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# An evidence based approach to predicting the future supply of aggregate resources in England

Minerals and Waste

Open Report OR/11/008



Green Balance

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BRITISH GEOLOGICAL SURVEY

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# An evidence based approach to predicting the future supply of aggregate resources in England

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## Executive Summary

Securing continuity in the supply of aggregate minerals for the construction industry is a major objective of minerals planning policy and practice in Minerals Policy Statement 1: *Planning and Minerals* (MPS1) (DCLG, 2006). At the same time, there are numerous constraints on where minerals can best be obtained, led by geological availability and tight restrictions in protected areas. Over time, areas suitable for quarrying are worked out or encounter insurmountable obstacles to further operations, and new arrangements must be made. This research study sheds light on this process by tracking the supply of construction aggregates from existing sites; highlighting where and why supply problems can be expected to arise in the future; and suggesting ways of easing the transition where continuity of supply could be at risk.

Identifying land for future quarrying, and securing extraction, is a complex balance between markets, constraints, positive planning objectives and practicalities. This study illustrates competing issues and describes how they have been resolved, or otherwise, in strategic planning terms. Tensions in the aggregates supply pattern reinforce the need for a clear and equitable approach to deciding where aggregates working should take place and on what scale. The areas with greatest demands – the conurbations – are not the places where sufficient quarrying can readily be accommodated. Indeed whole counties and regions may be deficient in certain mineral types, and must import from elsewhere to meet their needs. Resource-rich areas need to be convinced that their exports to areas of greater demand or worse resource deficiency are sufficiently necessary to justify the environmental impact of working. At the same time, the locations where mineral companies are prepared to invest are strongly affected by the quality of mineral resources available, transportation to markets, and by the actions of competitors.

The starting point for the study is an evidence based analysis of the likely pattern of aggregates supply from planning permissions for quarrying which already exist. The most widely used indicator to the life-expectancy of these ‘permitted reserves’ is the landbank in an area, expressed in years. This equates to the number of tonnes of permitted reserves in operational and inactive sites (but not in statutorily dormant sites) divided by the annual rate of supply. Landbanks have a number of limitations, not least averaging out the circumstances at individual quarries so that the ability of individual companies to contribute to mineral supply can be unclear or even misleading. A key output of this analysis is a more accurate understanding of when individual sites will cease production (due either to their planning permissions expiring or their reserves being worked out) within a broad context of reserves with planning permission across an MPA area. This gives a clear indication of when and where alternative arrangements need to be made to ensure continuity of aggregates supply.

The study resolves this by the use of rundown charts. These collate information from individual quarries across an area, usually a Mineral Planning Authority (MPA). They are column charts showing from one year to the next first for reserves and second for annual supply how the industry is likely to operate using existing permissions. As the reserves are used up, both charts show steps downwards in reserves and supplies. Most data for the study are based on 2007, to identify likely rundown patterns at pre-recession rates of supply. The effect of the recession will be to enable permitted reserves to last longer.

Rundown charts are presented for numerous authorities and for different mineral types around England, showing how successful this method is at highlighting critical dates when shortfalls in supply can be expected. They can also help indicate the cause of the shortfalls. They illuminate the role of the productive capacity of processing plant, the contribution of inactive sites (whether brought back into use or remaining inactive), and the impact of the universal end-date of 2042 imposed on old mineral permissions which did not have their own specified end date. Many MPAs have more parlous supply positions than expected by government policy, particularly for sand and gravel, and by far the most important foreseeable shortfall in the medium- to long-term

is amongst the four rail-connected igneous quarries in Leicestershire producing around 15 Mt of crushed rock between them in 2007.

The most common and practical response to an emerging shortfall in the supply of an aggregate mineral is the allocation of new land for quarrying and the granting of additional permissions in the area. However, this may not always be a practical solution to the demand problem for reasons set out in the study. For example, these include:

- limited reserves remaining to exploit;
- MPAs may consider the constraints on further working to be over-riding; or
- mineral companies may not wish to develop the areas proposed by the MPA.

In these circumstances there may be a need to identify alternative supply arrangements, but the study found that this approach could also encounter obstacles. Not only is there resistance from the areas proposed for new or additional workings, but effective channels for resolving issues across regional boundaries do not exist. Addressing problems foreseeable within the next ten years is problematic enough, and very little attention is being paid to problems expected in the medium-term (2020 onwards) or beyond.

Consultations with a wide range of interested parties suggested that the issues most affecting continuity of supply could be broadly divided between three themes: uncertainty in the planning and investment process, environmental constraints, and adequacy of geological information to support planning for mineral supply.

The forward planning system exists to provide a measure of certainty for all parties about the type and location of development likely to be permitted. The study confirms previous work, showing that inadequacies in plan-making are discouraging aggregates proposals from coming forward. Some plans are out of date; others are not being prepared quickly enough; and changes to the planning system have created a hiatus in the preparation of some plans. MPAs also face increasing difficulties in assembling data to monitor the big picture for aggregates planning, as data is increasingly held back on confidentiality grounds (either by MPAs or mineral companies). Nonetheless, examples of good practice in long-term forward planning for minerals demonstrate what is possible, whether through co-operation between an MPA and a company, or between groups of companies and MPAs across authority boundaries.

Consideration of environmental issues focuses initially on the impact of nationally important landscapes and wildlife sites. As might be expected aggregates working has been resisted in these areas, though the study identified exceptions. There is debate over the weight to afford locally designated landscapes. This is in contrast to nationally designated areas for which clear government policy exists. The impact of wildlife designations appears to be of limited significance for national supply, though with important exceptions identified. These include nationally important igneous rock quarries in Leicestershire and limestone quarries in the east Mendips of Somerset. Wildlife designations can nonetheless be important in influencing aggregates planning at a local level, for example sand and gravel working in Cheshire.

The level of geological data required for planning for mineral supply varies considerably depending on the intended purpose. The adequacy of the geological database required to support long-term planning for mineral supply is variable across the country. Existing data provision, principally British Geological Survey (BGS) *Mineral Resource Maps*, are generally considered adequate for strategic level planning for mineral supply. Geological data which can prove indicated resources, specifically mineral quality and volume, is considered vital for the delineation of preferred sites and specific areas. The data currently available from BGS, with the exception of some areas covered by more detailed surveys, is generally insufficiently detailed for this purpose. Specially commissioned studies and mineral company information frequently supplement the national resource information. Some consultees suggested that a degree of reliance on operators for mineral resource information in some areas can result in a bias towards industry's 'preferred areas'. Confidentiality may also be a limitation to the use of industry data

and illustrates the continued need for independently sourced and compiled resource information. Furthermore, the growing shortage of minerals planning expertise in local authorities may increasingly limit the appropriate utilisation of geological information.

It is not practical to have more detailed mineral resource information in all parts of the country. However, a targeted approach to data acquisition is required in areas where significant constraints on supply are demonstrated and clear deficiencies in the evidence base occur. This is particularly important for nationally significant resource areas such as Leicestershire.

As a result of this assessment of aggregate resources, working sites and constraints, a number of supply issues have been identified. These include some major considerations, such as replacing the output from the Leicestershire igneous rock quarries and limestone from the Peak District National Park, and more localised issues such as alternative sand and gravel supply options in the West Midlands. These not only illustrate a range of problems but the need for appropriate procedures for addressing them. Any change in supply pattern required to compensate for reduced output from a constrained resource area will have environmental, social and economic implications. In no case is there a simple solution, but in all cases there is a clear requirement for a proper debate and prompt decision-making to avoid continuity of aggregates supply being put at risk.

# 1 Introduction

Brown and Highley (2006) highlighted that permitted reserves of primary aggregates have been in decline for a number of years. Thompson *et al.* (2008) examined the reasons for this decline, and highlighted that the introduction of new complexities into the planning system, as a result of the Planning and Compulsory Purchase Act (2004) could exacerbate this decline in the future. These reports have led to discussion and debate over the future supply of aggregate resources in England: if current reserves are in decline, where will aggregates be supplied from in the future. More generally, Aggregate Working Parties (AWPs) have also raised concerns about constraints on specific aggregate resources in their region, which will limit the supply of primary aggregates over the medium to long-term (2020+). These perceived constraints raise issues regarding the ability of certain MPAs to meet future apportionments, if additional aggregate resources are not identified.

Aggregates are the most widely used construction materials in the UK and are essential to the growth of a modern economy. Although England's aggregate supply is derived from a diverse range of sources (e.g. secondary and recycled, marine, land-won, imports), Mankelow *et al.*, (2008) concluded that land-won supply of primary aggregates from outside major designations is likely to remain the most likely alternative source of supply in the foreseeable future. Indigenous aggregates production also results in significant economic benefits to the English economy (Brown *et al.*, 2008).

Policies contained within Minerals Policy Statement 1: *Planning and Minerals* (MPS1) (DCLG, 2006) aim to ensure a steady and adequate supply of aggregates whilst minimising impacts on the environment. As reported in a previous study (Bee *et al.*, 2010), the continued application of MPS1 to '*protect internationally and nationally designated areas of landscape value and nature conservation importance from minerals development, other than in exceptional circumstances*' is likely to result in limited replenishment of permitted reserves within these designated areas. These areas are National Parks, Areas of Outstanding Natural Beauty (AONBs), Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites. For ease of reference in this report, the phrase 'protected areas' will be used to cover all of these designations. The continued application of these policies depends on the government's proposed reshaping of all planning policy.

With just under a third of aggregates currently being supplied from within nationally protected areas (Mankelow *et al.*, 2008), with the application of MPS1 a progressive shift of aggregates supply from within these protected areas to locations outside them is likely. This progressive shift is likely to be more pronounced after 21<sup>st</sup> February 2042 when operations without their own end-dates granted before 22<sup>nd</sup> February 1982 are required to cease production (under the Town and Country (Minerals) Act 1981). After this date these quarries will require new planning permissions if they are to continue. For those which are located within the protected areas, the effect of MPS1 will be that such permissions are likely to be more difficult to obtain than those outside, unless the protected area is unaffected by the proposal or there are considerations of overriding public interest.

Although 2042 appears to be a critical date, some large sites in protected areas are likely to be worked out or their planning permissions expire beforehand. Whether there will be an abrupt downward step change in output from quarries within these protected areas in 2042, or a more gradual decline leading up to this date will, therefore, depend on the pattern of quarry end-dates within individual Mineral Planning Authorities (MPAs). Where significant reductions in future output are highlighted by this study, there is a need to consider alternative sources of supply and the relative environmental implications of the resulting change in supply patterns. Although Ove Arup & Partners (2010) developed a number of qualitative scenarios for aggregates production in

2042 and beyond, using a horizon scanning methodology, there is currently a lack of quantitative evidence about projected ‘run-down rates’ for primary land-won aggregate in England. Evidence of specific supply constraints is also required to fully explore potential supply patterns to 2042 and beyond. This information will help mitigate possible supply disruptions, by enabling better informed planning decisions.

In response to a project specification prepared by the Department of Communities and Local Government (CLG), August 2010, the British Geological Survey (BGS), in consortium with Green Balance and Capita Symonds Ltd, was commissioned by the Minerals Industry Research Organisation (MIRO) to conduct such an evidenced based assessment of the future supply issues concerning aggregate resources in England.

The constraints identified during this study impact on supply over a range of timescales. They include short-term constraints on supply that are of immediate concern and may be impinging on current aggregate provision or are likely to affect supply during the current *Guideline*<sup>1</sup> period. Medium-term supply constraints which will be of significance for supply during the next *Guideline* period i.e. 2020 onwards; and long-term supply constraints will principally have implications for supply from 2030 onwards.<sup>1</sup>

## 1.1 OBJECTIVES OF THE STUDY

The overarching aim of the study is to identify the principal locations where shortfalls in supply might occur and use a sample of MPAs to illustrate the range of concerns about the nature of these issues.

The objectives of this study, as set out in the project proposal, are to:

- i) determine the principal constraints on aggregate supply in England;
- ii) assess the potential aggregates supply patterns to 2042 and beyond; and
- iii) identify case study areas considered to be priority areas for further investigation based on supply constraints and run-down figures, with a view to determining:
  - whether the existing geological database is adequate to support long-term planning; and
  - the environmental implications of the alternative supply patterns.

## 1.2 OUTLINE OF APPROACH AND EVIDENCE GATHERING

### 1.2.1 Consultation

Qualitative evidence on the future constraints on aggregate resource in England were obtained through structured interviews with the secretaries of all nine English AWP, five of whom also represented MPAs. The consultation aimed to establish where maintaining a steady and adequate supply of aggregate is deemed to be problematic within the current plan period or likely to be problematic in the future and to identify the particular types of supply constraint. Appendix 1 lists the meetings held with AWP Secretaries. The issues identified were followed up with a range of other consultees as detailed below:

- Numerous MPAs selected on the basis of the AWP interviews and pre-existing reported aggregate supply issues;
- the Planning Officers Society (POS); and

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<sup>1</sup> The numerical aggregates supply figures are currently stated in the *National and regional guidelines for aggregates provision in England 2004–2020* (2009). These are often supply called the *Guidelines*. The current *Guidelines* indicate how provision for the supply of aggregates should be met in accordance with anticipated need to 2020.



- the Mineral Products Association (mpa) and member companies (Lafarge, Tarmac) and the British Aggregates Association (BAA).

In each case discussions sought views on a range of questions (Appendix 2) to determine:

- those MPAs concerned about their ability to meet their share of the sub-regional apportionment of 2005–20 *Guidelines*;
- those MPAs concerned about their ability to meet requirements after 2020 (or the plan period) if demand remains similar to levels at the time of writing;
- specific types of aggregate resources that are perceived to be affected by constraints;
- where concerns are reported, whether there are indications of how a shortfall in supply could be addressed;
- the likely impact of the Governments proposed Localism Bill on future aggregates supply;
- the levels of geological data required to support long-term planning for aggregate supply and the key deficiencies; and
- concerns regarding future inter-regional supply.

### **1.2.2 Collation of rundown data**

The Project Team met in August 2010 to determine what it considered, based on existing knowledge, to be the ‘critical’ areas likely to affect the future supply of aggregates in England. Based on this understanding, the team approached the ‘critical’ MPAs to gather information required to track the way in which aggregates supplies from existing permissions in these authorities could be expected to decline in the future. Additional authorities were also approached, based on recommendations during consultation with AWP Secretaries and industry representatives.

In order to inform the research and provide evidence of when potential shortfalls in supply may occur, the prospective rundown of aggregate supplies within individual MPAs was established. The limitations of time and budget meant that this is restricted to a selected sample of what are deemed ‘critical’ MPAs. Analysis is supplemented by case studies arising from the consultation exercise and by a more generalised analysis using published data. An important part of the study has been to further develop in some detail a method for characterising the current rundown of aggregates supplies at the MPA level, which provides an insight into the scale and timing of potential shortfall in supply. The method used, assumptions made, the work carried out, the findings and a review of the results are described in Section 2 of this report ‘

Assessing rundowns in aggregate supplies’.

The remainder of the report is informed by the issues raised in the consultation and by the findings of the rundown study. These are grouped under four broad themes which represent the key supply issues identified. A section of the report is dedicated to each theme:

- i) Uncertainty in planning (Section 3);
- ii) The impact of environmental policies and protected areas (Section 4);
- iii) The adequacy of the geological database to support planning for minerals supply (Section 5); and
- iv) Maintaining a supply of strategically important aggregates resources — alternative supply scenarios (Section 6).

Section 6 is forward looking and responds to the principal constraints on aggregates supply identified by examining future alternatives supply scenarios for land-won aggregates. The environmental implications of alternative supply patterns are assessed and adequacy of the geological database to support planning for mineral supply in these specific areas is discussed. Key findings and recommendations are set out in Section 7.

The outcomes of the consultation on future constraints on aggregate resource in England have largely been absorbed into the report rather than recorded individually. The key issues raised are documented as case studies, under the most relevant theme.

Much of the technical information and the detailed findings from this research are included in appendices, leaving the main report as a summary of the work undertaken, the main findings and their potential implications.

## 2 Assessing rundowns in aggregate supplies

This section supports the investigation of Project Objectives 1 and 2, which aim to determine the principal constraints on aggregate supply in England and assess the potential aggregates supply patterns to 2042 and beyond, based on evidence from the rundown in reserves in selected MPAs.

### 2.1 POLICY BACKGROUND

The Managed Aggregates Supply System (MASS) is the term given to the mechanisms used for ensuring that the construction industry receives the aggregates it needs at the optimum balance of economic, environmental and social interests. Through their support for MASS successive governments have to date recognised that measures must be taken to ensure that areas well-endowed with mineral resources are able to provide for more than their own requirements, and send aggregates to consuming areas which cannot reasonably meet all of their own needs.

An aggregate landbank is the tonnage of already permitted reserves in operational and inactive sites (but not in statutorily dormant sites) within a specific local area at a given point in time. It is usually expressed in terms of number of years' supply at an average rate of output. Government policy on aggregates requires MPAs to grant sufficient permissions to maintain appropriate 'landbanks' of permitted reserves, so that continuity of supply is achieved. Policy on landbanks is a long established and integral part of the MASS. MPS1 (Annex 1) requires MPAs to use landbanks as an indicator of when new permission for aggregates extraction are needed. The landbank indicators are at least seven years for sand and gravel at the intended rate of supply and at least ten years for crushed rock aggregate. A longer period may be appropriate to take account of the need to supply a range of aggregates types and qualities, the location of permitted reserves relative to market and the productive capacity of permitted sites. These periods are intended to allow for the length of time it takes to apply for and obtain permission for aggregates extraction and then bring the site into production. Maintenance of adequate landbanks ensures that planning decisions are made which enables demand to be met. The maintenance of landbanks for sand and gravel and crushed rock, or, where there is a distinct market, for specific types or qualities of aggregates, is regarded as being of fundamental importance in helping to ensure that sufficient permitted reserves are available to be worked in the right place at the right time (Gunn *et al.*, 2008). The principle is straightforward: declining landbanks of permitted reserves indicate that the potential to supply aggregates is being eroded. The remedy to this is to grant more planning permissions to bolster an area's landbank.

### 2.2 CONTINUITY OF SUPPLY

The MIRO commissioned report '*Reasons for the Decline in Aggregate Reserves in England*' (Thompson *et al.*, 2008) drew attention to the ongoing reduction over time in the quantity of aggregates reserves with planning permission. New permissions were not keeping pace with the rate at which mineral was being worked (and other losses), for a variety of reasons. As a result, the landbanks of supply were in many parts of the country lower than the policy level. The current study addresses the apparently increasing challenge this represents to continuity and adequacy in the supply of aggregates, one of the key purposes of mineral planning policy.

### 2.3 AGGREGATE LANDBANKS AND THEIR LIMITATIONS

#### 2.3.1 Landbanks in principle

The main features of landbanks are:

- for aggregates they apply to supplying areas, not to individual quarries;
- types of aggregate which are not interchangeable should have separate landbanks;

- they apply to the industry as a whole, regardless of individual companies; and
- the permissions within them are expected to be genuinely workable.

At any one time in an aggregates producing area there are likely to be operations starting work on their planning permissions, in ongoing production and approaching the ends of their lives, with corresponding levels of permitted reserves at the individual sites. The threshold level of concern – a landbank in an area which falls below the preferred level of seven years for sand and gravel or ten years for crushed rock – takes this broadly into account. Landbanks provide an indicator of the degree of need for new permissions to be granted.

### 2.3.2 Landbanks in practice

Gunn *et al.*, (2008) indicate that ‘landbanks do not provide a fully satisfactory indication of the ability of localities to supply aggregates in the future’. Although landbanks are central to the operation of MASS, as this is one of the key performance measures of the system to be monitored, a range of complicating factors has long been recognised as reducing the effectiveness of landbanks as a tool for securing continuity of supply. MPS1 alludes to a number of these, of which two issues are particularly relevant to this research.

Firstly, landbanks are a proxy for the ability of the industry to supply aggregate but, given that almost all aggregates are processed before sale, the actual ability of the industry to supply aggregate is controlled by the existence or otherwise of processing plant. The key objective should be to sustain the ‘productive capacity’ of the industry. If a small number of sites have large permitted reserves (enough to ensure that an area’s landbank is comfortably in excess of the threshold levels of concern), then the landbank figure may fail to take into account the significance of other sites which are running out of workable aggregates.

Based purely on landbanks, an MPA, or a region (as illustrated by Case study 1), might consider that supply is not a problem. However, in some instances if a permission in one locality is about to expire and is not replaced, then the loss of that source might well cause a genuine shortage in local supply (as is illustrated by the concern expressed by the North East AWP for County Durham in Case study 2). It is often the case that production rates cannot simply be increased at sites with large reserves to compensate for the loss of sites where reserves have run out (or for various reasons it is not in the interests of those companies to do that).

#### **Case study 1: how data can mask different approaches to long-term planning**

According to the 2008 aggregate monitoring report, 31 % (45.5 Mt) of the total reserve of sand and gravel in the East of England region (138.5 Mt at end of 2008) resided in Cambridgeshire and Peterborough. At the end of that year, the landbank for the region as a whole stood at 8.7 years (based on the preferred apportionment method). However, this figure conceals a variation from 16.1 years in Cambridgeshire to 5.4 years in Norfolk and 5.5 years in Hertfordshire, which are well below the *Guideline* figure of ‘at least 7 years’ as stated in national policy for MPAs. The approach to long-term planning is clearly different in MPAs even within the same region and the rigidness of some authorities to maintain a landbank at exactly seven years rather than at least seven years has been cited as a deterrent to many operators from submitting applications. It can also, as in the case of Norfolk and Hertfordshire, lead to landbanks falling below the target whilst new applications are processed and potentially force some companies out of business (Thompson *et al.*, 2008).

The Surrey rundown charts provide an illustration of an authority where reserves are substantially locked up in a small number of sites (Appendix 6). The reserves chart shows that by 2019 the rate of reduction of reserves has dropped to a trickle, with 3 million tonnes (Mt) remaining available. However, the sales rundown chart shows a massive decline in sales rates in

the very short-term from the permissions available in 2007. It is clear that the reserves in existence are simply not available to the market, the reason being that much of the total reserve is locked up in a small number of sites with low output rates. MPS1 (Annex 1, paragraph 4.1) recognises this issue by advising that a lengthier landbank may be needed to take into account the productive capacity of permitted sites. This is in effect an admission that landbanks do not capture all the information needed to decide whether or not there is a risk to continuity of supply.

### **Case study 2: restriction of Magnesian Limestone in County Durham to a limited number of sites**

The North East AWP indicated concern over future supplies of magnesian limestone in County Durham, an important source of crushed rock locally, because of an increasingly limited number of sites. Concern was also expressed regarding the majority of reserves being held in a single site and consequent potential impact on supply.

While the overall permitted crushed rock reserve position in County Durham appears healthy (estimated at 109.6 Mt as at 31/12/2008) and will be further supplemented following the issue of the planning permission to extend Thrislington Quarry (by approximately 17.65 Mt), mineral extraction at two of the county's main magnesian limestone quarries (Aycliffe and Bishop Middleton) are scheduled to cease by the end of 2015. In 2008 approximately 44 % of the magnesian limestone sold from County Durham's nine magnesian limestone quarries and 28 % of the crushed rock sold from County Durham's aggregate quarries originated from these two quarries. In addition a third magnesian limestone quarry, Crime Rigg Quarry, is scheduled to cease extraction in 2021 (County Durham, 2010). Durham County Council indicates that, without further permissions, over time remaining permitted reserves of magnesian limestone will become predominantly bound up in a small number of sites under limited ownership (County Durham, 2010), contrary to advice in MPS1 and potentially limiting future supply. Nevertheless, Durham County Council considers that additional permissions should not be granted when significant quantities of permitted reserves remain to be extracted (Appendix 3).

Secondly, with reference to MPS1, a low landbank does not override the importance of maintaining the proper application of planning policies when determining a planning application for aggregates working. When landbanks are below the threshold level there is clearly greater pressure on MPAs to permit planning applications than would otherwise be the case. MPS1 states of the threshold levels: '*A landbank below these levels indicates that additional reserves will need to be permitted if acceptable planning applications are submitted*' (MPS1 Annex 1, paragraph 4.1).

