Department of the Environment
Welsh Office



# MINERAL PLANNING GUIDANCE:

# TREATMENT OF DISUSED MINE OPENINGS AND AVAILABILITY OF INFORMATION ON MINED GROUND

Planning Policy Guidance Note 14 sets out broad planning and technical issues in respect of development on unstable land. The present guidelines develop that guidance, with particular reference to problems caused by disused mine openings, and should be read in conjunction with it. The problems are reviewed and the methods of dealing with them are described. The responsibilities for dealing with such problems, and the liabilities which may arise, are outlined. Guidance is given on the role and operation of the planning system. The vital importance of adequate information for both planning control and treatment works is emphasised. The provision of readily available information depends on accessible, well indexed databases. Options for producing, or improving, such databases are outlined.

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# INTRODUCTION

1. The Government wishes to encourage full and effective use of land. Difficulties may be experienced in achieving this aim in areas of past underground mining for minerals. Mine voids, and openings (entrances) such as shafts and adits, may give rise to ground movements which may threaten public safety or damage buildings and structures. Open shafts also pose risks to people and livestock.

2. A wide range of minerals and rocks have been mined in England and Wales including coal, metalliferous ores, limestone, chalk, flint, sandstone, clay and rock salt. Extensive mining dates mainly from the industrial revolution but there are numerous older mines, some of which are Roman, or even earlier.

3. The earliest mines consisted of a simple chamber reached through a vertical shaft ("bell pits", Figure 1a) or a short tunnel, or adit, cut into a hillside. Later, many mines were developed as networks of interconnecting chambers with remnant blocks of mineral left to support the roof ("room-and-pillar mines", Figure 1b), again with access through shafts or adits. Room-and-pillar mining of some minerals has continued to the present day.

4. Metalliferous minerals frequently occur in sheet-like veins, infilling former fissures, or as large irregular ore-bodies, within barren rock. Some of these were worked initially from trench-like open-vein workings which, later, served for access to deeper parts of the ore-body. More often, deep shafts gave access to lower levels in the ore-bodies which were then usually extracted by breaking rock, separating out the mineral, and replacing waste rock ("vein stoping", Figure 1c).

5. Deep mining of some minerals, notably in many coal mines, has been carried out by extracting each bed of mineral from a long underground face. The mineral is reached by underground roadways between which the face is cut evenly forwards. The roof behind the working face is temporarily supported during extraction but supports are moved forwards as the face advances, allowing controlled subsidence of the worked ground ("longwall mining", Figure 1d). In such workings, the mined ground subsides relatively quickly, but the access roadways may remain open for protracted periods.

6. An extensive legacy of mined ground has been left, therefore, in many parts of England and Wales especially in, but by no means limited to, coalfields and metalliferous orefields. Mining has taken place in all counties in England and Wales and some 20 percent of the land area in 16 counties has been subject to underground mining (reference 1). An illustrative map of the extent of mining is shown in Figure 2. Within these areas, there are large numbers of mine openings — adits, shafts and open-vein workings (Figure 3) — and of underground voids of various types. Instances of mining subsidence and of collapse of mine openings are numerous.

7. Adequate precautionary and remedial measures can reduce the problems arising and enable land to be put safely to appropriate uses. Treatment works may involve covering, capping , plugging and filling, or gating or grilling of openings, together with the erection of a boundary fence or wall around a mine entry, or around land which is at risk of subsidence from underground workings. A description of types of mine opening and some general information on methods of treatment are given in Appendix A and some examples are shown in Figure 4.

8. Before such works can be undertaken, the locations and nature of mine cavities and openings must be known. Whilst documentation exists for many types of mine, this often is widely dispersed and difficult to consult. There are obvious benefits in ensuring that such information is readily available in order to guide the preparation of planning policies, planning applications and site investigations.

9. Improved practices can, thus, contribute to the Government's objectives for the use and re-use of land. These guidelines are concerned with treatment of disused mine openings and, more generally, with availability of information on mined ground.

# PURPOSE OF THE GUIDELINES

10. The purpose of these guidelines is to advise local authorities, landowners, developers and others of the specific consideration which needs to be given to the problem of disused mine openings. The guidelines are intended to assist in ensuring that development on mined ground is suitable; that physical constraints on the use of land are taken into account at all stages of the planning process; that any scope for the use of precautionary measures is fully explored so that hazards which arise are reduced and land is not unnecessarily sterilised; and that conservation interests are recognised as early as possible. The guidance applies to mine openings and not to other types of artificial openings, such as wells, although some of the principles may be generally applicable to these. The guidance does not apply to natural openings in the ground such as sinkholes.

11. These guidelines are intended also to demonstrate the need to compile information on mined ground in readily accessible, well-organised, data systems and for expansion of information so that it can be of benefit to the wider community in the future.

12. These guidelines supplement, and should be read in conjunction with, Planning Policy Guidance Note 14 : "Development on Unstable Land" (reference 2), which sets out the wider planning and administrative issues.

## PROBLEMS DUE TO MINE OPENINGS

13. Open mine entrances present an obvious hazard to the health and safety of people and livestock. Concealment by vegetation or by a thin layer of tipped material increases the risk because the hazard is no longer obvious. Open shafts expose people and livestock to a risk of injury or death. Mine adits invite exploration by the adventurous and may put people at risk from secondary hazards such as roof falls, getting lost in workings, effects of explosive or noxious gases, and deep water. Adits may also lead into internal shafts or raises, the existence of which is not evident at the surface, and may not be obvious underground.

14. Mineshafts may be partly or completely infilled in which case the fill may subside into voids at the base or into passages from the shaft into workings at various levels ("insets"). This can sometimes lead to slow, progressive subsidence at the surface which can give early warning of more serious movements.

15. However, collapses of shafts may occur rapidly and without prior warning. Deterioration of walls or linings of shafts, of platforms on which shaft fill rests, and the settlement or collapse of shaft fill into remaining voids, may lead to sudden failures of the surface of the ground. The area of ground affected is commonly several times the shaft diameter in width, particularly where there is any thickness of superficial deposits resting on the bedrock (Figure 5). Instances are known where the sudden failure of one shaft disturbs the ground to the extent that other nearby shafts also fail. Deterioration of the roof above an adit opening also can lead to collapse of the ground surface (Figure 1a). Experience in the South Wales coalfield, since 1960, and in Shropshire indicates that mine entries (shafts or adits) are, by far, the commonest cause of ground collapse due to former mining activities.

16. Subsidence associated with mine openings, therefore, may cause serious damage to, or collapse of, buildings and structures as well as obvious risks to people, vehicles and livestock. There is a need to take the potential for such collapses into account when considering the use of land and development proposals.

17. Mine openings may pose problems for both underground and surface mineral extraction. Old mine openings may modify existing structural features, disturb and weaken a rock mass, or induce changes in the level and flow of groundwater. The stability of quarry slopes excavated into previously mined ground can be impaired. Unsuspected cavities behind the working face can lead to unpredictable scattering of debris ("fly rock") during blasting.

18. Mines may be a source of hazardous emanations. Explosive methane, often from coal mines, radon (a radioactive gas emitted from certain minerals within some granites, ore-bodies, black shales and phosphatic rocks), carbon dioxide, or hydrogen sulphide may pass from mine openings and accumulate, for example in poorly ventilated foundations or underground pipes. Deoxygenated air may occur. A fall in atmospheric pressure can lead to increased emission of gases from mine openings. In addition, mine openings can provide pathways for the lateral migration of gases such as methane and carbon dioxide from landfill sites.

19. Humid conditions above mine openings may lead to rotting of wooden structures. A case is recorded of a death resulting from collapse of rotting floorboards in a house built over an open shaft. Rising vapours may be corrosive and lead to deterioration of concrete or metal in foundations or in shaft treatment works. The stability of treatment works may also be affected by displacement of fill from beneath a mine cap, by the action of water, thus causing the cap to slip or to fall into the shaft.

20. Water within some mines may be contaminated and can affect the quality of surface water if it issues from a drainage adit. Mine adits may become blocked, leading to the impoundment of large volumes of such water, and can give rise to problems if the blockage is suddenly released. Disposal of waste into open shafts may pollute water some distance away. In addition, migration of leachate from landfill sites into mine entries can affect the quality of groundwater.

21. Thus, the dangers posed by disused mine openings, may result from open and concealed entries; unstable fill; deterioration of linings and coverings; emission of gas or corrosive vapours; effects of concealed entries and voids on stability of slopes and on blasting in quarries; contamination and discharges of groundwater; and through openings acting as pathways for gases and leachate from other sources. These may pose direct hazards to people, livestock, vehicles and current mining operations, and direct or indirect risks to buildings and structures. There is danger to people attempting to explore old mines without proper safeguards and expertise. There also may be risks to those carrying out site investigations or construction on potentially unstable ground.

22. These problems can be reduced or eliminated by proper precautionary measures designed to suit the geological and engineering circumstances and the intended subsequent land uses. For these to be safely undertaken, however, locations of openings

and their condition and characteristics must be adequately investigated and known.

## USES OF MINE OPENINGS AFTER ABANDONMENT

23. Whilst openings into abandoned mines may represent a threat, some also have uses which may impose constraints on treatment works. Some uses may continue long after mineral extraction has ceased. Such uses may include:

a. the need to retain access to minerals which have not been worked out; in some metalliferous mining areas and, for coal, in the Forest of Dean this is embodied in local mining laws;

b. the use of some underground space for waste disposal, storage, industrial processes, mushroom growing, water supply, or leisure activities;

c. the need for access to carry out treatment works or to monitor the stability of underground voids, treatment works and water levels;

d. avoidance of "pooling" of explosive, or other, gases which might then migrate through cracks and fissures in the ground to give unexpected, dangerous concentrations and access for the monitoring of such emissions; and

e. the need to maintain mine openings for ventilation or pumping in respect of neighbouring or inter-connecting mines.

24. In addition, mines may be of ecological value, notably as bat habitats and because of small organisms such as insects and spiders. Closure could either seal off bat access or disrupt the ventilation needed for survival of colonies of these, or other animals, or of plants. Mines may also contain scientifically important geological or mineral features. A number of mines have been designated as Sites of Special Scientific Interest. In addition, some mines are of archaeological or historical interest, including some Scheduled Ancient Monuments such as Grimes Graves in Norfolk. There may be instances where a mine entrance is a listed structure or is attached to a listed structure. Scientists and mining historians, therefore, may use mines for research purposes or as an educational resource. Several mining landscapes and ,in some cases, reopened mines have been incorporated into mining museums. A number of organisations are currently engaged in cataloguing mine sites and landscapes which are of archaeological or heritage value.

25. Some mines are used for the purpose of recreation, for example by caving clubs. A number of old mines have been reopened as tourist attractions.

26. Provision for access and for security and safety is required if mines are to be used for these purposes. Before mine openings are treated, therefore, careful consideration should be given to the possible need for access for current or future uses. In addition, the impact of treatment works on wildlife habitats and on historic mining landscapes should be taken into account. Possible effects of treatment works on any nearby active mines should also be considered carefully.

## RESPONSIBILITIES AND LIABILITIES IN RESPECT OF MINE OPENINGS

27. The primary responsibility for mine openings rests with the owner of those openings whose identity, particularly in the case of long-abandoned mines, may not be clear. The owners and occupiers of land adjoining mine openings may also have safety responsibilities. In addition, landowners may have a responsibility in relation to any unfenced source of danger in, or on, land adjoining a highway.

