Monuments Protection Programme

LIME, CEMENT AND PLASTER INDUSTRIES
STEP 4 REPORT

Gill Chitty
January 2001

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CONTENTS **PAGE**

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EXECUTIVE SUMMARY

This report on the lime, cement, plaster and whiting industries in England forms Step 4 of the structured approach developed by the Monuments Protection Programme (MPP) for the evaluation of industrial monuments. It identifies frameworks for management and future conservation action for the industry, including statutory designation where applicable. The model established in 1995 is followed here with the modifications adopted in more recent Step 4 reports.

The purpose of the Step 4 report is to document the assessment of the Step 3 evaluations for the industry and the rationale of the recommendations arising from it. The report presents a site-by-site assessment of the Step 3 evaluations, confirming the identification of monuments of national importance for the purposes both of Section 1(3) of the 1979 Ancient Monuments and Archaeological Areas Act and paragraph 8 of Planning Policy Guidance Note 16 (PPG16), and recommending appropriate action for conservation management.

The evaluation of the lime, cement, plaster and whiting industries for MPP was undertaken by Michael Trueman between 1995 and 2000, initially for Lancaster University Archaeology Unit and subsequently for Trent and Peak Archaeological Unit. In all 266 sites were evaluated at Step 3 and this sample is estimated to represent less than 1% of the population of lime industry sites that existed historically. The selection aims to be broadly representative of the industry's principal periods of development from the Roman period through to the modern cement and plaster industries.

As in previous reviews, coverage has been found to be poor for early sites, with only a few examples of sites identified from the Roman, medieval and earlier post medieval periods, and there are other aspects that are under represented. Survival of machinery and plant associated with preparation and refining processes *in situ* is extremely rare. Site types are identified which are priorities for further research and field survey and, where appropriate, for future designation. In view of the under representation in the MPP sample of field kilns from some regions (see 5.7), it is recommended that further consideration be given to candidates for scheduling that meet the criteria for selection in the national context.

Step 4 assessment has resulted in a large number of recommendations for new scheduling compared with the industries recently surveyed for MPP. Scheduling is recommended at 110 sites, and affirmed for 27 existing scheduled monuments. Seven lime-industry buildings are recommended for consideration for listing and ten for review of the scope and grade of listing. A significant proportion of assessed sites already included one or more listed buildings (72 or 27%) and delisting, when this becomes permissible for these particular cases, is recommended in 34 instances to rationalise dual scheduling and listing designation. An amendment to current legislation would be required to permit delisting in these cases.

Appendix I provides a summary list of conservation action recommended for each site assessed at Step 4. Appendix II lists priority cases for statutory designation by scheduling. Appendix III provides a list of sites identified for urgent recording in advance of site clearance, for recording action to support conservation management and where further survey and evaluation is required for assessment of national importance. Appendix IV provides guidance on the selection of field kilns as candidates for scheduling. Appendix V (bound separately) provides a detailed assessment record for each lime industry site that has been considered in this study.

1. BACKGROUND

1.1 Steps 1- 3 for the lime, cement, plaster and whiting industries (hereafter referred to as 'lime industry') were undertaken between 1995 and 2000. The staged approach includes the description of the industry's range, form and documentation; data gathering and specialist consultation; field visits and reports on site evaluations. The main phase of Step 3 work was carried out between May 1996 and October 1997. A period of public consultation on the Step 3 report followed, between November 1998 and January 1999, which identified a number of additional sites for inclusion. Field visits, evaluation of additional sites and the revision of Step 3 reports were completed between August 1999 and April 2000.

1.2 *The Lime, Cement and Plaster Industries Step 1 Report* (Trueman 1996a) characterised the industry, its technology, and historical development. It considered its national significance, patterns of regional development, and outlined the basis for selective assessment of identified survivals in England. A preliminary list of lime industry sites for survey was compiled at Step 2 and augmented by consultation with a range of local and national experts. The final coverage at Step 2 included 604 sites. The *Lime, Cement and Plaster Industries Step 3 Report* (Richardson and Trueman 1997) presented the evaluation of 217 selected sites and a review of the survey coverage.

1.3 Following comments and new information provided through the Step 3 consultation process, a number of additional sites were evaluated and a total of 266 sites were finally presented for this assessment. Also in response to comments made in the consultation, the description and assessment of the industry was subdivided into the four distinct industrial processes that have developed around the working of chalk and limestone. Separate Step 1 - 3 reports were produced for each:

- lime industry (Trueman 2000a)
- cement industry (Trueman 2000b)
- gypsum industry (Trueman 2000c)
- whiting industry (Trueman 2000d).

2. SCOPE OF THE STEP 4 REPORT

2.1 The scope of the Step 4 report is restricted to a consideration of those sites evaluated at Step 3 and it is helpful, particularly in the case of large scale industries, to recall the process by which candidates for evaluation are selected in the earlier stages. Sites are selected for survey because they are documented to preserve structures and remains representing important characteristics of the industry in the context of the national resource. The Step 3 survey does not provide a definitive listing of sites for the industry and does not draw on a comprehensive survey of its historic remains. The quality of coverage varies from area to area and from period to period and selection is made on the basis of the best existing information sources that are available. In the case of the lime, cement, plaster and whiting industries, there was a large body of existing information about sites in some SMRs and local studies, but few well-documented regional or detailed case studies of the industry.

2.2 The comments on the scope of coverage in the Step 3 Report are re-stated here:

It is clear that for some aspects of the industry, the number of potential sites available for assessment was vast, including for example large numbers of small rural kilns. However,

in arriving at the Step 2 shortlist the only practical way to make the selection was based upon the extent of the information supplied or available for each site. Therefore, only sites of demonstrable interest as defined by the selection process were included at Step 3. It is acknowledged that as a result of this, other sites of similar quality will exist and will not have been assessed.(Trueman 2000a, 3).

2.3 In some instances Step 3 evaluation shows that, although historical and archaeological evidence clearly demonstrate the potential significance of a site, there remains uncertainty about the quality of preservation. These sites remain included in the survey so that their significance and the management of their potentially important remains can be considered in the context of the national resource for the industry.

2.4 A proportion of the sites evaluated at Step 3 are not judged to be of national importance in the state of present knowledge (74 sites). They remain significant for historical study of the industries, and their architectural and historical interest in the local context may be recognised by designation as listed structures and in Local Plan designations. As emphasised above, the Step 3 survey does not provide a definitive listing of sites for the industry and there are large numbers of sites which were not evaluated as part of this exercise, which remain regionally and locally important.

2.5 The majority of the sites selected for evaluation at Step 3 include standing buildings. Most are situated in rural areas and only a small proportion remain in continuing use for the industry. A very small number of works have retained *in situ* plant or equipment of historic interest. Most sites are significant not only for the special historical interest of their association with the lime, cement, plaster and whiting industries but also for their architectural qualities, their group value in association with other buildings and the important contribution which they can make to the distinctive character of the local scene and the historic landscape character of an area.

2.6 Detailed inspection of standing buildings is not undertaken as part of the Step 3 evaluation and some buildings could not be inspected internally during field visits. Where recommendations are made for these to be considered for listing, further assessment will be required by Listing Branch.

2.7 The place of listing in the choice of conservation action for this industry is discussed fully below (5.3). The lime industry sites that have been selected for evaluation at Step 3 include a significant number of structures that are already listed. 72 or 27% of assessed sites have one or more components that are listed. This reflects the fact that listing has customarily been used as the more appropriate designation for the conservation of industrial archaeology, particularly where substantially complete 19th century and later buildings are concerned.

2.8 The computerized Listed Building System (LBS) was not available for searches at the time that shortlisting for this industry was carried out in 1996. During the revision of Step 3 reports in 1999, however, it was possible to include a computer-based search of the List and this produced entries for 382 sites, mostly lime kilns (Trueman 2000a, p.5, Appendix B). The LBS is now available for future MPP short listing, and the uncertainty over the extent of existing designations that has occurred in the past will be avoided. The majority of listed lime industry sites were not assessed in this programme, however, and are discussed below in 5.3 and *re* regional considerations in 5.7.

2.9 There are no significant departures from the Step 4 assessment model as presented in earlier reports (see Brown 1998,1999; Chitty 1995, 1999). As before, the Step 1-3 consultant's advice on the relative weighting of sites or individual components has been

used to discriminate between compelling cases for national importance (indicated as Y in the individual summaries, or Y* where assessed as of clear or outstanding national importance), and cases where the site is evaluated primarily of regional or local significance (indicated as R or L).

2.10 The changes that have taken place in local authority boundaries and in the relationship between county and unitary authorities between 1996 and 1998 have been reflected in the numberinging of sites in this report. They may be correlated with the Step 3 report as follows:

Former county name and number in Step 3 report	**New local authority name and number in Step 4 report**
Avon 1	North Somerset 1
Avon 2	Bath and North East Somerset 1
Avon 3	South Gloucestershire 1
Avon 4	South Gloucestershire 2
Humberside 1	East Riding of Yorkshire 1
Humberside 2	North Lincolnshire 1
Humberside 3	North Lincolnshire 2
Humberside 4	North Lincolnshire 3
Humberside 5	East Riding of Yorkshire 2
Humberside 6	East Riding of Yorkshire 3
Humberside 7	North Lincolnshire 4
North Yorkshire 6	West Yorkshire 1

2.12 The sub division of the limestone industries into four distinct sets of processes - the production of lime, of cement, the gypsum-based industries, and manufacture of whiting - is followed here in the detailed discussion of their character and assessment, and in the commentaries on the period and regional coverage. All four aspects of the industry are considered together in section 3 on the protection and conservation of industrial monuments, and in the final section of the report summarising the findings and recommendations of the Step 4 assessment.

3. THE PROTECTION AND CONSERVATION OF INDUSTRIAL MONUMENTS

3.1 This report follows the policy guidance used in previous Step 4 work which is summarised in outline in this section. The assessment of the lime, cement, plaster and whiting industries has required a close consideration of the existing policy framework in relation to listing and scheduling for disused kiln buildings and structures (discussed below in paragraphs 5.2 and 5.3).

Statutory protection

3.2 The legislative framework for historic environment conservation has developed around a distinction between ancient monuments and historic buildings for which the applicability of scheduling and listing is often straightforward. In the case of the industrial heritage this distinction is not always so clear-cut, and there is often a choice between listing and scheduling for the protection and preservation of industrial structures to which national importance is attributed. A consideration of the relationship between listing and scheduling with particular reference to industrial monuments is provided in Appendix I of the *Lead Industry Step 4 Report* (Chitty 1995*)*. The form of statutory protection recommended in the Step 4 report generally signals the type of management regime which is judged to be the more beneficial for the conservation of a site or building. Scheduling is used selectively for a relatively small number of nationally important sites for which unchanged preservation is a high national priority (Fairclough 1996, 3).

3.3 Listing will normally be preferred to scheduling for a building or group of buildings where continuing or adaptive use is considered to be the optimal management regime. Conversely, where repair works which would not require listed building consent, or adaptive re-use schemes, are likely to compromise the significance of a nationally important building, scheduling will normally be the preferred regime in order to preserve the building and, or, its plant out of use, or in a low intensity use consistent with its vulnerable character. Scheduling will also often be the more appropriate course of designation for well preserved, nationally important buildings where they form one of a closely associated group of industrial components also of national importance in a well preserved setting, the integrity of which would be significantly compromised by adaptation which would be difficult to resist under listed building controls. Examples here include a number of well preserved 18th and 19th century works which retain not only important buildings but substantial remains of the layout, transport infrastructure, and process flows of the industry. Outstanding sites include the limeworks at Amberley Chalk Pits (West Sussex 3), Betchworth (Surrey 11), Langcliffe and Meal Bank (North Yorkshire 4 and 5), and Cow Dale lime works (Derbyshire3).

3.4 Where equipment and machinery survives *in situ*, and where its historical integrity remains high (i.e. all or most of the fabric of the equipment or machine is authentic) and where the threshold of national importance is crossed, scheduling will normally be recommended in order to bring the stringent controls of scheduled monument consent into play. Class consents (deemed scheduled monument consent for certain classes of works) exist for routine maintenance and emergency health and safety measures, allowing continuing safe use. Repairs and alterations, however, come under the strict controls of scheduled monument consent which assures that preservation of the historic value of equipment or plant is given appropriate consideration. A good example is the case of Moorswater lime kiln (Cornwall 8A), a 19th-century lime-burning kiln, already listed. Despite its altered condition it is recommended for scheduling because of the rare survival of in situ machinery (for a water-powered haulage system taking wagons up an incline to the kiln mouth), the need for close controls over changes and monitoring of the site's management.