The reliance on '*acceptable*' applications being submitted is important. The '*acceptability*' of a proposal is on the balance of all the relevant material considerations. Previous MIRO-funded research by Bee *et al.*, (2010) demonstrated that MPAs were overwhelmingly influenced in their decisions by the acceptability of planning applications for aggregates working in amenity terms, and hardly influenced at all by landbanks (though the position was not necessarily the same in decisions by Inspectors and the Secretary of State). This raises two important considerations. First, '*acceptable*' applications might be approved in any event even if the landbank is above threshold levels, so the landbank is an entirely subsidiary matter. Second, if a low landbank is afforded little weight in decisions on planning applications, then it may be failing to do its job in its own terms and its usefulness must be called into question. The large number of authorities in which landbanks have fallen below threshold levels (e.g. Thompson *et al.*, 2008 and Carter Jonas, 2011) suggests that this is the case.

In addition to the points discussed above related to MPS1, additional features of the landbank approach are that all reserves in inactive sites with planning permission are assumed to be

available and will be worked, whereas all reserves in dormant sites are not considered as they require further authorisation before working can recommence. Neither of these assumptions is reliable as some inactive sites are highly unlikely to ever be worked and dormant sites could potentially gain planning permission and contribute to future supply.

The combined effect of the issues discussed above is that landbanks do not provide an entirely satisfactory indication of how the remaining quantity of permitted reserves will affect continuity of aggregate supply. Accordingly, the reporting of landbanks alone could be considered insufficient as a basis for policy making or deciding planning applications.

## 2.4 RUNDOWN CHARTS

A starting point for the current project has been to find a more precise or robust source of evidence than landbanks to express any risk to continuity of supply. Central to the current project is establishing a more detailed understanding of the pattern of future rundowns in reserves held in existing permissions: when and where will supply be truly at risk and what are the causes? This would provide a sounder evidence base for considering the short- and long-term options for securing continuity of supply.

This study has developed further an alternative approach (as presented by Mankelow *et al.*, (2008, 2010)) to charting the availability of aggregate resources as a more effective means of highlighting threats to continuity of supply from individual MPAs. A similar approach was also adopted by Jackson (2010) but on a regional basis. The approach uses the same annual monitoring information collected by MPAs throughout England i.e. annual sales and the permitted reserves at the end of the year, by mineral type. Calculation of run down charts does rely on several simplifying assumptions (Appendix 4) and, therefore, does not take account of all possible factors and uncertainties.

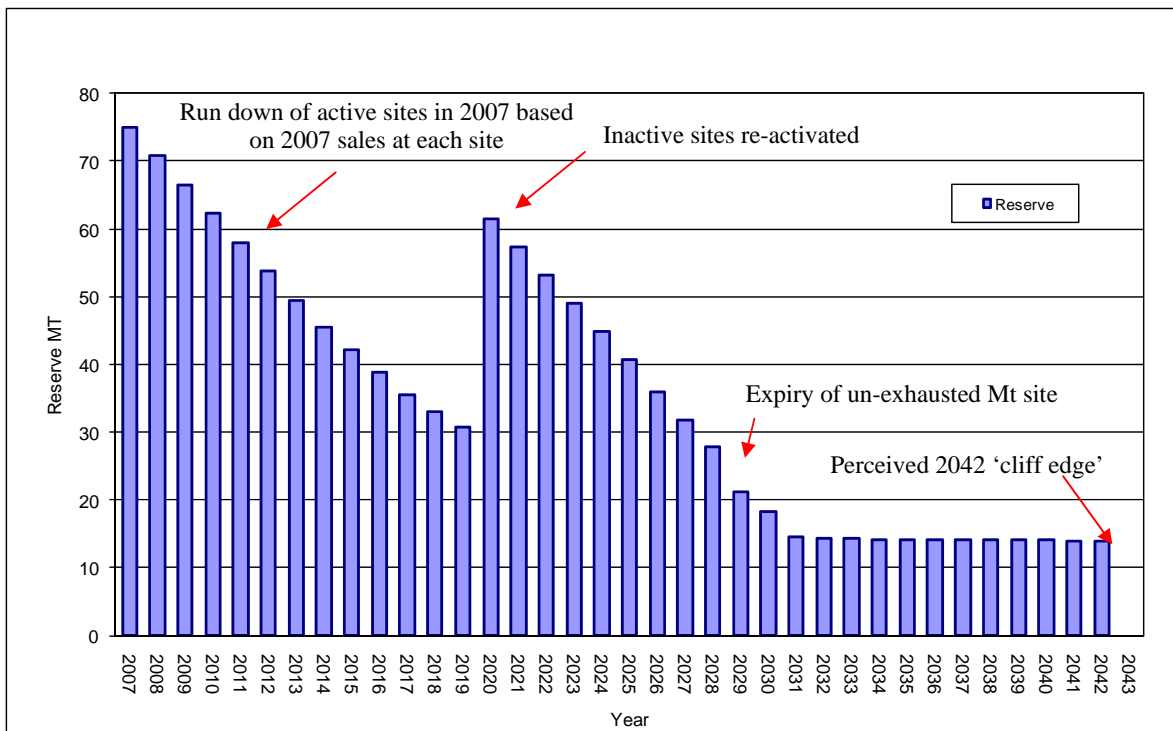
Starting with reserves, all permitted reserves at sites active in the year are summed and entered into a vertical column chart, with years on the x-axis (starting with the current year) and reserves (in millions of tonnes) on the y-axis. The objective is to estimate the height of columns for future years, assuming that no further planning permissions are granted. The assumptions used in the compilation of the column entries for future years can, broadly, be used to overcome the limitations of landbanks, as follows.

- i) The key determinant of future column entries is the loss of permitted reserves (from the total in the left-most column) due to sales from active sites. The rate of sales from each site is an assumption. This might be the continuation of the most recent year's sales rate (this study assumes as standard the continuation of 2007 sales rates), the average of recent years' rates, the policy rate of supply in the MPA's development plan, or the sales rate needed to achieve the supply rate in the MPA's apportionment from the regional *Guidelines*. Each year the height of the column of permitted reserves will decline to reflect sales the year before, so the chart steps down to the right.
- ii) When a site is worked out, no more sales can take place from the site and the stepping-down of the columns to the right flattens out in response. When a site becomes time-expired but with reserves remaining in the site, the remaining permitted reserves are lost and the next column steps down more sharply to reflect this. The overall shape of the column chart gives a clear indication of the way in which permitted reserves will run down, in a visually impressive way, which cannot be achieved with landbank data.
- iii) Inactive sites can be incorporated into the chart. Where it is known that inactive sites are to be phased into use as others are worked out, or there is a reliable prospect of future working, then the reserves in those inactive sites can be incorporated from the outset (left-most column). Where the likelihood of them coming back into use is less clear, assumptions must

be made about how to use the information. The availability of these sites can be indicated by assuming that they should only appear on the chart in later years, causing an uplift in the level of permitted reserves that year relative to what it would otherwise have been. Large reserves at inactive sites can cause a significant spike in the chart. Examples are used in this report to show the effect of presenting inactive sites in different ways in the rundown charts. Once included, an assumption must be made about the rate of sales from these sites, now assumed to be active. This study has assumed (unless otherwise indicated) that when inactive sites recommence they will be worked at the rate they experienced immediately prior to their suspension, though this may be unrealistically low if output was being run down prior to suspension. If any sales at all are assumed, the gradient of the decline of reserves in the chart will be steeper than it would otherwise have been.

- iv) Reactivated dormant sites will appear on the column chart as a sudden uplift in the level of permitted reserves. There should be no need for any of the assumptions required for inactive sites with uncertain futures, as the reserves will have been identified in the decision on the controls over reopening, and the sales rate will be established from annual monitoring. Dormant sites have not been included in the rundown charts in this study, because there is no certainty that they will be reactivated.
- v) All sites without their own end-dates have been given the end date of 22 February 2042, so any permitted reserves remaining at such sites at this date will then be lost. One of the purposes of this study has been to examine to what extent 2042 presents a ‘cliff-edge’ for permitted reserves on the rundown charts for each area.

An indication of how the chart might look is given in Figure 1.

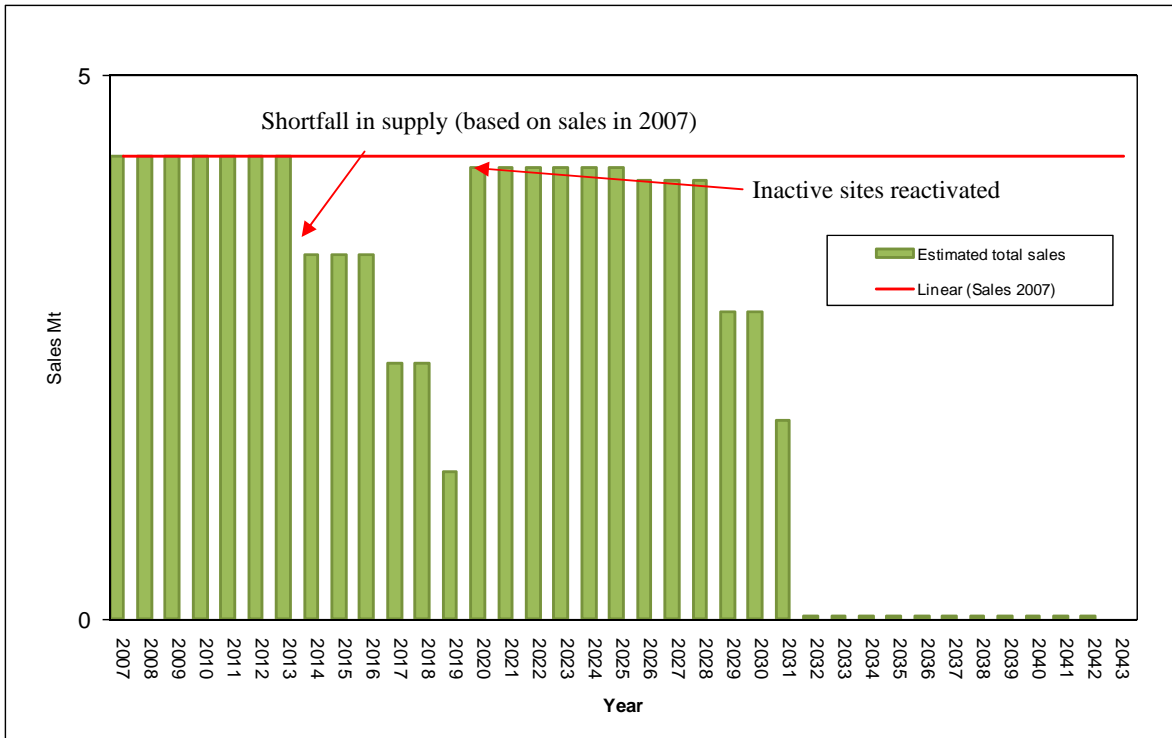


**Figure 1.** Example of a possible run-down graph of permitted reserves for a major crushed rock producing MPA.

At the same time as preparing a rundown chart of permitted reserves, the sales information used as an input to it should also be presented in its own column chart. In a similar way to the column chart on permitted reserves, the sales chart should have the current year’s sales from all active

sites presented in the left-most column. A similar process is adopted to populate the columns for sales in future years. The sales chart is perhaps the more important of the two: it is, fundamentally, the pattern of future sales which the reserves can support which matters for mineral planning, more than the level of reserves per se.

The shape of the sales chart is likely to differ from the reserves chart (Figure 2). Instead of a reasonably gradual rundown in supplies, the expectation would be for a continuation of sales at the assumed rate until either a site is worked out or the permission expires. There will then be a downward step-change in supply from sales. The sales rate is unlikely to rise from one year to the next: the reactivation of inactive or even dormant sites would generally be in response to the loss of another site, rather than to increase the annual output from an area. Figure 2 shows a possible effect of reactivating inactive sites in 2020.



**Figure 2.** Example of a possible run-down graph for sales of permitted reserves for a major crushed rock producing MPA.

The especially valuable insight which the sales chart offers is a measure of productive capacity in the industry. It shows how much aggregate supply the permitted reserves are genuinely capable of sustaining, and also the critical dates by which steps must have been taken to maintain output or substitute it by other means. Comparing the sales and reserves charts will show, for example, when sales cannot be sustained even where there are apparently large permitted reserves.

Each time a new planning permission is granted for aggregates working, or perhaps annually, the charts can be revised to a new base. Provided there are data from numerous sites there should be no difficulty with confidentiality of the information, as individual sites cannot be identified. It is only in the years when there is a change in the pattern of the stepping down of the charts that site information might possibly become apparent. As the end dates of planning permissions are public knowledge, these could be tied to pronounced step changes in the charts in those years to give an approximate measure of the circumstances at an individual site, notably on the assumed sales from the site in years up to that point. However, as future sales are only an assumption, this



too may be acceptable to companies within the confidentiality agreement accompanying the annual monitoring surveys.

#### **2.4.1 Rundown findings in sample MPAs**

The rundown approach is discussed further in Appendix 4, together with proposals for a nationally consistent method of recording rundown information and a list of MPAs for which rundown charts have been prepared. The rundown analyses for crushed rock for aggregate in selected MPAs is presented in Appendix 5, whilst the analyses of the rundown of sand and gravel for aggregate for selected MPAs is presented in Appendix 6.

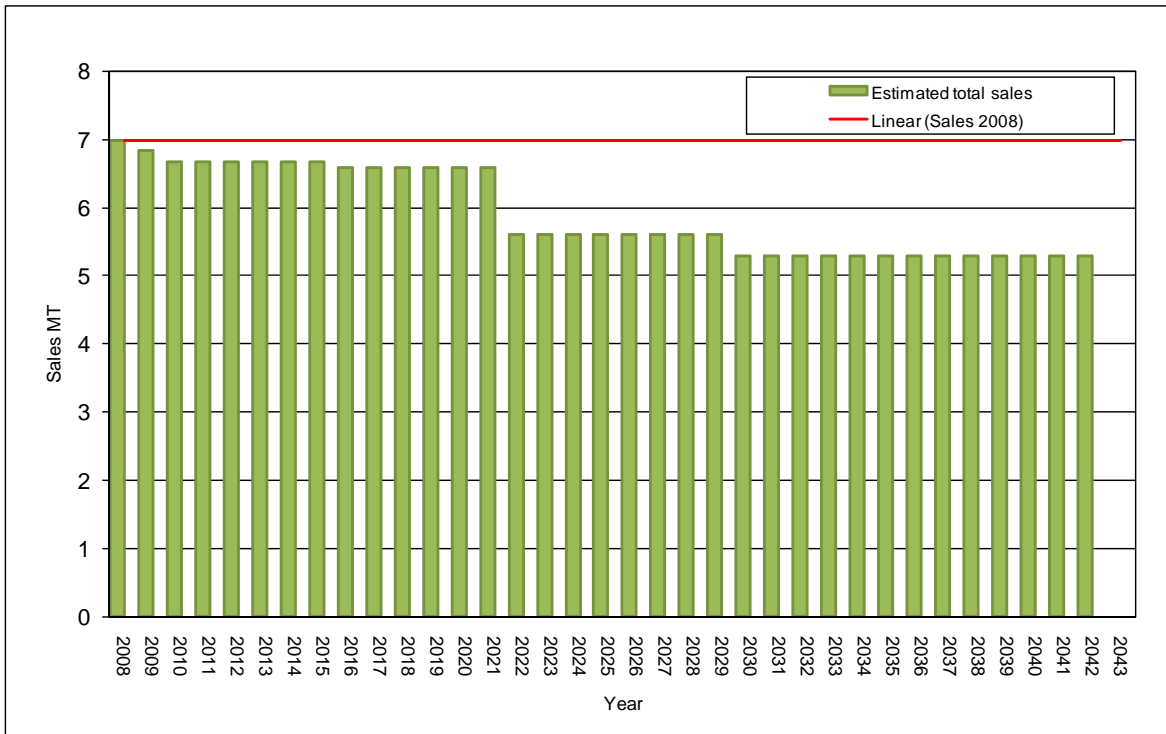
The rundown charts show how successfully the method works, revealing details about the rundown in reserves that the landbank approach overlooks. The common experience is for the most part that the rundown in reserves is not evenly spread over time; the graphs, especially of sales, do not step down evenly from one year to the next until the reserves are all used up. Rather, the declines tend to be focused on pronounced step changes, particularly when larger producing sites cease operations. The timing of these large step changes give a useful indication to mineral planners, industry and MPAs as to the dates by which alternative supply arrangements need to be established. Sometimes the future supply of aggregates is shown to be ‘front-end loaded’, with provision in the short-term but rapid declines thereafter (e.g. sand and gravel in Worcestershire) whereas elsewhere there can be a long-term commitment to a low level of output (e.g. sand and gravel in Nottinghamshire). The rundown approach, as previously discussed, can also highlight where an authority’s reserves are substantially locked up in a small number of sites (e.g. Surrey).

The rundown charts can also be used to address general issues which are not obvious from the landbank approach, as described below.

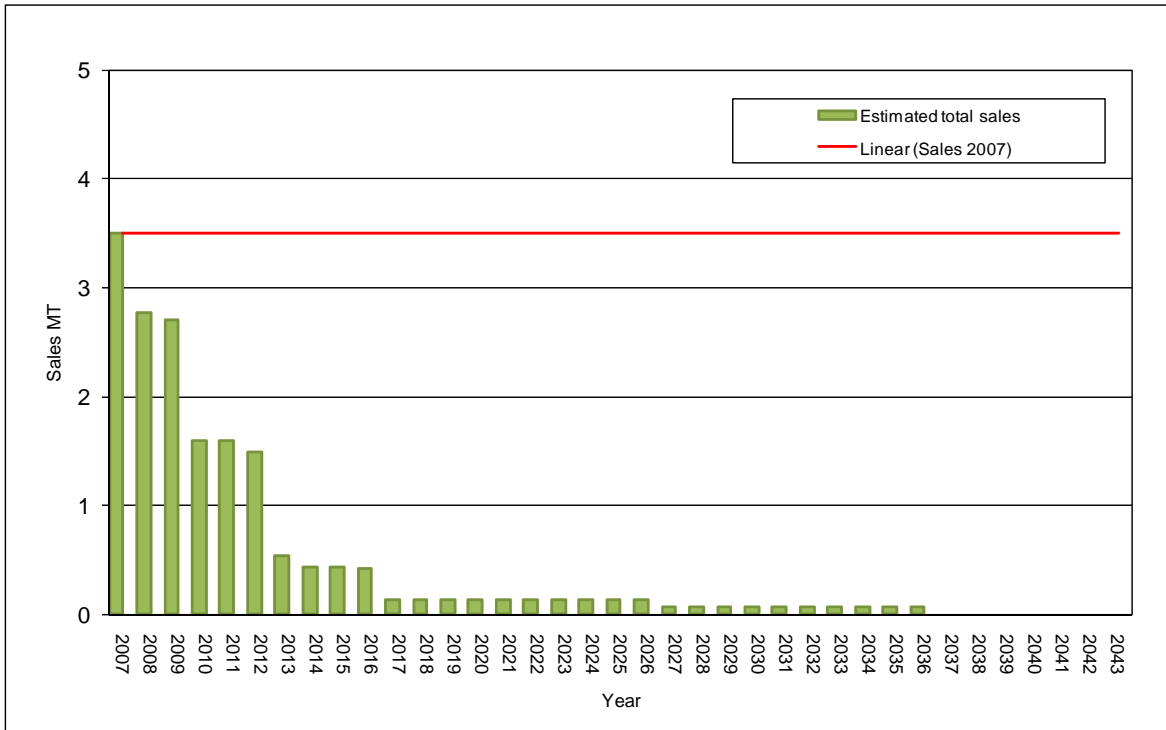
##### **2.4.1.1 PRODUCTIVE CAPACITY**

Derbyshire County Council is unusual in nearly being able to sustain its rate of crushed rock production in 2008 for 35 years using only the permitted reserves that were available in 2008 (2007 data was not made available for Derbyshire). Figure 3 shows that there is only a very limited decline in output over the years. The chart does not include sales from currently inactive sites, which represent a further buffer to enable it to meet sales requirements. Maintaining the productive capacity for rock in Derbyshire does not appear to be a major problem for the county based on the analysis of sales data from this project.

Nottinghamshire is the largest producer of sand and gravel in the East Midlands. Figure 4 shows that its average sales rate has been 3.7 million tonnes per annum (Mtpa) in recent years and that the county had a landbank of 7 years at the end of 2007. The sales rundown chart shows that important contributing sites will cease operations after working in 2007, 2009 and 2012. After just five years the productive capacity of the county would be only about 0.5 Mtpa from permitted reserves available in 2007. This is a much more rapid erosion of the county’s productive capacity than would have been apparent from the landbank figure. Part of the explanation for this sales pattern is that over one fifth of the reserves are in inactive sites with uncertain reopening dates, but the main cause is that some significant supplying quarries are expected to cease operations in the short-term. The rundown chart alerts the MPA and industry to the desirability of finding ways to maintain productive capacity in particular by those dates when sales fall away.



**Figure 3.** Estimated decline in sales of crushed rock for aggregate from active sites in Derbyshire.



**Figure 4.** Estimated decline in sales of sand and gravel for aggregate from active sites in Nottinghamshire.

The rundown approach can also identify where a permission in one locality is about to expire and if it is not replaced, or working extended, how the loss of that source might affect local supply. The Old Moor extension of Tunstead into the Peak District National Park has an end date

of 2040. It is likely that the reserve in this permission will not have been worked out by 2040 and if the permission is not extended or an alternative source is not identified, the impact on local supply could be considerable. To respect confidentiality, the rundown chart prepared in this study for Derbyshire includes the Tunstead Old Moor site, but an end date of 2042 is used, so the dramatic drop in reserve from this individual site cannot be seen separately from that observed by all sites with 2042 end dates (Figure 3).

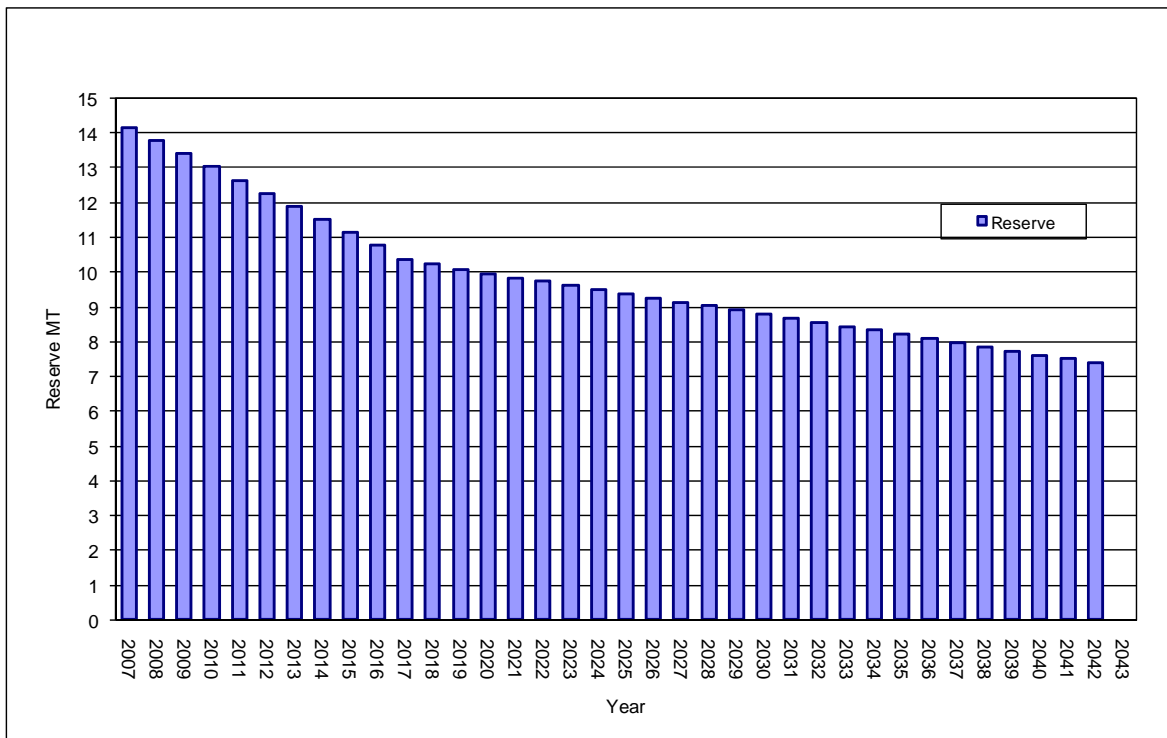
#### 2.4.1.2 INACTIVE SITES

Landbanks of permitted reserves include reserves at inactive sites. However, this can give a misleading impression. Figure 5 showing crushed rock supply in Northamptonshire indicates that permitted reserves were 14.2 Mt at the end of 2007, sufficient for a landbank of 36.3 years. However, the reserves figure includes an estimated 10 Mt in an inactive former ironstone working. If this is excluded the remaining reserves of 4.2 Mt (Figure 6) would provide a landbank of 10.7 years. Without knowing when (or if) the inactive site will be reopened, or the rate at which it would be worked afterwards, the reserves in the inactive site are misleading and should be excluded from the rundown assessment. The rundown chart of the remaining crushed rock sites gives a more accurate picture of the future pattern of supply (Figure 5). In MPAs with large quantities of reserves in inactive sites, the overall pattern of rundown of reserves is affected by the assumptions made about date of reactivation and rate of rundown. This is illustrated in Appendix 5, where the position in Leicestershire is reviewed. Two rates of rundown are shown for both reserves and annual supplies. In the first pair of cases inactive sites are excluded (Figure 7 and Figure 8), while in the second pair all the 90 Mt of reserves at inactive sites are assumed to be reactivated in 2020 and then operated at the rate they were operated in their final year of working before suspension (Figure 9 and Figure 10). The review shows that reopening inactive sites is unlikely to enable the MPA's 2007 rate of working to be resumed, but that output can be sustained for many years at a rate of about 3.5 Mtpa, higher than would otherwise have been practicable. This provides more insight into the output which the county can sustain than a landbank figure.

