see Leat*

Ventilation Control Wall

In some cases the problem of poor air underground was overcome by building walls sealed with clay or moss, or by using sealed ducts, which controlled air flow. This was particularly necessary at early mines that employed firesetting.

Ventilation Fire House

A small building over a shaft-top that contained a 'furnace' that created an updraft and thus helped ventilate a mine. There are documented 18th century examples in the Peak District. Early steam engines were also known by miners as fire houses.

Water Blast

A documented 18th century method of ventilation which entailed dropping water down a pipe in a shaft in such a way that air was forced out at the shaft base, from where it was directed into further pipes that led to the area of the mine being worked where there was insufficient air flow.

Water Storage Pond

On the limestone plateau surface water was often scarce and this had to be collected in ponds at mine sites because water was essential for the ore-dressing process. These usually held rainwater and sometimes were fed by catchment leats, or by leats from other ore-dressing sites situated uphill from the mine.

Waterwheel Pit

In the 17th to 19th centuries waterwheels were occasionally used both at surface and underground to drive pumps. At surface they were usually set within a long but deep pit.

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The majority of the maps were prepared by Tim Allen from the National Park Authority's GIS data, with background detail under licence from the Ordnance Survey. Two maps showing national plant distributions are reproduced with the kind permission of the Controller of HMSO and the Queen's Printer for Scotland.

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