3.5 Since a significant part of the value of *in situ* machinery lies in its immediate context, the housing and related structures of scheduled machinery will normally also be scheduled. Machinery, whether *in situ*, *ex situ* or reconstructed, may also be listed where it and its housing satisfy the relevant criteria. The Shillingstone lime works (Dorset 1), as an actively working concern, was suggested for listing on this basis but in view of its subsequent closure and stripping out is now more appropriately considered for scheduling to preserve the early 20th century kilns out of use. Another exceptional example is the Hawton Works, Newark (Nottinghamshire 12), a unique survival of a Victorian mill housing gyspum grinding machinery. The building is redundant for industrial use and listed grade II. The grinding machinery is recommended for scheduling to indicate the desirability of long term preservation of the machinery with minimal change.

3.6 The designation by local planning authorities of Conservation Areas under the 1990 Planning (Listed Buildings and Conservation Areas) Act may provide an appropriate framework for the conservation of large complexes of buildings and for the physical context of individual scheduled or listed buildings. Conservation Areas share a special historic character which it is considered desirable to preserve and enhance. Within them, there are controls on demolition, and planning policies are normally used explicitly to prevent harmful land-use changes and can therefore include open areas which form important elements in the layout of an industrial group. Local authorities will be encouraged to designate Conservation Areas where the context of an industry includes related buildings (such as housing, offices or public buildings) which have continued in use, or related historic elements, such as a canal, railway or wharf structures, earthwork and landscape features. Exceptionally, designation as a Conservation Area may be appropriate for a group of industrial structures where it is the character of the group as an ensemble which is of particular value rather than, or in addition to, individual structures.

3.7 The value of Conservation Area designation as an aid to conservation management has been particularly relevant for the lime industries and a number of examples illustrate its range of possible applications. Sandsend Mill cement works (North Yorkshire 1) is an example of an extended building group, elements of which are already listed and proposed for scheduling, that would also benefit from consideration for Conservation Area designation for the larger beachhead group. Lilleshall lime works (Shropshire 2) is an area of 17th -19th century lime workings associated with an early canal, industrial housing and lime quarries. It is proposed for scheduling in part and merits serious consideration for management as a Conservation Area even if listing of specific building elements is not judged appropriate. The small group of housing and kilns at Bold Venture lime works (Lancashire 8) is an example on a more modest scale where individual elements may be listable but where the value of conservation of the rail-side group as a whole could still be signaled through local designation. There are examples of more altered industrial groups of this kind at Zouch Plaster Mills (Nottinghamshire 2), and Barnby Basin lime kilns (South Yorkshire 4). Southam 'model village' (Warwickshire 1) - an early 20th-century housing development using a patent cement construction process (Calway System) and built to accommodate workers at a local cement works - is another candidate, as is housing at Beeding cement works, c1902 (West Sussex 8) and the late 19th-century housing for Nelson's cement company, Stockton (Warwickshire 5).

Limitations of statutory protection

3.8 For some industrial monuments, neither scheduling nor listing offers the best management option. The prescriptive controls of the scheduled monument consent procedure may be inappropriate, for example, for the conservation management of very extensive areas of

industrial extraction and processing, or for machinery and plant which is in active industrial use.

3.9 Neither scheduling nor listing may be sustainable for large complexes of disused industrial buildings and plant where no positive conservation regime exists, and where the investment of the substantial resources required for conservation cannot be assured in the long-term. The appropriate response in such circumstances, or in the case of a heavily polluted or otherwise hazardous industrial site, may be to accept that such remains cannot be physically conserved but should be properly recorded prior to redevelopment or reclamation. There are a number of significant sites of the lime and cement industry where there is opportunity for an organised programme of recording in advance of decisions about their future use and these are noted in the individual site assessments. Urgent cases are listed in Appendix II.1, e.g. Mason's cement works, Claydon (Suffolk 8), Beeding cement works (W Sussex 8).

3.10 Under the current planning regime of PPG16, scheduling will not be used simply to denote or reward national importance. It will be reserved for those cases where protection is required beyond that achievable through the planning process, where the management objective is preservation with minimal change and where a national context for decision-making is considered essential. It will also be used to identify those monuments for which archaeological considerations are deemed to take priority over other land-use issues. It is recognised that those responsible for the local planning process must have regard for a range of environmental, economic and social factors and must balance the weight of these with matters of archaeological and historical importance.

3.11 The scheduled monument consent process, with its presumption in favour of unchanged preservation, can, if necessary, place the needs of long term archaeological conservation ahead of the other considerations which planning authorities, given their own priorities and duties, are bound to take into account. Scheduling may, therefore, be used to denote the requirement for a national, as well as a local, context for decision making and actively to direct damaging development away from monuments of national importance.

3.12 In the case of extensive abandoned industrial remains with, in addition to their archaeological interest, special geological or ecological interest, limited statutory protection may already be afforded by their inclusion in Sites of Special Scientific Interest (SSSI) under the 1983 Wildlife and Countryside Act. Over forty of the lime industry sites assessed are of special interest for their natural attributes as part of coastlines, estuaries and uplands, as habitats for protected species, for rare exposures of geological interest and for the ecologies of the earthworks and wooded areas of former quarries and lime burning sites. Twenty-seven sites are designated SSSIs. English Nature issues lists of potentially damaging operations (PDOs) for each SSI, and permission must be obtained from English Nature prior to undertaking any of these operations. The protection afforded by SSSI status enables English Nature to enter into management agreements with applicants if permission for an operation is withheld. Dialogue about sites of common interest and joint agreement on desirable management action for conservation can effectively serve historic environment as well as nature conservation interests.

Non-statutory protection

3.13 For individual industrial sites, the task of the MPP Step 4 process is to identify cases of clear national importance suited for statutory protection, and to distinguish from them cases where

(a) a site is of national importance but scheduling is not appropriate, or
(b) national importance cannot currently be demonstrated satisfactorily, or
(c) less than national importance must be ascribed.

3.14 For nationally important archaeological remains, the relative merits of management through scheduling and management through the planning process have been discussed elsewhere (Fairclough 1996). Generally speaking the planning system is well suited for the management of monuments where continuing or adaptive re-use is the preferred option, where a programme of research and recording is an acceptable alternative to long term preservation, and in the context of historic centres of urban and rural settlement.

3.15 For industrial remains which, following consideration by the MPP, have been judged to be of less than national importance according to the criteria adopted by the Secretary of State (PPG 16, Annex 4), scheduling is not available as a tool for protection, although listing may still be appropriate on the basis of architectural and historical criteria. A proportion of these remains will fall under benign management regimes, in the care of conservation organisations, or as part of other, non-heritage designations such as SSSI. Other remains may benefit from the active, although low-key, conservation measures under ESA or Countryside Stewardship, or locally negotiated management agreements under the aegis of Local Authority and National Park conservation strategies.

3.16 Where industrial remains of national importance which are not scheduled, or are of more local importance, come under development pressure or are at risk, their conservation lies solely in the hands of local planning authorities. In many instances the threat to archaeological remains may lie outside the normal scope of planning controls by virtue of the provisions of the General Permitted Development Order 1995. Article 4(1) of the Order, however, allows permitted development rights to be withdrawn (i.e. requires an application for planning permission to approved) in cases where there is reliable evidence to suggest that permitted development is likely to take place which could damage an interest of acknowledged importance. Such remains will often retain archaeological information worthy at least of proper recording. Increasingly, they may be valued as elements in the local scene that merit retention for that reason. PPG16 provides advice on the appropriate weighing up of development proposals affecting remains of less than national importance, and PPG15 on the importance of conserving the wider historic environment of which these remains form part.

3.17 Demolition of unlisted and unscheduled buildings outside a Conservation Area (over 50 m3) is normally interpreted as 'development' but planning permission will rarely be required. Notice must first be given to the planning authority in order that there may be an opportunity for it to approve details of the method of demolition and any proposed restoration of the site (see Mynors 1999, p.171 and DoE Circular 10/95). This opportunity should provide the means for allowing time and access for necessary recording works, for example, in advance of the clearance of buildings of former lime and cement works. The stripping out of machinery and plant however may not be covered by such notice requirements.

Industrial remains in urban conservation

3.18 The majority of lime industry sites lie in rural contexts and away from major centres of population. This aspect of industrial archaeology is generally speaking not a significant aspect of urban conservation. There are a few exceptions, however, such as the lime works based in ports and on the harbours of coastal towns, and the policy framework outlined in previous Step 4 reports is represented here for its relevance to those cases.

3.19 In *Managing the urban archaeological resource* (1992), English Heritage published its approach to the conservation and management of archaeological remains in an urban context. Industrial archaeology is an important aspect of urban archaeology and particularly characteristic of towns which have developed in the last three centuries. It is an integral part of the urban historic fabric, both built and buried, and its management will be most effective where it is fully integrated with urban conservation in all its forms. Preservation has to be finely balanced with other conservation needs in historic urban centres and with the wider conservation imperative to ensure they continue, or are regenerated, as viable social and economic centres. In urban contexts, therefore, it will often be more effective to consider industrial archaeology within the non-statutory framework of PPG16, as outlined above, than in the context of scheduling with its emphasis on physical preservation in preference to adaptation or re-use. Locally managed conservation programmes linked to designated Conservation Areas, initiatives such as Regeneration through Heritage and English Heritage's new Heritage Economic Regeneration Schemes (HERS) provide opportunities for the management of industrial archaeology in the context of urban renewal.

3.20 MPP-type evaluation of the urban industrial resource is recognised, nevertheless, as a valuable tool for developing research frameworks within which the industrial heritage can be further investigated and better understood, and for developing conservation and planning strategies. English Heritage's two-part programme, of Extensive Urban Surveys(EUS) and more detailed Urban Archaeology Database(UAD) projects, forms the basis for assessment of current knowledge and understanding of the overall archaeological resource in historic centres; and for devising strategic policies for urban archaeology suitable for adoption as Supplementary Planning Guidance to the Local Plan. This approach has been developed in partnership with local planning authorities and provides a framework for the assessment of historic industrial quarters and centres in an urban context. It links a structured evaluation of archaeological and built heritage resources with the local planning process.

3.21 English Heritage's urban assessment programme began with UADs for urban centres with origins in the medieval and earlier periods, usually excluding later (19th and earlier 20th century) urban growth. As the programme has evolved, a successful case has been made for selective inclusion of urban development of later periods. Extensive Urban Surveys have typically included assessment of industrial and commercial quarters of later periods within their scope and Step 3 evaluations provide a measure of national importance for the component site elements within such historic zones. This type of survey-based approach with strategic objectives will be particularly appropriate as a mechanism for assessing historic industrial areas which contribute distinctive character to the urban scene and as a means of integrating the industrial heritage in conservation planning.

Industrial landscapes

3.22 The recognition of historic landscape character been developed through the work of the Countryside Commission, now the Countryside Agency, and English Nature, in particular through the Countryside Character Programme and the English Heritage historic landscapes project (Fairclough, ed.1999). While scheduling or listing may be used to protect core areas or compact groups of industrial remains, the overall archaeological interest of extensive industrial landscapes is likely to be managed better for its contribution to landscape character under wider countryside management regimes, including the agri-environment measures administered by MAFF. In most cases, these areas will include other conservation interests, such as the biological heritage and ecological concerns. In such cases it will be necessary to ensure that the importance of the cultural component of these landscapes is recognised.

3.23 The inclusion of historic attributes and character areas in landscape assessments is likely to be an important mechanism for integrating conservation management on this scale. Other mechanisms that may be appropriate include designation within local plans, and the use of conservation plans and development strategies to manage particularly vulnerable landscape character. Rural Conservation Areas have been used to good effect in the Yorkshire Dales National Park in Swaledale and Littondale to attract and target resources for the conservation of distinctive landscape attributes such as field barns and walls which are at risk of neglect or demolition. These RCAs cover extensive areas from 20 - 70 km2. It would be worthwhile to explore a similar approach for managing the redundant structures of quarrying and lime burning where they characterise important historic landscapes of the limestone uplands.

Landscape value

3.24 The character of many limestone and chalk bearing landscapes of the country is strongly influenced by remains of quarrying and mining, their transport systems and the processes of lime, plaster and cement making. The contribution that the industrial history of an area makes to its landscape and local distinctiveness is without doubt an important consideration. Nevertheless neither scheduling nor listing lend themselves as a means of conserving or managing landscape features and character. Individual sites are assessed in terms of their landscape context, and its particular value is noted where relevant. Some weight is given to landscape value where this forms part of a site's suitability for public enjoyment and education.

Regionality

3.25 The assessment process for Step 4 seeks to ensure that the potential for significant variation and distinctive characteristics within a region, as well as the country as a whole, is fairly represented in the group of sites selected for statutory designation. In general for the lime industries, variation is between regions rather than within them but groupings of distinct character, such as for example the imposing Northumbrian 'estate' kilns or the Derbyshire pye kilns, are reflected in the assessment.

Toxicity

3.26 For remains relating to many industrial processes, toxicity can be a significant conservation issue. Techniques have been developed for containing contaminants to

prevent their release into watercourses and drainage systems, and to minimise contact with humans or animals. Research into the management of contamination continues. The minimisation of ground disturbance is a management objective entirely compatible with scheduled status but less so with listing, with its stronger presumption in favour of continued use or adaptation. Where toxicity (and the desirability of site clearance on health and safety grounds) is a serious issue on a site where adaptive re-use offers the only sustainable future option, scheduling may be preferred in order to ensure controlled archaeological clearance of contaminated industrial remains.