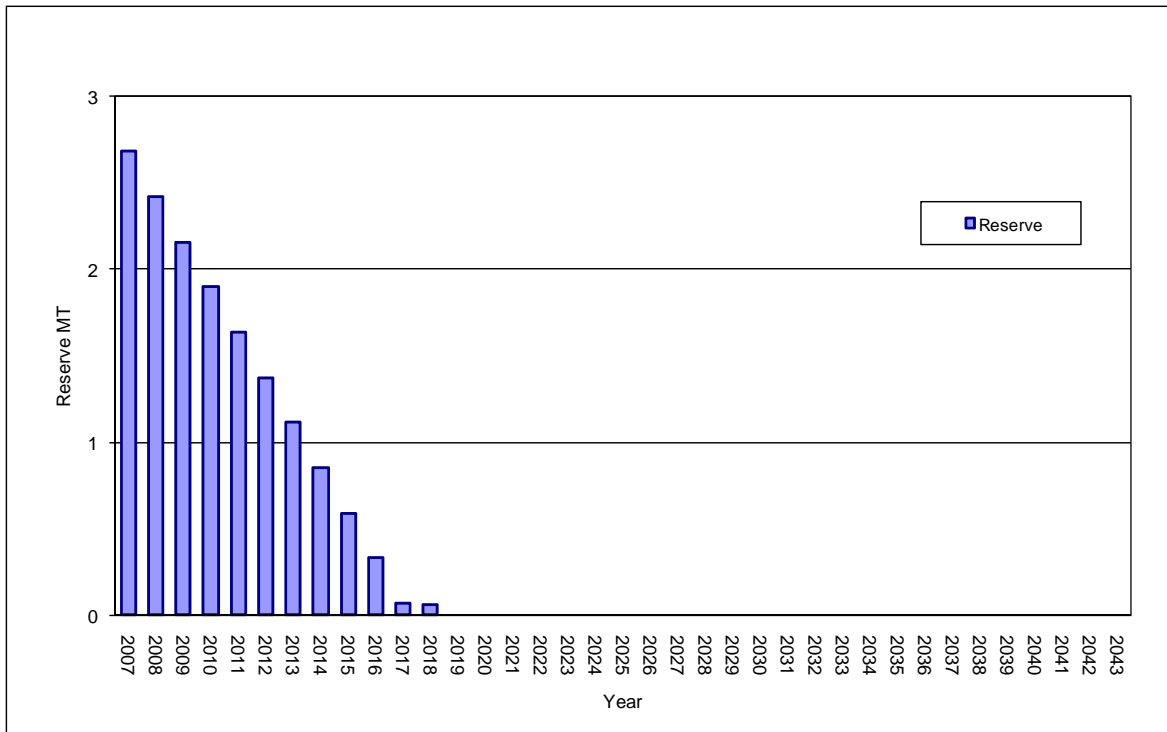
An additional point arising from the study of crushed rock reserves in Northamptonshire is that the ironstone in the inactive site is typically only suitable for very low specification aggregate uses such as constructional fill, which contributes less than 0.2 % to total national aggregate supply in England. As with the use of landbanks, the rundown methodology needs to address the merit of presenting all resources in the same table, irrespective of their quality (for more discussion about quality of resources see Section 2.4.1.5).

#### 2.4.1.3 THE IMPACT OF 2042

Most planning permissions for aggregates working have imposed on them a condition specifying the end date by which time the winning and working of mineral must cease. Many mineral operations in England, including several within what are now protected areas, were established prior to 1948 and were authorised to operate under the planning system through Interim Development Orders (IDOs). The Town and Country Planning (Minerals) Act 1981 imposed a condition stipulating that all the operations with permissions granted prior to 22 February 1982 (or deemed to be granted by IDOs) but without their own end-date must cease no later than 21 February 2042 i.e. 60 years later. Where reserves still exist in these sites by 2042, or there is geological capacity to extend the permissions, it will be less likely that new planning permissions are granted to extract resources within internationally and nationally designated areas of landscape value and nature conservation, under the policies in MPS1, than in locations outside (this is unless the reasons for their designation would be unaffected by the proposal or, there are imperative reasons of overriding public interest).

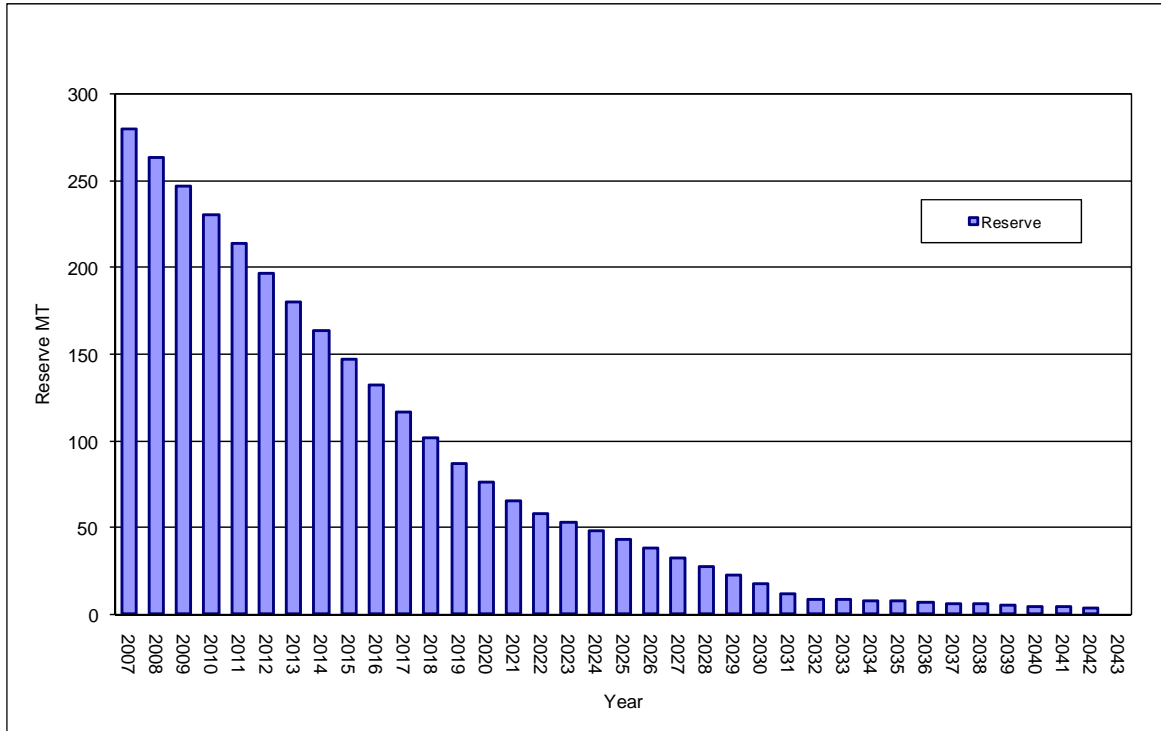


**Figure 5.** Estimated decline in reserve of crushed rock for aggregate from active sites and one inactive site, with approximately 10 Mt reserve, in Northamptonshire.



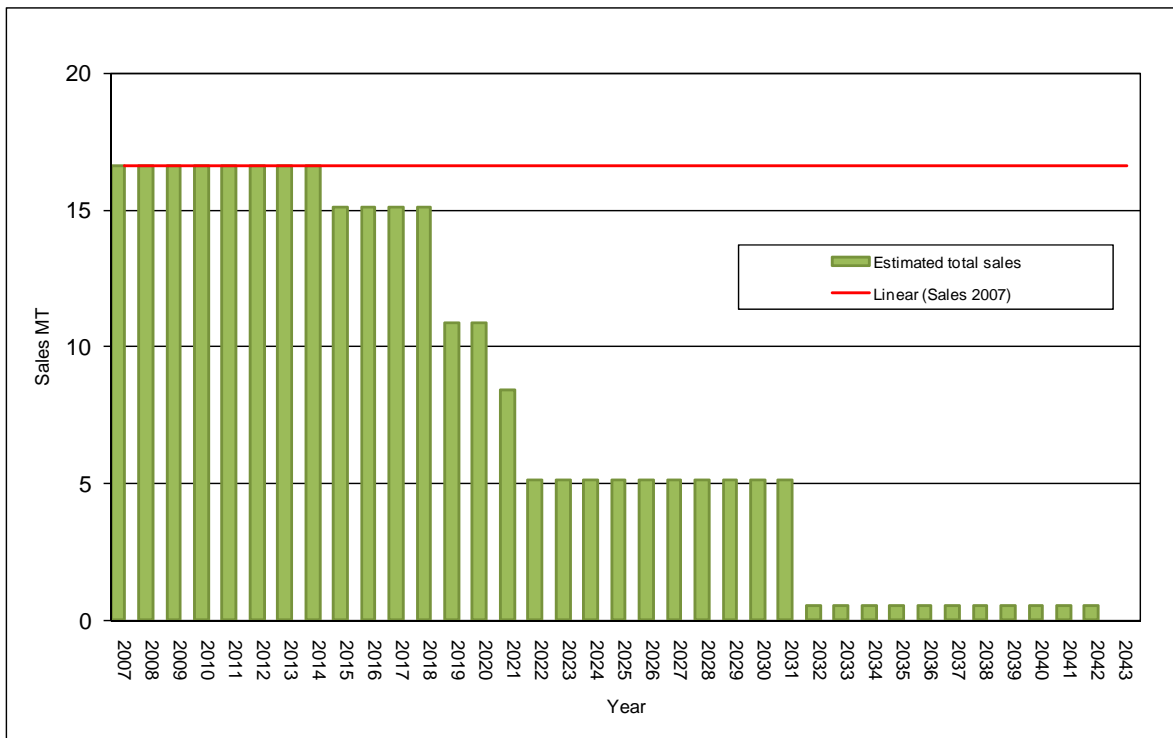
**Figure 6.** Estimated decline in reserve of crushed rock for aggregate from active sites in Northamptonshire.

Appendix 7 describes the background to the law and the changes introduced. Although it is possible for permissions granted at any time to have later end dates, very few active sites analysed in this study were attributed with post 2042 permission end dates, and where they were, reserves were expected to be worked out prior to this date. The graphs for active sites included in this report, therefore, show a ‘cliff edge’ either before 2043, or at 2043, at the point where the reserve is expected to have been worked out or the last active permissions expire. As 2042 approaches, new permissions with end dates later than 2042 will be granted, and also sites with automatic 2042 end dates which will retain unworked reserves at that time may well be given extended permissions with later end dates. As a result, any ‘cliff-edge’ effect in the rundown charts now (2011) will tend to be reduced over time.

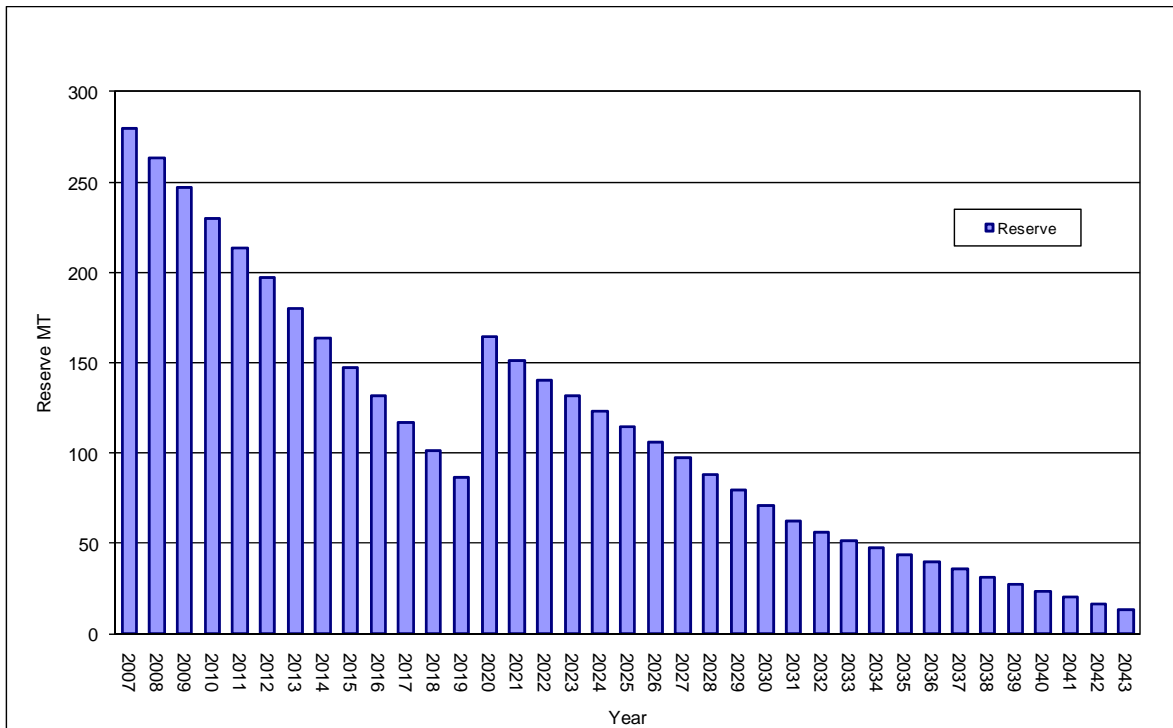


**Figure 7.** Estimated decline in reserves of crushed rock for aggregate from active sites in Leicestershire.

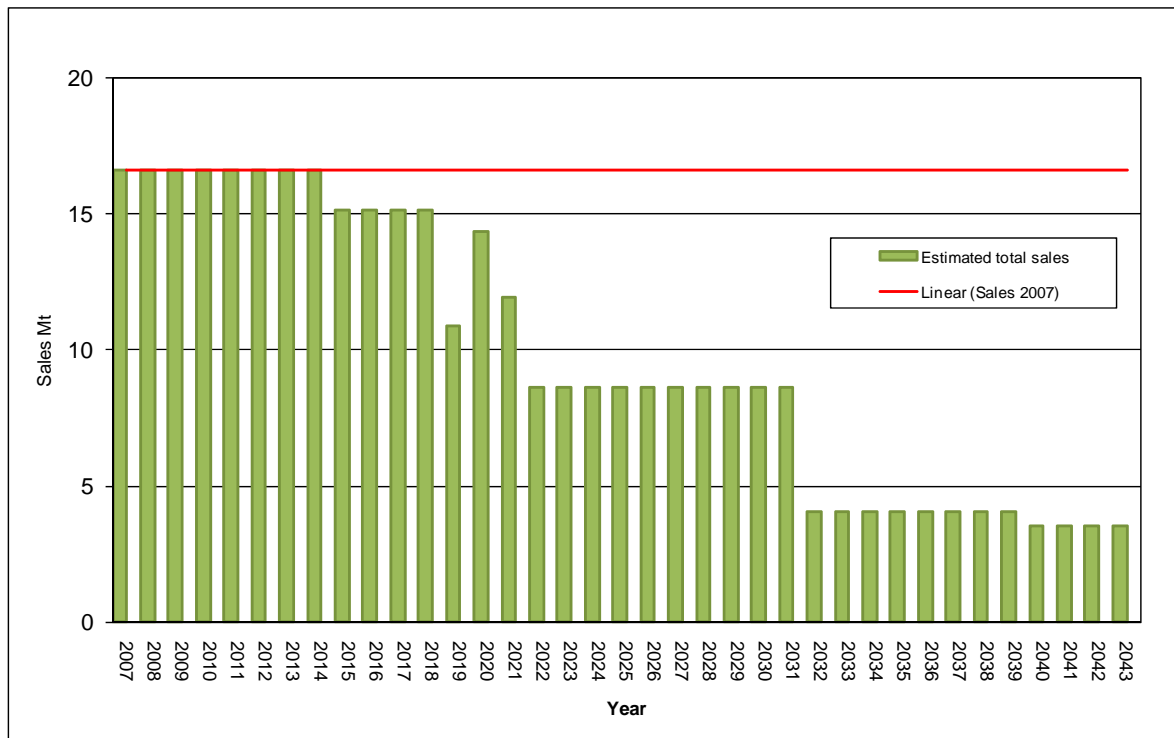
Some old aggregates permissions are so extensive that even 60 years after the end date law came into effect (and in some cases after well over 40 years of operation beforehand) significant quantities of mineral will still remain in those sites. Permission will cease in 2042, unless operators of those reapply for permission. An important part of this study has been to establish how significant the 2042 date is to the rundown of aggregates supplies in England. Will permissions with this end date generally have been worked out by that time, or will the quantity of permitted reserves ‘fall off a cliff edge’ on the expiry day? The method used in this report for charting the rundown in aggregates reserves is ideal for capturing this information.



**Figure 8.** Estimated decline in sales of crushed rock for aggregate if inactive sites are excluded in Leicestershire.



**Figure 9.** Estimated decline in reserve of crushed rock if inactive sites are reactivated in 2020 in Leicestershire.



**Figure 10.** Estimated decline in sales of crushed rock for aggregate if inactive sites are reactivated in 2020 in Leicestershire.

The study could only examine the experiences of a sample of MPAs. However, assuming that recent rates of working are sustained, these indicated that:

- i) existing sand and gravel sites will generally be worked out well before 2042;
- ii) whether reserves at currently inactive sites are used up before 2042 depends on whether these sites are reactivated, when and at what rate they are then worked;
- iii) this also applies at dormant sites, with the added uncertainty of the scale of the reserves which will be approved for working at reopening; and
- iv) there are important crushed rock permissions with both large reserves and 2042 end dates in Derbyshire which will be far from worked out by 2042. In this respect Derbyshire is the worst-affected authority assessed during this study (the Derbyshire rundown is described in Appendix 5).

Various other MPAs appear to have hard rock permissions which are unlikely to be worked out by 2042. However, these have not been assessed in detail, including Cornwall, Devon, North Somerset, South Gloucestershire, Lincolnshire, Shropshire, Staffordshire, Cumbria and Lancashire.

The contrast between landbank information and rundown chart information is profound. Landbanks fail to take account of end dates at all, so they over-estimate the availability of reserves which will in practice be lost completely when a permission expires still with workable mineral remaining within it. This is especially clear in authorities affected by the 2042 rule, such as Derbyshire. The landbank for limestone and dolomite in Derbyshire at the end of 2007 is formally indicated to be 79 years, but the rundown chart shows that if no new permission of reserves are granted, there will be a massive and instantaneous drop in supplies on 22 February 2042 to nil. Therefore the reserves can serve the market for 35 years at best, unless permissions are extended in time, less than half the period claimed by the official monitoring method.

The likelihood is, of course, that existing planning permissions in Derbyshire and in other MPAs in a similar position will generally be renewed provided they comply with current regulations and policies, and thus alleviating the ‘cliff edge’ effect or at least rolling it further into the future.

#### 2.4.1.4 NEW PLANNING APPLICATIONS

Only permitted reserves which already exist are certain. Future permissions are highly likely to be granted. However, the date and quantity of these permissions is uncertain. For this reason, neither landbanks nor rundown charts can properly make allowance for permissions that may be granted in the future (though both give a clear indication of when there is a need for such permissions). With no allowance at all for future permissions, both monitoring methods tend to overstate the rapidity of the decline in reserves. Equally, neither landbanks nor rundown charts explain why the existing level of permitted reserves is as recorded; for that the circumstances of the individual authority must be investigated e.g. through a consultation approach. Some insight into the level of permitted reserves is given in Appendix 5 and Appendix 6, which analyse each of the sampled authorities. In addition the following four themed sections, report the findings of the consultation exercise, highlight the constraints on specific aggregate resources and the potential impact on future supply.

#### 2.4.1.5 MATERIAL QUALITY

The consultation highlighted a number of important issues, regarding the availability of material of a specific type or quality not apparent from either landbank data or the rundown information presented in this study. For example:

- reserves of high quality Carboniferous Limestone in the North East represent an important but very minor component of total reserves (Case study 3);
- the reserves of hard rock in the East of England are of poor quality (Case study 4); and
- the poor quality sand and gravel in Warwickshire and Worcestershire result in industry disinterest (Case study 12).

Issues regarding resource quality and their associated suitability for particular aggregate end-uses and the relevance of this to planning for minerals supply are discussed in Section 5. The rundown approach could be applied to specific rock types to analyse the rundown in supply of material of particular specification, although this may be difficult because of confidentiality. The rundown approach does not need to be constrained to an MPA level, but could easily be adopted and applied at a regional or national level.

#### **Case study 3: total reserves of crushed rock in the North East masking issues relating to the continuity of supply of Carboniferous Limestone**

Previous work has highlighted that the strong overall position of crushed rock reserves in the North East (217 Mt at end of 2008, representing a landbank of 29.2 years, based on annualised apportionments, NERAWP, 2008) conceals geographical differences in the region and also between types of aggregates. Furthermore, industry has previously expressed concern regarding the extent to which the limestone crushed rock landbank in Durham and the Tees Valley is dominated by Magnesian Limestone and the impact of this on the release of new reserves of more versatile Carboniferous Limestone (Thompson *et al.*, 2008).

Reserves of Carboniferous Limestone have reached historically low levels, amounting to 7.36 Mt at end 2008 and representing a landbank of 8.6 years, based on 2008 sales, (County Durham, 2010). In its Minerals Local Development Framework Technical Paper Durham County Council suggests a gradual reduction in remaining permitted reserves to exhaustion by 2024, in the absence of further permissions. This is a significant issue given that Carboniferous limestone currently represents about 28 % of the county’s crushed rock production for aggregate use (based



on 2008 production figures from NERAWP, 2008 and sales from County Durham, 2010). (Appendix 3)

#### **Case study 4: lack of hard rock resources in the East of England**

The East of England is the smallest crushed rock producing region in the country (producing less than 0.5 Mt in 2005). Consequently it is a major importer of crushed rock, consuming 23 % of sales from the East Midlands (Mankelow *et al.*, 2007). The East of England has very limited resources of material suitable for crushed rock aggregate and where they are available these are confined to limestone in Cambridgeshire and 'Carstone' (a type of sandstone) in Norfolk. Although Cambridgeshire and Norfolk include hard rock figures in their apportionment, the EEAWP do not think the apportionment will be met, but that the shortfall in crushed rock for aggregate is likely to be made up by sand and gravel.