28. The Mines and Quarries Act 1954 requires the treatment of every opening of a disused or abandoned mine to prevent anyone from accidentally falling down it or from accidentally entering it. This requirement does not apply to mines, other than coal mines, which have not been worked since 1872. The 1954 Act also deems certain mine openings to be statutory nuisances which, under the Environmental Protection Act 1990, the relevant district council is required to abate.

29. Those carrying out treatment works on mine openings may acquire responsibilities for maintenance and liabilities for any damage which may arise, even if they originally had none in respect of the mine openings.

30. The responsibility for determining whether land is suitable for a particular purpose rests with the developer. It is for the developer to determine the existence, location, and condition of any mine openings and to ensure that any treatment carried out is fit for the purpose.

31. A fuller discussion of these matters is given in Appendix B and a list of legislation relevant to mine openings is at Appendix C.

## PLANNING CONTROL

32. As explained in the Planning Policy Guidance on "Development on Unstable Land" (reference 2), the stability of the ground, in so far as it affects land use, is a material planning consideration. Mine openings can affect the stability of the ground and

may, thus, affect land use. It is important, therefore, that these should be considered at all stages in the planning process.

33. There are three distinct aspects of the operation of planning control in respect of mine openings:

i. The need for, and operation of, planning control over the treatment of mine openings;

ii. Consideration of mine entries and underground mine openings in determining planning applications; and

iii. Consideration of mine openings in development plans.

## (i) The need for, and operation of, planning control over the treatment of disused mine openings.

34. Covering, capping, plugging and filling (Appendix A) are all engineering operations in, on, over, or under the land and are, therefore, development within the meaning of section 55 of the Town and Country Planning Act 1990. These operations, thus, require planning permission. Treatment works should not be regarded as *de minimis*. In some circumstances such works may be permitted development as defined in Part 19 Class C and Part 20 Class E of Schedule 2 to the Town and Country Planning General Development Order 1988, as amended, ("the GDO"), generally requiring the prior approval of the local planning authority. In other circumstances, such works would be incorporated in the requirement for specific planning permission for other development. In some instances, a mine entrance may be a listed structure or may be attached to a listed structure in which case Listed Building Consent would be required before any works could be undertaken.

35. The four main circumstances where treatment of mine openings may be required are:

a. to meet the statutory requirements consequent on mine closure;

b. for public safety reasons, with no change in land use or development;

c. to safeguard conservation interests; and

d. for safety and stability reasons where development is proposed.

### *Mine closure*

36. Section 151 of the Mines and Quarries Act 1954 requires the owner of an abandoned mine, or of a mine which has not been worked for twelve months, to secure the surface entrance to each shaft or opening to the mine using an efficient enclosure, barrier, plug or other device so designed and constructed as to prevent anyone from accidentally falling down the shaft or entering the mine opening accidentally, and to maintain the enclosure, barrier, plug, or other device. The extent of works undertaken may range from simple measures, such as gating or fencing, to more extensive works. Works may be provided for in conditions attached to the planning permission for mining or may constitute permitted development under the GDO.

37. New underground mining requires planning permission from the relevant mineral planning authority. Such planning permissions should have regard to the need for treatment of mine openings to a standard suitable for the proposed after use of the site. Since mining operations are often long-term activities, it may not be possible to identify the final use of land affected by new mine openings and, thus, to determine the appropriate final treatment of such openings at the outset. In such circumstances, the aim should be to return the site to the condition of a green field site.

38. It is, therefore, recommended that, when granting planning permission for underground mining, the mineral planning authority should consider the need to apply a condition requiring agreement to the treatment works for each mine opening at the cessation of working. This would neither conflict with, nor duplicate, the statutory requirements under the Mines and Quarries Act 1954 since treatment meeting the requirement under this legislation may not be adequate to ensure safety of specific subsequent uses of the land.

39. All existing planning permissions for underground mining may be considered for updating in accordance with the provisions in section 105 of the Town and Country Planning Act 1990 and such updating may have regard to planning conditions providing for treatment of mine openings (reference 3).

40. For mines with both new and existing permissions, treatment works would have to be undertaken at the expiration of permission or at the cessation of mining, whichever came first. Liaison is required between the mineral planning authority, the mineral operator and the Inspector of Mines to identify the cessation of mining and the need for any action to ensure compliance with the treatment condition.

### *Treatment for public safety reasons*

41. Where no change in land use or development is proposed, the treatment of mine openings may be required:

— as emergency action following the collapse of a mineshaft or adit, or of shallow workings;

— to prevent such emergency situations arising; or

— to abate a statutory nuisance.

The level of treatment required will vary according to circumstances, from the minimum need to meet the statutory requirements to full and complete stabilisation. Such works may constitute permitted development under the GDO and, in some cases, may not require the prior approval of the mineral planning authority.

42. It is recommended, however, that the local planning authority should be notified of such works at the earliest opportunity in order for the location and treatment of the mine openings to be recorded in an appropriate data collection. Where the prior approval of the mineral planning authority is required, authorities may wish to consider whether delegated authority might be given to officers, particularly for emergency works. Such approvals may be included in the planning register.

### *Treatment to safeguard conservation interests*

43. Where mine openings contain features of archaeological, geological or biological interest which it is desirable to conserve, treatment may be required in order to control access. In some circumstances this will coincide with the need for treatment to comply with statutory or safety requirements and will constitute permitted development under the GDO. In other circumstances, however, there may be no specific statutory or safety requirements and the treatment will require specific planning permission.

### *Treatment to facilitate development*

44. Where development or intensification of the surface use of a site is proposed, mine openings should be treated to ensure the stability and safety of the land. The treatment should be appropriate to the land use and the risks involved although, on developed land, it is unlikely that fencing alone would be regarded as an adequate safeguard. The minimum requirement is likely to be a secure barrier to prevent ingress and full and complete stabilisation may be required.

45. Whilst such works may be regarded as permitted development under the GDO, it is considered that these should be taken into account by the local planning authority alongside the development proposed. It is, therefore, recommended that the treatment of disused mine openings, in such circumstances, should be covered by a condition on the permission for the development of the site.

46. Applications should be decided by the relevant district or county authority, as appropriate to the proposed category of development, in order to ensure that adequate treatment is undertaken and that the location and treatment of the mine opening is recorded in the planning register or another appropriate data collection.

47. In addition, treatment of mine openings would have to be carried out to the satisfaction of building control inspectors in circumstances where the Building Regulations apply.

48. Consideration of proposed surface mineral extraction in areas which have been mined previously may need to take account of treatments to mine openings located near site margins. Collapse of these could have effects on the support of ground outside the area which is the subject of the planning application.

## (ii) Consideration of mine entries and underground mine openings in determining planning applications

49. In areas where potential instability of land associated with mine openings may be a material planning consideration, there is a need to take due account of this when determining planning applications. It is primarily for the developer to provide the sound information which is needed to support such planning decisions and safe, cost-effective development of land. The planning authority needs to consider the submitted information, to request more where necessary, and to evaluate the proposed development in the light of such information. Some information can be secured through statutory consultations which are required in respect of issues relating to mine openings. In addition, there are valuable non-statutory consultations which can be undertaken.

### *Assessment of the site*

50. When making individual planning applications, it is important that the developer should provide adequate evidence to the local planning authority to demonstrate that potential instability due to mine entries and underground mine openings has been taken into account, or that adequate treatment works have been carried out or are proposed. Where mine openings are known or are suspected to exist, the applicant may be required to provide a mining stability report in support of the application. In coalfield areas, the information provided will reflect the results of consultations with the British Coal Corporation, which should be undertaken at the earliest stage. Any report should

draw attention, where appropriate, to conservation interests and the measures to be taken to avoid damage to these.

51. Any mining stability report should be prepared by a properly qualified and experienced expert who should be able to demonstrate relevant professional experience in the assessment and evaluation of the stability of mine openings. Such an expert would normally be a corporate member of a relevant professional institution such as the Institution of Mining Engineers, the Institution of Structural Engineers, the Institution of Mining and Metallurgy, the Royal Institution of Chartered Surveyors (Minerals Division), the Institution of Civil Engineers, or a Chartered Geologist, although membership of these bodies does not mean that the relevant expertise is necessarily held by an individual. The expert may be an independent consultant or a Director or Partner or authorised representative of an organisation. The local planning authority may maintain a list of professional organisations which keep registers of their members who are capable of providing adequate reports. This should be open for consultation by any prospective developer wishing to engage a specialist. Such specialists may need to draw upon the expertise of others such as mining historians.

52. Before making a "stability report" , the expert must undertake such inspections and investigations as are considered necessary to allow an opinion to be reached on the stability of the development. Investigations should be carried out by, or under the direction of, the expert who should ensure that they are designed and executed in accordance with the relevant British Standard Code of Practice. Such investigations normally include a desk study of existing published and unpublished data, a site reconnaissance and, if necessary, a ground investigation by indirect methods such as geophysics and remote sensing, and by direct methods, for example, drilling, trenching, and pitting. A comprehensive desk study and field reconnaissance represents the minimum investigation which should be carried out by the expert in order to determine whether it is necessary to prepare a full stability report.

53. Where development proposed in a mining area is subject to an environmental assessment under the Town and Country Planning (Assessment of Environmental Effects) Regulations 1988, that assessment should have regard to the existence of any old mine openings.

54. Those investigating mines which may be of conservation value should use appropriate experts to assess conservation issues. In particular, assessment of bat colonies, which are easily disturbed, should be undertaken by experienced persons. Lists of appropriately qualified surveyors are maintained by the Nature Conservancy Council for England, the Countryside Council for Wales, and by the Bat Conservation Trust.

## *Statutory and other consultees*

55. Before treatment of disused mine openings is permitted, it is necessary to take the opinion of various statutory consultees. The local planning authority normally will have a list of these. In addition, there are a large number of organisations which are not statutory consultees but which hold valuable information and expertise and which it may be prudent, where appropriate, to consult. The following paragraphs make reference to statutory consultees and information on non-statutory sources of advice and information is given in Appendix D.

56. The British Coal Corporation has well defined responsibilities in respect of treatment of openings of coal mines vested in the Corporation and is a Statutory Consultee by virtue of article 18 of the GDO. It is essential that the Corporation should be consulted about such openings at the earliest opportunity. The Corporation defines the form of treatment necessary for these within the procedures laid out in the National Coal Board "Handbook on Treatment of Disused Mineshafts and Adits" (reference 4) and these procedures must be followed in such cases.

57. The Nature Conservancy Council for England (English Nature) and the Countryside Council for Wales are statutory consultees on treatment works under the terms of the Wildlife and Countryside Act 1981 in respect of the preservation of bat habitats (reference 5) and, under article 18 of the GDO, for development proposals on, or which might affect, designated Sites of Special Scientific Interest. The Countryside Council for Wales should also be consulted in respect of any developments which would, separately or cumulatively, have a significant impact on the visual amenity of the countryside or public enjoyment of the countryside in designated landscapes of national importance.

58. Where works affect a scheduled ancient monument, consent under the Ancient Monuments and Archaeological Areas Act 1979 will be required from the Secretary of State for the Environment who is required to consult English Heritage. Prior discussion with that body may assist to speed the decision. In Wales, applications for scheduled monument consent should be made to Cadw - the Welsh Historic Monuments Executive Agency. English Heritage and the Secretary of State for Wales are statutory consultees, under the GDO, where works might affect the site of a scheduled ancient monument. In some instances Listed Building Consent may also be required (references 6 and 7).