Underground mines and works

3.27 The protection of underground works such as mines involves complex legal, technical and administrative issues. These demand a different approach to selection by MPP from that normally afforded to the surface remains of industrial activity. Further consideration of these issues is provided in the *Lead Industry Step 4 Report* (Chitty 1995, Appendix II). Where a mining site is selected for scheduling based on the assessment of its surface remains, the protection afforded to below ground remains within the defined constraint area will - unless specifically excluded - be deemed to extend also to underground mining remains. *De facto* protection therefore extends to a fairly large sample of mining remains, albeit that they may not be accessible at present and their condition may not be known.

4. CHARACTERISATION OF THE LIME INDUSTRY FOR STEP 4

The discussion of the industry here is drawn from the Step 1 - 3 reports for the lime industry by Michael Trueman (1996a, 1997, 2000a) for Lancaster University Archaeological Unit and the Trent and Peak Archaeological Unit.

4.1 Definition

The lime industry is defined for the purposes of the MPP survey as the buildings, sites, equipment, and machinery concerned with the processes of preparation and production of lime by burning and slaking. The extraction of limestone and chalk is considered fully as part of the quarrying industry, although closely associated quarry sites have been included in assessments for the lime industry in some cases. The production of mortar using lime is not included in this survey and historically this has usually been carried out separately at the construction site.

4.2 Introduction

4.2.1 From at least the Roman period the lime industry has provided the basic ingredient for lime mortar and has been an essential material for the building trades throughout the country. Since the medieval period lime has also been known as an agricultural fertiliser and was an important element in soil improvement and land reclamation during the post medieval period. It had a role in a host of processes during the historic industrial period, including the closely related cement industry, which has continued through into modern manufacturing and production.

4.2.2 The basic raw material required for producing lime is limestone or chalk, the naturally occurring forms of calcium carbonate. Roasting or calcining these rocks at a high temperature (900-1200°C) releases carbon dioxide leaving 'quicklime', or calcium oxide, a white caustic alkaline substance. Quicklime is unstable in normal atmospheric conditions and combines with water to produce calcium hydroxide. This process, known as slaking, takes place as a strong chemical reaction that releases heat and reduces the quicklime lumps to a stable powder. 'Lime' as a generic term is used for slaked and unslaked lime.

4.2.3 Lime mortars set by means of a reaction with atmospheric carbon dioxide, by which the slaked lime is gradually converted back to calcium carbonate. Different setting properties derive from clay impurities in the parent rock and result in naturally 'hydraulic' or 'semi hydraulic' limes. This is due to the presence of silica and alumina in certain limestones which form insoluble compounds when burned at high temperatures, producing a lime with an increased strength which will set under water. Cement is distinguished from lime by the higher proportion of clay minerals and the method of production (see below Section 6).

4.2.4 The main uses of lime historically have been in building construction and for agricultural purposes. In the building trade, lime has been the main ingredient in lime mortars, concretes, plasters, renders and washes since the Roman period. In agricultural use it was spread on ploughed land as a fertilizer and soil improver. From the early 19th century lime was also used widely in a variety of industries, including as a flux in blast furnaces, in the production of gas and oil, a large number of refining processes, the chemical, pharmaceutical and food industries.

4.2.5 Lime burning sites varied in scale from isolated field kilns, serving a farm, estate or the immediate locality, to large commercial works alongside canals, railways and

quarries. The availability of transport for stone and for fuel to the lime burning site was an important factor in choice of location away from the quarry. The type of limestone and suitability of fuel were also key factors in the quality of lime produced. Stone required preparation by breaking or crushing to an appropriate size for packing and burning. After the kiln firing, the resulting quicklime might be slaked on site, bagged and stored, or transported, with attendant risks, to the point of use.

4.2.6 Typically a large lime works would include a kiln or bank of kilns, accessed by a charging ramp or a lifting mechanism for loading. There would be shelters or accommodation for workers (lime burning went on continuously for periods of days and weeks) and storage areas or buildings for the lime and for raw materials. There might also be a crushing mill for stone and slaking pits or yards. Often the source of stone -a quarry, mine or hushing - would be near at hand. On rail, river, canalside and coastal works, stone and fuel might be transported for some distance to the site, unloaded on a wharf and moved around the works on a wagonway. The kiln component of the works was the most characteristic element of the industry and is described in some detail below.

4.2.7 Kilns for lime burning evolved through the history of the industry. 'Intermittent' kilns were charged, burned and the lime drawn in a single episode. 'Continuous' kilns were charged and burned continuously for weeks at a time with periodic drawing of lime and adding of further raw materials. Many kilns burnt a mixed charge of fuel and stone, but in flare kilns and furnaces the two were burned separately. Changes in kiln form were designed to increase volumes of continuous production and maintain the quality of the lime by closer control over the burn.

4.2.8 The simplest kiln type is the *clamp kiln*, where firing takes place in mound of mixed fuel and stone without a permanent superstructure, often in an excavated bowl or pit. *Flare kilns* are permanent masonry structures, fired intermittently. Within a rectangular, bottle shaped or domed kiln super structure, the top-loaded charge of stone is separated from a stoke pit or furnace below. In practice it has been found that it is not always possible to distinguish this type of kiln in field evidence from the *draw kiln*, which differs in being a continuously fired, mixed feed kiln. Like flare kilns these are permanent masonry structures, often constructed against an artificial bank or the side of a quarry or slope to aid top-loading. They contain one or more 'pots' - the tapering chambers within which burning of the mixed charge (fuel and limestone) takes place. At the base of the pot, draw holes or 'eyes' allow a controllable airflow through the kiln and provide access to draw out the lime. The architecture of these, the commonest of surviving historic kiln types, is characterised by the form of the draw arches around the draw holes, for which there might be as many as four for a single pot, with connecting access tunnels. The development of the draw kiln appears to be a British invention, which was to become of international importance, and these structures are a distinctive and widespread feature of the industry.

4.2.9 In the late 19th and 20th century, new lime kiln forms were adapted from types developed for cement production and other industries. The *vertical mixed feed or shaft kiln* is a development of the draw kiln and operates in a similar way, with a tall masonry or steel-cased chamber, in a straight or tapering cylindrical form. Both single shaft and two shaft forms are known, some surmounted by chimneys, with one or more draw holes at the base. *Vertical furnace-fired kilns* have a similar form but the stone is loaded separately into the shaft, with several furnaces located around the outside restricting the burning zone, and using a range of fuels, including gas and oil.

4.2.10 *Horizontal ring kilns*, of which the Hoffman kiln was the first, were developed for

brick firing in Germany. The stone was stacked within a ring-shaped tunnel and coal was fed in through multiple feeder holes. A controlled burn was achieved using a series of flues and fuel feeds so that the burning zone advanced continuously around the tunnel, new stone being loaded in advance and the burned lime unloaded behind using a railway. Many variations on this basic design were devised. In the *horizontal tunnel kiln*, the material to be fired was carried on trucks or plates through a stationary burning area. The *horizontal rotary or inclined kiln* was developed for the 19th-century alkali industry and adapted later for lime burning. It employed a long steel cylinder, mounted at a slight angle. Fuel entered at one end and stone at the other; the cylinder was rotated to distribute the stone charge.

4.3 Historical background

4.3.1 There is no firm evidence for pre-Roman lime making in Britain but documentary sources, excavated sites and the abundant use of lime mortars, plasters and renders in Roman buildings all attest extensive production of lime from the 1st century AD. Excavated examples of clamp and flare kilns are recorded. Direct evidence is lacking for the post Roman and early medieval period, but again there is clear evidence of the use of lime mortars in Anglo Saxon buildings and sites.

4.3.2 From the 13th century onwards there are good documentary sources for the making and use of lime in building accounts and evidenced in the buildings themselves. It appears that kilns were often constructed for specific building works, close to the castle, town walls or ecclesiastical building for which the mortar would be required. There is some evidence by the late medieval period that commercial kiln banks were producing lime for a general market. The agricultural use of lime for improving arable and pasture is also documented as early as the 13th century but the extent to which it was adopted in practice is uncertain. Clamp kilns and flare kilns are known from excavations and there is some evidence also for the emergence of draw kiln technology.

4.3.3 The expansion of the lime industry in relation to agricultural improvement began in the later 16th and 17th centuries, alongside the growing demand for lime to supply building work. Clamp, flare and draw kilns all appear to have been in use. The 18th century saw an enormously increased demand from urban development, industrial growth and agricultural improvement on a large scale, for lime of a variety of qualities. To produce the quantities required using small intermittent clamp and flare kiln firings was impractical and these were largely replaced by the construction of large, continuously-fired draw kilns which dominated production to the end of the 19th century.

4.3.4 Small-scale production continued in rural areas to produce lime locally for agricultural and building use. Elsewhere the industry in the later 19th and 20th centuries is characterised by large-scale production and the transfer of kiln technologies from the cement and other industries, including the Hoffman kiln, vertical shaft kilns and rotary kilns. The demand for reliable hydraulic mortars grew steadily and successful production of Portland cement from the mid-19th century represented an economic challenge to lime production and gradually took over markets from it during the last century.

4.4 Regional considerations

4.4.1 The essential raw material for the production of lime is limestone or chalk and this can be extracted from a range of geological deposits formed from the Silurian through to the Cretaceous period. Limestones of varying quality and thickness occur in almost every county in England and all have been exploited to some degree for lime burning. Even in upland areas, where only thin and impure limestones were available, the overriding need was for lime to improve poor quality acid soils which meant that the even poorest sources of stone were used for local lime production.

4.4.2 The early industry is characterised by local production to supply specific building needs and, due to the difficulties of transporting limestone over any distance for burning, the available local limestones were exploited. As with all heavy industries dependent on a large volumes of raw material and significant fuel consumption, the location of sites was governed by the source of raw materials and available transport, and the location and particular demand of markets. Large-scale production away from quarry sites only became feasible with canal, rail and water transport from the later 18th century.

4.4.3 Industries like lime working, which have a long early and pre-industrial period history, often display well-developed regional characteristics even though the technology may be essentially the same from area to area. A tradition of supply from one type of production or kiln form can remain well established, long after it might logically have been superseded, until overwhelming economic forces bring about a change. The Step 3 report identified a number of characteristic regional styles of kiln structure, for example, in Derbyshire, East Anglia, West Gloucestershire and Northumberland. These reflect concentrations of local study, and particularly well-defined constructional characteristics, as much as uniquely distinct groupings. Other regionally characteristic groups undoubtedly remain to be recognised and defined more systematically. The Step 1 report commented that the known regional studies of the industry 'at present are too scattered geographically and divergent in approach for regions to be consistently defined by the real vernacular tradition' and that view has not been modified significantly by the Step 3 process (Trueman 1996, 31).

4.4.4 The range of regional variation as influenced by geographical and topographical factors is discussed fully in section 5.6 on Regional Representation. Upland regions and marginal land with limestone outcrops are characterised by scattered field kilns for agricultural use. The absence of easily available limestone sources in central Lancashire gave rise to a unique local tradition of extraction of limestone by hushing. In regions where good quality limestone was readily available, even in remote situations, it was exploited for commercial works to supply urban and industrial markets if transport was available, or could be provided, by river, canal or rail. Commercially produced lime and limestone was also transported along the coast.

5. DISCUSSION OF STEP 4 ASSESSMENT FOR THE LIME INDUSTRY

5.1 Selection for Evaluation

5.1.1 The exercise of estimating the range and size of historical populations for an industry provides a coarse index for assessing whether the sample evaluated for Step 4 assessment accords with the industry's complexity and scale. For the lime industry the numbers of sites that have existed historically since the Roman period can only be estimated in general terms and the possible historical population of 50,000 suggested in the Step 1 report was an educated guess that is likely to be at the top end of the scale. Some 7000 lime kiln sites are 'known' sites, that is documented in local and national records (Trueman 2000a, Appendix C) and these are largely of the later post medieval period. Few areas have been the subject of systematic study and a search of early Ordnance Survey mapping in some randomly selected areas shows that the numbers documented in some SMRs can be doubled or tripled using this source alone. During the 18th and 19th centuries in upland areas and on marginal land, for example, each farm holding might have had one or more field kilns, operated seasonally or on demand.

5.1.2 For the earlier periods, it is reasonable to expect that every major Romano British, Anglo Saxon and medieval masonry building will have been supplied by one or more kilns, in many cases constructed and fired specifically to supply a particular programme of building work. Only fifteen lime working sites covering those periods were identified in this exercise, and there must remain large numbers of unidentified kiln sites associated with the hundreds of Roman villas, religious and military buildings, and the thousands of medieval churches and secular buildings that are known to have been built. For these periods the Step 3 survey clearly represents only a fraction of a single percent of the possible historical population. The 18th and 19th centuries are better represented by around 170 production sites, ranging from large commercial concerns to isolated field kilns. For this key period of industrial expansion, urban growth and the boom in agricultural lime making, there is a more representative sample, but out of an historical population of perhaps 15,000 to 20,000 for the industrial period, the Step 3 sample is still only around one percent. There are, by contrast, nearly 400 listed lime kiln building entries on the LBS which represents a healthy complement to the evaluation for MPP (see below 5.7).