## 3 Uncertainty in planning

This section supports the investigation of Project Objective 1, which aims to determine the principal constraints on aggregate supply. A clear theme identified during the consultation is uncertainty resulting from the planning system and the difficulties this creates, particularly for medium- to long-term planning for mineral supply. A range of issues which could potentially influence future aggregate supply are discussed under the following headings:

- Data availability and confidentiality;
- The duration of plans;
- Reliance on outdated plans;
- Uncertainty about the future apportionment process;
- Cross-boundary issues; and
- Commercial considerations.

### 3.1 DATA AVAILABILITY AND CONFIDENTIALITY

MPAs rely on data provided by aggregate operators in order to monitor current aggregates provision and also to assist in meeting strategic aggregates allocations within future development plans. The availability of such data is essential for making informed planning decisions and ensuring the continued supply of minerals. However, a number of issues and concerns surrounding the provision of data were raised during the consultation, which are explored below.

#### 3.1.1 Monitoring of current aggregates provision

Data on current aggregates provision are collected by each MPA via annual monitoring surveys of the industry. These surveys collect data on annual sales and the volume of permitted reserves in extraction sites. Data is collated and reported by each Aggregate Working Party in their Annual Monitoring Reports. Every fourth year the Department for Communities and Local Government commission a national collation, the Aggregate Minerals Survey, which, in addition to sales and permitted reserves of aggregates, also collects data on consumption, transport method and by environmentally designated areas.

Both the annual monitoring and the four yearly surveys rely on the voluntary participation of the industry. Data on an individual quarry are normally considered to be confidential. Therefore, for the Annual Monitoring reports, any figure disclosed must include at least three companies' interests unless all the parties involved have been contacted and their prior approval obtained in writing, permitting the release of the information. For MPAs with only a few different companies working in their area, or with only a small number of sites, this results in data being merged with adjacent MPAs (e.g. Rutland is merged with Leicestershire). Certain MPAs, when previously approached on this issue, felt that such merging meant that data loses any value it had (Mankelov *et al.*, 2011).

For the purposes of the four yearly *Aggregate Minerals Survey* members of the Mineral Products Association (mpa), who account for a major proportion of total sales, have, in the past, relaxed these confidentiality restrictions. This does allow additional data to be disclosed, particularly for environmental designations (Mankelov *et al.*, 2007). However, for non-mpa members the normal three company rule has to still be applied. Additionally, given that the four yearly survey present data primarily at a regional scale, issues of confidentiality are not as pronounced as for the annual monitoring which generally attempts to present figures at an individual MPA level.

#### 3.1.2 Aggregates allocations in future development plans

MPAs are able to utilise information available from the BGS (mineral resources digital data set) to identify at a strategic level the location and extent of mineral resources suitable for aggregates

working. However, in order to provide robust evidence for the appraisal of options for the delivery of a sustainable supply of aggregate resources, MPAs often rely on the industry to provide data and information (collected at the industry's expense) at a site level. In the course of preparing their draft mineral plan documents, many MPAs, therefore approach their need for such strategic aggregates allocations by issuing a call for sites to landowners and the minerals industry. This may provide information about sites already known to promoters, accompanied by geological data in varying degrees of reliability, but falls short of the MPA providing direction to aggregates suppliers towards areas which the MPA might prefer to see worked.

There is recognition amongst MPAs that there is a need to protect mineral operator's reasonable needs for commercial confidentiality. However, there is increasing unease amongst operators regarding Freedom of Information. As public bodies, MPAs are subject to the Freedom of Information legislation and this has led to reluctance by industry to provide data and information as commercial confidentiality cannot be assured (Mankelov *et al.*, 2011).

### 3.1.3 Obtaining data to produce run-down charts

In order to produce rundown charts, such as those created for this study, an MPA requires knowledge about the number of sites (active, inactive and dormant) in its area, the amount of permitted reserve at each site, the sales figures for each site in each year and the expiry date of the planning permission. The name of the site, albeit useful, is not essential to creating a rundown chart. Anomising data entry (as was carried out in this project) can help to alleviate concerns over data confidentiality. When tendering for this project, preliminary indications from many of authorities suggested that problems with the confidentiality of data on annual output and reserves did not exist (e.g. the information has been published with planning applications or Review of Old Mineral Permissions - ROMPs), or can be overcome by aggregating, estimating or rounding the information. In reality, the project team encountered more problems than anticipated in gathering this information, with confidentiality being the cause of most concern although availability of staff resources is a further issue (many MPAs were busy with the four yearly survey at the time). To alleviate these concerns, where possible, either the MPA or the project team contacted industry to request permission to obtain data, or used data already within the public domain. The mpa and BAA were also contacted to ensure they were aware of the project and its objectives. Preliminary rundown charts were also shown to MPAs and industry during the project consultation phase.

## 3.2 THE DURATION OF PLANS

A 'plan-led' system has operated in England since the Planning and Compensation Act 1990. A 'plan-led' system is based on a '*presumption in favour of development which is in accordance with the development plan*' (Planning Policy Guidance Note 1), unless material considerations indicate otherwise. The 'plan' therefore provides the '*essential framework*' to guide and control the development of land and buildings in a planning authority and sets out proposals as to how it should develop in the future. If plans are out of date, or the plan does not extend over a sufficient period, it is obviously difficult for those led by the plan (e.g. the minerals sector) to undertake longer term planning. This is a particular issue for planning for mineral supply and new quarry sites as the lead time to establish new operations can be in the range of 5–15 years and they tend to attract heavy opposition from communities (mpa, 2010a).

Industry representatives indicated that companies are typically looking 20–30 years ahead in terms of planning for future aggregates provision and potentially up to 40 years in the case of greenfield hard rock sites and extensions. It was suggested that planning authorities should also be taking a longer term approach (i.e. beyond the current plan period). A holistic, long-term approach to planning, such as in Derbyshire, Cambridgeshire (Case study 5), and the Cotswold Water Park (Case study 11), can benefit all and ensure minimum overall effect on the environment. Industry consultees also indicated that short-term political thinking, typically up to

the next local election (every four years in the counties and in some other authorities three years out of four) hampers long-term planning in England. Different areas of the country and different resource types will naturally require different planning approaches over varying times scales.

### **Case study 5: Earith/Mepal area – Cambridgeshire’s approach to long-term planning**

The Cambridgeshire and Peterborough Minerals and Waste Plan identifies the Earith/Mepal area as a strategic area for sand and gravel extraction and construction/demolition waste management until 2026 and beyond. The vision for Earith/Mepal, outlined in the Earith Mepal draft Master Plan (2008), is to undertake development in a planned and sustainable way, ensuring there is no adverse impact on the integrity of the Ouse Washes whilst continuing to be a major producer of sand and gravel to 2026 and beyond. The Earith/Mepal area is identified as an area where there are interrelated minerals and waste issues, and other issues such as transport and flood protection opportunities to make sustainable use of land and water resources, together with a significant contribution to the achievement of bio-diversity targets through quarry restoration. Recognising that sand and gravel will continue to be required and thinking strategically about where and how sites might develop within the area well into the future clearly helps balance the needs of all parties (Cambridgeshire and Peterborough, 2008).

### **3.3 RELIANCE ON OUTDATED PLANS**

In September 2004 the Government introduced a revised planning system. The Planning and Compulsory Purchase Act 2004 replaced the old system of County Structure Plans and Local Plans with a new system made up of Regional Spatial Strategies and Local Development Frameworks (LDFs). The Regional Spatial Strategies (RSS) set out the long-term framework for the region to promote sustainable economic growth whilst the LDFs present the spatial planning strategy for the local authority.

The consultation indicated that the transition from Minerals Local Plans (MLPs) to the new Development Framework system has, in some areas, resulted in slow progress in delivering Minerals Development Plans, leading to a policy vacuum and reliance on outdated plans (e.g. Kent County Council and Surrey County Council). This in turn has led to uncertainty, particularly for industry, when looking at where to apply for permissions to work aggregates in the longer term. Thompson *et al.* (2008) also cite ‘*changes to the planning system*’ as a reason for the decline in aggregates reserves in England. The mpa indicated that in October 2010 only 15 new-style Core Strategies had been adopted in England and the ‘*The necessary degree of certainty for investors and communities intended by the plan-led system is still lacking.*’ (mpa, 2010b). The decision to revoke RSS by the coalition Government as part of the Localism Bill has in some instances compounded the issue (Section 3.4). West Sussex, for example, have suspended work on their Minerals and Waste Core Strategy until there is greater certainty regarding how the possible changes to the planning system will affect them.

### **3.4 UNCERTAINTY ABOUT THE FUTURE APPORTIONMENT PROCESS**

The introduction of the Localism Bill to Parliament in December 2010 has led to uncertainty about the future supply of aggregates. The bill aims to shift power from Central Government to individuals, communities and councils and abolish RSS. What this means for MASS, which has provided an essential, though non-statutory, framework to manage the regional imbalances in supply and demand for construction aggregates at a national level for over 30 years remains unclear at the time of writing. However, modifications to MASS (and its regional arrangements), including possible reductions in scale, have the potential to adversely impact on future capacity to supply. Furthermore, continued application of MPS1 policies depends on the Government’s proposed reshaping of all planning policy including minerals. The boundary between reduced national policy and that left for local authorities to adopt at their own discretion is unclear.

### 3.4.1 Implications for future aggregate supply

Mineral resources, unlike other forms of development, can only be worked where they naturally occur in economically viable quantities. Quarries are not viewed by the general public as a popular form of development. Unsurprisingly, concern is reported by several consultees (AWP Secretaries, MPAs, and industry representatives) that in general the move toward localism (with regards to minerals planning) could lead to *'institutionalised NIMBYism and parochialism'* (mpa, 2010a), which in turn could make strategic planning in the national interest difficult.

#### **Case study 6: Oxfordshire sand and gravel – the impact of new guidance on apportionment**

The previous Secretary of State's Proposed Changes to Policy M3 of the South East Plan which were endorsed by the new Government for immediate mineral planning purposes, (letter of 6 July 2010 from the CLG Chief Planner to all English local authorities), required Oxfordshire to plan for a significant increase in output to 2.1 Mtpa of sand and gravel, reflecting the greater geological availability of sand and gravel in the county compared with many other South East authorities. Although the Secretary of State reduced the allocation of the South East from 13.25 Mtpa in the 2003 *Guideline* to 11.12 Mtpa in the 2009 *Guideline*, Oxfordshire's share of regional requirements rose from 15.1 % (1.82 Mtpa) to 18.9 % (2.1 Mtpa).

When the South East Plan (the Regional Spatial Strategy for the South East) was initially revoked by the Secretary of State for Communities and Local Government in July 2010, the government also issued guidance that planning authorities could set their own minerals supply requirement figures if they have *'new or different information and a robust evidence base'*. Oxfordshire County Council, therefore, commissioned consultants to produce a robust, locally derived assessment of the quantity of sand and gravel that needs to be supplied from Oxfordshire. Although the decision to revoke RSSs was found unlawful by the High Court (and they were subsequently re-established) the government is set to abolish them through the Localism Bill. Oxfordshire have, therefore, continued with their detailed reassessment and are working towards an apportionment of 1.82 Mtpa sand and gravel in the interim, which they believe is sufficient to serve the needs of the MPA and are looking at existing sites to meet this apportionment.

Although Oxfordshire have the geological capacity to meet a greater apportionment, it is likely that they would only be able to do this if they opened up additional resources: see Case study pair 4 in Section 6.3. As is demonstrated by the activation of campaigning groups such as Parishes Against Gravel Extraction (PAGE) and the Anti Gravel Group of Residents in Oxfordshire West (AGGROW), any such attempt is likely to be highly controversial and subject to local politics.

It is difficult to provide evidence to demonstrate the impact the proposed Localism Bill might have on maintaining a steady and adequate supply of minerals, as it is simply too early to tell. Specific points relating to decentralisation and the proposed Localism Bill and its impact on future aggregates supply raised during the consultation (and, therefore, not necessarily exhaustive) are discussed below:

- *Disparities in resource distribution.* The intervention of planning at a regional and national level has enabled resource-rich areas to supply resource-poor areas of demand. Industry consultees felt the localism agenda may not be able to reliably address these disparities, with some authorities potentially refusing to supply resource-poor markets, beyond their own administrative boundaries (Section 3.5). Since supplies will be determined at the local level this will potentially result in undersupply of aggregates at the national level. However, some MPAs did acknowledge that there will be a continued requirement to

consider cross-border movement of aggregates and a need for co-operation between authorities.

- *Challenging apportionments.* The apportionment process can become highly politicised as discussed below. Consultees indicated that certain authorities will apportion what is feasible politically, irrespective of demand. This is considered likely to result in an increase in imports from outside the region (and potentially from abroad), with associated sustainability issues and increased pressure on exporting areas. The mpa's view is that '*MPAs may re-visit and challenge the aggregates apportionment in existing or emerging development plans*' such as in Oxfordshire (Case study 6) and '*with greater responsibilities on local councils for setting planning policy, and increasing the ability of local residents to influence and object to developments...there is a real danger that development such as mineral extraction...will be resisted even more than currently...*', particularly where extraction serves distant markets (mpa, 2010b).
- *Political undercurrent.* Hints of a political undercurrent appeared during the consultation. For example, during consultation within the East Midlands concern was expressed that resource rich areas such as Leicestershire may have been overly relied upon and regions such as the South East have not taken sufficient responsibility to ensure the sustainable use of their aggregate resources.

### 3.4.2 Declining options for future aggregates supply

The change in institutional approach is arising at a time when the options available for future supply are generally diminishing rather than expanding. In particular:

- *Resource depletion.* More areas of the country are being identified with genuine limits to maintaining past outputs of aggregates. Examples cited during the consultation include the Idle valley in Nottinghamshire (Case study 7) and north-west Surrey (Case study 8).

#### **Case study 7: limits to sand and gravel resources in the Idle Valley, Nottinghamshire**

Nottinghamshire is the largest sand and gravel producer in the East Midlands, accounting for 37 % of the region's production. It has a sand and gravel landbank of 9.1 years, based on the apportionment method (EMRAWP, 2008). Importantly for the planning of future provision, sand and gravel extraction in Nottingham is concentrated in two distinct areas, the Trent and Idle valleys. Given the position of the Idle Valley in the north of the county it is well placed to serve markets in Yorkshire and the Humber. Nearly all of Nottinghamshire's production that is not used in the East Midlands (1.02 Mt in 2005) is exported to Yorkshire and the Humber (Mankelov *et al.*, 2007).

The East Midlands AWP indicates that resources in the Idle Valley are low (just over 2 years supply based on 2007 figures) and the MPA has confirmed that new supplies will be difficult to locate. As supply from the Idle Valley declines production is likely to become concentrated in the Trent Valley to the south, with implications for the sustainability of future supply to areas in the north of the county and particularly markets in South Yorkshire. The EMAWP suggest that future planning should attempt to limit the dependence placed on Nottinghamshire's sand and gravel resources in order to reduce the burden on the Trent Valley and prevent environmentally costly transportation, which is contrary to national and regional attempts to reduce carbon emissions (EMRAWP, 2010). Therefore, whilst Nottinghamshire appears in a relatively strong position with regard to its overall sand and gravel landbank, the run-down of a specific resource area has implications for the sustainability of future supply to markets outside the region (Section 4.3.2 and Appendix 3).

- *Protected areas.* Areas of Outstanding Natural Beauty (AONB) acquired the same status as National Parks in landscape terms, and an obligation on public bodies to have a ‘duty of regard’ for them, since the passage of the Countryside and Rights of Way Act 2000 (though AONBs had been given equivalent protective status to National Parks for aggregates planning purposes before that. These protected landscapes can only be subjected to major quarrying in exceptional circumstances). The near-completion of the network of SACs and SPAs for birds has introduced the full force of European Directives in support of wildlife of European importance, which can be of primary importance at the expense of aggregates working (and most other developments) unless there are imperative reasons of overriding public interest at the national level.
- *Concentration of sites and ownership.* Aggregates workings continue to concentrate into a smaller number of larger sites, just as they are operated by a smaller number of larger mineral companies.

### **Case study 8: disparity in resource estimates for concreting aggregates in Surrey**

Surrey County Council was until 2006 the largest supplier of sand and gravel in the South East. However, its share of regional output has declined in recent years, amounting to 17.1 % in 2008. Although Surrey has the fourth largest reserves in the region only 22 % of these represent concreting sand and gravel (sharp sands and gravel) (SEERAWP, 2008).

Surrey County Council states in its Primary Aggregates Development Plan Document that ‘*available resources for concreting aggregates are becoming increasingly difficult to identify*’ and ‘*The likely outcome is that identified potential reserves of concreting aggregate will be almost fully exploited before 2026*’ (Surrey Primary Aggregates DPD, 2009). When consulted on the issue, other parties argued that although there is a shortage of permitted reserve in Surrey, there is no resource shortage in Surrey, and the principal constraint is the planning framework and political issues in the South East (including permissions not being granted within an Area of Great Landscape Value (AGLV) – (Case study 20)). Surrey suggests that future production is constrained by the ‘*...unacceptable impact on social and/or environmental considerations*’ (Surrey Primary Aggregates DPD, 2009).

A clear disparity exists between Surrey County Councils estimated resource of concreting aggregate available from 2010–26 and that estimated in previous work undertaken by the BGS in the South East. The BGS estimates resources of concreting sand and/or gravel in Surrey that are not constrained by national or international environmental designations and excluding urban areas and infrastructure to be 495 Mt (Benham *et al.*, 2006). Although, no account was taken of resource quality and properties, the study suggests that additional resources could be made available in the county. Whilst Surrey County Council acknowledged during the consultation that there are further resources in the county, which could potentially be exploited, they also indicated that they do not envisage allocating additional sites in the near future (Appendix 3).

In this context the apportionment process within regions has become more difficult in recent years. In the most recent round of apportionments of the *Guidelines*, issued in June 2009, increasing attention has been paid to matters such as environmental capacity to accommodate aggregates working e.g. Staffordshire and Stoke-on-Trent (Case study 9), and Milton Keynes (Case study 10), as well as long-established matters such as market demand and historic rates of supply.

### **Case study 9: uneven distribution of sand and gravel supply in the West Midlands**

During the sub-regional apportionment of 2005–20 *Guidelines*, Staffordshire and Stoke-on-Trent expressed concern regarding their ability to deliver the resources required during the plan period at an ‘*acceptable environmental cost*’. The West Midlands AWP expect future supply of sand and gravel could potentially be a problem if other authorities within the region are not prepared to take on a larger apportionment to make up any shortfall.

Staffordshire accounts for more than 64 % of the region’s sand and gravel production and is the largest sand and gravel producing MPA in England (Mankelow *et al.*, 2007). Staffordshire and Stoke-on-Trent had a landbank of 12 years based on 2008 reserves (WMRAWP, 2008). However, the total permitted reserves of sand and gravel in the West Midlands continues to show a steady decline from 134 Mt in 2005 to 124 Mt in 2006 to 112 Mt in 2007 (WMRA, 2010). The region’s largest landbanks are in Herefordshire, Staffordshire and Shropshire, whilst the landbanks in Worcestershire and Warwickshire are below the national *Guidelines* (WMRAWP, 2008). However, justification given for not maintaining these landbanks was that mineral operators were not forthcoming with major applications in these areas. The quality of the resource in Warwickshire was cited as the principal concern by industry consultees.

Staffordshire is concerned that its high apportionment is having an adverse impact on its diminishing resource areas. Industry representatives felt that in the case of Staffordshire there was not sufficient evidence for the environmental constraints presented in the work undertaken for the apportionment process (Appendix 3).

#### **3.4.3 Implications for the apportionment process**

Those regions which completed (or virtually completed) their apportionment process through the RSS system prior to the announcement of an intention to abolish RSSs are in a different position from those which did not achieve a final decision. For example, in the South East, Surrey was given a considerably reduced apportionment and Oxfordshire a slightly larger one. This has provided a clear basis for planning at the MPA level (though there is still some scope for testing the regional policy at the MPA level). This impact of new guidance from Government on the apportionment process is explored with reference to Oxfordshire in Case study 6 and Case study pair 4 in Section 6.3. In contrast, in the West Midlands, a redistribution of sand and gravel obligations, supported by Staffordshire and Stoke-on-Trent but resisted by other MPAs, resulted in a stalemate due to no independent Examination of the proposals taking place or a final decision being forthcoming (Case study 9).

The Government has not, as yet, made a decision on the process for resolving disputes between MPAs in a context of arguments for changing the aggregates supply pattern and there are no proposals on the table at present in place of RSSs.

### **3.5 CROSS-BOUNDARY ISSUES**

Administrative boundaries have relatively little bearing on the pattern of aggregate supply in England, as illustrated by the extensive flows reported in Mankelow *et al.* (2007). Consideration of cross-boundary aggregate flows is a key issue for minerals planning and numerous examples of this were cited during the consultation. Extraction in one MPA frequently serves a nearby market in another, commonly across a regional boundary e.g. supply from the Avon Valley of Hampshire into the Bournemouth/Poole conurbation of Dorset (22 % of Hampshire’s production is exported outside the region) (Mankelow *et al.*, 2007) and supply from the Idle Valley of Nottinghamshire into South Yorkshire (Case study 7).

The tightness or looseness of the boundary around an urban area for apportionment purposes can have a significant impact on the choice of where to allocate sites. A tight administrative



boundary effectively results in limited choice of where to allocate sites, potentially resulting in a disproportionate effect on land use in small, resource-rich MPAs, such as Milton Keynes (Case study 10).

#### **Case study 10: disproportionate apportionment of sand and gravel relative to the land area of MPA (Milton Keynes)**

The SEEAWP have indicated that Milton Keynes may have an issue meeting its apportionment for sand and gravel during the current *Guideline* period, given the small size of the MPA.

Data on sand and gravel sales and reserves in Milton Keynes are confidential because of the small number of sites. Milton Keynes is located at the centre of the Milton Keynes and South Midlands Growth Zone and prior to the recession it was predicted that by the end of 2021, 220 000 new homes would have been built within the zone. Significant improvements to transport infrastructure were also proposed, (Harrison *et al.*, 2005).

Concerns highlighted by SEEAWP specifically relate to the utilisation of mineral-bearing land on the outskirts of the MPA, an area of comparatively ‘attractive landscape’. It was suggested that just because the land is not within a protected area, it does not mean that the land is not of significant value to local residents. The Milton Keynes Local Plan (adopted 2006) retains the adopted Borough of Milton Keynes Local Plan (1995) policy to ‘safeguard and protect the Areas of Attractive Landscape’ and, therefore, Policy MLP11 states that ‘Permission will not be granted for mineral development in the Areas of Attractive Landscape, where such development would result in a detrimental impact on the landscape quality of the area, unless it can be shown that it is necessary to meet an essential need which cannot be met by any other means’.

Designation of protected areas impacts on the supply pattern in adjacent MPAs and regions. For example:

- the South Downs National Park is likely to impact on supply in Hampshire and West Sussex (Case study 17);
- there is concern in the North West region regarding long-term supply of crushed rock, given ‘restrictive policies’ applying in the Yorkshire Dales National Park (Case study 18); and
- the reduced apportionment in the Peak District National Park involves a transfer of a share of supply to Derbyshire (Case study pair 3, in Section 6.3). This case also has implications for the South Yorkshire MPAs, which are under some pressure from the East Midlands RAWP to meet their own needs from local sources rather than by imports from the Peak District National Park.

One approach to addressing cross boundary issues is Area Action Plans, as illustrated by the vision for the Cotswolds Water Park (CWP), straddling the border of Wiltshire and Gloucestershire (Case study 11).

#### **Case study 11: Cotswolds Water Park — cross boundary and inter-regional mineral planning for sand and gravel**

The lakes of the Cotswolds Water Park (CWP) are the legacy of a long history of mineral working through open pit excavation of (mainly) sand and gravel for aggregate. The CWP was first designated in 1967 and still provides a key resource of sand and gravel for Gloucestershire, Wiltshire and Swindon (all within the South West Region). Since its designation, these local authorities have worked together, through a Joint Committee, to manage the longer term

development of the CWP (including minerals development) in a way which balances the social, economic and environmental requirements of the area. In 2006, the Joint Committee instigated the development of a Master Plan for the CWP to set out a 20 year vision for the water park. Consultants were subsequently commissioned to develop a strategic review and implementation plan for the area and the Master Plan was adopted by the Joint Committee in 2008 (Cotswold Water Park, 2006).