59. The National Rivers Authority must be consulted, under article 18 of the GDO, where works or operations are carried out in the bed of or on the banks of a river or stream. It is prudent also to

consult the relevant water companies. For example, the use of mines for waste disposal may pose a hazard to underground water sources, and infilling of workings may divert, interrupt, or affect the quality or quantity of underground or surface flows of water. Disposal of wastes into mines requires a Waste Disposal Licence from the relevant waste disposal authority.

60. Local authorities have responsibilities in respect of private water supplies and can provide information about any private supplies in the vicinity of proposed treatment works.

### (iii) Consideration of mine openings in development plans

61. There is a need for development plans to take due account of the presence of mine openings and of their potential effects on the stability of the ground and, thus, on land use. General policies and proposals in respect of land instability should be set out in Structure Plans and Part 1 of Unitary Development Plans. Local Plans and Part II of Unitary Development Plans should be used to give detailed expression to such policies and proposals. The criteria which will be used in determining any planning application, and the planning conditions normally expected to be met, should be set out (reference 8). Local Plan and Unitary Development Plan proposals should take due account of the existence and location of mine openings and may recommend action on land reclamation, or other remedial action, to enable beneficial use of land which is subject to such constraints.

62. Local planning authorities should identify, where possible, the locations of mine entries and openings in surveys of their areas. Areas where mine openings are suspected to exist but have not been located should also be recorded. This information should be generalised to define areas within which mine openings may be a physical constraint to development and within which checks and investigations might be expected prior to any planning application.

## INFORMATION ON MINED GROUND

63. Prospective developers or their consultants need information on the nature and extent of past underground mining and on the extent of conservation interests associated with mined ground, before development is contemplated or a planning application is prepared in areas of past underground mining. Data searches prior to site evaluation need to be as thorough as possible to aid in the design of comprehensive but cost-effective site investigation and are facilitated by a readily accessible data system. Documentary data should never be used, however, in place of adequate investigations of the ground.

64. Rapid access to data may be particularly important during emergencies. A data system can provide useful information to the emergency services when subsidence has occurred, or to rescue organisations when people are trapped underground.

65. Suitable data systems may also aid assessment of priorities and resources required for reclamation of derelict land; help to identify locations where existing development may be at risk; assist in design of current mining operations; or help to secure conservation of habitats and features.

66. There is an obvious value, therefore, in preserving relevant information in an organised and accessible manner, for the benefit of current and future development and redevelopment and for forward planning. There is also a clear advantage to planners and developers and others if information can be made readily available at specific locations where access is possible. Relevant information includes that on the nature and extent of past mining, locations and treatment of disused mine openings, current uses of mines and mine openings, and features which might merit protection and conservation.

67. Sources of information on mined ground are diverse including maps, photographs and documentary records. Whilst some information has been published, much is manuscript material held in archives and files. The physical condition of documentary records is variable. Early plans, for example, may be fragile and subject to restricted access. The completeness and accuracy of records reflects the accuracy of original sources and difficulties in transferring information between base maps. Whilst some collections of information are well indexed and easy to use others may have relevant information dispersed amongst a great deal of other data and use of these is time consuming. In addition, reliable interpretation of records and data often requires considerable expertise.

68. Information becomes most useful if it is abstracted by suitable experts and compiled into a rational, and well indexed system. Such systems can be manual indexes to sets of maps, or can be digitally stored. However, there may be limitations on the use and content of data since some records may be confidential. Significant numbers of mine workings have no documentary records, thus no collection of data is likely to be complete. Care should be taken by those providing information to make clear what is included, how the system should be used, and the responsibilities which rest with the user of the data. Appendix E sets out fuller information on these matters.

69. Data collection exercises can be a relatively expensive investment. The full value is realised only if, after the initial effort, additional data is included as it becomes available. Whilst this could be done by undertaking further searches at intervals, it is more efficient if those acquiring primary data, such as planners, engineers, developers, researchers and conservation interests lodge relevant information in appropriate data systems for the common benefit of all users of mining information.

70. A number of organisations, including some local authorities, already maintain databases of mining information. There is a need, however, to ensure that all mining areas are adequately covered by readily usable sources of information.

71. Such sources of information can be used to give indications of areas in which ground problems might occur in order to give a basis for the formulation of planning policies and the assessment of what information should be submitted in support of any planning application. Areas should be added on an inset map to the proposals map, and information on the location of any supporting database may be included in the reasoned justification. Planning policies should, where appropriate, reflect such information.

72. For these reasons, local authorities are encouraged to make provision, where appropriate, for publicly accessible databases of information on mined ground. The majority of purposes for which such databases are required relate to responsibilities of the district councils, however it is for the local planning authorities to determine the specific policies and practices and to make decisions in the light of their responsibilities and the circumstances pertaining in their areas. It is not the intention that databases should be duplicated where these exist already. In such cases, the local authority should review the existing arrangements to determine whether any new provisions are required. There also may be scope for considering any opportunities for collaboration between authorities in the provision of facilities.

73. It is important that data systems should be regularly maintained and updated. This is most readily achieved if organisations and individuals acquiring new data cooperate by lodging it in appropriate data systems. Therefore, those acquiring such data are encouraged to place information in an appropriate location as a matter of course.

## CONCLUSION

74. The Secretaries of State look to local authorities, landowners, developers and others to implement the advice in these guidelines.

75. All concerned with the development of land and with public safety should strive to ensure that mine openings are adequately and appropriately treated, but that access is retained where necessary. The undesirable consequences of untreated or inadequately treated mine openings should, thus be reduced to a minimum in future.

76. The need to coordinate adequate information should be reviewed by local planning authorities and the possibility of setting up a data system on mined ground should be considered carefully. Such data systems should be well organised and maintained, and readily accessible to the public in order that information on potential problems for use of land can be taken into account in development proposals and site investigations, and precautionary measures to make hazardous openings safe can be fully explored.

77. Such data systems may contribute to the definition of general areas within which constraints to development resulting from mining activities or from conservation interests associated with mines should be taken into account at all stages of the planning process. The identified areas would be those within which it normally would be expected that adequate site investigation data should be provided with any planning application so that this can be decided on the basis of sufficient information.

78. Organisations and individuals acquiring new information on mined ground and mine openings, including data on treatment works carried out on such openings, are encouraged to lodge it in an appropriate data system as a matter of course.

79. Such steps should ensure that:

- — mine openings and mined ground are identified at an early stage in the planning process;
- — appropriate policies for land use are developed;
- — planning constraints due to mined ground are taken into account at all stages in the planning process;
- — development on mined ground is suitable;
- — hazards due to mine openings are reduced; and
- — data systems become more comprehensive as time passes.

The specific policies and practices to be adopted by local planning authorities are, however, for them to decide in the light of their responsibilities and the circumstances pertaining in their areas.

80. The advice contained in these guidelines has some resource implications for local authorities. The implications may be significant for those authorities which have large, intensively mined areas and no existing mine data system. The principal costs would be incurred in respect of the recording and interpretation of documents, which

requires specific expertise, and investment in database systems. It has been estimated (reference 9) that the initial cost of setting up a 1000 record database on a personal computer would be of the order of £20,000, but with low running costs thereafter. The costs could be several times higher for intensively mined areas which are not included within existing data systems. However, the costs may be reduced where a mining data system exists already or facilities used for other purposes can be extended to include this use. In some cases, local authorities may wish to consider whether to collaborate in the provision of a data system capacity.

# APPENDIX A

# NATURE AND TREATMENT OF DISUSED MINE OPENINGS

A1. This Appendix reviews briefly some characteristics of disused mine openings and of treatments which are carried out in order to make them safe.

## Nature of disused mine openings

A2. Entry to mine workings is normally gained via vertical shafts or by horizontal or inclined adits (Figure 3). Such openings enabled exploration and assessment of mineral deposits, access to proven minerals, and ventilation and drainage of mines. Historically, entry was often made from surface quarries as removal of barren overburden became uneconomic. A single mine may have been served by a number of shafts and some of these may be in close proximity.

A3. As mining technology developed, and as near-surface mineral reserves were worked out, the length, as well as the depth, of mine entries increased. Groups of mines were also interconnected. For instance, the County Adit drains a group of mines in the Chacewater-St. Day area of Cornwall and the associated opening is a considerable distance from the mines which it served.

A4. Whilst mine openings are normally associated with surface features such as mine buildings, headgear and spoil heaps, this is not always the case. Air shafts, for instance, may be further away. Some entries may be remote, therefore, from parts of the underground workings which they served. Abortive exploratory openings may exist far from other evidence of mining. Small mines, such as some of those mining chalk or marl for agricultural purposes, show little surface evidence but were commonly located close to hedgerows or in copses. Subsequent removal of hedges and copses may lead to lack of appreciation of possible location of such mines. More generally, surface evidence of early mining may have become obscured by subsequent development.

## Characteristics of mine openings

A5. Mine openings may vary in size from less than 1m to over 7m in diameter, though most are less than 3m. In general, the largest shafts are associated with comparatively recent coal mining. Openings vary in cross-section from circular to square or rectangular, although open-vein workings are laterally extensive slots in the ground (Figure 3). Other excavations, for winding and ventilation gear, may be associated with shafts.

A6. The characteristics and stability of mine openings depend on the physical nature of the ground through which they pass, the behaviour of groundwater, and the measures taken to support the walls. Openings in hard, homogenous rock, free of inflowing water, may be inherently stable without wall or roof support. Where wall rocks are soft, consist of alternating hard and soft materials, are extensively fissured and jointed, or transmit substantial inflows of water, the walls and roof may need to be supported. Materials which were used for supporting such openings included wood, brickwork, stone blockwork, metal rings, or concrete linings (Figure 6).

A7. In areas where soft, unconsolidated deposits overlie solid rock, shafts are commonly lined through the weak materials. Shaft linings may be founded on bedrock but were often supported on suspended platforms made from wood or iron girders. However, the condition of the wall rock or linings may deteriorate as time passes. This may lead, eventually, to collapse. However, in some circumstances, the void may have filled with water thus giving some support to the walls.

A8. It may, therefore, prove necessary to avoid developing land which is close to a lined opening in fractured, weak rocks or superficial deposits because of the possibility of a "run of ground" into the opening. However, treatment to a standard concomitant with safety considerations and the proposed use of the land may make the site suitable for development.

A9. Many mine entries were abandoned as they stood. Only for those mines abandoned since 1872 (and for pre-1872 mines accessible to a highway or place of public resort) is there a legal requirement for the mineral operator to close the entry to prevent accidental ingress. Many old mine entries, thus, remain open and unprotected. Shafts of small diameter may become concealed by vegetation and soil. Other entries were covered at, or just below, the surface, often with timber, and many of these have become concealed subsequently by vegetation, tipping or surface development. Shafts have often been used as convenient rubbish pits. Loose rubble was frequently tipped into shafts whilst interconnecting mine galleries were left empty. Such fill can collapse laterally into the voids thus causing a cavity to form within the shaft. The presence of shaft equipment and the composition of debris have often led to blockage of shafts, with debris piling up to the ground surface, above large voids. Even where such "bridging" has not been significant, consolidation, particularly in the presence of water, can lead to the formation of voids within loosely tipped material infilling the shaft.

A10. Mine entries are, thus, often concealed and there may be no sign at the surface of anything untoward. As a result, significant number of early shafts are unrecorded and unsuspected.

A11. Whilst more recent mine openings may have been treated adequately to meet the legal requirements for mine closure, the treatment will not necessarily have been to a standard suitable for a specific subsequent use of the site.