5.1.3 These statistics provide a useful perspective on the sample selected for evaluation and proposed for designation. Against the small percentage of sites selected must be balanced the fact that the diversity and complexity of the industry is not as great as in other more elaborate industrial processes, such as the metal industries and more refined manufacturing processes. There is significant regional variation, however, and the lime kiln is a distinctive feature of the built historic environment in almost every region of the country.

5.2 Scheduling recommendations and considerations

5.2.1 The recommendations resulting from the Step 4 assessment for individual sites are presented in Table 1 (p.23). Twenty-five existing schedulings for lime industry sites are included in the Step 3 evaluations. In addition eight other scheduled sites that include lime industry remains were identified through SMR searches at the late stages of Step 3 and are not included in the field evaluations (see Appendix A, Trueman 2000a). Existing schedulings range in scale and period from the extensive remains of the Langcliffe Hoffman kiln (1873-1930s, North Yorkshire 5) to the sites of

excavated Roman and medieval kilns for which little field evidence remains. Some lime kilns are scheduled as elements of larger groups primarily concerned with other industrial processes, such as the Twyford waterworks kilns (Hampshire 1) or Gawton arsenic mine (Devon 2), others are protected by virtue of being a component of an unrelated field monument such as a prehistoric barrow. All these sites are affirmed as appropriately managed under their existing designation.

5.2.2 In addition to this small number of lime industry sites, already protected as scheduled monuments, the report recommends 93 new proposals for scheduling on the basis of the Step 3 evaluation. These represent about 47% of those assessed and the addition of a substantial body of industrial monuments to the Schedule to represent a major national industry. The selected group covers a range of periods and technologies, across a variety of scales of working and contexts, from isolated field kilns to commercial kiln banks in quarries and ports, on canals, railways and riverside wharves.

5.2.3 All the sites recommended for scheduling are assessed as important in a national context and most are evaluated as of clear or outstanding importance. The key factors that have influenced the choice of recommendations for scheduling are

- the strength of the assessment of national importance and the evaluation of individual components as of high importance, justifying closer management of conservation action. Decision-making about works affecting the monument must have clear national context.

- the preservation of the historic industrial infrastructure, layout and context of the site, such as associated wharves, transport structures, and extraction or other industry, which may not satisfactorily be included within a listing designation

- the quality of archaeological preservation or potential and its vulnerability, and the need to have greater control over management issues that would not fall within listing controls, such as control of vegetation or public access

- the public benefit offered by the monument's amenity potential or value in an educational or recreational context.

5.3 Listing considerations

5.3.1 In terms of existing statutory protection, the majority of historic lime works are managed by listing rather than scheduling. Most of the 382 existing listings for the industry are of kilns and the majority of these are structures that have long been out of use and have little or no potential for alteration or conversion to bring them back into an alternative use. A few have been adapted for storage and there are a small number of actively working 20th-century lime works where listing is clearly the appropriate designation. The large number of listed structures of the lime industry is a reflection of the fact that listing has customarily been used as the more appropriate designation for the conservation of industrial buildings, particularly where substantially complete 19th century and later structures are concerned. In the case of the lime industry, the majority of these are the type of substantial, ruined masonry structures that may be more suited to designation as scheduled monuments for long term preservation out of use.

5.3.2 Where a lime kiln selected for assessment is already listed, it has been considered for scheduling if the Step 3 evaluation indicates that it is of clear national importance. Additional weight is added if the kiln represents a particular aspect of the industry that is characteristic of the region or in the national picture and if it is well preserved. Its vulnerability to neglect, particularly in isolated situations outside the setting of an historic centre of settlement, may also be a factor. Clearly conservation resources are an issue here since scheduling signals that long term preservation out of use is intended.

5.3.3 The context of a lime industry building within an historic town or rural settlement is also an important factor. Listing will continue to be the more appropriate designation for structures that form part of a local group with other historic buildings. Listing indicates that the structure is a valuable element in the local historic environment and that careful consideration should be given, in the local and the national context, before permitting works to alter or demolish it. It remains the appropriate conservation management for buildings that are in active industrial use with a viable economic future. It may be used where evaluation has indicated that the site is primarily of regional and local importance rather than nationally important but where there is still judged to be a special historic or architectural interest.

5.3.4 At a total of 68 lime industry sites evaluated at Step 3, one or more component buildings are already listed and these correlate to about 85 of the entries for listed buildings in the LBS.[1] In a significant number of cases, the schedulings recommended here will introduce dual designation for buildings that are already listed. A number of existing scheduled sites also include listed structures. Delisting, when this becomes permissible in due course (changes to current legislation would be required), is recommended in 30 cases to rationalise this situation.

5.3.5 It is recommended that consideration should be given to new listing action on four of the lime industry sites assessed. They include industrial housing or converted buildings in residential and museum use better suited to management by listing. Upgrading of the listing of a small number of listed sites could also be justified. In the case of nine existing listed building groups, all evaluated as of clear national importance, a review of the list grading and its scope is recommended. Currently only one lime industry building in England, Littlemill lime works (Northumberland 13), is designated II* and this is recommended for scheduling and delisting in due course when permissible.

5.4 Other recommendations for conservation action

5.4.1 In the case of five sites it was not possible to make a reliable judgement about the significance of the site and buildings in terms of national importance, because of uncertain interpretation or lack of information because access was not obtained for a Step 3 survey. These sites are recommended for further survey and evaluation and may form proposals for statutory designation in the future. See Appendix III.3 for a listing.

5.4.2 The management of conservation action is recommended to continue locally at 47 of the assessed sites, recognising national importance where it is now indicated by the

[1] The correlation with LBS entries is not a straightforward one and in many cases the Step 3 field workers were not aware at the time of their visit that the site included buildings that were already listed. It is calculated that around 85 of the 382 lime industry building entries in the LBS were incidentally included in the Step 3 survey, i.e about one fifth (Trueman 2000a, p.5).

Step 3 evaluation. In some complex cases this will be in conjunction with listing and scheduling action. The main mechanisms for conservation management locally will be through the development plan and development control process, and through local authority and national park historic environment conservation policies and strategies. Conservation Area designation is suggested as a particularly appropriate mechanism for conservation of building groups and their setting in a number of cases.

TABLE 1: LIME INDUSTRY: SUMMARY OF PRINCIPAL RECOMMENDATIONS FOR CONSERVATION ACTION

CODE	Principal recommended conservation action	No. of sites
1	Affirm scheduling	22
2	Affirm scheduling with revision of constraint area	3
3	New scheduling recommended	93
4	Revise existing scheduling of related site	0
5	Assess for listing	4
6	Retain existing listed status and review list grading and/or description	9
7	Reassess importance following further survey/evaluation	5
8	Retain existing listed status and conserve in accordance with PPG15	25
9	Conservation action through the planning process and local authority conservation service in accordance with local and national policies	47
10	Consider for scheduling of underground works	0
11	Defer for assessment with relevant or associated industry	1
12	Delist to avoid dual designation	30
0	No action as destroyed or misidentified	6
	NB 197 Lime industry sites were assessed but in some cases several types of conservation action are recommended for a single site.	

5.4.3 The historic landscape context of many lime-working sites is undoubtedly an important aspect of their local importance. Lime kilns, their quarries and transport systems are typical attributes of historic landscape zones characterized by limestone extraction and limeburning. Lime industry remains can survive in large numbers in such areas, especially where the use of locally burned lime for agricultural improvement was common practice in the 18th and 19th centuries. In the Yorkshire Dales National Park, for example, nearly 1000 kiln sites are documented and half are estimated to survive in some form. Landscape assessment and conservation programmes, together with management agreements linked to agri-environment schemes, will provide the most effective mechanisms for protecting the distinctive local landscape character of which historic industrial sites can form an important element. The use of Rural Conservation Areas as a mechanism for introducing

programmes of active conservation to areas of specific historic character has been mentioned above (3.21). Where the landscape value of a site has been assessed here as particularly relevant in context it is noted in individual Step 4 assessments.

5.4.4 Finally, a small number of the sites assessed are assigned no conservation action either because they had been demolished prior to the Step 3 evaluation or because they were found not to be significant in historic terms for the industry.

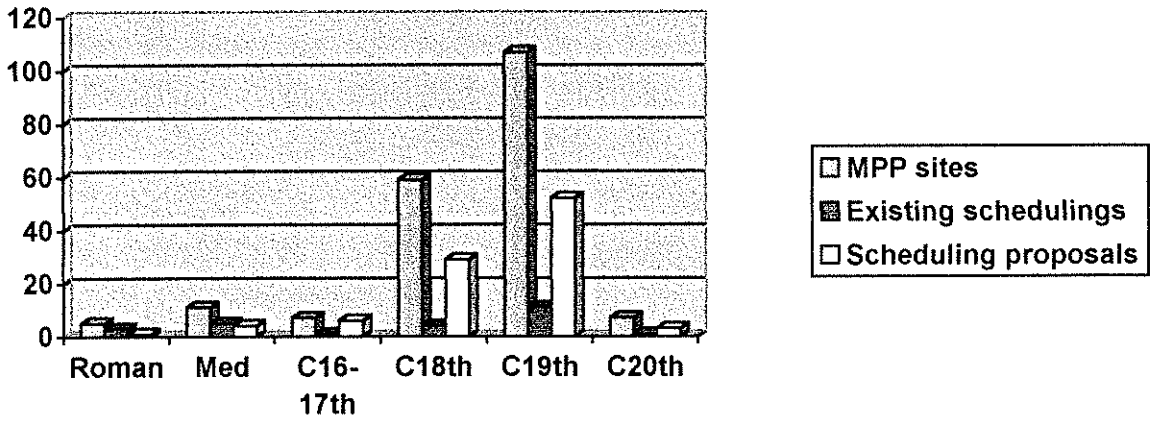

Figure 1: Lime industry:
Period presence of sites assessed for MPP and scheduling proposals

5.5 Period commentary

5.5.1 In previous Step 4 reports a presentation of the distribution of sites across historical periods has been found helpful to illustrate the balance of the assessment and to identify areas that are under represented. The method here follows that used in earlier reports for reporting period presence. Each lime works or kiln site is assigned to the principal period of construction and use represented by the surviving structures or remains. Figure 1 shows the numbers of assessed lime industry sites grouped by period, and for later examples by century, together with the numbers proposed for scheduling.

5.5.2 The earliest lime burning sites, in the Roman period, are seriously under represented. Only five sites were identified for assessment. Four of these are excavated, three are already scheduled and the fourth (Gloucestershire 6) is recommended for scheduling subject to verification in the field at Step 6. The heavily reconstructed Moons Hill 'kilns' on the Isle of Wight, listed grade II, cannot be ascribed to the period with certainty and are satisfactorily managed under the present designation.

5.5.3 Medieval kilns are also poorly represented with only 11 sites identified for assessment, mainly associated with major building projects such as castles (e.g. Bedford and Guildford), ecclesiastical sites (Bardney Abbey and St Catherine's oratory, Isle of Wight) and manorial centres. Seven of these medieval sites are excavated, one has been destroyed; three others are sites documented as areas of medieval lime burning and for which there is good archaeological potential. Four new schedulings are recommended to add to the five sites already scheduled. These are at Stevington (Bedfordshire 2) and Guildford Castle (Surrey 8), Garway (Herefordshire

1) and the outstanding relict landscape of late medieval and post medieval lime burning and brick making at Ticknall (Derbyshire 22).

5.5.4 The picture for the early post medieval period, the 16th and 17th centuries, is regrettably no better populated than earlier ones. It is certain that there will have been a very large new demand for lime for construction in this period, with major urban and rural house building, military works, and significant civil war defence projects, as well as growing agricultural usage. Only seven sites were identified for assessment; all but one are recommended for scheduling in part at least. They are all extensive earthworks of limestone working and lime burning with early origins, such as Sheddon Clough hushings (Lancashire 12), Clee Hill and Brown Clee Hill workings (Shropshire 10), Lilleshall lime works (Shropshire 10), Grin Hill, Buxton (Derbyshire 2), and Wrens Nest, Dudley (West Midlands 2).