The strategic review identified a requirement that *'a more co-ordinated approach is needed between the MPAs in relation to the chosen extraction areas and the chronological ordering of extraction'* and that *'this mainly involves the MPAs of Wiltshire and Gloucestershire at present, but will increasingly require input from Oxfordshire MPA in the future'* (Scott Wilson, 2008). According to the Master Plan *'extensive aggregate reserves remain within the boundary of the CWP, with a general cross-industry consensus that there is sufficient extractable resource at current levels of production (about 2 million tonnes per annum) for a further 20 years extraction, subject to grants of planning permissions'*. It is anticipated in the Master Plan that mineral working would continue beyond that period for a further 10–15 years but at a declining rate. The plan also suggests that *'It is certainly possible that Oxfordshire will also start to look towards the CWP area of the Upper Thames Valley to fulfil its apportionment of sand and gravels at some stage in the future'*.

In order to deliver the vision in the Master Plan a key objective for the CWP is to create a single planning framework in the form of an Area Action Plan to ensure a systematic, coordinated and collective approach to development control to be adopted by the respective planning authorities.

### 3.6 COMMERCIAL CONSIDERATIONS

Superimposed on the forward planning policy framework is the reality of the existing supply pattern on the ground, where the stimuli on the aggregates industry can be wide ranging. Consultees indicated that certain issues are beyond the control of the planning authority and are largely related to commercial decisions made by industry. During the consultation, industry representatives commented that supply patterns over time are strongly influenced by the following commercial factors:

- *Areas which industry favours* - an authority can make provision for sites but locations elsewhere might be favoured by the industry, resulting in little up-take. This is principally a function of three factors:
  - *Resource quality*: consultees indicated that industry naturally has a preference for the best quality resources and this is one of the principal factors influencing site location. Consequently, although sites may be needed, if quality is an issue, it may not be commercially viable to work a deposit, see for example Case study 12 on Warwickshire and Case study 13 on the North East region;
  - *Infrastructure*: requirements for costly infrastructure can be a major deterrent to resource development, see Case study 14 on West Yorkshire;
  - *Location of existing operations*: the aim for an operator is to have a network of quarries. Consultees indicated that industry would not look to open sites elsewhere just because there is provision in the plan if they have existing established operations. This is the experience in the West Midlands where the industry is reluctant to move from its main operational bases in Staffordshire (Case study 12). Similarly during a recent call for sites in Essex, all of those initially proposed were close to existing operations. The MPA responded by indicating a preference for sites in the south-west of the county, although industry clearly did not require sites in the authority's preferred area;

### Case study 12: resource quality and proximity to markets in West Midlands

During consultation the WMAWP indicated that industry focuses on the best quality resources and if there are higher quality deposits (such as in Staffordshire in the West Midlands), industry will naturally work this, rather than lower quality resources in other counties.

With regard to alternative sources of supply of land won sand and gravel within the region, the WMAWP indicated that Warwickshire and Worcestershire are short in terms of landbank, but industry is not forthcoming with major applications. Warwickshire's landbank of 4.6 years (WMRAWP, 2008) is well below the MPS1 *Guidelines* as a result of the lack of suitable sites coming through the planning system (WMRA, 2010). The quality of the resource in Warwickshire was cited as the principal concern by industry representatives.

Industry representatives highlighted that Shropshire has extensive sand and gravel resources and suggested that the West Midlands apportionment exercise missed a solution, believing that a better balance between Staffordshire and Shropshire may have been achievable. However, Shropshire recognises '*proximity to markets*' as needing to be addressed as part of the preparation of the Core Strategy (Shropshire, 2008). In its Core Strategy Shropshire states that '*very little sand and gravel produced from Shropshire is now exported eastwards to the main markets in the West Midlands due to the availability of more proximate and higher quality materials closer to these markets*' (Shropshire, 2010) i.e. in Staffordshire.

### Case study 13: restrictions on sand and gravel resources in North East

There is concern over the ability of the North East region to meet its minimum required landbank for sand and gravel beyond 2020 and the availability of higher quality resources in the Tees Valley and Tyne and Wear.

The sand and gravel landbank at the end of 2008 was 12.3 years in Northumberland and 5.5 years in Durham (NERAWP, 2008). In consultation the NEAWP indicated that there are quality issues with sand and gravel resources in the south of the region, resulting in limited commercial interest in developing deposits, since industry tends to focus on the better quality resources found in North Yorkshire. Whilst higher quality resources are found to the north of the region, this area is relatively isolated, resulting in additional transportation costs to supply the principal markets further south. The AWP reported that some MPAs in the region were concerned that the Tees Valley wanted mineral extraction to cease because of its urban nature, and if the authority were given a lower apportionment, this would discourage the industry from investing in the area (Appendix 3).

- *Markets* - the existing pattern of quarry development reflects a desire to minimise haulage distances e.g. the concentration of production in Staffordshire in the West Midlands and issues with proximity to market for resources in Shropshire (Case study 12);
- *Deliverability of sites* - historically the minerals industry owned their own land. However, a shift in recent decades to working leasehold sites has resulted in issues with landowners refusing mineral working or delays whilst conditions are agreed;
- *Cost of planning applications* - Thompson *et al.* (2008) highlight that the costs of preparing and submitting planning applications have increased substantially. Industry consultees indicated that there are benefits of scale when going through the planning process. Consequently this reduces the number of sites of potential interest to industry;

- *Viable deposit size* - although good quality resources are known in certain parts of the country, deposit size can preclude their development e.g. West Yorkshire (Case study 14). A number of MPAs indicated that industry generally prefers larger sites. Therefore, a limited yield may be seen as a reason for not justifying the expense of a planning application. This view is supported by Thompson *et al.* (2008) who report there is a '*shortage of sufficiently large sites in some areas*';

#### **Case study 14: access to concreting aggregate resource in Yorkshire and the Humber**

Access to concreting sand resources presents an issue across the region where future supply into West Yorkshire is the principal concern.

In 2007, 41 % of land-won sand and gravel sold in Yorkshire and the Humber Region was used for concreting purposes. Yorkshire and the Humber's *Guideline* figure for land-won sand and gravel has increased from 73 Mt (2001–2016) to 78 Mt (2005–2020) (Y&HRAWP, 2008). The regional landbank at the end of 2008 was 8.6 years, based on the apportionment method. The regional figure obscures important differences between individual MPAs and the proportion of aggregate suitable for concrete production. In its Annual Report the Y&HRAWP report that in North Yorkshire the landbank of sand and gravel at the end of 2008 at sites suited to southward distribution remained below seven years; the single sand and gravel quarry in West Yorkshire had a landbank of only 1.1 years; the landbank in the East Riding/North Lincolnshire had fallen to below five years and although the landbank at sites in Doncaster remained over 12 years, this was dominated by soft sand, unsuitable for concrete production (Y&HRAWP, 2008)

Previous work by the BGS supports the view that future sand and gravel supply in Yorkshire and the Humber region, particularly into West Yorkshire is likely to be problematic. BGS reported that whilst extensive resources of sand and gravel do exist in West Yorkshire the likelihood of developing new sites is limited as sterilisation by built development has significantly reduced access to adequately sized deposits. Furthermore, industry indicate that most prospective areas in the Calder, Aire and Wharfe valley have limited access to major roads. The Wharfe Valley is regarded as unviable for new developments due to the proximity of landscape/environmental designations (Bide *et al.*, 2009).

With reference to West Yorkshire, industry indicate that on the basis of economics only sand and gravel sites containing in excess of 1–1.5 Mt of mineral are viable. The figure will vary depending on the level of investment in infrastructure required and the potential cost of submitting an application. The issue of minimum viable deposit size is a severe constraint on the development of river terrace deposit in West Yorkshire, which are fragmented into small resource packages by rivers, canals and roads. This results in the need for expensive infrastructure investments to either work areas to their full capacity or to link areas so that an economically viable resource of more than 1 Mt can be extracted (Bide *et al.*, 2009).

- *Economic climate* – industry consultees indicated that the current economic climate is a significant constraint on new development at present, particularly for greenfield sites. During periods of economic uncertainty and associated concerns regarding future demand the minerals industry naturally concentrates on its existing portfolio. This factor coupled with a shortage of large sites and the '*perceived difficulty of obtaining planning permission for entirely new, greenfield sites*' reported by Thompson *et al.* (2008) makes the likelihood of significant greenfield developments in the near future unlikely. Furthermore, during consultation it was highlighted that the economic circumstances would have to be very secure for major companies to be willing to invest in large new sites in light of previous experiences such as the Rodel superquarry on the Isle of Harris. A parallel MIRO project by Colin Buchanan and Partners highlights the significant financial costs associated with developing new aggregate quarries and indicates this to be a '*major development barrier*';

- *Mothballing and sale of sites* - commercial decisions frequently result in the closure, mothballing or sale of sites with implications for future aggregate supply as illustrated by Cheshire (Case study 15); and
- *Investment in infrastructure* - industry acknowledges that infrastructure such as roads and rail heads may have to be built in the future to access specific resource areas. However, industry consultees indicated that a longer term approach to planning, providing greater certainty, would facilitate industry investment in infrastructure.

In summary the view of industry is that the depressed economic climate coupled with changes in Government policy and uncertainty regarding how future aggregate provision in England will be managed makes long-term planning extremely challenging.

### **Case study 15: environmental constraints on sand gravel supply in Cheshire**

The North West region does not have an adequate landbank (based on current apportionment *Guidelines*) for land-won sand and gravel and will experience a deficit towards the end of the apportionment period (Evans and Mosquera, 2010).

The region's *Guideline* (2005–2020) figure for land-won sand and gravel is 52 Mt, compared with a reserve of 46 Mt in 2008. Consultees indicated that Cheshire, which accounts for 54 % of regional production (Mankelov *et al.*, 2007), is unable to meet its proposed revised apportionment (Evans and Mosquera, 2010).

During consultation it was reported that future working and extensions to existing quarries in Cheshire may be constrained by hydrological impacts and wildlife designations. Furthermore, since some construction sand in Cheshire is derived from silica sand sites, the exhaustion of reserves or closure of these sites could present potential issues for construction sand supply in the future, as some of these sites only gained permission on the basis of national need for silica sand.

In addition the NAWWP indicated that in Cheshire there is concern that some sand and gravel sites with large reserves have been sold for non-mineral purposes or mothballed. With reference to crushed rock sites in Greater Manchester it was indicated that some have been used for landfill prior to the reserves being exhausted, because of the pressure for new waste sites (Appendix 3).

## **3.7 DISCUSSION**

- Significant concerns exist regarding the ability of the planning system to facilitate medium- to long-term planning for minerals. Consequently, the current planning system could be viewed as a constraint on future aggregate supply in its own right.
- An essential prerequisite for monitoring and long-term planning for mineral supply is reliable and up-to-date information on sales, movement, consumption and permitted reserves of aggregate. However, clear difficulties exist regarding data provision, as highlighted by this and other studies as a result of confidentiality restrictions and resources within MPAs to collate statistics. Furthermore, reductions in central government funding are likely to place the onus for data collection for future aggregate supply assessments almost entirely on industry.
- If the planning framework does not extend over a sufficient forward period of time, it is clearly difficult to undertake long-term planning. This is a particular issue for the minerals industry because of the long lead-time to establish operations, in part resulting from the significant period of time required to thoroughly address the complex and often controversial issues that are inherent in proposals for mineral working.

- Reliance on outdated plans as a result of changes to the planning system means the plan-led system does not currently provide the degree of certainty for investors and communities that was intended.
- The introduction of the Localism Bill has contributed to uncertainty regarding future aggregates supply. There is concern that planning for minerals at a local level will not be able to reliably address the disparities between resource distribution and the locations of markets for aggregates. Concern specifically relates to the greater ability of communities to influence decisions, particularly against unpopular forms of development such as mineral operations, and the risk that MPAs may challenge the aggregate apportionments in existing or emerging development plans, as has happened in some parts of the country.
- Consideration of cross-boundary aggregate flows at both the MPA and inter-regional level is fundamental to long-term planning for minerals supply. The impact of localism on this is unclear. However, greater dialogue regarding cross-boundary resources and between importing and exporting regions is now essential in some parts of the country, and desirable between individual exporting and importing MPAs.
- Commercial considerations introduce further significant uncertainty into the forward planning process.

## 4 The impact of environmental policies and protected areas

This section supports the investigation of Project Objective 1, which aims to determine the principal constraints on aggregate supply, by specifically examining the complex effect of environmental policy and protected areas on future aggregate supply.

### 4.1 POLICY BACKGROUND

MPS1 includes in its national policies for minerals planning a statement on ‘*protection of heritage and countryside*’ (paragraph 14). This explains the degree of protection from inappropriate mineral working which should be afforded to wildlife, landscape, historic and cultural heritage, Green Belt land, woodland and agricultural land, and the scope for environmental benefits from mitigation and restoration of mineral workings. It also distinguishes different levels of protection afforded to European sites of wildlife importance, World Heritage Sites, nationally designated landscapes (National Parks, the Broads and Areas of Outstanding Natural Beauty), and sites of regional and local importance. The statement makes clear that it is not only designated areas that are to be protected but that authorities are also required more generally to:

*‘take account of the value of the wider countryside and landscape, including opportunities for recreation, including quiet recreation, and as far as practicable maintain access to land. Minimise the impact of minerals operations on its quality and character and consider the cumulative effects of local developments’.*

The continued application of MPS1 policies as experienced by the previous ASRP study ‘*An evaluation of decisions for aggregates working in designated areas since the introduction of MPS1*’ (Bee *et al.* 2010) is likely to cause limited replenishment of permitted reserves within internationally and nationally protected areas of landscape value and nature conservation. Over time, and with the continued application of MPS1 policy, a progressive switch of aggregates supply can be expected from within these protected areas to locations outside them ‘*other than in exceptional circumstances*’. However, the environmental implications of concentrating supply outside these areas requires careful consideration during the planning process.

The working of aggregates, like other minerals, is for the most part prohibited within wildlife sites of European importance SACs and SPAs by virtue of a ‘precautionary’ approach to ensure that development will not adversely affect the integrity of these areas for the purposes for which they are protected. Permission is also unlikely to be granted for aggregates development which would damage a SSSI. Within areas designated at a local level for their landscape or wildlife interest, the case for aggregates working is a matter of judgement according to the local policies and circumstances of the case.

### 4.2 AGGREGATES SUPPLY FROM PROTECTED AREAS

The following section presents the results of rundown issues where protected areas are involved. The quantity of aggregates supplied from nationally-designated areas is assembled every four years in the *Aggregate Minerals Survey*. The most recently published results are for the 2005 survey (Mankelow *et al.*, 2007). Mankelow *et al.* (2008) report that one third of the 140.28 Mt of land-won aggregates sold in England that year came from protected areas:

- National Parks supplied 14.76 Mt (10.5 %);
- Areas of AONB supplied 7.83 Mt (5.6 %);
- SPAs & SACs (outside National Parks & AONBs) supplied 2.56 Mt (1.8 %); and
- SSSIs (outside other designations) supplied 21.66 Mt (15.4 %).

This study identified only one instance where a local landscape designation potentially presented a significant regional aggregates supply issue (the Area of Great Landscape Value adjacent to the Surrey Hills AONB). A number of other supply issues relating to local designations are also identified (e.g. Areas of Attractive Landscape in Milton Keynes - Case study 10). These other issues are not discussed in this section since they are considered to be unlikely to significantly impact on regional or national supply.

The main constraints on aggregates working identified in the study were nationally protected landscapes. National and European wildlife designations were also significant constraints in three of the locations studied: igneous rock working in Leicestershire (Case study 21), limestone production in the east Mendips (Case study pair 2) and sand and gravel working in Cheshire (Case study 15). Each of these is discussed in the report, with additional detail in Appendix 3.

#### **4.2.1 The Peak District National Park**

The Peak District is an important supplier of high quality limestone aggregate. However, five working quarries will cease working there within about five years, principally due to the permissions becoming time expired. The Peak District National Park Authority does not expect to permit further workings in or around these sites. As a result, alternative arrangements must be made to enable the supply of about 1.2 Mtpa (at pre-recession supply rates). Supplying the shortfall has, in part, been taken up by Derbyshire County Council, though, some issues still remain (as described in Case study 16).

#### **Case study 16: distribution of limestone reserves in Derbyshire and the Peak District National Park and their impact on supply to surrounding areas**

Five quarries come to the end of their permitted life by 2016 and all are located on the eastern side of the National Park. The Authority is unlikely to extend working at these sites, given the policy approach taken in their core strategy. On average these sites cumulatively produce a total of around 1.2 Mt of aggregates per annum of which approximately 77 % of the aggregate material is distributed to East Midlands markets and 21 % is distributed to Yorkshire and the Humber markets. In view of the Authority's policy approach, Derbyshire has agreed in principle through the 2009 East Midlands apportionment process to accept the 77 % of the 1.2 Mtpa output expected to be lost when quarries in the Park close in the period 2010-20 (i.e. the volume of aggregate from the five sites that supplied markets in the East Midlands). Derbyshire's additional apportionment could be met from quarries within the Buxton area, to the west of the National Park boundary, or from quarries to the south-east of the Park. If South Yorkshire's market share is also supplied from Derbyshire there are concerns that cross-Park haulage would increase from the Buxton area. The EMAWP has acknowledged that there is a requirement for dialogue with South Yorkshire MPAs to determine whether their needs can be met more locally (EMRAWP, 2010). There is currently no mechanism to allow this dialogue to take place. Additional background to the issue is presented in Appendix 3.

#### **4.2.2 The South Downs National Park**

The recent designation of the South Downs National Park has introduced a major new constraint on the working of sand and gravel resources in parts of Hampshire and West Sussex. Much of the National Park had previously been within either the Sussex Downs AONB or East Hampshire AONB, and proposals for aggregates working would have been subject to the same policy constraint as in the National Park. However, the final boundary confirmed for the National Park incorporated areas which had been outside the AONBs, and it is within these that sand and gravel resources are newly affected. The new National Park Authority will assume full



control of planning powers from April 2011, and its policy approach to this issue is awaited. Case study 17 summarises the issues.

#### **Case study 17: the effect of the South Downs National Park on availability of soft sand in West Sussex and Hampshire**

The designation of the South Downs National Park has incorporated areas of soft sand resources which were not previously constrained. This is adding to the difficulty of finding workable deposits in Hampshire and West Sussex.

Hampshire and West Sussex County Councils are struggling to identify new aggregates sites to sustain production at historic levels. Total reserves of all sand and gravels in Hampshire at the end of 2008 were 7.6 Mt. This equates to a landbank of only 2.9 years, based on the apportionment method for the period 2001-2016, the smallest in the South East (SEEAWP, 2008). The West Sussex Minerals and Waste Development Framework states that even if all remaining allocated Minerals Local Plan sites came forward and were granted permission, *'the best-case scenario'*, there would still be a shortfall of 5.23 Mt of sand and gravel during the plan period (2006–2026). Since that assessment the apportionment to West Sussex has increased from 0.91 Mtpa to 1.03 Mtpa in the 2010 apportionment in the Secretary of State's Proposed Changes to Policy M3 of the South East Plan (West Sussex, 2008).

Consultees from industry expressed particular concern about the potential future policy direction of the South Downs National Park and its impact on supply. Although the report of the Panel which heard the Examination in Public (EiP) of proposals to change Policy M3 of the South East Plan (2009) states that *'a significant proportion of the viable soft sand resource in Hampshire, West Sussex and East Sussex is within the South Downs National Park'* and that *'these resources are recognised as being of regional significance for high quality construction sands'* future National Park policy is as yet unclear. The Panel decided that the policy approach to working in the National Park should be left to local decision rather than set out in the regional Plan (paragraph 4.8). The matter has, therefore, been deferred for future resolution, primarily by the National Park Authority (Appendix 3).

#### **4.2.3 The Yorkshire Dales National Park**

High Specification Aggregate (HSA) suitable for purposes such as road surfacing is produced from three major gritstone (hard sandstone) quarries in the Yorkshire Dales National Park. This material is now in relatively short supply, compared with aggregates for other purposes, and options for the future are now a matter of concern for a number of parties. Case study 18 outlines the issues.

#### **Case study 18: restricted availability of High Specification Aggregate from the Yorkshire Dales National Park**

Permitted reserves of High Specification Aggregate (HSA) are running down in this protected landscape, with limited alternative sources in the region.

The Yorkshire Dales National Park is sixth largest producer of crushed rock in the country, with 35 % of production being exported outside the region, principally to the North West (Mankelov *et al.*, 2007). It has an overall strong position for crushed rock reserves (120.2 Mt at the end of 2008, equating to a landbank of 29.1 years, based on their sub-regional apportionment, Y&HRAWP, 2008), but this masks a considerably lower figure for HSA. HSA is obtained from a hard sandstone known locally as gritstone, which is obtained from Dry Rigg, Arcow and Horton Quarries. Total reserves of HSA in the Park decreased by 44 % between 2001 and 2008

and the HSA landbank based on average sales during the period 2004–2008 inclusive was only 8.7 years (Y&HRAWP Annual Monitoring Reports, 2001–2008).

The NRAWP supports the views expressed during consultation as it too has raised concern regarding the medium- to long-term supply of hard rock, and more specifically HSA. This is in the context of what it views as ‘restrictive policies’ within the relevant regional spatial strategy documents applying to National Parks and AONBs, the limited distribution of HSA resources and the reducing size of the HSA landbank (NRAWP, 2010). The issue is explored further in Appendix 3.

#### 4.2.4 The Forest of Dean and the Wye Valley AONB

Permitted reserves of Carboniferous Limestone in the Forest of Dean area of Gloucestershire have been declining in recent years, raising concerns about the continuity of supply. The limestone outcrop is partially located within the Wye Valley AONB, and the largest active quarry on the outcrop is sited within the AONB. The way in which the options for supply have been addressed in the county and region are discussed in Case study 19.

##### Case study 19: declining hard rock reserves in Gloucestershire

A potential issue regarding a shortfall in supply of high quality crushed rock in Gloucestershire arose during consultation.

Gloucestershire is a modest supplier of crushed rock, supplying 8 % of the South West region’s sales in 2008 (SWRAWP, 2008). Its rock resources are located on the oolitic limestone of the Cotswolds, a lower quality resource, and the Carboniferous Limestone outcrop in the far west of the county in the Forest of Dean which supplies higher quality stone. The latter is the principal source of supply with sales of 1.22 Mt in 2008. The outcrop lies partially within the Wye Valley AONB, and the largest of the five quarries operating on the outcrop, Stowfield, is within the AONB. Historically there has been crushed rock working in a prominent position overlooking the Wye Valley, at Tintern Quarry (now ceased).

Permitted reserves in the Forest of Dean have been declining. The landbank for crushed rock in the whole county has been around 11 years for some time, but this concealed a more pronounced shortage in the Forest of Dean. The supply position in Gloucestershire is unusual in the South West region. This is the second largest crushed rock supplying region in the country, with production being dominated by Somerset (Mankelow *et al.*, 2007). The overall permitted reserves in the region are high (899 Mt at the end 2008), amounting to a landbank of more than 30 years based on the apportionment method, with all crushed rock-producing MPAs except Gloucestershire having a substantial landbank of permitted reserves.

The prospective shortfall in reserves of Carboniferous Limestone within the Forest of Dean has been of concern for some time. Thompson *et al.* (2005) state that there are outcrops outside the AONB boundary which are free of other major designations. However, there are other constraints and practicalities to working the resources in these areas. Thompson *et al.* (2005) also identified opportunities for other MPAs in the region to pick up a shortfall of crushed rock from Gloucestershire and supply the same markets, notably from Somerset, South Gloucestershire and North Somerset.

Gloucestershire County Council permitted an extension with 8.7 Mt of reserves at Clearwell Quarry in 2007, and has also approved an extension, subject to a legal agreement, with about 10 Mt at Stowfield within the AONB. That permission will allow the rate of output at Stowfield to rise to over 1 Mtpa. Preferred areas have been identified in the MPA’s plans which would make provision for further extensions on the outcrop. The identified solution to the problem of

declining reserves has, therefore, been to sustain local production from the AONB, rather than opt for a supply away from that outcrop and the AONB proposed by Thompson *et al.* (2005).