## Locating disused mine openings

A12. Before mine openings can be treated they must be located and this may be a difficult task. Whilst indirect methods, such as geophysical surveys can be used these are not always successful. Excavation of trenches across areas where mining features are thought likely to occur is commonly used but even this may miss openings. Stripping the surface of the site is the best means of locating mine openings but this is often too costly and impractical. Even this may not reveal all openings if, for example, the head of a shaft is deeply buried.

A13. Generally, therefore, it cannot be assumed that all mine openings have been found but the objective is to achieve a reasonable level of certainty that the site has been investigated adequately. Additional inspection of the ground is undertaken at the construction stage to ensure that no openings have been missed during the pre-construction site investigation.

A14. A report on locating mine openings has recently been revised for the Department of the Environment (reference 10). Information on good site investigation practice is available from British Standards, the Construction Industry Research and Information Association (CIRIA), and other sources (references 11, 12, and 13).

## Treatment of disused mine openings

A15. Whilst all abandoned mine openings should be treated, the objectives of treatment will vary from deterring people from entering them, to controlled entry, or complete closure. The methods used may be simple expedients or solutions designed with specific subsequent land uses in mind. Where no development of land is involved, the treatment may be the minimum required to prevent accidental entry. However, for public safety reasons, a landowner, occupier, local authority, or some other body, might wish to carry out treatment to more than the minimum standard in order to reduce the risks and the consequent liabilities. Where development is proposed, the treatment should be to a standard suitable for safe subsequent use of the land.

A16. A review has been undertaken recently of methods of treating disused mine openings and the circumstances in which these should be used (reference 12). The principal conclusions were that, whilst safety must be the prime factor, the selected methods will depend on:

a. the permanence of the treatment works needed — temporary measures may be cheap in the short-term but require maintenance which may prove more expensive in the medium- to long-term;

b. any requirement for continued access to the opening;

c. the numbers of openings to be treated — for example there may be dozens of openings in a fairly small area in some old metalliferous mining fields;

d. the type of subsequent land use, such as protection for occasional visitors near a rural footpath in contrast to built development in, or close to, an urban area;

e. the budget available for the works, although it is important that treatment works are suitably designed and executed; and

f. the need to comply with the requirements laid down by British Coal Corporation in respect of treatment of coal mine openings.

A17. A wide variety of approaches have been adopted for dealing with disused mine openings, from simple cheap temporary action costing a few pounds to elaborately engineered, expensive permanent solutions costing, in some cases, tens of thousands of pounds (Table 1). In general, low-cost treatments are most likely to be used as a precaution where the mine has not been abandoned or where an abandoned mine is located in a rural area which is seldom visited. More stringent measures are required in rural areas which have more intensive land use, in urban fringes and in urban areas. Where development is proposed, the treatment needs to be of an adequate standard to safeguard public safety and property and this sometimes may require high-cost solutions.

A18. Prevention of accidental or intentional entry to an adit opening may be achieved by low-cost fencing or grilles. When continued access is required grilles can incorporate a gate, or can be specially designed to permit continued use by bats. If there is a risk of subsidence of the opening then internal supports may need to be emplaced. If no access is required the opening can be sealed by a mound or bund of soil, or a masonry wall and the entry can be selectively infilled to prevent subsidence.

A19. A minimum safeguard against accidental entry into mineshafts is a sturdy fence and warning notices. In many circumstances, additional measures are likely to be required. These may range from covering the opening with concrete or wooden sleepers as a temporary provision, where limited use of the land is likely, to provision of a reinforced

concrete plug or cap in more demanding situations (Fig. 4). A manhole, can be included where continued access is required for monitoring or maintenance, and a cabin is sometimes built over the treated opening to keep people away. It may be necessary to incorporate a grille where access for bats must be safeguarded. When no future access is required, the shafts may be infilled. Caution is needed, however, since permanent closure eliminates the possibility of monitoring treatment works or of any unforseen effects. Even when an opening is permanently sealed it may be prudent to mark its location, for example with a cairn, in order to warn future users of the land.

A20. In some areas of shallow mining, it may be cost-effective to excavate the workings and to backfill the void in order to remove the problem permanently. Sometimes mineral extracted during excavation may help to offset the cost of treatment works.

A21. Other treatments, however, may be subject to deterioration as time passes. Mine vapours, for example, may cause corrosion of metal used in works, or concrete may deteriorate. Treatments using non-durable materials, therefore, should be carried out such that the materials are not concealed. Maintenance is important and works should be inspected on a timescale reflecting the treatment methods used, any latent instability of the site, and the possibility that works might become damaged, vandalised or removed. This may be difficult or impossible where extensive landscaping of sites has taken place. Any repairs that are required should be undertaken as soon as possible after the need is identified.

A22. In general, treatment works should be fit for the purpose and should not create a false sense of security. Selection of the type of treatment should, therefore, take full account of the characteristics of the location, use of the land, the need for continued access, and the scale of any hazard. There is also a need to take environmental acceptability into account when treatments are proposed.

A23. In some instances, diligent searches for recorded mine openings may be unsuccessful leaving a possibility that an unlocated opening is present on a development site. In such circumstances, it is prudent to use the suspect part of the site for open-space uses such as gardens or parking after strengthening the ground with a geotextile grid. This does not offer complete protection but, in the event of a subsidence, would hold the ground long enough for people to escape.

A24. Treatments of mine openings are rarely recorded in a systematic manner even though these may be relevant to future development or redevelopment. For example, mined ground may be treated in a way which is quite adequate for bearing small loads but not for subsequent larger scale development. In such cases, the assumption that potential problems had been removed would be misleading. There is a need to record treatments which have been carried out in order to assist those who need to undertake future investigation or development of land.

A25. Fuller information on methods of treatment of disused mine openings is contained in results of research completed recently for the Department of the Environment (reference 14). The key source of information on treatment of coal mine shafts is the National Coal Board Handbook (reference 4). An important reference for mine openings in general is the CIRIA guide on "Construction Over Abandoned Mine Workings" (reference 15). However, it is essential that investigation of sites and design and execution of any works is undertaken by appropriate experts.

# APPENDIX B

# RESPONSIBILITIES AND LIABILITIES IN RESPECT OF MINE OPENINGS AND THEIR TREATMENT

B1. The law relating to mine openings is complicated, involving over 30 statutes as well as the Common Law. Since the order of precedence of these statutes is not always clear, and a number of aspects have not been tested in the courts, no definitive statement on responsibilities and liabilities is possible. However, this Appendix summarises some of the main issues.

## Ownership of mine openings

B2. The primary responsibility for mine openings rests with the owner of those openings. In many cases, the owner will be the surface landowner. However, the ownership of minerals and of the right to work them may be separated from surface ownership. For example, reserves of gold, silver and uranium are all owned by the Crown but, with the exception of small gold mines in Wales, no mines have been worked exclusively for these metals in modern times. The ownership of all coal and mines of coal, with the exception of small amounts of alienated coal, is vested in the British Coal Corporation (BCC, formerly the National Coal Board). This ownership includes any entries to mines of coal and BCC, therefore, has certain responsibilities in relation to coal mine entries. In other cases, however, the ownership of mine entries may not be clear because of separation from surface ownership. Doubts may also arise as to whether mine openings were acquired separately from adjoining strata and whether ownership of a mine opening includes any lining, the airspace within the opening, or any fill or treatment works.

## Responsibilities of owners and occupiers of land

B3. The owners and occupiers of land may incur specific responsibilities under the Health and Safety at Work Act 1974 and the Occupiers Liability Acts 1957 and 1984 in respect of any hazards on their land, including any mines or entries, and may also have Common Law responsibilities in respect of these. These responsibilities relate to the safety of employees, legitimate visitors, and trespassers, particularly child trespassers, on their land or premises. Particular concern may exist where entries may occur close to rights of way or in land which is subject to public access. Landowners also have a specific responsibility under the Highways Act 1980 in relation to any unfenced source of danger in, or on, land adjoining a highway.

## Treatment of mine openings on cessation of working of mines

B4. The position under the Mines and Quarries Act 1954 is as follows. There are two stages after the abandonment of the mine opening or cessation of working or use. These are:

a. the owner of the mine, defined as the person for the time being with the right to work the mine, must notify the Inspector of Mines on the expiration of two months, starting with the day the mine was last worked or abandoned or the mine outlet was last used or abandoned (section 139); and

b. the owner of an abandoned mine, or of a mine which has not been worked for twelve months, is required to secure the surface entrance to each shaft or opening to the mine by means of an efficient enclosure, barrier, plug or other device so designed and constructed as to prevent anyone from accidentally falling down the shaft or from entering the mine opening accidentally (section 151).

B5. It should be noted that treatment which is adequate for this purpose is not necessarily sufficient for any other purpose. In addition, these provisions do not apply to those mines which closed prior to the 1954 Act. Neither do these provisions apply to mines, other than mines of coal, stratified ironstone, shale and fireclay, which have not been worked since 1872. The owner of such mines may be difficult to identify.

B6. The responsibility for maintaining a safe place of work at working mines, and for those mines closed since 1974, rests with the mine operator, even after the cessation of operations, under the Health and Safety at Work Act 1974.

## Abatement of a statutory nuisance

B7. Part III of the Environment Protection Act 1990, requires each local authority to inspect its area from time to time and to seek abatement of any statutory nuisance found there. If a landowner or occupier fails to comply with the abatement notice, the local authority may abate the nuisance itself and recover the costs from the landowner. By virtue of section 151 of the Mines and Quarries Act 1954, certain mine outlets are deemed to be statutory nuisances. These include outlets of disused and abandoned mines which have not been protected as required by section 151, and unprotected outlets of mines which have not been worked since 1872 and

which, by reason of their accessibility from a highway or a place of public resort, constitute a danger to members of the public. A place of public resort includes a place frequented by the public to which they have no legal right of access.

## Rehabilitation of derelict land

B8. The Local Government (Miscellaneous Provisions) Act 1976 also enables local authorities to make safe and keep safe dangerous excavations on land to which the public has access. The Derelict Land Act 1982 may allow central government to grant aid for such works. A recent change to the administration of Derelict Land Grant allows treatment of some shafts in isolation to be considered for grant. Formerly, mineshaft treatment was only permissible as part of a wider reclamation scheme.

B9. The Minerals Workings Act 1985 gives powers to local planning authorities to obtain access in certain circumstances and to investigate and treat potential surface dereliction due to actual or apprehended subsidence of abandoned mine workings for minerals other than coal.

## Right of support for land

B10. In general, landowners have a Common Law right of support for land in its natural state, except where there are statutory rights of withdrawal of support or rights within a mining lease. The British Coal Corporation has extensive rights to withdraw support subject to compensation under the Coal Mining (Subsidence Compensation) Act 1991. Damage caused by withdrawal of lateral or vertical support may result in legal action against the person whose actions cause the damage. Clearly, in the case of historical mining, there may be difficulty both in identifying the person who caused the damage and in proving that the actions caused the damage.

## Supervision of treatment works

B11. Whilst the interest of the Inspectorate of Mines normally ceases when the mine is abandoned, the Inspectorate acquires a new interest, under the Health and Safety legislation, if works are to be undertaken within a shaft or adit. In such circumstances, the Inspectorate may deem that the works are a mining operation, direct that a properly qualified manager should be in charge, and inspect the works.

## Responsibilities and liabilities acquired as a result of carrying out treatment works

B12. Because of the responsibilities, liabilities and inherent risks associated with mine openings, treatment works are carried out by a wide range of individuals and organisations including central and local government, landowners and occupiers, mining history groups, developers of the land surface, mining interests, and nature conservation bodies, using both public and private sector funds. In doing so, they may acquire responsibilities for maintenance and liabilities for any damage arising from inadequate or negligent treatment works, even if they originally had none in respect of the mine openings. The landowner should be notified of any works undertaken by, or for, another party if the ownership can be established.