5.5.5 As is clear from Figure 1, the numbers of surviving sites are much more significant in the 18th century, with the construction of substantial draw kilns structures and the growth of the commercial industry. Sixty lime burning sites and commercial works with origins in the earlier industrial period were selected for evaluation. Four existing schedulings of 18th-century lime kilns are confirmed in Derbyshire (1 and 16), Greater Manchester (1) and at Gawton arsenic mine (Devon 2) and 29 new schedulings are recommended. Many of these sites include buildings that are already listed and delisting is recommended to follow scheduling in due course. One new listing is identified for consideration (Ebernoe Common, West Sussex 6) and five listed kiln groups are recommended to be reviewed for upgrading to reflect their national importance. These schedulings and listings include typical coastal and riverside lime works on quays and harbours, such as Beadnell and Seahouses harbours (Northumberland 15 and 17), Cothele Quay (Cornwall 10), Halton Quay (Cornwall 9), Morwhellham Quay (Devon 1), New Quay kilns (Devon 3) and The Wharfage, Ironbridge (Shropshire 8). Canalside works recommended for scheduling are at Froghall Wharf lime basins (Staffordshire 2), on the Chesterfield canal at Anston (South Yorkshire 3), and at the Black Country Museum, Dudley (West Midlands 3) but these are not as well represented for the 18th century as was expected.

5.5.6 While large commercial masonry draw kilns are present in the selected sample in large numbers, smaller scale rural lime burning sites and of isolated field kilns are less well represented. Examples recommended for scheduling include Kilve (Somerset 7), Hillington (Norfolk 1), Puttenham (Surrey 6), Yewdale and Scales Green kilns (Cumbria 6 and 5). There are even fewer good examples of flare and clamp kilns for the period but three flare kilns in West Sussex (4,6,and 7) are an unusual survival with others at Monks Dale (Derbyshire 9). There is also a cluster of Derbyshire pye kiln sites.

5.5.7 Extensive 18th-century lime working associated with quarries, most of which continued to develop through the 19th century, include a range of scales. Litton Edge (Derbyshire 15) is a good example of a small works serving a rural community, of which few early examples survive. At the other end of the scale are the impressive landscapes of sites such as Meldon lime works (Devon 10, associated with a later, scheduled viaduct), Kepwick Quarries and kilns (North Yorkshire 9) and the relict landscapes of smaller scale workings, such as Wenlock Edge lime works (Shropshire 9). 'Little Switzerland' (Norfolk 8) is an exceptional 18th - 19th century chalk extraction site for lime burning where a network of canals and basins was constructed to access working faces directly.

5.5.8 For the 19th century, as can be expected, the coverage far exceeds that of other periods. Over half the lime burning sites (107) assessed originated in the 19th century, and many sites with earlier origins continued in production through the same period, so that around 75% of assessed sites represent the industry of this era in some form. There is a reasonable coverage of regional tradition and good coverage for the technological range for the period , although once again small scale and rural field kilns are less well represented (see 5.7).

5.5.9 Outstanding sites for innovative 19th century technology and large scale production include three in North Yorkshire representing all three main kiln types (4, Meal Bank; 5, Langcliffe; and 7, Toft Gate). In Derbyshire too there are impressive remains of contrasting character, also with well preserved site layouts and infrastructure (3, Cow Dale lime works; 7, Carder pye kiln; 8 East Buxton lime works; 10, Millers Dale lime works; 25A-C Blackwell Hall Farm pye and flare kilns). For the 19th century industry associated with chalk extraction there are outstanding industrial groups in Surrey (10 Brockham chalk pits; 11 Betchworth; 12 Oxted chalk pits) and West Sussex (3 Amberley chalk pits). Important rail-side works are at Bellmanpark (Lancashire 9), Littlemill (Northumberland 13) and Cockshaw (Northumberland 5); and quayside and coastal works at Cotehele Quay (Cornwall 10B), Bucks Mills (Devon 5), Beaumont Quay (Essex 1), Bower Yard kilns, Ironbridge (Shropshire 7), Castle Point, Lindisfarne (Northumberland 18), Monkwearmouth, and Marsden lime works (Tyne and Wear 1 and 3). At Moorswater (Cornwall 8A) the survival of a water-powered winding mechanism, is one of the rare examples of remaining in situ plant for servicing a kiln, and at Nurcott (Somerset 1) a water-powered incline, with the wheel pit adjacent to the kiln, is also an unusual arrangement.

5.5.10 As architecturally imposing elements in the landscape, there are some spectacular monumental examples of individual kilns and kiln banks from this period. A group of Northumbrian kilns, built to serve large rural estates, is particularly impressive (6 Low Alwinton; 7 High Hartington; 9, Great Tosson; 19, Crindledykes;). Other examples of substantial, approaching commercial-scale, kilns are situated in isolated and scenic locations in uplands or on the coast (e.g. Twiston, Lancashire 1; Townhead, Cumbria 3; Smardale Gill, Cumbria 4; Hallsannery, Devon 6).

5.5.11 The 20th-century industry, by contrast with the preceding one, is represented by only seven sites, although in addition a number of 19th century lime works and burning sites continued to produce lime through at least the first half of the century. The small number of 20th century sites reflects the decline in lime burning in the period, due to competition in the building industry from imported limes and from cements and, in agricultural use from the mass production of artificial fertilizers and the spreading of crushed rather than burnt lime. Two important sites, Shillingstone lime works (Dorset 1) and Cocking lime works (West Sussex 1), preserve good early 20th century layouts and plant in situ and are recommended for scheduling as exemplars of the traditional limeburning process using 1920s and 1930s kilns and hydrating plant (see above 3.5). Other outstanding sites are the flare kilns at the scheduled Twyford Waterworks (Hampshire 1), and at Chinnor cement and lime works, (Oxfordshire 2).

5.6 Regional representation

5.6.1 There are clear regional differences in the siting and scale of lime burning sites, governed by the location of suitable sources of limestone or chalk, the availability of fuel and transport for commercial scale production, and the nature of local demand. Quarry, coastal, riverside, canal or rail-side locations were favoured according to these

circumstances. In the North East and South West, for example, where limestone was scarce, it was imported by sea and river and here substantial lime kilns or kiln banks on quays, waterfronts and even quite small navigable creeks are characteristic. In thinly populated rural areas, where the demand was primarily for agricultural use but limestone was readily available, large numbers of seasonal, small-scale operations, each with their own small quarry, were more typical. Large commercial operations were successful where suitable quarry sources could be linked with networks for bulk transport. Aside from geographically influenced factors such as these, regional distinctiveness can also be distinguished in technological and constructional differences and in terms of vernacular variation.

5.6.2 Several regional groups with distinct kiln characteristics were identified. Derbyshire pye kilns are a distinct clamp kiln type, occurring as a small cluster of a dozen or so sites in that area though they may be sought more widely in the East Midlands. There is an 'East Anglian' kiln type distributed across Norfolk, Suffolk, Cambridgeshire and Essex, characterised by a circular barrel vaulted chamber constructed with a central column and multiple draw holes, and built partly underground into a slope or bank. The West Gloucestershire kiln group has a distinctive form of construction with short parallel tunnels from twin draw arches. In Northumberland is a group of large, well built, polygonal or sub-circular kilns, with several draw arches to each pot, which were built to serve large estates.

5.6.3 It is in the vernacular character of the post medieval industry - in the variation of local field kiln form and construction material - rather than in commercially operated industrial works that regional characteristics are most strongly expressed. The issues surrounding the selection and representation of field kilns in the study are discussed further below.

5.7 Selection and representation of field kilns

5.7.1 In the selection of sites for MPP, attempts were made to differentiate between field and commercial kilns in order to ensure that there was a balanced coverage for the industry. *Field kilns* are characterised in broad terms as small rural lime kilns, occasionally with an associated shelter or lime shed, and often adjacent to a small quarry. They may be quite remotely situated but are usually accessible from minor roads or trackways. Field kilns were probably seasonal in operation in most cases. Some provided an individual farm or estate supply and some were 'selling kilns' supplying local agricultural and building needs. The term *commercial kiln* is applied to sites set up for larger scale commercial operation, commonly associated with an industrial transport system (canal, rail, river or roadway) and full-time production. There are often banks of kilns or multiple pots, with storage and shelter buildings and there may be mechanisation for charging and unloading. To an extent the distinction between the two types of kiln is simply one of scale of production and there can be a degree of overlap. Large numbers of both types survive from the 18th and 19th centuries.

5.7.2 The initial MPP shortlist for the lime industry reflected a bias towards commercial sites in the sources consulted. Attempts to correct this imbalance were made at Step 3 but field kilns remained under represented in the selected sites (Trueman 2000a, pp.6-7). Only about one fifth of MPP assessed lime burning sites are field kilns, i.e.39 out of 197. The main reasons for this are a lack of systematic regional studies for the rural industry and uneven coverage in local and national archaeological record sources.

5.7.3 Additional research at Step 3 reassessed the scale of surviving field kilns nationally and examined the extent to which the large number of lime kilns already listed provides an adequate sample of statutorily protected lime industry buildings. Five areas were also identified where recent local surveys had been completed on lime industry sites but not included at Step 3 (Cornwall, Somerset / former Avon, Herefordshire, Kent, and the Yorkshire Dales). These corpora were reviewed together with listed building data from the LBS and information about known sites from SMRs (Trueman 2000a, 10-23). The statistics quoted below must be treated with caution because they are based on studies and drawn from sources with very different approaches. Nevertheless the review provides a measure of the scale and consistency of coverage.

5.7.4 Approximately 7000 lime kiln sites of all types are 'known' on record, that is documented in local and national records. Analysis of the data suggests that perhaps a third of 'known' lime industry sites retain some form of physical remains. Nearly 400 of these lime kilns are statutorily protected as listed buildings and this listed stock may thus be estimated to represent around 5% of 'known' sites and perhaps 2% of the notional historical population. The more substantial survivals and nationally important examples, mainly commercial kilns, were evaluated at Step 3. The majority (c300) of the listed kilns that were not included in the MPP exercise are field kilns in rural areas. It appears probable, given the level of this listing coverage, that overall field kilns are well represented numerically by statutory designations.

5.7.5 Adequate numerical representation, however, does not necessarily mean a good range of coverage. The detailed picture that emerges from the Step 3 analysis shows that regional coverage by listing is very uneven, from county to county, and between regions. Though in some regions and counties the numbers of listed kilns may be a fair reflection of 'known' sites (i.e. the *c*7000 documented in the NMR/SMRs), in others there is clearly an imbalance. The North East and Cornwall / Devon, for example, have significantly better coverage (c15% and c20% of known sites are listed in the respective areas); the Yorkshire and West Midlands regions, for example, are poorly covered averaging less than c2% (Trueman 2000a, pp12-13).

5.7.6 In summary, field kilns are not as seriously under represented in the national picture of statutorily protected historic industrial sites as first appears from the MPP study but the regional coverage is weak in places. However, insufficient research has yet taken place to establish patterns of local variation that would provide the basis for a balanced national selection to represent regional distinctiveness and vernacular character. The review indicates that hundreds of additional candidate sites can potentially be identified which would require a substantial phase of further research and fieldwork. The resources for this would be difficult to justify in view of the large number of sites that are already statutorily protected, or are proposed to be so as the result of the current exercise.

5.7.7 It is also the case the majority of historic field kilns may be more appropriately managed as elements of historic landscape character, rather than through statutory designation, and are primarily of significance in a regional or local context, rather than a national one.For landscapes characterised by large numbers of small field kilns, such as that of the Yorkshire Dales National Park, other mechanisms for conservation are likely to be more appropriate than scheduling or listing. Rural Conservation Areas, for example, have been used with success to target resources for conservation of field barns and walls in the YDNP (see 3.23). Field kilns can be viewed as analogous in terms of their vulnerability to neglect and gradual dilapidation. They are common features of traditional agricultural practice, now largely redundant, that contribute an

important visual element to the local scene but are not necessarily of high individual importance or listable quality.

5.7.8 The protection and conservation of field kilns will be managed effectively at different scales through these alternative mechanisms. There will be a relatively small sample of representative sites selected for permanent preservation as important examples of regional distinctiveness in a national context, or listed as of special interest. A substantially larger element will be identified as of significance in a regional or local context, for which management through historic landscape and countryside conservation policies will be more effective.

5.7.9 Rather than recommend further thematic survey to correct the imbalances in regional coverage, in the case of this industry it is proposed that the aim should be actively to encourage good candidate groups for future statutory designation to come forward. These should aim to fill the gaps that the Step 3 review has shown to exist in regional coverage and should be accompanied by appropriate documentation for MPP desk-based assessment. The framework for evaluating sites of national importance for the industry is laid out in the Step 1- 3 reports for the industry. Guidance on the selection of lime industry sites as candidates for scheduling is set out in Appendix IV.

12. SUMMARY OF RECOMMENDATIONS AND IMPLEMENTATION

12.1 The conservation management action recommended as the result of the Step 4 assessment of all the lime industries is summarised below. The lime industries were divided into four separate industries in the course of Step 3, and as a result several sites have been assessed for two or more industries. This has meant that when the statistics compiled for individual industries are aggregated there is double counting of some sites. To avoid confusion, the figures presented here are for the Step 4 assessment of the lime industries as a whole. For detailed discussion of each industry see the relevant section of the report, for lime (section 5.), for cement (section 7.), for gypsum (section 9.), and for whiting (section 11.).