#### 4.2.5 The Surrey Hills AONB and adjacent AGLV

There are soft sand resources within Surrey but many of these are located within the Surrey Hills AONB. The County Council has resisted the working of these resources within the AONB (other than as an ancillary product from silica sand operations), so attention has turned to the options available outside. Some of the resources are within Areas of Great Landscape Value (AGLV), a landscape designation developed by the County Council to recognise special landscapes outside the AONB. The County Council has recently advocated that the AGLV should be treated in the same way as the AONB for mineral planning purposes. Case study 20 outlines how this planning policy approach emerged and is being pursued, and the effect that this is having on soft sand allocations in the Minerals Plan currently in preparation.

#### **Case study 20: conflict between soft sand supplies and a county landscape designation**

The Area of Great Landscape Value (AGLV) identified by Surrey County Council has for many years aimed to protect attractive countryside from inappropriate development. Most of the AGLV is located in areas where it forms a buffer zone to the Surrey Hills Area of Outstanding Natural Beauty. Both the AONB and the AGLV contain soft sand resources.

In 2007 a review of the AGLV was carried out for the Surrey Planning Officers Association by an independent firm of landscape assessors, Chris Burnett Associates, to consider the whole of the area designated as AGLV and, following landscape assessment advice, whether the AGLV should be retained in whole or in part. The report argued that almost all the AGLV should be retained and that some parts merited designation as AONB. Based on this advice, the Surrey Hills AONB Board considers that a boundary review of the Surrey Hills AONB is required and that the review should incorporate land outside of the designation which is currently identified as AGLV. Although Surrey County Council has endorsed this view, Natural England have responsibility for undertaking a review of protected landscapes but has no timetable for the review of the Surrey Hills AONB at present.

In practice, there was only one site for soft sand working which the County Council had been proposing to allocate in its Primary Aggregates Plan, and this site was duly omitted. In a supplementary report this has been identified by Chris Burnett Associates as of AONB standard. The site in question had attracted more opposition than any other site proposed to be allocated, for a range of reasons aside from its AGLV location, and since then the mineral company promoting the site has withdrawn its interest.

The Inspector holding the Examination of the Minerals Plan is expected to report in March 2011 with a decision on the principle of treating the AGLV on the same basis as the AONB.

#### 4.2.6 Wildlife designations in Leicestershire

In practice, one of the principal locations identified where wildlife designations have a significant bearing on the medium- to long-term pattern of aggregates supply is in Leicestershire where SSSIs surround large parts of some of the major crushed rock producing quarries and thus limit lateral extension (e.g. Mountsorrel and Bardon). Environmental constraints are not, however, the only constraint identified in Leicestershire (Case study 21 and Appendix 3). From this exceptional case we conclude that (assuming our broad consultations did not miss anything else significant and that our detailed studies are representative) wildlife issues are generally

regarded as more localised supply issues rather than strategic concerns. They appear to largely affect the outcomes on individual sites but not the pattern of aggregates working across an authority.

### **Case study 21: technical and environmental constraints on future supply of igneous rock from Leicestershire**

A range of constraints and associated concerns regarding the supply of igneous rock from Leicestershire were raised by the EMAWP, industry representatives and major importing regions. Supply of igneous rock from Leicestershire is of national strategic importance.

Leicestershire's igneous rock resource are of economic importance out of proportion to their relatively small size and account for over 70 % of total igneous rock production in England (Mankelow *et al.*, 2008), with 59 % being exported outside the region, principally to the East of England, West Midlands and London (Mankelow *et al.*, 2008).

During its sub-regional apportionment process the EMAWP indicated that whilst short-term (2005–2020) provision is assured (with a landbank at the end of 2008 of more than 21 years based on the apportionment method, EMRAWP, 2008), shortfalls in supply can be expected in the future (see Figure 16) because of a range of constraints. These constraints include: logistical issues affecting access to reserves at some sites; technical issues associated with the depth of working including slope stability issues and greater costs; geological issues with depth of overburden and defining the extent of the mineral resource at depth, limiting options for lateral extensions to existing sites; environmental constraints (for example Mountsorrel is surrounded by SSSIs at approximately 60 % of its rim) and limitations on the ability to expand laterally; significant permitted reserves existing in inactive, non-rail linked sites; and lagtime, as consultees indicated that even if new permissions or major extensions were granted, a minimum of 5 to 7 years would be required for such large units to reach full production capacity (EMRAWP, 2010).

The medium-term concerns expressed regarding crushed rock supplies from Leicestershire are supported by rundown data collated for this study, which indicates that Leicestershire could continue to supply its 2007 sales rate for a further seven years from its active sites, though output would then fall by about 1.5 Mt to just over 15 Mtpa for the four further years 2015–2018 unless further permissions were granted. The EMAWP cautions that as a result of the constraints detailed above up to 20 % of the permitted reserves may in practice not be recoverable. This would bring forward the closure dates for the quarries and reduce their ability to meet production levels anticipated in Leicestershire's apportionment (Appendix 3).

## **4.3 AGGREGATES SUPPLY FROM OUTSIDE PROTECTED AREAS**

The following section presents the issues surrounding supply of aggregates from outside designated areas. If permissions in the future are only likely to be granted within nationally designated areas in '*exceptional circumstances*', then over time these designated areas will contribute less aggregates to overall demand, and other sources (including land-won aggregates from outside designated areas) are, consequently, likely to contribute more material.

### **4.3.1 North-west Surrey**

The difficulty of finding workable resources of sand and gravel in north-west Surrey has been a recognised challenge for decades. The Surrey Structure Plan made provision for a decline in the productive capacity of aggregates processing plant in north-west Surrey, first in its 1989 version (Policy MN10) and again in its 1994 version (Policy DP25). The 1989 policy was elaborated in the Surrey Minerals Local Plan 1993 (Appendix 3).

The policy approach now is for each MPA to identify sufficient land for aggregates working to enable its ‘apportionment’ of the regional total to be achieved. This apportionment is decided through the authority’s development plan (which is tested at Examination) and informed by the process of apportionment amongst all authorities in a region. Ideally that apportionment process should respond to ability to provide mineral (see ASRP 2/8, *Proposed toolkit for developing aggregate apportionment options*, Land Use Consultants *et al.*, 2011). There has been an ongoing debate about the ability or otherwise of the area to maintain its output of sand and gravel (Appendix 3), but the direction of travel continues to be clear. The apportionment to Surrey of the Government’s allocation in 2003 to the South East region was 2.62 Mtpa, but the apportionment based on the 2009 allocation is just 1.27 Mtpa, largely in recognition of constraints in north-west Surrey.

#### 4.3.2 Nottinghamshire

Evidence suggests that the decline in sand and gravel production in the Idle Valley in north Nottinghamshire has progressed further than the decline in north-west Surrey (Case study 7 and Appendix 3). The resource and environmental constraints on further working in the Idle Valley has prompted more attention to generating supplies from alternative resources. The experience in this area indicates the difficulties which can arise when the choice between alternatives includes different environmental constraints. The short-term alternative of additional working in the Trent Valley to the south involves additional transport of aggregates north to their market mainly in South Yorkshire (as well as local issues), with the additional transport impacts and carbon emissions that entails. However, encouraging South Yorkshire to increase its ability to meet its own need is against a background of constraints on supply in the whole of the Yorkshire and the Humber region. The combined sales of sand and gravel from South and West Yorkshire slumped from 1.1 Mtpa in 2003 to just 0.4 Mtpa in 2007 and 2008, while almost all the permitted reserves in Doncaster are for soft sand rather than concreting sands and gravels (Y&HRAWP, 2008) (Case study 14). This suggests that replacing the lost supply in proximity to the demand may be difficult geologically and environmentally.

#### 4.3.3 Northamptonshire

Sand and gravel supply in Northamptonshire is caught between the difficulties of an expanding demand in the Milton Keynes South Midlands Growth Zone area and finding environmentally acceptable sites for working following years of depletion of river terrace deposits (Case study 22).

#### **Case study 22: environmental constraints affecting the supply of sand or gravel in Northamptonshire**

The protection of river valley resources in Northamptonshire has resulted in a downturn in aggregates supply capacity in the county.

Northamptonshire contributes 6 % to regional sand and gravel supply (Mankelow *et al.*, 2007). The supply of aggregate in Northamptonshire has been a longstanding issue. Sand and gravel sales from Northamptonshire have declined significantly over the last 20 years and the county’s remaining landbank is only 3.8 years, based on the apportionment method.

The EMAWP has commented that ‘*Sand and gravel extraction has focused upon the middle reaches of the Nene Valley, either side of Northampton. Mindful of the difficulties of obtaining suitable fill material, (without which the whole area could become a ‘waterpark’ by default), over the last 20 years, the County Council has operated a policy of discouraging extraction in the valley and directing proposals to the topographically higher ‘drift’ deposits*’ (EMRAWP, 2010).

The attempt to redirect production capacity and reserves away from river valleys and into areas of lower quality glacial deposits in the north-west of the county has largely failed. Few applications were made in that area, and the county landbank for sand and gravel declined. Furthermore, the Milton Keynes South Midlands Growth Zone, located on the south-east side of the county, is placing significant and sustained demand on aggregates. A report on aggregate supply in the Growth Zone concluded that ‘...Northamptonshire appears unlikely to be able to respond to higher levels of aggregate demand’ as ‘...the remaining unconstrained resources are becoming scarce.’ (Harrison *et al.*, 2005).

The County Council has responded by making a renewed attempt to find sites for aggregates working, accepting that even if successful this cannot be a long-term arrangement. In its Adopted Core Strategy Northamptonshire County Council states that ‘*It is becoming increasingly difficult to identify new sites for soft sand extraction in the county*’ (Northamptonshire County Council, 2010). Nonetheless, the County Council has:

- encouraged the industry to identify sites in the early part of its plan-making process;
- granted further permissions and allocated land for working in the Nene Valley west of Wellingborough (east of Northampton); and
- committed to achieving the county’s 2003-based apportionment level (i.e. 0.97 Mtpa), and identified enough sites with which to do so to 2026.

This has been more successful. EMAWP reports that as a result sales of sand and gravel are expected to rise and one company that imports material from Derbyshire into Northamptonshire will cease doing so once a permitted reserve comes on stream in the Nene Valley (EMRAWP, 2010). The achievement appears to be at the price of compromising the MPA’s policy of restraining sand and gravel working in the Nene Valley. See Appendix 3 for more details.

#### **4.3.4 Cotswold Water Park**

The Cotswold Water Park is an example of strategically planned sand and gravel extraction in the upper Thames Valley on the borders of Wiltshire and Gloucestershire in the South West region. However, there are difficulties geologically and environmentally in finding new resources and permitted reserves, especially in Wiltshire. This has local consequences for each authority, cross-boundary effects between them, and implications for cross-boundary pressure to work resources in the adjacent South East region, as described in Case study 23.

#### **Case study 23: constraints on sand and gravel supply in the upper Thames Valley and impact on surrounding areas**

Constraints on sand and gravel supply in the Cotswold Water Park area of Wiltshire and Gloucestershire could have implications for surrounding areas.

The Cotswold Water Park is a substantial area of the upper Thames valley on the borders of Wiltshire and Gloucestershire where a planned programme of aggregates extraction and restoration to water-based uses is taking place (Case study 11). Working in the Wiltshire part of the area is expected to come to an end by 2015, and the expectation in the short-term is that Gloucestershire will take over responsibility. However, both counties have limited resources suitable for working. Wiltshire’s sand and gravel landbank is the most critical having fallen from only 5.6 years in 2007 to 4.5 years in 2008, with that in Gloucestershire at about ten years based on the past sales method. Landbanks reduce considerably when based on the apportionment method with Gloucestershire falling below 7 years (SWRAWP, 2008).

The consequence for Wiltshire of the cessation of working within the Cotswold Water Park is that the county is likely to fail to meet its apportionment. This could cause pressure for

previously unworked areas elsewhere in the county to be opened up. In Gloucestershire the supply prospects are slightly better. There are unworked areas on the county boundary which might be extended and a preferred area in the upper Thames valley has been identified with 3.5 Mt. These should be sufficient for the Cotswold Water Park area to 2020. Furthermore, the last Gloucestershire Minerals Local Plan did not allocate a site containing 7–8 Mt of reserves which might supply 0.45–0.5 Mtpa (this was omitted because it was not required). After that there are no clear choices available and a rundown in supplies is likely. Both Gloucestershire and Wiltshire look over the regional boundary to Oxfordshire, where the resources of the upper Thames Valley around Lechlade remain unworked. Meanwhile Oxfordshire too is under pressure to find additional sand and gravel resources to meet its apportionment, which increased from 1.82 Mtpa based on the 2003 allocation to 2.10 Mtpa based on the 2010 allocation (Case study 6).

#### 4.4 DISCUSSION

- Within protected areas designated for their wildlife and especially for their landscape value there are clear policy constraints on aggregates working. The designation encapsulates the environmental interest and elevates its importance in planning decisions. The evidence shows that these are not absolute constraints, with working allowed in the Gloucestershire part of the Wye Valley AONB, for instance. Nevertheless, the majority experience is that aggregates working is severely constrained in these areas, notably in the Peak District National Park and Surrey Hills AONB from the cases studied. In other cases the prospects for working have not been resolved and await decision in due course, notably in the new South Downs National Park and, for HSA, in the Yorkshire Dales National Park. In the case of a landscape designation created at the county level, which has a lower level of protection, there has been a particular dispute between the parties over the weight which should be given to it in relation to aggregates working proposals.
- Outside protected areas, the difficulties are more pronounced due to the less definitive policy framework. There are different degrees of environmental and/or geological constraint. Overcoming these, if practicable at all, may well raise the cost of development. The economic consequences will affect mineral companies' level of interest in proceeding with schemes, taking into account matters such as competitors and proximity to markets. Distinguishing environmental, geological and economic limitations on working is difficult or impractical. Disputes between the parties can be more intense outside protected areas as the outcomes are less prescribed.
- MPAs may see the benefit in quarrying moving away to another apparently less constrained area. However, there is likely to be resistance to move into new areas not only from the residents and the MPA in the new area (as demonstrated in Oxfordshire, Case study 6) but from the mineral companies who would potentially prefer to continue in the constrained area. This is very clear in the Northamptonshire case study, where efforts to support new locations for working largely failed, mainly because the quality of material in these new areas is uncompetitive with other resources still being worked. Even when aggregate shortfalls are arising or in prospect in sensitive areas, such as the Peak District and Yorkshire Dales National Parks highlighted in our case studies, there can still be resistance to accommodating requirements in alternative locations.
- The pressure on MPAs to maintain output in existing areas can rise due to the obligations imposed through MASS to ensure continuity of supply to the construction industry. This is clear in the case of crushed rock supply from the Forest of Dean area of Gloucestershire, with aggregates released even in the Wye Valley AONB. Encouragement for continued aggregates working in the area now designated as the South Downs National Park is especially pronounced. Continued working is being supported by some parties in the Peak District and

Yorkshire Dales National Parks, as well in areas where resources are now much more tightly constrained than before, such as north-west Surrey and the upper Thames valley.

- There are other cases where the environmental constraints on working are severe and rundowns in supply are expected very soon or even occurring, but no solution has yet been found for making up for the shortfall beyond the short-term. This is apparent in the South Downs and Yorkshire Dales National Parks, north-west Surrey and the upper Thames Valley around the Cotswold Water Park of Wiltshire and Gloucestershire. In other areas there are usually only partial solutions.



## 5 Adequacy of the geological database to support planning for minerals supply

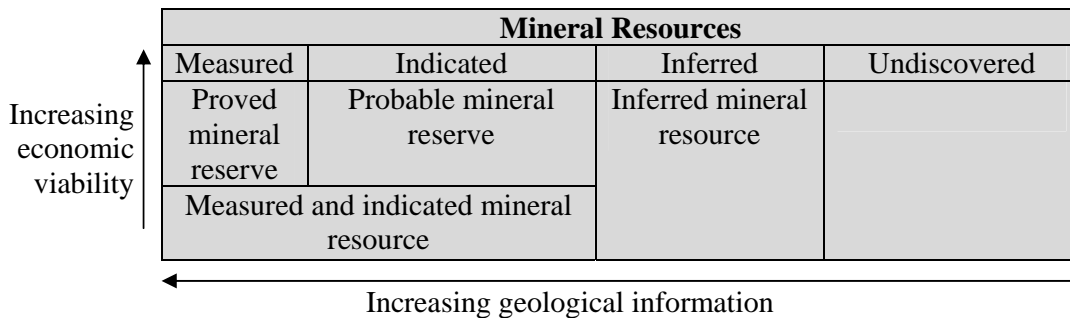
This section contributes to the investigation of Project Objective 3, by examining the adequacy of the existing geological database to support planning for minerals. It provides an introduction for the subsequent assessment (Section 6) of the adequacy of geological data in specific areas considered to be a priority for further investigation.

MPS1 clearly identifies the need for MPAs to ‘*use the best available information on mineral resources within their areas*’ to achieve the Governments national objectives for mineral planning. Specifically, this policy requires that MPAs must provide a clear guide as to where mineral extraction is likely to take place in the form of specific sites, preferred areas or areas of search: the first two are often combined or used interchangeably by MPAs for the sake of simplicity.

MPAs are also required to define Mineral Safeguarding Areas ‘*in order that proven resources are not needlessly sterilised by non-mineral development*’. No presumption of working is assumed for safeguarding areas as it is for other individual site allocations, so less detailed information is required. Finally, it is also specified that there is a need to ‘*identify at the regional level, those minerals which are of national and regional significance and include policies for them in RSS*’. Consequently it is essential that organisations responsible for planning for mineral supply to have access sufficient geological data to make informed and robust planning decisions.

### 5.1 RESOURCES AND RESERVES

Mineral deposits can be classified into resources and reserves: resources can also be subdivided into measured, indicated and inferred categories, depending on the level of geological information available, as well as economic factors (Figure 11). Generally, a mineral resource is known to exist within the boundaries outlined by geological mapping, which may be supplemented by more detailed geological data. Deposits of potential economic interest are influenced by numerous factors, including demand for the mineral and extraction technology, which may change substantially over time.



**Figure 11.** The relationship between geological information, economic viability and mineral resource categories. Note increasing economic viability only applies to ‘mineral reserves’.

For the allocation of specific sites or preferred areas considerable geological information is required and resources typically need to be assessed to the *measured and indicated* levels. However, for strategic planning purposes it is sufficient for a mineral resource to be inferred. Once a resource is well-defined geologically and is proven to be economically viable it is termed a ‘reserve’. If this obtains planning permission to be extracted it is then a ‘permitted reserve’.

## 5.2 LEVELS OF DATA REQUIRED FOR SPECIFIC MINERALS PLANNING PURPOSES

Legislation and policy require mineral planners to complete a diverse array of tasks. Varying levels of geological information are required depending on the expected output. Consultation with stakeholders demonstrated that information which can prove indicated resources, specifically data on mineral quality and volume, is considered vital for the delineation of preferred sites and specific areas. Generally this type of information is not available from the BGS *Mineral Resource Maps*, discussed in Section 5.3.1 (although it does exist for those areas covered by industrial minerals assessment unit (IMAU) studies). Consequently information on mineral quality and volume is frequently sourced from industry and is not always considered impartial.

The following comment received during consultation highlights the importance of the availability of robust geological evidence to support the planning process: The WMAWP highlighted that ‘*a lack of agreement on the quality, thickness and even the extent of aggregate resources in many parts of the region was one of the major reasons why some members of the AWP queried the methodology for calculating the revised apportionment*’. In other words they suggested the evidence based was not credible.

### 5.2.1 Preferred areas and specific site definition

Preferred areas and specific sites are defined on an individual site basis and require detailed information on the qualities and quantities of minerals at these sites, coupled with an in-depth understanding of associated land ownership and environmental issues. Consequently minerals information must be at the *measured* and *indicated* level. This level of detail is necessary because these are the sites where MPAs would consider, and perhaps expect, mineral workings during the plan period. MPAs define these areas through consultations with the minerals industry, environmental groups, other statutory bodies (e.g. the Environment Agency) and the public. Data that may be appropriate for their definition includes borehole information, site reports, trenching information, laboratory analyses, volume calculations, detailed geological mapping and a consideration of economic and environmental constraints.

The level of detail required to support the planning process will also be a function of resource type. For example, a significantly greater number of test samples may be needed for superficial sands and gravels than for crushed rock (Section 5.3.2) as the former is generally more heterogeneous and it can be problematic to attribute specific physical and chemical properties to discrete mapped geological units. Appendix 8 lists some of the important properties that planners require information on when considering aggregate resources for specific common applications.

### 5.2.2 Defining mineral safeguarding areas

Unlike preferred area and specific site allocations mineral safeguarding areas are not restricted by environmental or land ownership constraints. Although, detailed impartial information on mineral quality and quantity at a county level is typically required, mineral information at an inferred level is commonly sufficient. Data that may be appropriate for the definition of these areas include geological mapping, regional borehole sampling (particularly for more heterogeneous deposits) and information on mineral quality from site investigations or laboratory testing.

One consultee indicated that ‘reasonable assurance’ is required that mineral is present for safeguarding purposes and consequently a dataset to bridge the gap between broad resource areas (provided by BGS *Mineral Resource Maps*) and detailed site specific information would be desirable.

### 5.2.3 Strategic planning

For strategic planning purposes planners require access to regional geological mapping or mineral resource data at an inferred level and an understanding of the complexities and limitations of the data. It may be necessary to refer to borehole records or reports from industry in areas lacking other data. Consultation highlighted that information at an inferred resource level is generally considered adequate for strategic planning and BGS *Mineral Resource Maps* are typically appropriate for this purpose.

Industry representatives consulted support the view that BGS *Mineral Resource Maps* are generally sufficient for high-level strategic planning (i.e. target area identification) and it is not practical to have additional more detailed information nationwide. However, consultees suggested that a targeted data acquisition approach is required where significant constraints on supply are demonstrated, particularly in nationally significant resource areas. An example quoted was that the national importance of Leicestershire's igneous rock resources warrants more detailed assessment.

## 5.3 DATA SOURCES AND LIMITATIONS

Information sources which can guide planning for mineral supply and contribute to mineral resource delineation are wide ranging. The type of information and the level of detail vary significantly between sources. It is, therefore, important to consider the limitations of specific data sources and ensure they are being used for an appropriate purpose. The principal information sources currently available to minerals planners in England are outlined below.

### 5.3.1 BGS data

#### BGS MINERAL RESOURCE MAPS

<i>Coverage</i>	<i>Scale</i>	<i>Available information</i>	<i>Limitations</i>
Complete digital coverage of England (compiled on a county basis)	1:50 000	<p>A two dimensional representation of the surface expression of mineral resources based on geological mapping data.</p> <p>Spatial data showing areas within which potentially workable minerals may occur. Unless indicated by Mineral Assessment Reports, all resources are inferred.</p> <p>An accompanying report for each county explaining the local mineral resources and giving some quality information for broad resource areas.</p>	<p>Generally lacking data on thickness, quality and quantity of resources and overburden.</p> <p>Data is based on geological formations identified by mapping and takes limited account of local variations in mineral quality.</p>

#### BGS GEOLOGICAL MAPS

<i>Coverage</i>	<i>Scale</i>	<i>Available information</i>	<i>Limitations</i>
Complete digital coverage of England	1:50 000	A two dimensional expression of the surface geology	No information on thickness, quality and quantity of resources and

		Individually mapped formations may enable interpolation and extrapolation of aggregate property data	overburden  Not collected with mineral planning purposes in mind
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#### BGS MINERAL ASSESSMENT REPORTS

<i>Coverage</i>	<i>Scale</i>	<i>Available information</i>	<i>Limitations</i>
Variable: many important resource areas are covered but significant gaps exist  Information is restricted to limestone and sand and gravel	1:25 000	Detailed assessments utilising specially commissioned borehole surveys  Information is available on overburden thickness and physical and chemical properties.  Volume estimates are available for sand and gravel assessments	Assessment criteria used may no longer be valid, with a requirement for re-analysis using current industry specifications  Borehole density generally means assessment is at an 'indicated' level.  Published as technical reports and not readily accessible to non-specialists

#### BGS BOREHOLE DATABASE

<i>Coverage</i>	<i>Scale</i>	<i>Available information</i>	<i>Limitations</i>
Variable: ranges from extensive to almost non-existent  Dependent on previous work, therefore concentrated on major roads and urban areas	Depends on coverage	Dependant on the purpose of the borehole. All contain thickness and overburden information and some may have information on aggregates.	Variable quality of reported data.  Most boreholes are not logged from a minerals assessment perspective.  Lack of information on resource quality

### 5.3.2 Mineral resource information

It is difficult to attribute mineral resource information, particularly quality and thickness, to mapped geological units, even when borehole information exists. This is especially true of sand and gravel resources, which can be extremely heterogeneous on a local scale, in terms of both quality and quantity. This variability is not usually captured by routine geological mapping. For hard rock resources this issue is less pronounced, as they are generally more homogeneous in both quality and thickness. However, this is not true for all hard rock resources which can be highly variable and thicknesses may be unpredictable in structurally complex areas. Consequently, attributing the same mineral properties to entire mapped geological units can be problematic especially for HSA end-use applications, since these can be sensitive to small variations in aggregate properties.