B13. Statutory liabilities placed on owners or occupiers of land cannot be displaced by the terms of any conveyance, although any conveyance may provide for recovery from the previous owner.

## Responsibility for determining the suitability of land for development

B14. The responsibility for determining whether land, on or under which mine openings are known or suspected to exist, is suitable for a particular purpose rests with the developer. It is for the developer to make the necessary investigations to determine the existence, location, and condition of mine openings, and to ensure that any treatment carried out prior to, or as a part of, the development is fit for the purpose.

B15. The British Coal Corporation has well defined responsibilities in respect of treatment of openings of coal mines vested in the Corporation and is a statutory consultee by virtue of article 18 of the GDO. It is essential that the Corporation should be consulted about such openings at the earliest opportunity. The Corporation defines the form of treatment necessary for these within the procedures laid out in the National Coal Board "Handbook on the Treatment of Disused Mineshafts and Adits" (reference 4) and these procedures must be followed in such cases.

# APPENDIX C

# LIST OF RELEVANT LEGISLATION

Statutes which cover matters which may relate to the general issue of ground subsidence (lateral and subjacent support) and, in many cases, make explicit reference to the issue of disused mine openings include:

Railway Clauses Consolidation Act 1845
Waterworks Clauses Act 1847
Public Health 1848 (Support of Sewers) Act 1883
Brine Pumping (Compensations) Act 1891
Mine (Working Facilities and Support) Act 1923
Public Health Act 1936
Coal Act 1938
Coal Industry Act 1975
Coal Industry Nationalisation Act 1946
Mines and Quarries Act 1954
Public Health Act 1961
Water Resources Act 1963
Mines (Working Facilities and Support) Act 1966
Mines and Quarries (Tips) Act 1969
Local Government Act 1972
Control of Pollution Act 1974
Health and Safety at Work Act 1974
Mines (Working Facilities and Support) Act 1974
Local Government (Miscellaneous Provisions) Act 1976
Highways Act 1980
Limitation Act 1980
Local Government Planning and Land Act 1980
Derelict Land Act 1982
Mineral Workings Act 1985
Town and Country Planning General Development Order 1988
Environmental Protection Act 1990
Planning (Listed Buildings and Conservation Areas) Act 1990
Town and Country Planning Act 1990
Coal Mining Subsidence Act 1991
Water Industry Act 1991
Water Resources Act 1991

In addition to legislation relating directly to practice, there are a number of statutes relevant to actions subsequent to an accident where liabilities may be involved, or which are concerned with other interests and, only incidentally, with disused mine openings. These include:

Law of Property Act 1925
Occupiers Liability Act 1957
Unfair Contract Terms Act 1977
Ancient Monuments and Archaeological Areas Act 1979
Wildlife and Countryside Act 1981
Defective Premises Act 1972
Building Act 1984
Occupiers Liability Act 1984
Local Government (Access to Information) Act 1985

# APPENDIX D

## ORGANISATIONS GIVING ADVICE ON, HAVING RESPONSIBILITIES IN RESPECT OF, OR HOLDING INFORMATION ON, DISUSED MINE OPENINGS

D1. Sources of information in respect of unstable land in general were given in PPG14 "Development on Unstable Land" (reference 2). This Appendix concentrates on those organisations which are able to give advice, and which hold information on, mined ground and, in particular, mine openings.

D2. The relevant local authorities for any area are responsible for administering the planning system and the Building Regulations. The local authorities are statutory consultees under the General Development Order 1988, as amended. They are sources of advice, and decisions, on planning matters and development proposals. Many authorities which have extensive mined ground within their areas maintain records of the extent of mined ground and the locations of mine openings. These guidelines encourage other authorities to establish data systems.

D3. Important sources of information and advice on mined ground in general are the Health and Safety Executive Inspectorate of Mines and the British Geological Survey. In rare instances where underground workings which formed part of a surface quarry are still open, the Health and Safety Executive Inspectorate of Quarries is a source of advice. The Inland Revenue Mineral Valuers Office provides information and advice to local authorities.

D4. The treatment of an opening of a mine for coal or associated minerals is permitted development under articles 19 and 20 of Schedule 2 to the General Development Order ("the GDO"). In addition, under article 12, the owner must be consulted when it is proposed to treat a mine opening. Developers are also required to consult the Corporation, under the Coal Industry acts, where development may affect coal mining interests. The Corporation has detailed records of those coal mines for which it has a direct, or an inherited, responsibility including abandonment plans for mines of coal and associated minerals by virtue of an agreement made with the then Department of Energy and the Health and Safety Executive. The Corporation has established a central computerised data service. This includes most of the coal mines in Great Britain. However, records in respect of "free mines" for coal in the Forest of Dean are held by the Forestry Authority at Coleford, Gloucestershire.

D5. The British Railways Board holds records and plans of mines in the vicinity of railway property dating back to the mid-19th century.

D6. The National Rivers Authority must be consulted, under article 18 of the GDO, where works or operations are carried out in the bed of, or on the banks of, a river or stream. It is prudent also to consult the relevant water companies since infilling of workings, for example, may divert, interrupt or affect the quality or quantity of underground or surface flows of water. In addition, it may be prudent to consult British Waterways in respect of mined ground close to waterways since disturbance of shafts can cause problems for these. Many shafts were sunk close to canals in order to facilitate easy loading and British Waterways holds a large amount of information on such mined ground.

D7. The Commission for the New Towns holds information in respect of Telford, Skelmersdale, Warrington and Washington.

D8. Where works may affect a scheduled ancient monument in England, consent is required by the developer, under the Ancient Monuments and Archaeological Areas Act 1979, from the Secretary of State for the Environment who is required to consult English Heritage. In Wales, applications for scheduled monument consent are made to Cadw, the Welsh Historic Monuments Executive Agency. English Heritage and the Secretary of State for Wales, as appropriate, are statutory consultees under the GDO, where works might affect the site of a scheduled ancient monument. Since scheduled ancient monuments form a small proportion of known archaeological sites it is useful to refer to records of sites held by the Royal Commission for Historic Monuments in England and by the Regional Archaeological Trusts in Wales.

D9. The National Association of Mining History Organisations has access to extensive knowledge of mined ground, takes particular interest in the industrial archaeology of sites, and has published guidelines on archive research (reference 16). The Institute of Mining History and Archaeology also has access to extensive information.

D10. The Nature Conservancy Council for England (English Nature) and the Countryside Council for Wales are statutory consultees on treatment works under the terms of the Wildlife and Countryside Act 1981 in respect of preservation of bat habitats and under article 18 of the GDO for development proposals on, or which might affect, designated Sites of Special Scientific Interest. The Countryside Council for Wales should also be consulted in respect of any developments which would, separately or cumulatively, have a significant impact on the visual amenity of the countryside or on public enjoyment of the countryside in designated landscapes of national importance.

D11. Advice on fauna and flora associated with mined ground can be obtained from the Institute of Terrestrial Ecology. Information on bats can be obtained from the British Cave Research Association and the Bat Conservation Trust. In addition, there are many local groups which record information on bat habitats.

D12. The recreational potential of , and many aspects of research on, underground spaces falls within the interests of the British Cave Research Association and the National Caving Association.

D13. A nation-wide review of mining instability has been completed for the Department of the Environment and the published results include a set of regional reports with 1:25,0000 scale maps which provide a useful starting point for identification of areas within which mined ground may cause problems (reference 1). In addition, the Department has commissioned a number of applied geological mapping studies of specific areas and the results include maps of mined ground. A list of these studies is available from the Minerals Division of the Department of the Environment.

D14. Apart from these major sources, information is held by a wide variety of organisations and individuals including some commercial concerns, museums, societies and private collectors.

D15. The addresses of specific organisations mentioned above are:

Bat Conservation Trust
The Conservation Foundation
Lowther Lodge
1 Kensington Grove
London SW7 2AK

British Cave Research Association
London
WC1N 3XX

British Coal Corporation
Mine Records Office
Hobart House
Grosvenor Place
London SW1X 7AE

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

British Railways Board
Mining Engineer's Department
Wyvern House
Midland Station
Derby

British Waterways
Greycaine Road
Watford WD2 4JR

Cadw
Brunel House
2 Fitzalan Road
Cardiff CF2 1UY

Commission for the New Towns
Glen House
Stag Place
London SW1E 5AJ

Council for British Archaeology
Bowes Morrell House
111 Walengate
York

Countryside Council for Wales
Plas Penrhos
Fford Penrhos
Bangor LL57 2LQ

Department of the Environment
Minerals Division
2 Marsham Street
London SW1P 3EB

English Heritage
Fortress House
23 Saville Row
London W1X 2HE

English Nature
Northminster House
Peterborough PE1 1UA

The Forestry Authority
Alice Holt Lodge
Wrecclesham
Farnham
Surrey GU10 4LH

Health and Safety Executive
Mines Inspectorate
St. Annes House
University Road
Bootle L20 3MF

Health and Safety Executive
Quarries Inspectorate
Daniel House
Trinity Road
Bootle L20 7HA

Inland Revenue
Mineral Valuer's Office
42 Eastgate
Leeds LS2 7LE
(for enquiries from Local Authorities only)

Institution of Mining History Associations
Department of Economic History
Amory Building, Rennes Drive
Exeter EX4 4RJ

Institute of Terrestrial Ecology
Monks Wood Experimental Station
Abbots Ripton
Huntingdon PE17 2LS

National Association of Mining History Organisations
c/o Peak District Mining Museum
The Pavilion
Matlock Bath
Derbyshire DE4 3NR

National Caving Association
27 Old Gloucester Street
London WCIN 3XX

National Rivers Authority
Rivers House, Waterside Drive
Aztec West
Almondsbury
Bristol BS12 4UD

Royal Commission for Historical Monuments in England
Fortress House
23 Savile Row
London
W1X 2JQ

Royal Commission on Ancient and Historical Monuments Wales
Crown Buildings
Plas Crug
Dyfed
SY23 2HP

# APPENDIX E

# INFORMATION ON MINED GROUND AND MINING DATA SYSTEMS

E1. This appendix makes reference to the nature and condition of information on mined ground, types of data system and their limitations, and their maintenance and costs.

## Types and condition of data

E2. Information on mined ground is very varied and includes maps, plans, cross-sections, drawings, aerial and other photographs, geophysical records, written accounts and other documents such as legal agreements, sales ledgers, transport records and newspaper accounts of subsidence. Whilst some of the information is published, a great deal is manuscript material held in archives and files. In addition to records devoted specifically to mining, useful incidental information may also come, for example, from accounts by travellers and historians, and the personal knowledge of researchers and of residents in areas of past mining. Mining information, therefore, is often, found amongst a great deal of other data.

E3. The physical condition of original documents is very variable. Early plans may be fragile and unwieldy. These may be valuable historical documents and owners may be reluctant to allow them to be handled, consulted or copied.

E4. The accuracy of records varies greatly. Whilst many plans and other documents were prepared by specialists such as engineers, surveyors, geologists or other trained personnel, a substantial body of information was recorded by less expert observers. The scales of maps vary greatly and it may be difficult registering exact positions of features depicted on early maps on modern ones.