Designations

12.2 New schedulings are recommended in 110 cases. Existing schedulings at 27 sites are affirmed by the assessment, with recommendations that the constraint areas of four of these should be reviewed. In cases where dual listing and scheduling is inappropriate, delisting is recommended when this becomes permissible following changes to the present legislation. There are 34 recommendations for future delisting.

12.3 In the case of 27 assessed sites that are already appropriately designated as listed buildings, no additional conservation action is recommended. There are 10 listed buildings where the need for a review of the scope and, or, the grade of the listing has been identified. New listings are recommended for consideration in 7 cases.

12.4 It is suggested that in future access to the Listed Building System for short listing and detailed cross industry searches for MPP would support a much more efficient analysis of listed building data for Step 3 evaluations. This is an important requirement when listed buildings form a major part of the corpus of sites being considered.

12.5 In the case of 6 sites it is recommended that further research and survey should be undertaken to resolve uncertainty about identification and importance. These are listed in Appendix III.3 and may be followed by statutory designation as appropriate.

12.6 Cases that are judged to be in urgent need of conservation management through scheduling action are listed in Appendix II.

Coverage

12.7 The lime industries have made a significant contribution to shaping today's historic landscape and built environment. From at least the Roman period right up to the present, limes produced from limestones and chalks have supplied the key constituent of building mortars and finishes The development of the draw kiln appears to have been a distinctive British innovation during the early post medieval period. Early gypsum and alabaster working supplied high status buildings while in later periods gypsum plaster production became another key element in the building industry. Since the early 19th century cements have played an equally important element in engineering and construction projects, expanding production as lime-making correspondingly declined. The development of the Roman and Portland cement manufacture processes were English inventions of international significance. Limes have also played an important role as fertilizer in agricultural improvements and latterly in a great variety of industrial and manufacturing processes.

12.8 The assessment of coverage takes as its benchmark the major themes identified as significant for the industries in the Step 1 report: (Trueman 1996a, p.48). The selected sample of sites aims to represent complete layouts and key components for each phase of each industry's development (for lime, cement, gypsum and whiting), the range of kiln types illustrating major technological and organisational changes, the range of processes used in the industries, and the chronological and regional range of the industries.

12.9 On this basis, the Step 3 report and Step 4 assessment note a number of aspects of the industries for which coverage is weak or lacking. The sample selected for consideration for statutory protection provides reasonable coverage for much of the later periods of development and for many technical aspects of the industries. Priority should be given in future survey and in any future thematic review to the identification of the categories of site listed below which would be of clear national importance and candidates for scheduling. Given the uneven coverage of research and field survey for the industries, there is every possibility that good examples of some of these types will come forward as further study takes place.

Lime

12.8.1 The Roman and medieval lime industries are seriously under represented. Identifications of unexcavated kiln or burning sites and relatively undisturbed lime, working areas are very rare.

12.8.2 The early post medieval period of the 16th and 17th centuries is severely under represented for all aspects of the lime industries. The development of early draw kiln technology in the period is of particular research interest for the evolution of the industry.

12.8.3 Field kilns are under represented in the selected sample for later periods by comparison with larger commercial or estate kilns in the 18th and 19th centuries. Some areas lack good selected groups to represent distinct regional and local characteristics in the national context. Guidance on selection of field kilns as candidates for scheduling is provided in Appendix IV.

12.8.4 In the industrial period, canal-side works are under represented by comparison with coastal, riverside and rail-side kiln banks and works.

12.8.5 In the range of post medieval lime kiln types identified at Step 1, clamp kilns are poorly represented. Flare kilns, vertical mixed-feed, furnace-fired and horizontal-ring kilns are also all rare nationally.

12.8.6 Generally the preparation, shelter, slaking and storage components of lime burning sites are poorly represented, and well-preserved groups illustrating the full process flow are important survivals.

12.8.7 The small number of identified C20th lime sites reflects the decline of the industry in the modern period. With the closure of Shillingstone lime works, it remains to identify a lime works suitable for conservation management preserving an intact early C20th site layout and good range of components for the traditional process.

Cement

12.8.8 Early, 'Roman' cement production sites are rare, as are remains of the early period of artificial cement production.

12.8.9 In terms of regional coverage, Roman cement sites are notably lacking in north Kent, and Portland cement sites in the North East.

12.8.10 Cement kilns of all types are rare survivals from all periods before WW2. No sites were identified for the double kiln process and only poor remains for the dry process. Early C20th cement production site layouts are poorly represented.

12.8.11 Large scale, post-War cement works, which are unlikely to be sustainable for long term preservation, lack good documented case studies.

Gypsum

12.8.12 No gypsum plaster making sites have been identified before the C19th and any earlier sites will be of importance.

12.8.13 Clear evidence of the remains of medieval and early post medieval alabaster mining is also lacking though it should continue to be sought in areas with documented historical mining activity.

12.8.14 All technological aspects of gypsum plaster manufacture, at all periods, have extremely poor coverage.

12.8.15 Anhydrite mining in the C20th is poorly represented and is not well documented.

12.8.16 Large scale, post-War plaster works, which are unlikely to be sustainable for long term preservation, lack good documented case studies.

Whiting

12.8.17 No whiting manufacture sites have been identified before the C19th and any earlier sites will be of importance.

12.8.18 Only the North East and East Anglia are represented in the coverage and well-preserved sites from other areas will be important.

12.8.19 There is poor coverage of the technological range of the C20th industry and the industry lacks well documented case studies.

Recording

12.9 Specific recording recommendations are not now usually included in the Step 4 assessments for individual sites. It is presumed, given the guidance in PPG 15 and PPG16, that for a site of national or regional importance an appropriate level of survey and recording will be undertaken for conservation management purposes, and in advance of any proposed changes.

12.10 In terms of thematic studies, the recording of a representative sample of working C20th cement and plaster works, or recently closed works in the process of decommissioning and redevelopment, should also be a priority. Several groups of industrial housing for cement works were identified incidentally in the Step 3 survey. While there are some aspects of this housing that are distinctive to the industry, they

would be better assessed within a broader thematic study of 19th and 20th-century industrial housing.

12.11 Appendix III.1 presents a list of sites where urgent recording has been identified in circumstances where permanent preservation is not sustainable. Appendix III.2 lists sites where there is a significant requirement for survey and interpretation to inform the management and presentation of industrial sites and landscapes, and possibly also to inform the limits of scheduling. These sites are a priority for resources.

Local planning authorities

12.12 Finally, where reliance is placed on the local planning system as the primary means for the conservation management of a site, it will be appropriate to notify the local authorities concerned. A formal notification confirming the site's assessed importance in the national scene, and the view that conservation action is best managed at the local level, can be a useful mechanism to ensure that appropriate consideration is given to the significance of the site in the planning process. It can also strengthen the position of local archaeological and conservation officers advising owners and users on the management of such sites.

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APPENDIX I

SUMMARY OF CONSERVATION ACTION RECOMMENDED BY SITE

CODE	Recommended conservation action
1	Affirm scheduling
2	Affirm scheduling with revision of constraint area
3	New scheduling recommended
4	Revise existing scheduling of related site
5	Assess for listing
6	Retain existing listed status and review list grading and/or description
7	Reassess importance following further survey/evaluation
8	Retain existing listed status and conserve in accordance with PPG15
9	Conservation action through the planning process and local authority conservation service in accordance with local and national policies
10	Consider for scheduling of underground works
11	Defer for assessment with relevant or associated industry
12	Delist to avoid dual designation
0	No action as site destroyed or misidentified

BATH & NE SOMERS	1	Lime Kiln, Manor Farm, Kelston	Lime	Y				3										
BEDFORDSHIRE	1	Totternhoe Lime & Cement Co Works	Lime	Y*	SM	1		3						9				
BEDFORDSHIRE	2	Lime Kiln, Tithe Meadow, Stevington	Lime	Y				3										
BEDFORDSHIRE	3	Bedford Castle lime kiln	Lime	Y*	SM, CA	1												
BUCKINGHAMSHIRE	1	Pitstone Works, Castle Cement	Cement	Y*										9				
CAMBRIDGESHIRE	1	High Street lime kilns, Isleham	Lime	Y*	SM LBII	1											12	
CHESHIRE	1	Lime Kiln, Linenhall Street, Chester	Lime	0														0
CORNWALL	1	Porthleven lime kiln	Lime	Y	LBII								8					
CORNWALL	2	St Blazey lime kilns	Lime	Y										9				
CORNWALL	3	Boscastle lime kiln	Lime	R	LBII								8					
CORNWALL	4	Polkerris lime kiln	Lime	Y	LBII								8					
CORNWALL	5A&	Pont Pill North and South lime kilns	Lime	Y	LBII								8					
CORNWALL	6	Sandplace lime kiln	Lime	R	LBII								8					
CORNWALL	7	Highercliff lime kiln	Lime	R	LBII								8					
CORNWALL	8A	Moorswater lime kiln (A)	Lime	Y	LBII			3									12	
CORNWALL	8B	Moorswater lime kiln (B)	Lime	R	LBII								8					
CORNWALL	9	Halton Quay lime kilns	Lime	Y	LBII			3									12	
CORNWALL	10A	Cotehele Quay lime kiln (A)	Lime	Y	LBII						6							
CORNWALL	10E	Cotehele Quay lime kiln (B)	Lime	Y	LBII						6							
CORNWALL	11	Bohetherick lime kiln	Lime	Y	LBII			3									12	
CUMBRIA	1	Long Meg Gypsum & anhydrite mine, L	Gypsum	Y										9				
CUMBRIA	2	Foresthead lime kiln, Brampton	Lime	Y				3										
CUMBRIA	3	Townhead lime kiln	Lime	Y*				3										
CUMBRIA	4	Smardale Gill lime kilns, Crosby Garre	Lime	Y*	LBII			3									12	
CUMBRIA	5	Scales Green lime kilns, Ulverston	Lime	Y	LBII			3									12	
CUMBRIA	6	Yewdale lime kiln, Coniston	Lime	Y*	LBII			3									12	
CUMBRIA	7	Levens lime kiln	Lime	Y	LBII								8					
CUMBRIA	8	Barrowmouth Gypsum & Alabaster Mir	Gypsum	Y*				3										
CUMBRIA	9	Solway Anhydrite Mine	Gypsum	0														0
CUMBRIA	10	Plaster Works, Wetheral	Gypsum	0														0
DERBYSHIRE	1	Peak Forest Tramway - Buxworth Basi	Lime	R	SM, CO/	1												
DERBYSHIRE	2	Lime Works, Grin Hill, Buxton	Lime	Y*				3						9				
DERBYSHIRE	3	Cow Dale Lime Works	Lime	Y*				3										
DERBYSHIRE	4	Peak Forest Lime Industry Remains	Lime	Y				3										
DERBYSHIRE	5	Blackwell Lime Kiln	Lime	0														0
DERBYSHIRE	6	Flagg Lime Kiln	Lime	0														0
DERBYSHIRE	7	Carder Pye Kiln	Lime	Y*				3										

DERBYSHIRE	8	East Buxton Lime works	Lime	Y*				3										
DERBYSHIRE	9	Monk's Dale Lime Works	Lime	Y*				3										
DERBYSHIRE	10	Miller's Dale Lime Works (Oldhams Si	Lime	Y	LBII			3						9			12	
DERBYSHIRE	11	Biggin Dale Pye Kiln	Lime	Y										9				
DERBYSHIRE	12	Tides Low lime kiln, Tideswell	Lime	Y	SM	1												
DERBYSHIRE	13	Monyash Farmer's Lime Kiln	Lime	?								7						
DERBYSHIRE	14	Tissington Lime Kiln	Lime	Y*	LBII			3									12	
DERBYSHIRE	15	Litton Edge Lime Kilns and Quarry	Lime	Y*				3										
DERBYSHIRE	16	'Fin Cop' lime kiln	Lime	Y*	SM	1												
DERBYSHIRE	17	Aleck Low Pye Kiln	Lime	Y										9				
DERBYSHIRE	18	Roystone Grange Quarry, Ballidon	Lime	R	LBII								8	9				
DERBYSHIRE	19	Lime Kiln, Stanton in the Peak	Lime	Y										9				
DERBYSHIRE	20	Blore with Swinscoe Pye kiln	Lime	Y?				3										
DERBYSHIRE	21	National Stone Centre, Wirksworth	Lime	R										9				
DERBYSHIRE	22	Ticknall lime kilns	Lime	Y*				3										
DERBYSHIRE	23	Bull Bridge lime kilns	Lime	Y										9				
DERBYSHIRE	24	Chellaston Gypsum Workings	Gypsum	Y*										9				
DERBYSHIRE	25A	Blackwell Hall Farm Pye Kiln	Lime	Y				3										
DERBYSHIRE	25B	Blackwell Hall Farm Lime Kiln	Lime	Y				3										
DERBYSHIRE	25C	Blackwell Hall Farm Pye Kiln	Lime	Y*				3										
DERBYSHIRE	26	Tunstead Lime Works	Lime	?										9				
DEVON	1A	Morwellham Quay lime kilns	Lime	Y*	LBII						6							
DEVON	1B	Morwellham Quay lime kilns	Lime	Y	LBII						6							
DEVON	2	Gawton Arsenic Mine - lime kilns	Lime	Y	SM	1												
DEVON	3	New Quay lime kilns	Lime	Y*				3										
DEVON	4	Mouth Mill lime kiln	Lime	Y	LBII			3									12	
DEVON	5	Buck's Mills lime kilns	Lime	Y*	LBII						6							
DEVON	6	Hallsannery lime kiln	Lime	Y*	SM LBII	1											12	
DEVON	8	Tiverton lime kilns	Lime	R	LBII								8					
DEVON	9	Lynmouth lime kilns, Lynton	Lime	Y	LBII						6							
DEVON	10	Meldon Lime Works & Quarry	Lime	Y*	adj. SM			3										
DORSET	1	Shillingstone lime works	Lime	Y*				3						9				
DORSET	2	Charmouth Cement Works	Cement	R										9				
DORSET	3	Limekiln Hill, Puncknowle	Lime	Y	LBII								8					
DORSET	4	Lime Kiln, Whitmore Coppice, Langtor	Lime	Y*	SM	1												
DORSET	5	Lime Kiln, Bucknowle, Church Knowle	Lime	Y*				3										
DORSET	6	Apsley Lime Works, Branksome, Poole	Lime	Y										9				