### 5.3.3 Aggregate end-use

During the consultation it was suggested that increased knowledge of the aggregate products derived from particular deposits should be explored and greater awareness of material end-use would aid planning for mineral supply. The end-use of a mineral resource is dependent on its physical and chemical properties so these must be well characterised. It is important that planners consider the end-use of a mineral resource when planning for its future extraction, in an attempt to ensure it is utilised for the most sustainable purpose (e.g. sandstones with high PSV for road surfacing and high purity limestone for chemical use).

Cosultees also suggested that increased knowledge of the extent of processing which is being undertaken to meet end-use specifications would support the planning process. Economics also plays a significant role, as processing techniques as well as local market demands can control end-use. Furthermore, to non-specialist planners, information on end-use may be more valuable than information on geological properties such as grading, fines contents, durability and hardness (Appendix 8). However, determination of end-use properties for a specific resource would require companies to present additional information on mineral quality. As the remaining mineral resources encounter greater constraints on working, the pressure is likely to increase on mineral companies to demonstrate that they will not be wasting high grade minerals on low grade end-uses.

### 5.3.4 Hydrogeology

During the consultation hydrogeology was raised as an issue which requires better understanding. Specific reference was made to concerns regarding the renewal of licences. The Environment Agency issues these for a maximum period of 11 years, whilst many sites are worked for considerably longer. Hydrogeological data is essential for detailed site assessments (particularly within limestone areas), as discussed in Section 6 with reference to long-term planning for minerals in the Mendips. However, consideration of the adequacy of this dataset for general mineral planning purposes in England is beyond the scope of this study.

### 5.3.5 Commissioned studies

MPAs potentially have access to geological studies that have been commissioned by the region or individual MPAs to inform planning for mineral supply. These typically contain resource information in the form of both reports and spatial data. Examples include *'Assessment of potential yield for selected primary aggregates sites, Surrey'* by GWP Consultants and *'Former Gwent Aggregates Safeguarding Study'* by Cuesta Consulting. BGS has also been commissioned to produce numerous studies. Recent examples include *'Lincolnshire sand and gravel assessment'* and *'Sand and gravel resources of Milton Keynes Borough'*. The coverage and scope of these commissioned report is typically limited, but they generally benefit from being focused on the needs of the mineral planner. The very existence of these additional reports highlights the need for enhanced minerals information in specific areas, above and beyond that which is publically available.

### 5.3.6 Industry data

During the consultation it was reported that operators are increasingly relied on for information and if this is not provided major knowledge gaps can result. The minerals industry holds an extensive amount of mineral resource information from site investigations and more strategic studies. In many cases this information is available to MPAs. However, this information will be generally at a local scale so the regional context cannot be observed.

MPAs consulted during this study suggested that information supplied by industry can be biased towards the company which releases it, with the suggestion that industry are only likely to provide information where it works in their interest. Reliance on industry data may result in a

bias towards those areas which industry favours (Section 3.6), although other resource areas may be available. This demonstrates the desirability of having available impartial regional and national datasets. For example, there are extensive resources of sand and gravel in the south of the North East region (Case study 13). However, according to the NEAWP the industry's view is that the resources are too low quality. The relevant MPAs do not have sufficient evidence to contest this view, as the BGS *Mineral Resource Maps* do not provide details of aggregate quality.

Furthermore, industry data is frequently in a raw form (as borehole logs and site and laboratory reports), and consequently requires some geological knowledge for interpretation. This knowledge is increasingly lacking in MPAs, as discussed in Section 5.4. Confidentiality is also a major barrier to obtaining industry data. Although industry may be willing to share information with MPAs to support planning for mineral supply they may, understandably, object to it being integrated with other datasets and placed into the public domain.

## **5.4 COMPREHENSION OF GEOLOGICAL DATA**

It is widely acknowledged that mineral planning requires a specific set of skills and knowledge. It is critical that planners dealing with minerals-related issues understand the complexities of mineral resources and the consequent limitations of the available geological data.

The consultation highlighted that there are few mineral specific planners in England and, although there are planners who specialise in minerals-related issues, in most MPAs minerals issues are increasingly dealt with by planners with limited minerals expertise and/or without specific training. This issue is compounded by a lack of current minerals specific planning training. This problem is becoming even more acute as many MPAs reduce their staff numbers as part of the period of exceptional severe restraint in local authority expenditure beginning in 2011–2012. The consultation also highlighted that there is a prevailing attitude that becoming too specialised in a particular field, such as minerals, may affect future career prospects and can therefore act as a potential deterrent. The results of the consultation are supported by a recent note issued by the UK Minerals Forum working group on planning skills, which considered minerals planning training and skills in the UK (Hicks, 2011).

### **5.4.1 Presentation of geological data**

Although every effort is made to ensure that geological data and mineral information is accessible, almost all data sources require some knowledge of geological issues and interpretation before they can be applied in the planning process. This is a function of the complexity of many resources, especially when considered in three dimensions, a requirement for volume calculations.

#### **5.4.1.1 THREE-DIMENSIONAL MODELLING**

The consultation indicated that three-dimensional (3D) visualisation techniques might be a valuable tool to aid mineral planning in the future, particularly in areas of more complex geology. For example consultees indicated that Bardon Quarry in Leicestershire is not located on an igneous rock resource on a geological map, since the resource is masked by younger rocks at the surface. The EMAWP suggested that improved geological knowledge is required regarding the quality and variability of Leicestershire's igneous rock resources at depth and the potential for extensions under the Permo-Triassic cover rocks.

3D modelling is a valuable technique for displaying mineral resource information at depth. These models allow a clear and easily accessible 3D visualisation, which is generally easier to understand for non-specialist planners. However, the construction of 3D models requires a considerable quantity of geological information, generally in the form of borehole records, and physical and chemical data properties have to be attributed to the models. Consequently 3D

models can only be constructed in areas for which detailed minerals information already exists and can be time consuming and expensive to construct. Although they may aid in the understanding of mineral resources, and the estimation of mineral volumes, they do not compensate for a lack of primary data.

#### 5.4.1.2 GIS ANALYSIS

One method for presenting geological data in a more accessible format, and has been used in recent studies for both Lincolnshire and Milton Keynes, involves compiling a database of borehole information for the study area and interpreting this through a Geographical Information System (GIS). By interpreting data in this way resource volumes and overburden depths can be ascertained. If IMAU data is available (as it is for much of Lincolnshire) then the GIS can also be attributed with some quality information on deleterious materials, fines content and size fractions.

Interpreting and presenting the data in this way allows up-to-date industry specifications for aggregates to be used for defining areas of interest. Resource volumes can also be estimated, but accuracy depends on the quantity and quality of borehole data available. A high level of confidence can be attributed to total resource estimates in areas of good borehole coverage and where data on aggregate properties are captured.

## 5.5 DISCUSSION

Broader expenditure decisions and reductions in central government funding have already reduced, and will continue to impact on funding to finance basic research and data collection on aggregate resources. However, this study has demonstrated a clear requirement for additional data to support long-term planning for minerals in some areas:

- The availability of robust geological information is critical to many aspects of planning for mineral supply. Information sources which can guide mineral planning and contribute to mineral resource delineation are wide ranging.
- The level of geological data required for mineral planning varies considerably depending on the intended purpose, such as definition of specific sites or regional-level target delineation. It also needs to reflect the complexity of the geology and the heterogeneity of the resource type in question. Consequently it is important to consider the limitations of specific data sources and ensure they are being used in an appropriate manner.
- Existing data provision, principally BGS *Mineral Resource Maps*, are generally considered adequate for strategic level planning.
- Geological data which can prove indicated resources, specifically mineral quality and volume, is considered vital for the delineation of preferred sites and specific areas. The data currently available from the BGS, with the exception of those areas covered by IMAU surveys, is generally insufficiently detailed for this purpose. It is difficult to attribute mineral resource information, particularly quality and thickness, to geological units on maps, even when borehole information exists.
- Consultees conceded that it is not practical to have more detailed data coverage in all parts of the country. However, a targeted approach to data acquisition is required, in areas where significant constraints on supply are demonstrated and clear deficiencies in the evidence base occur. This is particularly important for nationally significant resource areas.
- A data set combining minerals resource information such as quality and thickness and associated end-use data, where available, for individual mapped geological units would be challenging to produce, but a major asset to planners attempting to match market

requirements with resource availability. This is a difficult task because certain aggregates have a very broad spectrum of end-uses, which are frequently dictated by economic factors.

- The degree of reliance on operators for mineral resource information in some areas may result in a bias towards those sites which industry favours. This is likely to reinforce attention on known resource areas, possibly at the expense of missing new ones, which might be less constrained or are outside of traditional source areas. Reliance on industry data also has implications for the confidence decision-takers in local government, the Planning Inspectorate and the Courts can place on data provided. Confidentiality is a further limitation to the use of industry data. These issues illustrate the continued need for independently sourced and compiled resource information, which is publically available.
- An identified growing shortage of minerals planning expertise in local authorities, caused by a range of factors, can result in difficulties with comprehension of geological information and its limitations. Novel techniques including 3D modelling of resources and GIS-based data analysis can make geological and resource information more accessible to non-specialists, but are costly to implement.



## 6 Maintaining a supply of strategically important aggregates resources — alternative supply scenarios

The previous sections have identified numerous constraints on access to specific aggregate resources. The type of constraints cited during consultation are highly varied but included environmental considerations, sterilisation by other forms of development, concerns over resource quality and quantity, together with commercial factors. In many instances these factors are overshadowed by policy-related considerations at the regional and/or national levels.

### 6.1 CONSTRAINTS ON FUTURE AGGREGATE SUPPLY

Table 1 shows that the constraints identified will impact on supply over a range of timescales, varying from short-term (issues that are of immediate concern and may be impinging on current aggregate provision or are likely to affect supply during the current *Guideline* period), to medium-term (constraints which will be of significance for supply during the next *Guideline* period i.e. 2020 onwards) and long-term (constraints which will principally have implications for supply from 2030 onwards). The constraints also vary in the extent of their geographical impact (reflecting the distribution of market destinations), and in their magnitude (in relation to the overall quantity of supply involved). Table 1 attempts to summarise these characteristics for constraints identified in a number of key supply areas. It ranks constraints timescales and spatial influence using a traffic light approach. Areas shown in bold text are the subject of more detailed analysis, as described in this section.

The study has highlighted a number of constraints which will potentially impact on supply over the short-term, as they are likely to have implications for supply during the current *Guideline* period. Short-term supply issues principally relate to sand and gravel provision, but do affect specific types of crushed rock resources e.g. Carboniferous Limestone in County Durham, for which landbanks are low, and HSA in the Yorkshire Dales National Park. Areas which face medium-term supply constraints generally indicate that they have sufficient resources for the current *Guideline* period such as Surrey, but are likely to face a shortfall beyond that point. Medium-term supply issues exist for both sand and gravel and crushed rock. Medium-term supply issues are apparent for igneous rock in Leicestershire. Whilst the supply issues in Leicestershire are not of immediate concern in terms of availability of material, the significance of the resources affected and the consequent impact on future national supply warrant action now, in terms of policy development.

### 6.2 ALTERNATIVE SOURCES OF AGGREGATES IN ENGLAND

Although some of the constraints identified can potentially be resolved or mitigated, the general consensus from both the consultation and rundown analysis is that some traditional resource areas are unlikely to be able to sustain production indefinitely, particularly in the medium- to long-term. For these areas in particular there is a need to assess alternative resources which may need to contribute in future to maintaining an adequate long-term security of supply.

A previous MIRO project (Mankelow *et al.*, 2008) examined alternative sources of aggregates which might need to be relied upon should the traditional supply sources from within National Parks and AONBs become curtailed once current permissions expire. These alternatives are potentially important sources of supply for those MPAs highlighted in this study as having reduced productive capacity. A range of potential options were considered, as summarised below.

**Table 1.** Summary of specific resource areas identified during consultation as facing potential supply constraints.

Constrained resource area	Principal constraints	Timescale <sup>1</sup>	Geographical impact <sup>2</sup>
<b><i>Igneous rock in Leicestershire</i></b>	Technical/logistical issues, protected areas, infrastructure	Medium	National
<b><i>Limestone in the Peak District National Park</i></b>	Protected areas	Short–medium	National
<b><i>Limestone in Derbyshire</i></b>	2042 end dates	Long	National
<i>High Specification Aggregate in the Yorkshire Dales National Park</i>	Protected areas	Short–medium	Inter-regional
<i>Magnesian Limestone in County Durham</i>	Reserves confined to a limited number of sites	Medium	Inter-regional*
<i>Carboniferous Limestone in County Durham</i>	Exhaustion of reserves in absence of new permissions	Short–medium	Inter-regional *
<i>Carboniferous limestone in Gloucestershire</i>	Protected areas	Short	Regional*
<i>Crushed rock in the East of England</i>	Resource quality, geological availability	Short	Regional
<b><i>Concreting aggregate in Surrey</i></b>	Protected areas, amenity impact	Medium	Inter-regional*
<i>Sand and gravel in Milton Keynes</i>	Environmental policy	Short	Regional*
<i>Sand and gravel in the Idle Valley Nottinghamshire</i>	Resource depletion	Short	Inter-regional
<i>Sand and gravel in Northamptonshire</i>	Environmental policy	Short	Inter-regional
<b><i>Sand and gravel in Staffordshire</i></b>	Environmental impact	Medium	Inter-regional
<i>Sand and gravel in the North East region</i>	Resource quality, infrastructure, urbanisation	Medium	Regional*
<i>Concreting aggregate in Yorkshire and the Humber</i>	Sterilisation, protected areas, commercial factors	Short	Regional*
<i>Sand and gravel in Cheshire</i>	Protected areas, environmental impact	Short–medium	Regional
<i>Soft sand in the South Downs National Park</i>	Protected area	Short	Regional*
<i>Sand and gravel in the upper Thames valley</i>	Resource availability, amenity and environmental impact	Short	Inter-regional

<sup>1</sup>**Timescale:** *short-term* = a potential issue for supply during the current *Guideline* period (red), *medium-term* = a potential issue for supply during the next *Guideline* period i.e. 2020 onwards (orange), *long-term* = a potential issue for supply from 2030 onwards (green).

<sup>2</sup>**Geographical impact:** *national* = distributed to four or more other regions (red), *inter-regional* = >10% of aggregate produced in the MPA distributed to one or more other regions (orange), *regional* = MPA exports none or limited production outside the region (even if an MPA exports little production outside its boundary, constraints will inevitably have implications for neighbouring MPAs, therefore affects are rarely confined to the MPA level and can be defined as 'local').

\* = estimated, as not determinable from Mankelov *et al.* (2007); bold text = area selected for examination of alternative supply scenarios.

### 6.2.1 Secondary and recycled aggregates

Mankelow *et al.* (2008) report that whilst secondary and in particular recycled aggregates are an important source of aggregates in England, the applications to which alternatives can be used is limited. Furthermore, it is felt that a limit to growth of the sustainable use of recycled and secondary aggregates is being approached (WRAP, 2006).

### 6.2.2 Marine dredged sand and gravel

Marine aggregates make an important contribution to aggregates supply in England, amounting to 9 % of total aggregates sales. This source makes a crucial regional contribution to sand and gravel supply. London (41 % of total primary aggregates consumption) and the South East (27 % of total primary aggregates consumption) have the highest dependency on marine aggregates and this is likely to remain a significant source of future alternative supply for these areas (Mankelow *et al.*, 2008). The industry considers that wharf capacity will not limit its ability to supply additional marine aggregate in the short- to medium-term (Highley *et al.*, 2007). In the longer term, investment in the dredging fleet is needed to sustain higher levels of supply. In addition, even if the marine aggregates industry does have the ability to increase their proportion of aggregates supply, it will be broadly limited to those geographical areas it already supplies. Information gathered from industry sources suggest that a significant and sustained increase in marine aggregate production will also require a more positive regulatory environment. The new Marine Management Organisation will need to take a more positive view about granting further (of extended) dredging permissions, notably to work the large new resource in the Eastern English Channel, than was taken by ministers in the mid-2000 on precautionary advice from Centre for Environment, Fisheries and Aquaculture Science (CEFAS) via Defra. In the short term, current problems with the proposed retrospective application of recent statutory Environmental Impact Assessment requirements to earlier permissions given on the basis of Environmental Statements prepared on a non-statutory basis will need to be resolved if even the present supply to the English market is to continue (pers. com. Lester Hicks).

### 6.2.3 Importing aggregates

England currently imports 4 % of its primary aggregate needs. Increasing imports from Wales and Scotland is constrained by the capacity to supply within limits stated in policy. Possibilities for increasing imports by ship from other countries are limited, principally due to restrictions on capacity to stockpile and subsequently distribute material through existing wharves (Mankelow *et al.*, 2008). The availability of sufficient deep-water berths for bulk carriers at an acceptable price is also relevant to the ability to import aggregates. Furthermore, Mankelow *et al.* (2008) suggest that significant imports are not a realistic option because of the additional cost that would be incurred and the impact this would have on downstream consumers. In relation to this Brown *et al.* (2008) report that the indigenous aggregates industry brings significant benefits to the English economy.

### 6.2.4 Underground mining of aggregates

A further potential source for the future supply of aggregates is from underground mining. To date there has been no underground production of aggregates in England and it remains a long-term option for future supply. This option faces significant challenges, principally the economic feasibility of underground aggregate operations (Millar *et al.*, 2010). Industry representatives consulted during this study are generally of the opinion that underground operations '*would be a last resort*' and do not represent an alternative supply option in the short- to medium-term.

### 6.2.5 Existing quarries outside designated areas

Given that none of the foregoing sources is able to provide a universal solution to shortage of aggregates supply if future provision from National Parks and AONBs is reduced, the study by

Mankelow *et al.*, (2008) concluded that land-won supply of primary aggregates from outside these and other major designations is likely to remain the most likely alternative source of supply in the foreseeable future.

Whilst increased working of primary land-won aggregate from outside of national and international wildlife and landscape designations results in social and environmental benefits within those designated areas, it may have the effect of concentrating the burden of environmental impacts on the remaining areas of supply which may themselves be within attractive landscapes. In some cases, a shift of aggregate production from within designated areas to alternative nearby resources outside those designations could give rise to a ‘necklacing’ effect, with increased activity (and associated impacts) taking place within the immediately surrounding areas.

### 6.3 SELECTED ALTERNATIVE SUPPLY SCENARIOS FOR PRIMARY LAND-WON AGGREGATES

Using selected examples of strategic aggregate resources identified as being constrained during this study we have examined alternative supply scenarios (Table 2). For each alternative supply scenario we have assessed the broad environmental implications, paying particular attention to the extent to which pressure would be placed on important features of the landscape in addition to the national and international wildlife and landscape designations mentioned in MPS1. Bearing this and other factors in mind, we have considered the relative capacity of each area to contribute to future supply (compared with the existing supply area) and the adequacy of the existing geological database to support the delineation of further resources for use in planning for mineral supply.

**Table 2.** Case study pairs used to assess the implications of potential alternative supply scenarios.

Case study	Case study pair	
	Constrained resource area	Alternative supply area
1	Leicestershire igneous rock	Existing rail-linked quarries in Derbyshire
2	Leicestershire igneous rock	Existing rail-linked quarries in the Mendips
3	Crushed rock in the Peak District National Park	Crushed rock in Derbyshire, outside the National Park
4	Sand and gravel in Surrey	Oxfordshire
5	Sand and gravel in Staffordshire	Shropshire

#### 6.3.1 Case study pairs

Case studies pairs one and two consider separate alternatives to strategic supplies by rail from Leicestershire. Case study pair three investigates the broad environmental implications of shifting aggregate production from within national designations, using the Peak District National Park and surrounding areas of Derbyshire as an example. Case studies four and five focus on resources of sand and gravel of regional significance, examining the potential implications of illustrative changes in future supply patterns for sand and gravel in the South East and West Midlands, respectively.

#### 6.3.2 Nationally significant crushed rock resources

Primary aggregates vary considerably in their distribution throughout England, with sand and gravel being relatively widely spread and crushed rock more unevenly spread. Some rock types

with specialist uses are very restricted in occurrence and are transported to relatively distant markets. Inter-regional flows of crushed rock are significantly larger than for sand and gravel, partly because of the greater demand for crushed rock and because some regions of the country have only limited or low quality crushed rock resources. Furthermore, the consistency and extent of some hard rock resources permits their working on a relatively large scale, facilitating the economics of rail transportation and thus distribution to a wide geographical area.

Accordingly, major quarries supplying very large quantities of aggregates to markets are of considerable importance to the pattern of provision in England. There are 27 quarries supplying over one Mtpa of aggregates, almost all of which are crushed rock quarries. Some of these typically supply about four to five Mtpa (Mankelov *et al.*, 2008). These are necessarily long-life operations, to justify the capital investment, and are of ongoing strategic importance in meeting future market requirements. Once established, the economic pressure is to sustain output through these sites particularly by lateral and depth extensions. These sites are sometimes rail-connected, allowing a significant proportion of production to be moved considerable distances and to supply markets outside the region. Additionally, major quarries often provide strategic environmental benefits by concentrating activity at sites with the financial resources to install high quality transport and environmental mitigation arrangements, thereby avoiding the need for a larger number of smaller sites. Rail-served quarries can also deliver aggregates at much lower environmental cost than by road (Fry and Wayman, 2007).

#### 6.3.2.1 IGNEOUS ROCK RESOURCES IN LEICESTERSHIRE

Large scale crushed rock production in Leicestershire is currently of strategic importance to the national economy. Four quarries in Leicestershire supply igneous rock aggregate of various types by rail to markets in London and the South East. The aggregate produced at Croft Quarry has a typical Polished Stone Value (PSV) of 56 and, as such, may be used as skid resistant road surfacing aggregate in many (but not all) situations. The Cliffe Hill site produces aggregates which have a PSV of around 55 and are utilised for a wide range of end-uses including concrete manufacture, asphalt production and rail ballast. The diorites quarried at Bardon Hill Quarry have a higher PSV (60), enabling the aggregates to be used more extensively in road surfacing applications, as well as in other asphalt products, concrete and other uses. The aggregate produced at Mountsorrel typically has a PSV of 53, limiting its use in road surfacing applications. Instead, the aggregate is primarily used as a general purpose aggregate, including concrete production but is also important for use as rail ballast. The Leicestershire Minerals Development Framework (2008) notes that around 30 % of the county's total igneous rock sales in 2005 were transported by rail. From other sources, including the operating companies' own publicity material, the typical output by rail from Leicestershire amounts to approximately 5.5 Mtpa. It is not known what proportion of this rail-transported aggregate is used for specialist (e.g. road surfacing) rather than general purpose applications.

##### *Continued development of igneous rock resources at rail-linked quarries in Leicestershire*

Prior to considering alternatives, consideration needs to be given to the 'baseline' scenario of continued development of igneous rock resources in Leicestershire, via existing railhead facilities.