E5. Whilst documentary evidence exists for many mines, significant numbers of unrecorded workings are discovered in the course of site investigations. Many of these were early mines which were not documented at the time or for which the records have been lost or destroyed subsequently. Only since 1850 has there been a legal requirement to keep mine records. Not until 1872 was there a requirement to lodge abandonment plans at the Mining Records Office. There is no requirement under Regulation 3 of the Miscellaneous Mines (General) Regulations, 1956, to send plans of mines employing less than 12 people to the Inspector of Mines for the district. In addition, some illegal and, therefore, unrecorded mining is known to have taken place since these requirements were introduced, for instance during the General Strike of 1926.

E7. Records, therefore, may not give a comprehensive indication of the distribution of mine workings and mine openings. However, records are usually sufficient for, at least, defining areas where there is a general local history of mining and geological conditions are suitable, and within which past mining may have taken place.

E8. Seeking and interpreting mining information requires considerable expertise and is a matter for properly qualified, experienced specialists such as mining surveyors or engineers and mining historians.

E9. A great deal of information additional to past records is obtained every year in the course of site investigations and works. Information on treatments carried out on disused mine openings and workings is widespread in, for example, site development records but only rarely has it been collated in order to be readily accessible. There is a case for improving the recording of such information in order to better inform future consideration of proposed changes to the use of land.

E10. There may also be a need to collate information on wildlife interests associated with mines, their historical or archaeological significance, and any current uses of mines or their openings, in order to assist in meeting planning, development and conservation objectives.

E11. Whilst there is a need for readily accessible, comprehensive information on mined ground to inform policy and decisions and there are a number of substantial existing sources of mining information (Appendix D) , other relevant information is widely dispersed and is not organised for rapid retrieval. Practical problems in securing these data include locating them, absence of indexes, staff effort involved in retrieving documents, and the commercial confidentiality and value of some types of information. Whilst the major collections have access arrangements for enquirers many smaller sources do not.

E12. It may be difficult, therefore, to carry out speedy and thorough compilations of relevant data, and crucial information may easily be missed. Searches for information prior to development of a particular plot of land are often duplicated unnecessarily. There are grounds, therefore, for collating information in a form which will improve efficiency. The information becomes most useful if it is abstracted and compiled into a rational and well-indexed system.

E13. The Department of the Environment commissioned a study of the most efficient and cost-effective systems for handling collections of data of varying sizes, including manual (card-index) and computer facilities (reference 9). In addition, a computerised system was developed for a trial area around Chacewater and St.Day in Cornwall (reference 17), which tested the feasibility of, and best

approaches for, collecting and collating mining data, aimed at authorities which do not have a database at present or are considering updating an existing facility. The following paragraphs outline various options.

## Types of mining data system

E14. Information may be organised into:

a. a cross-indexed catalogue of original documents designed to allow rapid location of the original data; or

b. a cross-indexed system containing data abstracted from original documents which may, in some cases, stand in place of the originals thus reducing handling and wear and tear.

E15. A simple catalogue may be all that is needed for a small data system whilst data abstraction may be needed to increase the utility of, and to protect large collections in which, records are used frequently. Since collections are widely dispersed, however, there is logic in keeping a central register of data so that sources can be readily located. Data systems incorporating abstracted information do not dispense with the need for original documents since these must be checked and re-interpreted during detailed work. However, such data systems do give an insurance against total loss of the information, for instance in a fire or flood.

E16. Both types of data systems can be organised either as:

a. paper copy such as a word index and master map or maps; or

b. a computerised database with or without facilities for graphical display of information and for printing out data and maps.

E17. The choice between these options depends on cost-effectiveness for the size and frequency of use of the data collection and the financial resources available for setting up the system. A well designed system may even reduce costs by saving considerable amounts of staff time spent in locating files. Effective manual systems exist already in a number of places and these may meet the requirement. However, modern micro-computers and the appropriate software may offer the most cost-effective solution for all but the smallest databases because, although initial investment is more costly, the subsequent operational costs are substantially smaller. Since converting a manual system into a computerised one can be excessively time consuming and expensive, there is an argument for computerising the information at the outset or, at least, storing data manually in a form which can be digitised later if necessary.

E18. Computer systems have the advantages of being:

a. easily reproducible for security of data and use in several places;

b. quicker for entry of new data;

c. directly linkable to graphics packages allowing custom-made maps to be produced quickly; and

d. a basis for a geographical information system (GIS).

E19. However, such systems also have some disadvantages. Computer technology is advancing rapidly thus hardware and software may become obsolete over a fairly short time scale. In addition, the longevity of material stored on computer is not yet known.

Problems due to incompatibility of equipment and computer language may arise where digital information is to be transferred into a system or where responsibility for keeping records of a particular area passes from one organisation to another which uses a different system. Computerised information may give a spurious impression of reliability and accuracy and needs, therefore, to be approached with a clear understanding of limitations on reliability and of the need to consult original records where appropriate.

## Preparation and maintenance of data systems.

E20. Preparation of a data system requires data to be located, collected, collated and stored. Since records, particularly old ones, may be difficult to interpret, data collection needs to be carried out by a mining surveyor, engineer or other appropriate specialist. Archivists and mining historians also, often, have a part to play. In addition, much information has to be located in terms of the National Grid and to be metricated from a wide variety of scales and units. This is time consuming and, therefore, expensive unless automatic methods are used.

E21. A wide variety of information may be stored but key categories (Figure 7) include:

a. mine openings which, with the exception of linear open-vein workings, are mainly point data;

b. mine roadways and drainage galleries which are essentially linear;

c. laterally extensive workings which, with the exception of some linear workings in veins, are areas; and

d. topographical and geological features within which unrecorded mine openings may be suspected.

Some basic sets of relevant headings are summarised in Table 5. However, more elaborate systems could take note of, and describe, for example, subsidence incidents or other relevant features such as conservation interests, uses of mines and mine openings, and treatment works which have been undertaken. It is important to record sources of data so that users of information can assess its reliability and original records can be readily traced.

E22. Data collection exercises can be a relatively expensive investment. The full value is realised only if, after the initial effort, data is added as it becomes available. Whilst this can be done by carrying out further searches at intervals, such an approach is relatively inefficient. It is desirable for planners, engineers, developers, and others to lodge data in appropriate databases as a matter of course for the common benefit of all users of mining information. It is necessary that the scope and location of data systems and the nature of information which is required should be widely understood if this is to be achieved.

## Limitations on data systems

E23. There are a number of limitations on the content and use of databases. Confidentiality of data is one of the most important. Some owners of original data may not wish to be disturbed by enquirers in which case access to original records may be impossible. Where information has a commercial value or is of a sensitive nature, it may be placed in a confidential archive. Alternatively, the system may contain only a brief reference to the existence of such information rather than any details of its content.

E24. In such instances, there are limitations on information which can be supplied to enquirers. It may be possible for the operator of a data system to secure agreement with the owner of data on the best way to proceed. The owner may agree to :

— release of generalised, but not detailed, information;

— the operator of the data system seeking specific permission for release of data; or

— the identification of ownership of the data so that any enquirer can seek permission directly from the owner.

E25. The recorded data should be as factual and complete as possible but interpretation should be left to the user. Guides to users of such systems should emphasise that no database of mining information is likely to be complete and that the onus rests on the user to ensure that no additional, unrecorded features are present in any site. Failure to do this might give rise to liability on the part of the owner of the data system. In addition, great care is needed to ensure that the content is accurately transcribed from original records to avoid any charge of negligence. It should be emphasised that the accuracy of the original records is the responsibility of those who made them and not of the owner of the data system.

## Costs of data systems

E26. The costs of preparing new data systems rest principally in the capital costs of equipment, the collection and compilation of information using appropriate expertise. Costs may also be incurred in adapting existing systems.

E27. It has been estimated (reference 9) that the initial cost of setting up a 1,000 record database on a personal computer would be of the order of £20,000, but with low running costs thereafter. The costs are likely to be several times higher in intensively mined areas. However, mining data systems exist already for a number of such areas and the costs of adapting these may be smaller. Advantage should be taken of existing facilities wherever possible.

E28. It may be possible to reduce the initial outlay by using computers acquired for other purposes. In areas where mined ground is very limited, paper records may be cost-effective but, in general, the costs of retrieving information from these is higher. In some cases, there may be economies in collaborating with other authorities or organisations in developing a data system. Operational and maintenance costs also need to be taken into account. These might be defrayed by provision of a chargeable service either provided by an authority or contracted out.

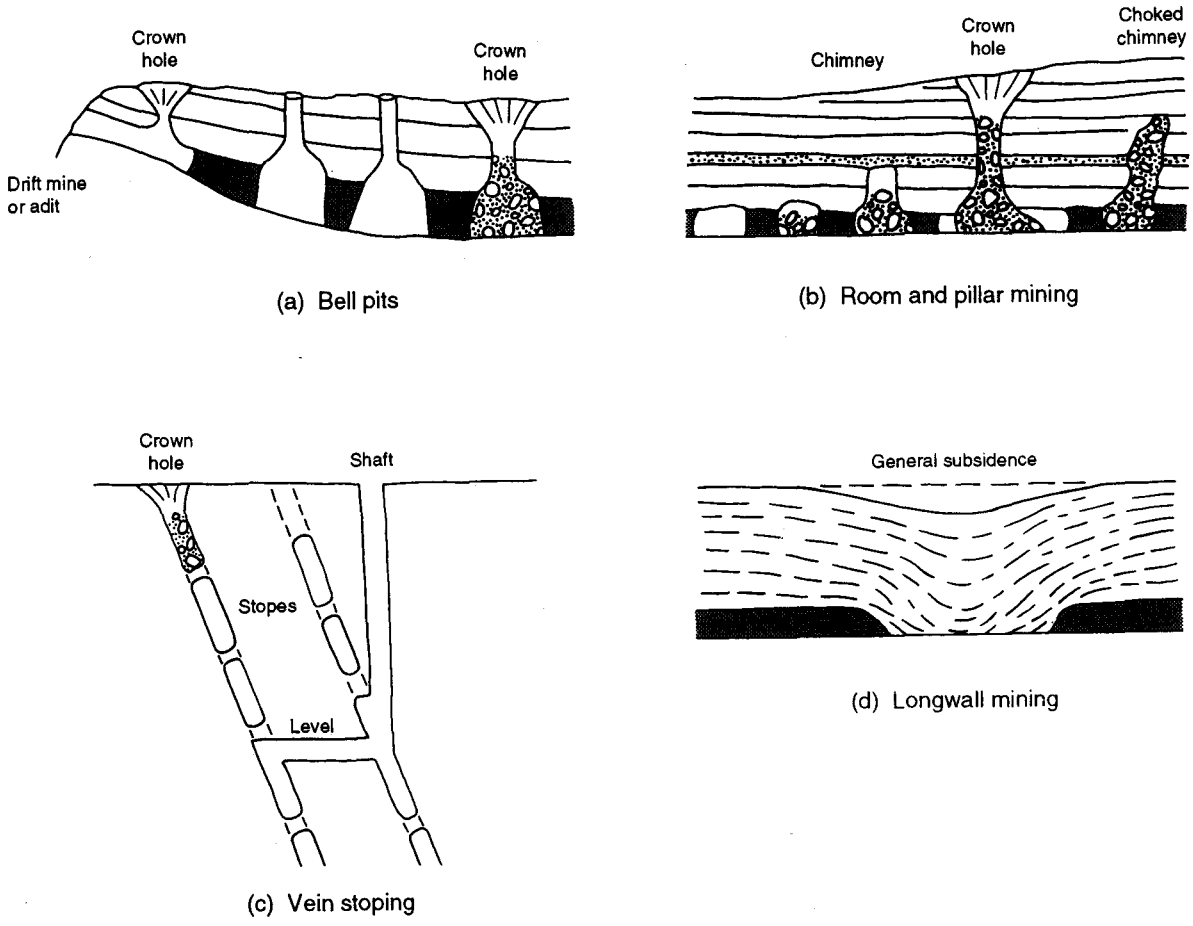



Figure 1: Types of mining and the effects of subsidence on the surface of the ground (Source: Reference 2)