DORSET	7	Monmouth Beach Cement Works, Lym	Cement	R									9					
DURHAM	1	Stanhope lime kilns	Lime	L									9					
DURHAM	2	Anfield Plain lime kilns	Lime	Y									9					
EAST RIDING YORKS	1	Lime Kiln, Brantingham	Lime	Y	SM	1												
EAST RIDING YORKS	2	Victoria Mill Whiting Works	Whiting	Y									9					
EAST RIDING YORKS	3	Hessle Whiting Mill	Whiting	Y*				3										
EAST SUSSEX	1	Offham Chalk Pit & Lime Works	Lime	R									9					
EAST SUSSEX	2	Beddingham cement kiln	Cement	Y*									9					
EAST SUSSEX	3	Mountfield gypsum mine and works	Gypsum	?Y									9					
ESSEX	1	Lime Kiln, Beaumont Quay	Lime	Y*				3										
ESSEX	2	Cement Works, West Thurrock	Cement	R									9					
ESSEX	3	Lime kiln, Purfleet	Lime	0														0
ESSEX	4	Cement Works, Saffron Walden	Cement	R									9					
GLOUCESTERSHIRE	1	Lime Kilns at Whitecliffe Furnace	Lime	R	adj. SM								9					
GLOUCESTERSHIRE	2	Lime Kiln, Touchway Barn	Lime	Y*	LBII			3								12		
GLOUCESTERSHIRE	3	Lime Kiln, Lydney Harbour	Lime	Y	SM	1												
GLOUCESTERSHIRE	4	Edge Hills lime kiln	Lime	Y	LBII							8						
GLOUCESTERSHIRE	5	Rocklands lime kilns	Lime	Y*				3										
GLOUCESTERSHIRE	6	Lime Kiln, Witcombe Wood	Lime	Y				3										
GREATER MANCHES	1	Marple lime kilns, Stockport	Lime	Y*	SM LBII	1										12		
HAMPSHIRE	1	Twyford Waterworks Lime Kilns	Lime	Y*	SM	1												
HEREFORDSHIRE	1	Garway Lime Kiln	Lime	Y				3										
HERTFORDSHIRE	1	Lime Kiln, Colliers End	Lime	?							7							
ISLE OF WIGHT	1	Roman kilns, Moon's Hill	Lime	R	LBII							8						
ISLE OF WIGHT	2	Lime Kiln, St Catherine's Hill	Lime	Y*	SM	1												
ISLE OF WIGHT	3	Medina Cement Works	Cement	Y*				3					9					
KENT	1	Northfleet Cement Kiln	Cement	Y*	SM	1							9					
KENT	2	Cliffe (A) Cement Works	Cement	Y*				3					9					
KENT	3	Cliffe (B) Cement Works	Cement / w	Y*				3					9					
KENT	4	Wouldhamhall & West Kent Cement W	Cement / lir	Y*						5			9					
KENT	5	Sharp's Green Works, near Rainham	Cement	R									9					
KENT	6	Cement Works, Elmley Ferry, I of She	Cement	R									9					
KENT	7	Whiting Factory, Stone Court Ballast C	Whiting	0	LBII													0
KENT	8	Swanscombe Cement Works	Cement	R									9					
KENT	9	Blue Circle Northfleet Cement Works	Cement	R									9					
KENT	10	Rugby Cement's Snodland Works	Cement	R									9					
KENT	11	Lee's Cement Works	Cement	R									9					

LANCASHIRE	1	Twiston Lime Kiln	Lime	Y				3										
LANCASHIRE	2	Lime Kiln, Crag Road, Warton	Lime	R	LBII								8					
LANCASHIRE	3	Lime Kiln, Blue Butts	Lime	R										9				
LANCASHIRE	4	Ribblesdale Cement Works	Cement	Y										9				
LANCASHIRE	5	Coplow Lime Works	Lime	Y										9				
LANCASHIRE	6	Bankfield Lime Works	Lime	0														0
LANCASHIRE	7	Peach Quarry & Lime Works, Chatburn	Lime	Y										9				
LANCASHIRE	8	Bold Venture lime works, Chatburn	Lime	Y						5								
LANCASHIRE	9	Bellmanpark Lime Works	Lime	Y*				3										
LANCASHIRE	10	Downham lime kiln	Lime	Y				3										
LANCASHIRE	11	Higher Twiston lime kiln	Lime	R										9				
LANCASHIRE	12	Shedden Clough Limestone Hushings	Lime	Y*				3										
LEICESTERSHIRE	1	Moira Furnace lime kilns	Lime	Y*				3										
LEICESTERSHIRE	2	Breedon on the Hill lime works	Lime	?										9				
LEICESTERSHIRE	3	Kings Mills, Castle Donnington	Gypsum	Y*				3										
LEICESTERSHIRE	4	Kegworth Plaster Mill	Gypsum	0														0
LINCOLNSHIRE	1	Gainsborough Gypsum Workings	Gypsum	Y*				3										
LINCOLNSHIRE	2	Castle Quarry and lime kilns, Castle B	Lime	R										9				
LINCOLNSHIRE	3	Bardney Abbey - lime kiln	Lime	Y*	SM	1												
NORFOLK	1	Hillington Lime Kiln	Lime	Y*				3										
NORFOLK	2	Gayton Lime Kiln	Lime	Y				3										
NORFOLK	3	Lime Kilns, Costessey	Lime	Y	COA			3										
NORFOLK	4	Lime Kilns & Quarries, Eaton	Lime	Y	-									9				
NORFOLK	5	Coltishall lime kiln	Lime	Y*	LBII			3									12	
NORFOLK	6	Lime Works, Whitlingham/Kirby Bedor	Lime	Y				3						9				
NORFOLK	7	Berney Arms & Burgh Castle Cement V	Cement /lim	Y*	SM		2							9				
NORFOLK	8	'Little Switzerland' - Chalk Extraction L	Lime	Y*				3										
NORTH LINCOLNSHI	1	Gainsthorpe Road lime kilns and ceme	Lime; ceme	Y*	LBII			3						9			12	
NORTH LINCOLNSHI	2	Lime kilns, Barrow on Humber	Lime	Y*	LBII			3									12	
NORTH LINCOLNSHI	3	Adamant Cement Works	Cement	Y										9				
NORTH LINCOLNSHI	4	Singleton Birch Whiting Works	Whiting	R										9				
NORTH SOMERSET	1	Lime Kiln, Canada Combe, Christon	Lime	Y				3										
NORTH YORKSHIRE	1	Sandsend Mill Cement Works	cement /lim	Y*	LBII, COA			3		5							12	
NORTH YORKSHIRE	3	Lime Kilns & Quarry, Raygill Delph	Lime	R										9				
NORTH YORKSHIRE	4	Meal Bank Quarry Limeworks	Lime	Y*				3										
NORTH YORKSHIRE	5	Craven Lime Company Works and Mu	lime	Y*	SM		2											
NORTH YORKSHIRE	7	Toft Gate Lime Kiln	Lime	Y*				3										

NORTH YORKSHIRE	8	Coldstones Lime Kiln	Lime	R										9				
NORTH YORKSHIRE	9	Kepwick Quarries & Lime Kilns	Lime	Y*				3						9				
NORTH YORKSHIRE	10	Northfield Quarry, Womersley	Lime	?								7						
NORTH YORKSHIRE	11	Cropton Lime Kiln & Quarry	Lime	R										9				
NORTH YORKSHIRE	12	Allerston lime kilns	Lime	Y	SM, LBII	1											12	
NORTH YORKSHIRE	13	Lime clamps, Troutdale	Lime	Y				3										
NORTH YORKSHIRE	14	Kirk Syke Lime Kiln, Scosthrop	Lime	Y				3										
NORTHAMPTONSHIF	1	Wakerley lime kilns	Lime	Y*	SM	1												
NORTHUMBERLAND	1	Ouston lime kiln	Lime	R	LBII								8					
NORTHUMBERLAND	2	Intakehead Lime Kiln	Lime	Y	LBII								8					
NORTHUMBERLAND	3	Allenheads lime kilns	Lime	Y	LBII								8					
NORTHUMBERLAND	4	Housesteads Roman lime kilns	Lime	Y*	SM	1												
NORTHUMBERLAND	5	Cocklaw lime works	Lime	Y*	LBII			3									12	
NORTHUMBERLAND	6	Low Alwinton lime kiln	Lime	Y	LBII						6							
NORTHUMBERLAND	7	High Hartington lime kilns	Lime	Y	LBII			3									12	
NORTHUMBERLAND	8	Ward's Hill sow kilns	Lime	Y				3										
NORTHUMBERLAND	9	Great Tosson lime kiln	Lime	Y				3										
NORTHUMBERLAND	10	Linkhamdean lime kilns	Lime	R	LBII								8					
NORTHUMBERLAND	11	Rock Midstead lime kiln	Lime	Y	LBII			3										
NORTHUMBERLAND	12	Peppermoor field kiln	Lime	R	LBII								8					
NORTHUMBERLAND	13	Littlemill lime works	Lime	Y*	LBII*			3									12	
NORTHUMBERLAND	14	Christon Bank lime works	Lime	Y	LBII			3									12	
NORTHUMBERLAND	15	Beadnell Harbour lime kilns	Lime	Y	LBII			3									12	
NORTHUMBERLAND	16	Beadnell Point medieval kiln	Lime	Y	SM	1												
NORTHUMBERLAND	17	Seahouses lime kilns	Lime	Y*	LBII						6							
NORTHUMBERLAND	18A	Castle Point lime works	Lime	Y*	SM		2											
NORTHUMBERLAND	18B	Kennedy lime works	Lime	Y*				3										
NORTHUMBERLAND	19	Crindledykes lime kilns and quarries	Lime	Y	LBII			3									12	
NOTTINGHAMSHIRE	1	Red Hill mine, near Ratcliffe	Gypsum	?Y								7						
NOTTINGHAMSHIRE	2	Zouch Mills (Plaster Mill), Normanton-c	Gypsum	R										9				
NOTTINGHAMSHIRE	3	Barton in Fabis wharf and gypsum min	Gypsum	L										9				
NOTTINGHAMSHIRE	4	Kingston-on-Soar Gypsum Mine and M	Gypsum	0														0
NOTTINGHAMSHIRE	5	Weldon Mine and Plaster Mill, Gotham	Gypsum	R										9				
NOTTINGHAMSHIRE	6	Marblaegis Gypsum Works, East Leak	Gypsum	0														0
NOTTINGHAMSHIRE	7	Heaselden Gypsum Mine, Cropwell Bi	Gypsum	0														0
NOTTINGHAMSHIRE	8	Cropwell Bishop - plaster and cement	Gyspum	Y										9				
NOTTINGHAMSHIRE	9	Orston Works (brick & plaster),	Gypsum	Y										9				