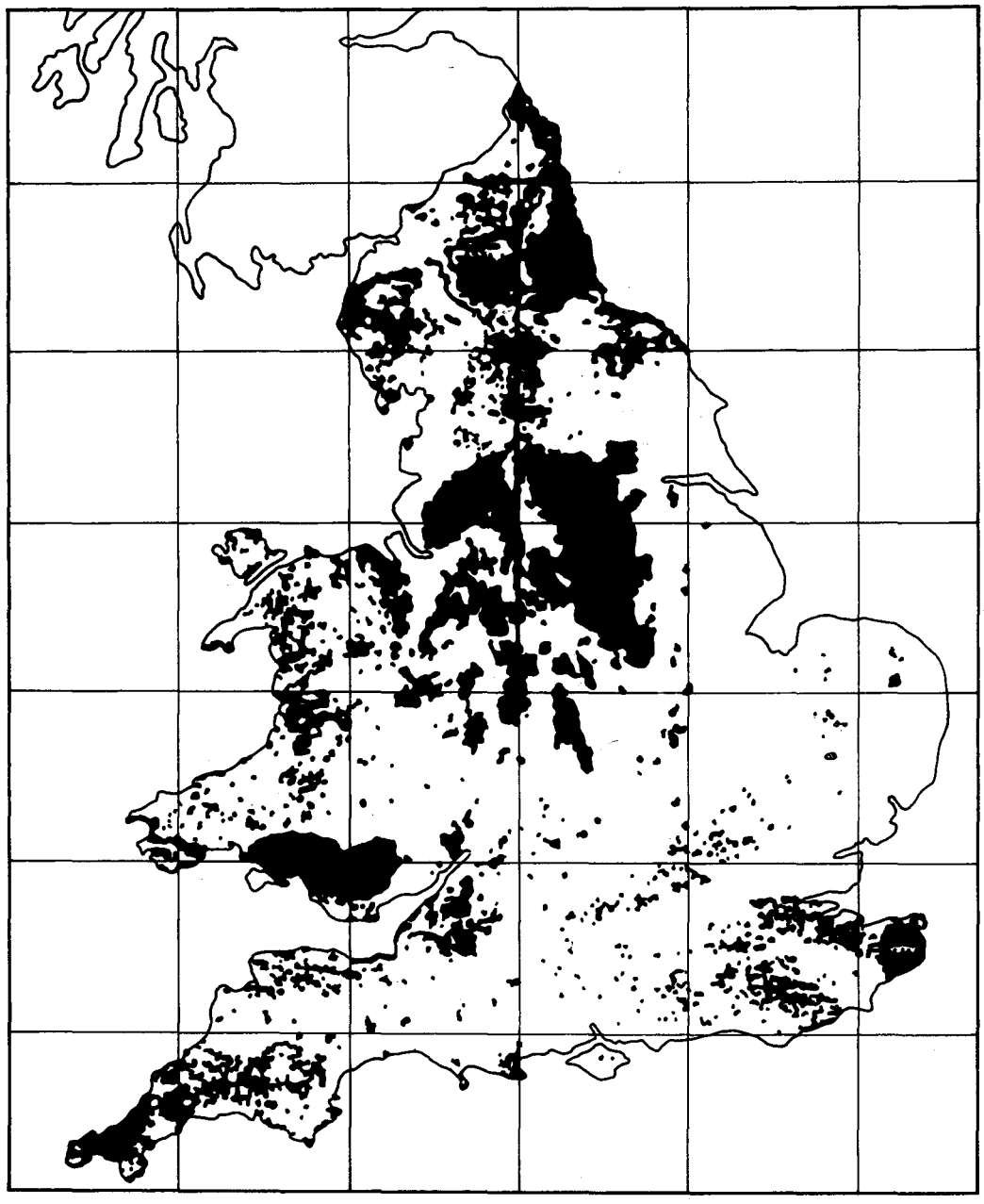


Figure 2: Illustrative map of the general extent of areas in England and Wales within which mined ground may be a material planning consideration (Source: Reference 1)

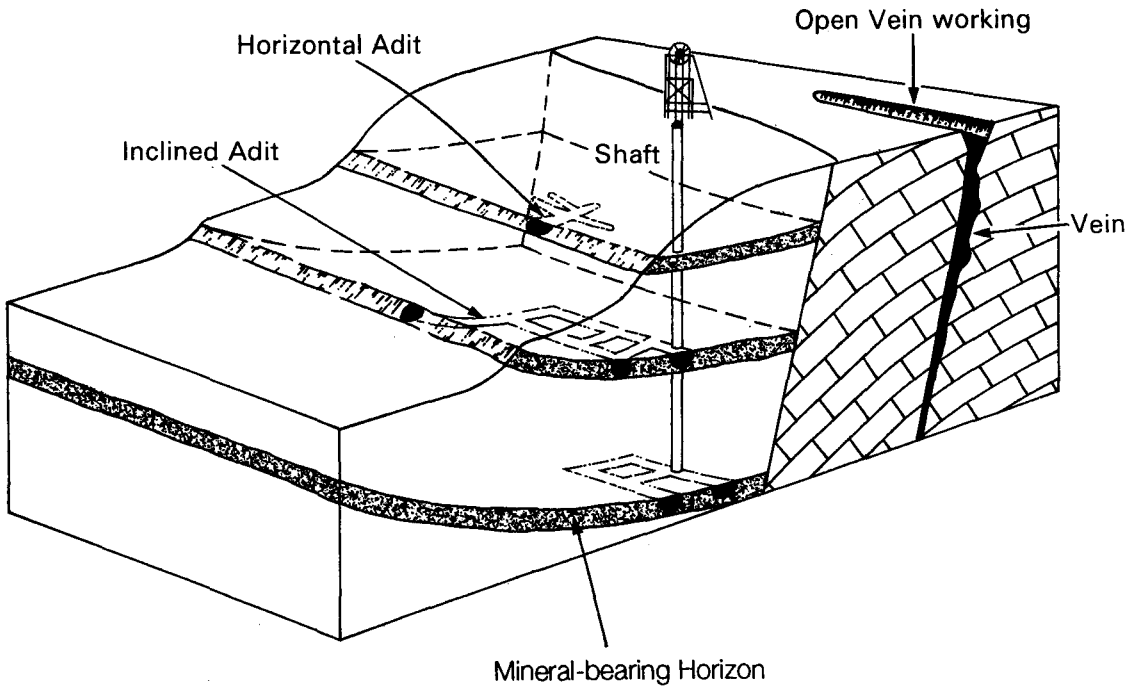
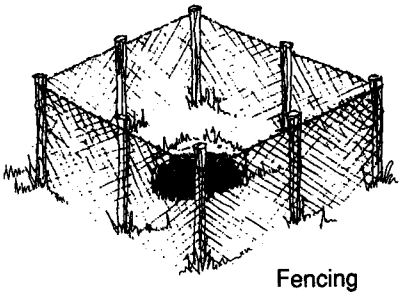
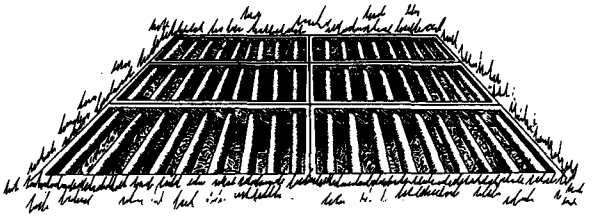


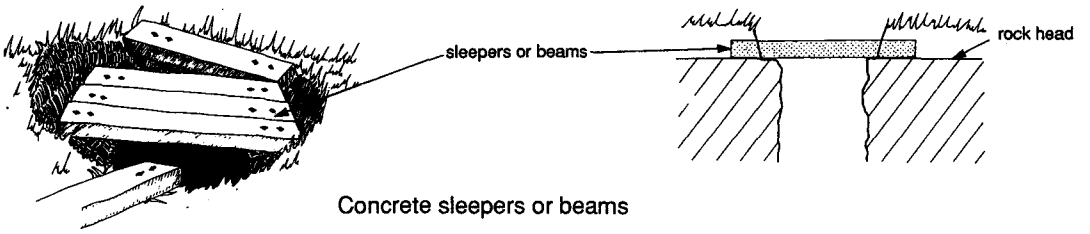

Figure 3: Types of Mine Openings



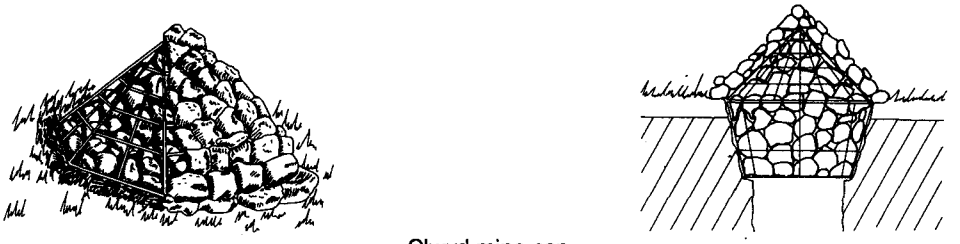
Fencing



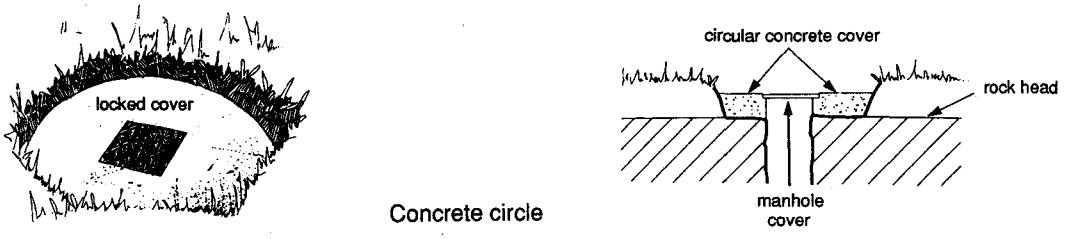
Grille



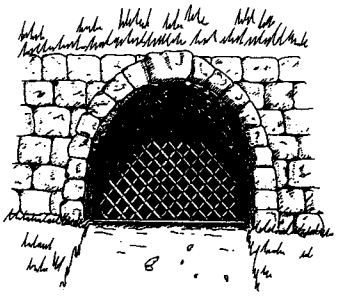

Concrete sleepers or beams



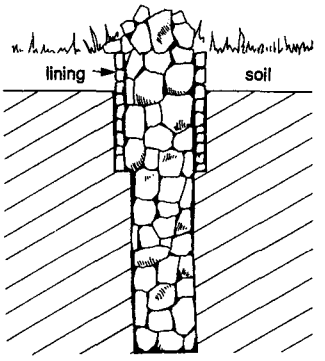
Clwyd mine cap




Concrete circle



Gate or barrier for adits




Filled shaft

*Note: The figure is given for illustrative purposes only and is not intended to show the best practice for treatment of openings since this should be assessed specifically for each opening to be treated.*

Figure 4: Examples of treatments carried out on disused mine openings
(Source: Derbyshire County Council "Code of Practice for Disused Lead Mine Shafts")

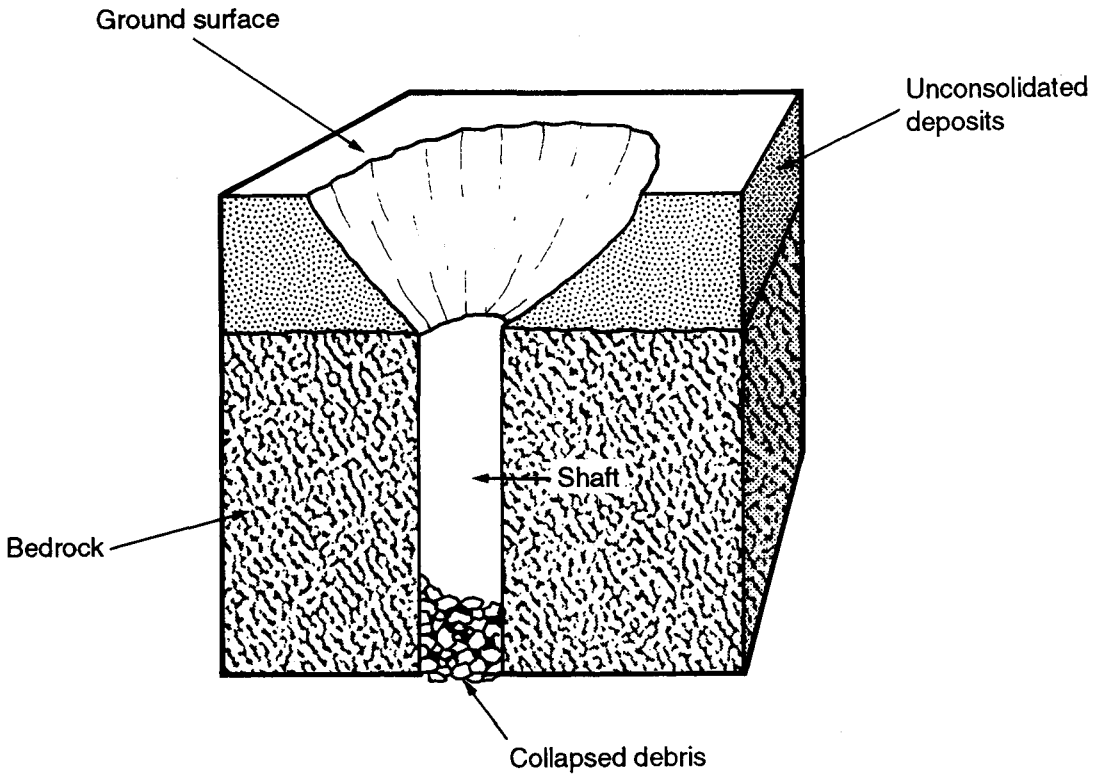
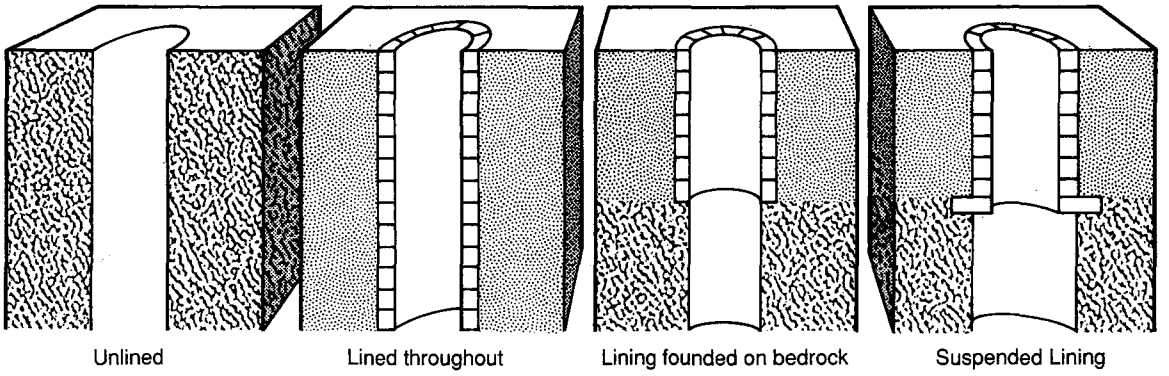



Figure 5: Collapse of Unconsolidated Deposits into a Shaft

A. Wall Characteristics




B. Shaft Condition

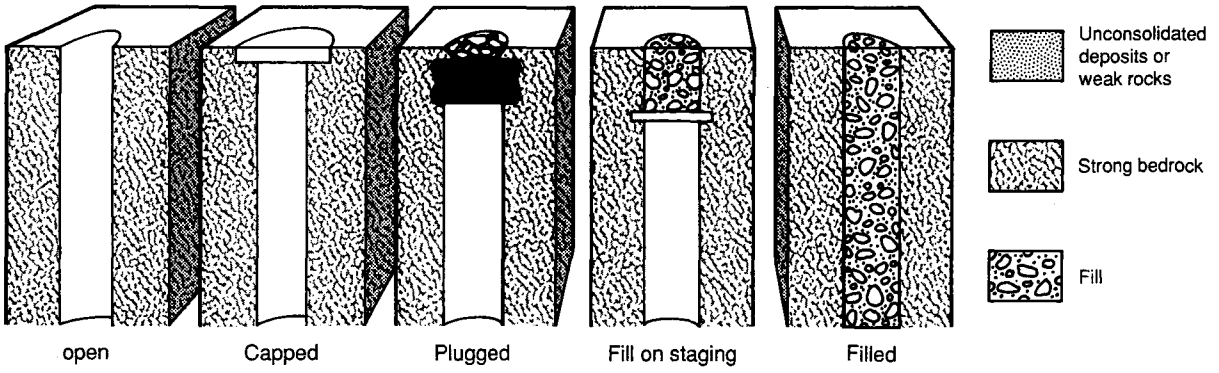



Figure 6: Characteristics and condition of Disused Mine Shafts

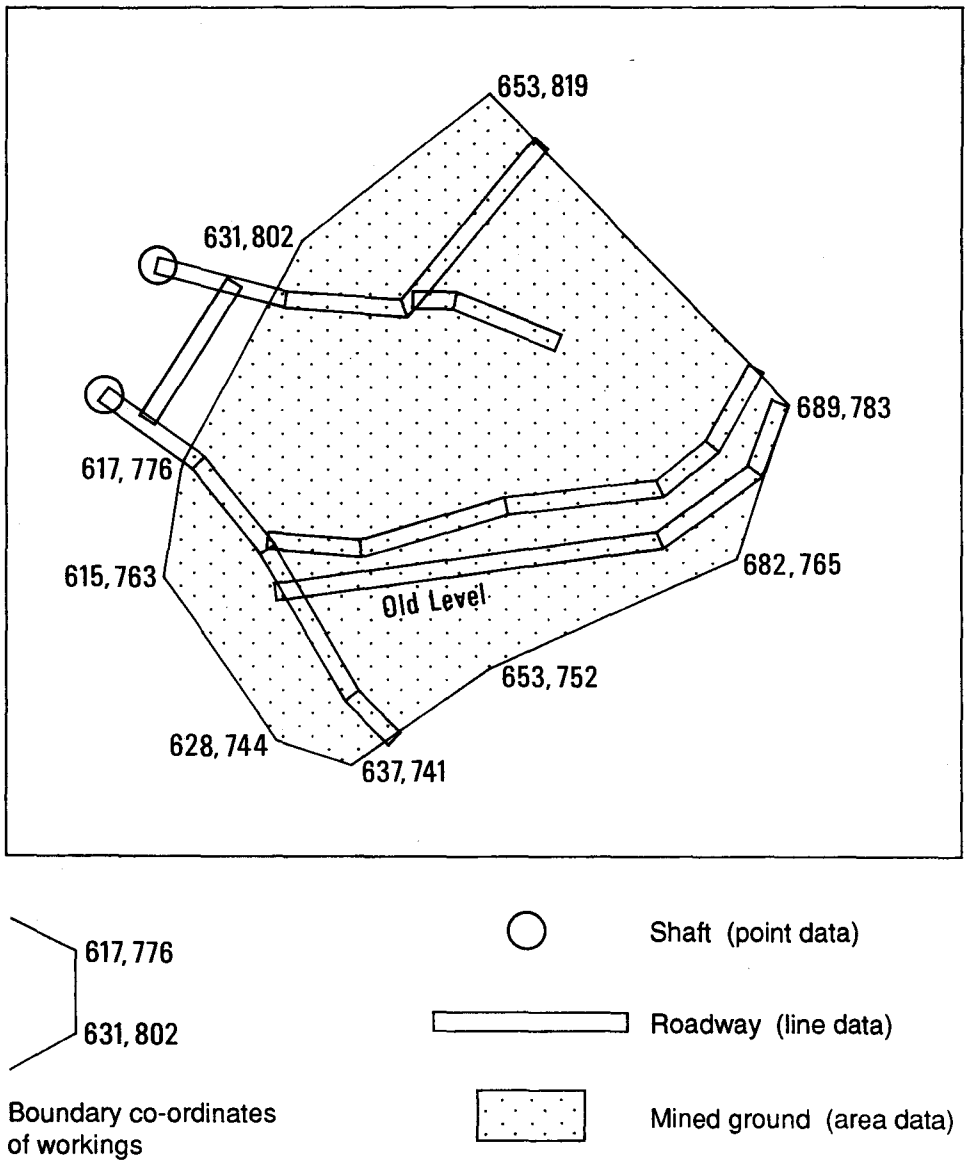



Figure 7: Example of a Digitised Mine Plan
(Source: Reference 9)

**Table 1 Types of treatments of disused mine openings**

| | | |
|---|---|---|
| General protection<br>(suspected opening cannot be located) | Netting | |
| Deterrents to entry | Warning signs<br>Mounds<br>Fences<br>Walls | |
| Partial closure of opening | Grid<br>Grille<br>Door<br>Gate | Beams<br>Cage<br>Cabin |
| Complete closure of opening | Cover*<br>Cap* | Plug*<br>Infilling |

Note: * These can be provided with openings such as manholes if access needs to be retained.

**Table 2 Data headings for mine workings**

(a) all workings:

| COMMON TO ALL | OPENINGS | ROADWAYS | WORKINGS |
|---|---|---|---|
| Identification code<br>Name<br>National Grid reference<br>Mineral(s) extracted<br>Whether directly surveyed<br>Source(s) of information<br>Location of original documentation<br>Comments | Depth (total)<br>Date of construction<br>Height (AOD)<br>Size<br>Shape<br>Inclination<br>Bearing | Line segment<br>- position<br>- width<br>- end points<br>- depths<br>- purpose | Boundary<br>- position<br>- depths (or depth contours)<br>Seam thickness/ vein width<br>Method(s) of working |

(b) additional information:

| |
|---|
| Ground surface profile |
| Type(s) of overburden |
| Thickness of overburden |
| Type(s) of bedrock |
| Groundwater level(s) |
| Additional subsurface information |
| Construction information |
| Adjacent shallow workings |
| Instability incidents |
| Gas problems |
| Existing condition |
| Conservation interests |
| Uses of mine or openings |
| Owner/tenant |
| Access |
| Interest groups |
| Treatment type and purpose |
| undertaken by whom |
| date |
| subsequent monitoring |

Note: the headings cannot be filled in for all mines and openings. A comprehensive record can be made only for directly surveyed and investigated mines.

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Printed in the United Kingdom for HMSO
Dd297753 3/94 C49 G531 10170