NOTTINGHAMSHIRE	10	Hawton Mill (Plaster), Newark	Gypsum	L										9				
NOTTINGHAMSHIRE	11	Staunton Works (Plaster)	Gypsum	0														0
NOTTINGHAMSHIRE	12	Hawton Works (gypsum & brick)	Gypsum	Y*	LBII			3					8					
OXFORDSHIRE	1	Kirtlington Cement Works	Cement	R										9				
OXFORDSHIRE	2	Chinnor Cement & Lime Works	Lime, ceme	Y*				3										
SHROPSHIRE	1	*Steeraways Mine & Lime Kilns*	Lime	Y				3										
SHROPSHIRE	2	Lilleshall Lime Works	Lime	Y*				3		5				9				
SHROPSHIRE	3	Llanymynech Hill lime works	Lime	Y*	LBII			3									12	
SHROPSHIRE	4	Lime Kilns & Quarries, Whitehaven	Lime	Y	LBII								8	9				
SHROPSHIRE	5	*Lime Kilns, Wem*	*Lime*	*R*	LBII								8					
SHROPSHIRE	6	Lime Kilns & Quarries, Benthall Edge	Lime, ceme	Y*	COA											11		
SHROPSHIRE	7	Bower Yard Lime Kilns, Benthall	Lime	Y*				3										
SHROPSHIRE	8	The Wharfage Lime Kilns, Ironbridge	Lime	Y*				3										
SHROPSHIRE	9	Wenlock Edge Lime Works	Lime	Y*				3										
SHROPSHIRE	10	Clee Hill & Brown Clee Hill Lime Work	Lime	Y*				3										
SHROPSHIRE	11	Downton Mine	Lime	?								7						
SOMERSET	1	Nurcott quarry lime kiln, Luxborough	Lime	Y				3										
SOMERSET	2	Treborough lime kilns	Lime	Y	LBII								8					
SOMERSET	3A	Lime Works, near Daws Castle	Lime	Y	LBII			3									12	
SOMERSET	3B	Lime Works, Warren Bay	Lime; ceme	Y	LBII?			3									12	
SOMERSET	3C	Warren Rocks Gypsum Workings	Gypsum	Y				3										
SOMERSET	4	Doniford Lime Kilns	Lime	Y*	LBII			3									12	
SOMERSET	5	Brean Down Lime Kiln	Lime	L	SM	1												
SOMERSET	6	Dunball Cement Works, Puriton	Cement	Y*				3										
SOMERSET	7	Kilve Lime Kiln	Lime	Y				3										
SOMERSET	8	Castle House, Bridgewater	Cement	Y*	LBII*								8					
SOUTH GLOUCESTE	1	Yate lime kilns	Lime	R	LBII								8					
SOUTH GLOUCESTE	2	Lime Kiln, The Chalet, Alveston Hill	Lime	R										9				
SOUTH YORKSHIRE	1	*Quarries and lime kilns: Warmsworth*	*Lime*	Y				3						9				
SOUTH YORKSHIRE	2	Havelock Bridge Works	Gypsum	L														0
SOUTH YORKSHIRE	3	Quarries and lime kilns, North and Sou	Lime	Y				3										
SOUTH YORKSHIRE	4	Barnby Basin Lime Kilns	Lime	Y										9				
STAFFORDSHIRE	1	Consall Forge Lime Kilns	Lime	Y	LBII, COA			3									12	
STAFFORDSHIRE	2	Froghall Wharf Lime Kilns	Lime	Y*	LBII			3									12	
STAFFORDSHIRE	3A	Gypsum Workings, Tutbury area	Gypsum	L										9				
STAFFORDSHIRE	3B	Draycott Mine, Coton in the Clay	Gypsum	L										9				
STAFFORDSHIRE	4A	Fauld Gypsum Mine (Ford Mine)	Gypsum	Y*				3						9				

STAFFORDSHIRE	4B	Fauld Gypsum Mine (Staton Mine)	Gypsum	Y*				3						9				
STAFFORDSHIRE	4C	Fauld Gypsum Workings (Hanbury Hil	Gypsum	Y										9				
STAFFORDSHIRE	5	Stanton's Cement and Plaster Works	Gypsum / c	L	COA									9				
SUFFOLK	1	Lime Kiln, Gazeley	Lime	R										9				
SUFFOLK	2	Lime Kilns and Quarry, Little Blakenha	Lime	Y										9				
SUFFOLK	3	Coddenham Lime Kilns	Lime	Y*				3										
SUFFOLK	4	Lime Kiln, Claydon	Lime	Y	LBII								8					
SUFFOLK	5	Waldringfield Cement Works	Cement	L										9				
SUFFOLK	6	Pakenham Whiting Works	Whiting	Y*				3										
SUFFOLK	7	Little Blakenham Whiting Works	Whiting	Y*				3										
SUFFOLK	8	Mason's Cement Works, Claydon	Cement	Y										9				
SURREY	4	Lime Kiln, Guildford	Lime	Y										9				
SURREY	5	Mid-Surrey Limeworks, Abinger	Lime	Y										9				
SURREY	6	Puttenham lime kiln, Guildford	Lime	Y*				3										
SURREY	7	Lime Kiln, Busbridge	Lime	Y				3										
SURREY	8	Lime Kiln, Guildford Castle	Lime	Y*				3										
SURREY	9	Lime Kiln, Deerleap Wood	Lime	Y								7						
SURREY	10	Brockham Chalk Pits and Lime Works	Lime	Y*	LBII			3						9			12	
SURREY	11	Betchworth - Dorking Greystone Lime	Lime	Y*	LBII			3									12	
SURREY	12	Oxted chalk pits	Lime	Y*				3						9				
TYNE & WEAR	1	Monkwearmouth lime works	Lime	Y*	LBII						6							
TYNE & WEAR	2	Sir Hedworth Williamson Lime Works	Lime	Y	LBII								8					
TYNE & WEAR	3	Marsden lime works	Lime	Y*	SM, LBII	1											12	
WARWICKSHIRE	1	'Model Village'	Cement	Y										9				
WARWICKSHIRE	2	Blue Lias & Griffin's Lime and Cement	Cement	R										9				
WARWICKSHIRE	3	Rugby Cement Works	Cement	Y*						5								
WARWICKSHIRE	4	Southam Cement Works	Cement	R										9				
WARWICKSHIRE	5	Nelson's Cement Company Housing, S	Cement	R										9				
WARWICKSHIRE	6	Nelson's Stockton Cement Works	Cement an	Y										9				
WEST MIDLANDS	1	Winterley lime works and surrounding	Lime	R										9				
WEST MIDLANDS	2	Wrens Nest Limestone mines	Lime	Y*				3										
WEST MIDLANDS	3	Black Country Museum lime kilns	Lime	Y*				3										
WEST SUSSEX	1	Lime Works, Cocking	Lime	Y*				3										
WEST SUSSEX	2	Limeworks at Amberley Chalk Pits Mus	Lime	Y*	SM		2			5				9				
WEST SUSSEX	3	Lime Kilns, Amberley	Lime	Y				3										
WEST SUSSEX	4	Lime kiln near Stilland Farm, Northcha	Lime	Y				3						9				
WEST SUSSEX	5	Lime kilns at Duncton Hangar	Lime	Y				3										

WEST SUSSEX	6	Lime kiln at Ebernoe Common	Lime	Y						5								
WEST SUSSEX	7	Lime kiln at Titch Hill Farm, Sompting	Lime	R										9				
WEST SUSSEX	8	Beeding Cement Works	Cement	Y*										9				
WEST YORKSHIRE	1	Silsden Lime Kilns	Lime	R										9				
WEST YORKSHIRE	2	Thwaite Mills (Putty & Whiting)	Whiting	Y*	LBII			3			6						12	
WILTSHIRE	1	Lime Kilns, Dower House, Winsley	Lime	R										9				
WORCESTERSHIRE	1	Lime Kiln, Bays Meadow Roman Villa,	Lime	Y	SM	1												
TOTALS		ALL ASSESSED SITES				23	4	110	0	7	10	6	27	93	0	1	34	

APPENDIX I

APPENDIX II

URGENT PROPOSALS FOR SCHEDULING

Site	Notes
Bellman Park (Lancashire 9)	Well-preserved 19th-century rail-side works, vulnerable and the subject of negotiation within development proposals for the adjacent site
Hawton works, Newark (Nottinghamshire 12)	Unique survival of a gypsum grinding mill with intact plant, listed II, vulnerable to vandalism and redevelopment of the surrounding area. In the sensitive local negotiations underway to secure the site, there is a role for scheduling action at an appropriate stage, in concert with the local authority.
Chinnor cement and lime works (Oxfordshire 2)	Unusual survival of a Victorian flare kilns associated with cement works and vulnerable to clearance and redevelopment of surrounding site.

APPENDIX III

SITES IDENTIFIED FOR FURTHER EVALUATION AND RECORDING ACTION

Site	Notes
1. Urgent recording in advance of decommissioning	
Pitstone works (Buckinghamshire 1)	Programme of photographic recording and documentation [site reported as demolished, 2000]
Shillingstone limeworks (Dorset 1)	Programme of recording in tandem with scheduling
Mason's Cement Works, Claydon (Suffolk 8)	Programme of recording for works (1948 rotary kiln)and related housing
Beeding cement works (West Sussex 8)	Programme of photographic recording and documentation for works and housing
2. Survey action	
Totternhoe Lime and Cement Co. Works (Bedfordshire 1)	Photographic survey of working site in tandem with scheduling of 19th and early C20th kilns.
Ticknall lime kilns (Derbyshire 22)	Survey of extensive multi-period workings required to inform scheduling and conservation management
Shedden Clough limestone hushings (Lancashire 12)	Survey of extensive post medieval workings required to inform scheduling and conservation management
'Little Switzerland' chalk extraction (Norfolk 8)	Survey of waterways and transport network for a unique landscape of the chalk marl extraction industry to inform scheduling and conservation management
Littlemill lime works (Northumberland 13)	Survey of complex of C18th -19th kiln banks and railway structures to inform scheduling and management
Steeraways mine and lime kilns (Shropshire 1)	Survey of multi-period lime working group to inform scheduling and management

Lilleshall lime works (Shropshire 2)	Survey of the extensive remains to inform scheduling, management and planning action. I
Fauld (Ford) Gypsum Mine (Staffordshire 4A)	Programme of field survey and recording for a small landscape of gypsum mining and plaster works, to inform scheduling and management.
Betchworth-Dorking Greystone Lime Co. works (Surrey 11)	Survey of C19th-C20th lime working complex for scheduling and management purposes
Wrens Nest limestone workings (West Midlands 2)	Survey of extensive remains to inform scheduling and management action.
3. Further survey and evaluation	
Lime industry	
Monyash Farmer's lime kiln (Derbyshire 13)	To identify site and evaluate reported 18th -century field kiln.
Lime kiln, Colliers End (Hertfordshire 1)	To identify and evaluate the reported preservation of an unusual outlying occurrence of an 'East Anglian' kiln type.
Northfield Quarry, Womersely (North Yorkshire 10)	To identify and evaluate reported 20th 'pit' kilns.
Downton mine (Shropshire 11)	To assess extent and quality of preservation of this limestone mine and lime working site.
Lime kiln, Deerleap Wood (Surrey 9)	To assess the quality and associations of the reported kiln structure.
Gypsum industry	
Red Hill mine, (Nottinghamshire 1)	To assess reported gypsum workings of C14th - C20th with potential national importance.

APPENDIX IV

THE SELECTION OF FIELD KILNS AS CANDIDATES FOR SCHEDULING

1. Selected sites must be evaluated as of clear or outstanding importance in a national context within the framework for evaluation set out in Steps 1 -3 for the lime industry. In general the key factors that influence the choice of candidates for scheduling are

- The strength of the assessment of national importance and the evaluation of individual components as of high importance, justifying closer management of conservation action. There must be justification for placing decision-making at the national level for works affecting the monument.

- The preservation of the historic industrial infrastructure, layout and context of the site, such as associated wharves, transport structures, extraction or related industry. This might include attributes that may not satisfactorily be included within a listing designation or managed as an ensemble under other forms of designation.

- The quality of archaeological preservation or potential and its vulnerability. This would support the case for introducing close control over changes in order to secure long term preservation, e.g. the need to control vegetation growth, damage by livestock or erosion by public access, for example.

- The public benefit offered by the monument's amenity potential or value in an educational or recreational context. e.g. accessibility or visibility from a public right of way or amenity area, association with an interpreted site or landscape, significance as a component of a valued historic landscape or in setting of other historic environment elements.

- Existing protection and / or beneficial management regime, e.g. inclusion in an AONB, ESA, National Trust estate or other actively managed conservation regime.

2. In terms of field kilns specifically, the representative value of a site in national or regional terms will add weight to the case for considering scheduling:

- Complete ensembles, or archaeologically well preserved, sites exhibiting typical layout, good structural survival and an assemblage of components (e.g. a lime kiln with integral shelter, lime shed/ cabin, holloway or engineered trackway, charging ramp, quarry, related domestic buildings) and / or association, for example, with significant remains of a related rural industry.

- Exemplars of regional kiln characteristics with distinctive vernacular materials, technological or architectural features (e.g. Kentish brick with flint, Herefordshire double arched openings to paired draw holes, corbelled sandstone and slate in Ingleton, YDNP).

- Unusual or exceptional examples of technological, architectural or operational evolution (e.g. triple arched kiln at Ledbury, Herefordshire;)

- Well documented examples especially any that can be linked to technological and operational stages in the industry's evolution (e.g. Cantley, Sedburgh, YDNP, associated with a contemporary documentary reference which potentially provides a *t.p.q.* for the transition from circular to rectangular kilns in the region).