The scope for continued medium-term production at existing sites is primarily limited, in most cases, by the availability of workable resources, rather than by environmental designations. Designations which could be affected by future working are primarily of a geological nature, including both SSSIs and (Local Geological Sites) LGSs. To varying degrees some of the quarries are also bordered by other designations including biological SSSIs, Ancient Woodland, Parks and Gardens, and/or by existing built development. Although there are no formal landscape designations, all of the quarries to the north-west of Leicester and almost all of the

identified resources fall within the proposed Charnwood Forest Regional Park. Appendix 9 contains an assessment of the specific quarries involved.

During consultation, industry representatives indicated there is a requirement for improved understanding of the geology around existing major operations, to support long-term planning, particularly for extensions. Specific reference was made to Leicestershire's igneous rock quarries. Analysis of the available geological data to support continued development of igneous rock resources in Leicestershire indicates that, although detailed mapping data exists for the surface outcrop of these rocks, there is very little information on mineral potential. Available borehole data (held by BGS) is generally inadequate for assessing resource potential. More detailed exploration data held by industry is commercially confidential and, therefore, not in the public domain. These resources extend, and can be economic to extract, under thick cover from younger sediments. However, this information is not captured by current geological mapping and, to make accurate resource assessments, the morphology of these igneous intrusions and the depth of overburden need to be understood. The limited data available from boreholes, geophysical records and geological descriptions are fragmented and not generally focused on resource evaluation. A detailed discussion of Leicestershire's igneous rock resources and associated geological data to support planning for mineral supply is presented in Appendix 8.

#### *Alternatives to supply of igneous rock by rail from Leicestershire*

The following two case study pairs look at different alternative supply scenarios for the current provision of aggregate by rail from Leicestershire to London and the South East. The crushed rock resources in both of the alternative supply areas are primarily Carboniferous Limestone, rather than igneous rock, but are capable of substituting for Leicestershire aggregates in all except the higher specification end-uses of road surfacing and rail ballast. These paired studies support the investigation of strategic supply issues, relating to crushed rock resources of national importance.

#### **Case study pair 1: replacement of crushed rock production in Leicestershire by existing rail-linked quarries in Derbyshire**

One alternative scenario for replacing material currently supplied by rail from Leicestershire would be from existing rail-linked quarries in neighbouring Derbyshire (Appendix 9). In contrast to the situation in Leicestershire, Derbyshire has very extensive unworked crushed rock resources. These are primarily of Carboniferous Limestone rather than igneous rock but as noted above are capable of substituting for Leicestershire aggregates in all except the higher specification end-uses (road surfacing and rail ballast).

#### *Environmental implications*

The environmental implications of increased production from the rail linked limestone quarries in Derbyshire are dominated in all cases by the National Park. Topley Pike is the only rail-linked aggregates quarry in the National Park, which is coming to the end of its life; a proposal to expand operations here was rejected on appeal in the 1980s. New rail-linked aggregates quarries in the Park are most unlikely to be permitted. Instead the National Park Authority is seeking an 'exit strategy' for aggregate quarrying within the Park (Case study 16). Nonetheless, for the existing and prospective rail-linked quarries outside the National Park (in the Buxton area), the designation would still exert an influence on future planning decisions, by virtue of the fact that the quarries are in all cases close to the National Park boundary and, to varying degrees, are visible from within the Park. The level of constraint would, however, be significantly less and, importantly, there is a degree of acceptance within the Derby and Derbyshire Minerals Planning Authority that the county should contribute to the goal of reduced quarrying within the National Park by taking on an increased share of the regional apportionment for aggregates provision.

*Opportunities for increased rail-linked crushed rock aggregate production in Derbyshire*

Any future increase in crushed rock production by rail from within the National Park, to compensate for any future reduction in supply from the rail-linked igneous rock quarries in Leicestershire, would seem to be extremely unlikely, because of the National Park Authority's strategy for seeking a reduction rather than any increase in future aggregate production within the Park, in order to protect the natural beauty and recreational opportunities which the area affords.

The only realistic prospects for substitution would be from the three large rail-linked quarries outside the Park (Tunstead, Dowlow and Dove Holes) and perhaps from future reactivation of two further inactive sites (Hillhead and Hindlow). Even here, increased quarrying activity may have potential impacts on the adjoining National Park, for example in terms of visual intrusion and potential effects on the water environment. Moreover, the increased supply of construction aggregates would conflict with the concept of reserving high purity limestone resources for industrial uses and cement manufacture – especially but not only at Tunstead and Hindlow, which have both been primarily associated with industrial use in the past.

If Dowlow, Dove Holes and the potential reactivation of Hillhead were the only realistic sources for replacing the strategic rail output from the Leicestershire igneous rock quarries, consideration would need to be given not only to the availability of unconstrained resources but also to the capacity of these sources to match the output currently supplied by rail from Leicestershire (totalling 5 Mtpa). Furthermore, substitution of rail-based supplies from Leicestershire by rail-based supplies from the Buxton area of Derbyshire would result in longer rail journeys to markets in London, the East of England and Yorkshire and the Humber because there are no rail routes across the intervening Peak District National Park. In addition the main rail route from the Buxton area to London and the East of England region would have to use parts of the congested West Coast Main Line/Manchester Branch/Trent Valley line.

*Adequacy of geological data to support long-term mineral planning in Derbyshire*

The limestone resources of Derbyshire were the subject of detailed mineral assessment surveys undertaken by the BGS in the 1970s and 1980s, the results of which were published in six mineral assessment reports. Each report describes the geology of the area, delineates the categories of limestone and reports the results of investigations of chemical and mechanical properties. Accompanying 1:25 000 scale maps show the distribution of limestones classified by their purity, and the occurrence of dolomite and dolomitised limestone. Subsequently, the data from these reports was collated, synthesised and summarised in a Guide to the limestone and dolomite resources of the Peak District (Harrison and Adlam, 1984). The Guide, which is the most comprehensive review of the mineral resource potential of the limestones of the area to date, concluded that the limestones exhibit little regional or stratigraphical variation in their aggregate properties. It noted, however, that the dolomites, dolomitised limestones and shale-dominated sequences may not be suitable for aggregate.

These assessment surveys were primarily focused on chemical properties of the resources for industrial uses, so a re-evaluation of the data in a form appropriate for a crushed aggregate end-use might be desirable. Nevertheless, the data are sufficient to separate areas of high quality and low quality aggregate (that is, softer dolomitic rock or geological units with a high mudstone content), categories that are not currently captured in landbank figures for the East Midlands.

This level of geological data found in Derbyshire is the highest for any area of hard rock resource in the UK and, therefore, is suitable for the delineation of mineral site allocations. Because of the structural complexity of the area, resource volume calculations though difficult may be possible on a site specific bases, especially with supplementary information from the minerals industry.

## **Case study pair 2: replacement of crushed rock crushed rock production in Leicestershire by existing rail-linked quarries in Mendips**

A further alternative scenario for replacing material currently supplied from Leicestershire would be from existing rail-linked quarries in the Mendip Hills (Appendix 9). The Mendip Hills are already of similar importance to Leicestershire in supplying crushed rock aggregates by rail into London and South East England. Of the seven active limestone aggregate quarries in the Mendips, only two (Whatley Quarry and Torr Quarry) are rail-connected.

### *Environmental implications*

Lateral extension of Whatley quarry is precluded on the southern flank by geological constraints (transition from limestone to shales) and by land ownership and existing rural development on the north. Limited opportunities exist to extend the quarry further to the west and (via a tunnel beneath the road) to the east. Thompson *et al.*, (2010) indicates there is substantial scope for deepening the quarry within the existing permission boundary and two theoretical scenarios were considered regarding alternative ways of accessing additional reserves. Although the geological resources here extend to much greater depths, the maximum practical depth of quarrying may ultimately be limited by the fuel costs and carbon emissions involved in quarrying to greater depths, and by the environmental, cost and regulatory implications of dewatering to enable this. The quarry is already operating below the water table, by means of pumped dewatering of the limestone aquifer. The quarry also lies wholly within the outer Source Protection Zone (SPZ3) of a public water supply borehole downstream, necessitating detailed mitigation works and compensation arrangements. Whilst, in theory, any impacts on this and other aspects of the water environment can be addressed through such mechanisms, the issue is a highly sensitive one and, in practice, may restrict the future development of the quarry.

The quarry also sits wholly within an Ecological Zones of Influence (EZI) for the UK Biodiversity Action Plan (BAP) species of Greater Horseshoe Bats from the nearby Mells Valley Special Areas of Conservation (SAC). The EZI relates to the foraging areas of the bats and is regarded by Somerset County Council's ecologist as being of comparable significance to the SAC itself. At Whatley, the designation would probably not preclude further deepening of the quarry (since the vegetation has already been removed), but it would present difficulties in extending the quarry further to the west or east, unless potential impacts could be adequately mitigated.

Further lateral extensions at Torr Quarry itself are largely precluded by geological constraints (major faults, thrusts and karstic groundwater conduits) as well as by completed restoration works around most of the perimeter and by proximity to a wooded area to the east which is designated as an SAC, SSSI and Ancient Woodland. An additional area of Ancient Woodland lies immediately to the south west of the site, although this coincides with the southern limit of the limestone resource. Much of the surrounding area also falls within the EZI for Greater Horseshoe Bats from the nearby Mells Valley SAC. Thompson *et al.*, (2010) demonstrated how substantial additional resource areas to the east of Torr Quarry's existing Leighton Extension could theoretically be worked in future in an integrated way, delivering aggregate by conveyor to the existing processing plant and railhead at Torr Works.

### *Opportunities for increased rail-linked crushed rock aggregate production in Mendips*

Subject to future planning applications and decisions, especially regarding the mitigation of potential impacts on protected bats and on groundwater resources at both quarries, and the protection of SAC woodland to the east of Torr Works, future developments at Whatley and Torr Quarry could deliver a maximum additional output capacity of 5 Mtpa, over and above their existing commitments, for a limited period of time. This represents 91% of 5.5 Mtpa that would be needed if the strategic rail-transported supplies from Leicestershire were to be completely 'switched off'. Moreover, the spare capacity in the Mendips would reduce dramatically to only



1 Mtpa (less than 20% of the shortfall requirement) once the reserves from deepening Whatley run out, leaving a very big gap in the strategic supply figures thereafter. In practice, output from the rail-linked Leicestershire quarries would reduce in stages, rather than all at once, and the need for alternative supplies might be offset for many years by the release of further reserves at one or more of those sites. Ultimately, however, the Leicestershire sources provide only limited scope for further expansion and alternative supplies from one or more other areas will be needed.

The analysis suggests that, if new reserves were able to be made available via the existing Whatley and Torr railheads, the length of time for which those operations can continue will be limited. In the longer term, unless a new rail-linked quarry was able to be developed elsewhere in the Mendips, the area would probably not be able to maintain strategic supplies by rail for more than a few decades. Most of the Mendips resource area is heavily constrained by a variety of designations but some areas in the Central Mendips are relatively free of constraints and would offer some potential in this regard, but this would be subject to the provision of a new rail link, at considerable economic and environmental cost. Provision of a new rail link would require reinstatement of the Torr Works/East Somerset railway branch past Shepton Mallet and Wells and into the Cheddar area, which would result in significant conflicts with landscape and tourism. As such this option would appear unachievable in terms of cost and present policy.

#### *Adequacy of geological data to support long-term mineral planning in the Mendips*

The geology of the Mendip Hills is well-documented and has been the subject of extensive scientific investigation. Numerous publications and papers, including the maps and memoirs of the BGS, cover a wide range of aspects of Mendips geology.

However, unlike the Peak District, the limestones of the Mendip Hills have not been systematically assessed for mineral resource purposes. Nevertheless, they have long been quarried for a variety of end-uses, including aggregate purposes. Consequently, there is a considerable amount of data relating to the chemical and physical properties of the limestone formations. Much of the information is site-specific. However, because the geology of the limestones is so well understood, the chemical and physical data can be extrapolated to inform a useful evaluation of potential limestone resources.

An exhaustive collation and synthesis of data from BGS maps, memoirs, archives, academic works and industry sources is presented in '*Limestone resources and hydrogeology of the Mendip Hills*' (Harrison *et al.*, 1992). This report is the most thorough and up-to-date description of limestone resources in this district, and, although considerable extra work has been conducted, not least by the quarry operators themselves, it still provides an important basis of any future mineral planning strategies. This report concluded that most of the limestone is potentially suitable for aggregate, although locally waste deposits, dolomitisation and mineralisation could adversely affect its quality and reduce the efficiency of quarrying operations. Dolomitisation is of particular significance as it is undesirable for concreting aggregates. A BGS report and accompanying map (Booth, 2007) attempted to delineate and describe the extent of dolomitic limestones in south-west Britain, including those of the Mendip Hills.

In summary minerals information for the Mendips is extensive and the level of available data could not easily be improved upon unless a substantial drilling and testing survey was undertaken. Such work is normally carried out by the commercial operators themselves. The available data is suitable to aid in the delineation of minerals site allocations, although extra information may be needed for accurate volume calculations.

#### 6.3.2.2 LIMESTONE RESOURCES IN DERBYSHIRE

The following case study examines the alternative supply scenario of shifting aggregate production from within the Peak District National Park to alternative locations in Derbyshire, outside the Park (Appendix 9).

### **Case study pair 3: replacement of crushed rock production in the Peak District National Park by Derbyshire outside the National Park**

The concept of reducing the future contribution of the Peak District National Park to the overall regional apportionment for aggregates provision in the East Midlands (with consequent increases for neighbouring MPAs) has been considered at length by the AWP and in the preparation of the Peak District National Park Local Development Framework (LDF) (Case study 16). Carboniferous Limestone resources outside the Park boundary which could potentially compensate for reducing supply from within the Park principally occur in two areas, to west of the Park around Buxton and to the south-east of the Park, to the south-west of Matlock.

#### *Environmental implications*

The environmental implications of working resources to the west of National Park, around Buxton, have largely been described in case study pair 1. In all cases the dominant environmental issues at these sites are likely to be proximity to the National Park boundary, potential impacts on the water environment, appropriate use of high purity limestone for industrial purposes and potential impacts associated with transportation. Although all of these quarries either are, or could be, rail-linked, at least some of their output is (or would be) transported by road as at present, and this would invariably involve movement through adjoining areas of the National Park.

South-east of the National Park many of the existing quarries lie close to the National Park boundary and some of them are also constrained by European designations and/or would need to be assessed for any impact they might have on the Derwent Valley Mills World Heritage Site.

#### *Opportunities for increased crushed rock aggregate production in Derbyshire outside the Peak District National Park*

Based on the analysis undertaken it seems that, unless Derbyshire's landbank policy can be challenged by arguments relating to transport distances and routes, the concept of seeking a progressive reduction in aggregate production from within the National Park will eventually result in a further concentration of large scale quarrying activity in the Buxton area, immediately adjacent to the Park boundary. Whilst there is scope, at several of those quarries, for the aggregate to be transported by rail rather than road, not all markets can be served by rail. For those which cannot, there would be an inevitable increase in the extent to which crushed rock is carried by road through the National Park.

Opportunities also exist to increase production from existing quarries or new sites in the area to the south east of the National Park. In the short- to medium-term, these opportunities probably represent the most likely market response. However, in the longer term they are likely to be limited by the availability of existing permitted reserves and the difficulty of obtaining additional reserves unless the obstacle of the large existing landbank in the Buxton area can be overcome.

In both areas, any increase in future quarrying, to compensate for reduced output from the Park, would have landscape impacts, both in relation to proximity to the National Park boundary and in relation to the quality and character of the land outside the Park. Although this land is not specifically designated for its landscape value, further quarrying would inevitably result in further landscape changes. Whilst this would not be desirable, if carried out by conventional approaches to quarry design, there may be scope to create long-term landscape and environmental improvements in these areas, through well designed future proposals for both quarrying and restoration (along similar lines to those previously examined in the Mendips – see Thompson *et al.*, 2010).

### 6.3.3 Regionally important sand and gravel resources

Land-won sand and gravel resources are generally distributed more evenly than hard rock resources, if anything being more abundant in the south and east of the country than in the north and west, where most hard rock resources are found. As a consequence, sand and gravel deposits generally tend to serve nearer markets and the geographical extent of the impact of any future constraints on their availability is likely to be primarily local in scale, though occasionally affecting inter-regional transfers.

#### **Case study pair 4: replacement of sand and gravel production in Surrey by Oxfordshire**

This case study pair is based on the notion (borne out during consultation and in a number of previous studies) that many parts of the South East are beginning to run out of sand and gravel resources that can be worked without unacceptable levels of environmental impact, whereas Oxfordshire might have a greater availability of relatively unconstrained resources (Appendix 9).

Partly in recognition of this argument, the sub-regional apportionment for Oxfordshire within the South East Plan (since abandoned) was increased by 15 %, following intervention by the Secretary of State. As an example of the issues involved, this case study compares the situation in Surrey (which has historically been the largest provider of sand and gravel within the South East), with the situation in Oxfordshire, in terms of both resource availability and the extent of major environmental constraints.

The Surrey Minerals Plan Core Strategy and Primary Aggregates development plan documents were submitted for examination in June 2010. The Core Strategy indicates that concreting aggregate extraction will be concentrated on the river terrace gravels of north-west Surrey and that soft sand extraction will be concentrated in the south west and east of Surrey. This is primarily a reflection of the geological resource distribution and the differences between the deposits in terms of end-use suitability. The superficial (Quaternary) river terrace deposits comprise sharp sand and gravel suitable for making concrete, whilst the Cretaceous 'Greensands' comprise finer-grained soft sands that are used primarily as building sands but also, in places, as higher grade silica sands.

#### *Environmental implications*

**Surrey** - major environmental designations in Surrey include the Surrey Hills AONB, which covers much of the Greensand outcrop, except in the east and far west of the county, and a large number of European designations and SSSIs, which affect some parts of the Greensand and some parts of the terrace deposits. More extensive than the AONB, is the Surrey Hills Area of Great Landscape Value (AGLV). Also important in this region are the Aerodrome Safeguarding Areas (ASAs) of Heathrow, Gatwick and Farnborough. These areas represent a 13 km radius within which the local planning authority must consult on any proposed developments that have the potential to increase bird-strike risk. Extraction sites that are restored for habitat creation are included amongst these. Appendix 9 contains detailed information on specific resource areas in Surrey.

**Oxfordshire** - the assessment in Oxfordshire is based on three strategic areas for possible future sand and gravel extraction beyond the current plan period. Area 1 (Clanfield/ Bampton/ Brighthampton), is located in the west of Oxfordshire (Figure 12). The most numerous designations in this area are listed buildings and scheduled monuments. There are also three SSSIs, two on the alluvial meadows of the River Thames and one adjacent to a tributary. A further potential constraint for this area is the presence of the Brize Norton Airfield to the north.

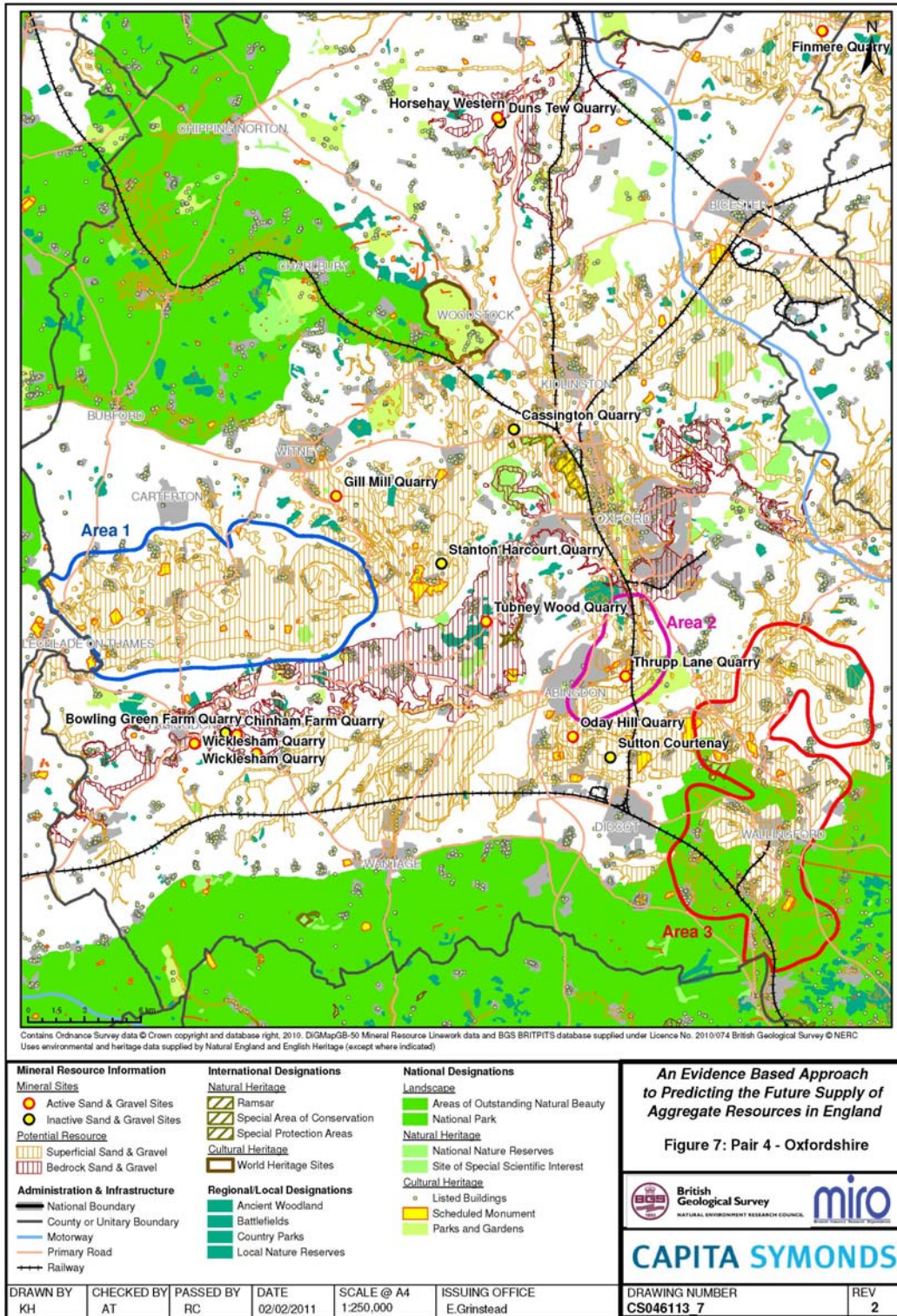


Figure 12. Relationship between geological resources and environmental constraints in Oxfordshire (case study pair 4).

The landscape character types of this potential resource area include alluvial lowlands, river meadowlands and lowland village farmlands. Quarrying is not a feature of these landscape types in this specific area of Oxfordshire and, as a result, minerals extraction may be considered as a potential local landscape pressure. Generally though, minerals development is noted (within the character descriptions) as having the potential to significantly contribute to biodiversity and high standards of restoration can mean successful integration with the character of the surrounding landscape. Any visual intrusion can be mitigated through use of trees and scrub that are characteristic of the area as screening.

The second potential resource area (Area 2) is located in south-east Oxfordshire (Figure 12), close to Abingdon. This area intersects three scheduled monument designations relating to settlement sites and ancient woodland. The resource is also partially sterilised by built development. Within the buffered area of resource lies Nuneham Common (Parks and Gardens).

The third potential resource area, Area 3 (Figure 12), near Wallingford, falls within or closely adjacent to the adjoining AONBs of the North Wessex Downs and the Chilterns. Significant parts of the resource in the south are sterilised by existing development within and around Wallingford. The northern part of the resource, however, is more distant from the AONB designations and relatively free of urban development. Area 3 also contains scheduled monuments and there is some potential, particularly around Warborough, for archaeological features to constrain future working. There are, however, resources in this area that are free from the mapped constraints.

#### *Opportunities for increased sand and gravel production*

**Surrey** - from the analysis undertaken it would seem that Surrey still has significant areas of unworked potential resources of sharp sand and gravel, in areas which are not sterilised by existing urban development and which are free of major designations and outside the AGLV. A number of these areas are identified as preferred areas for future working, although this does not necessarily mean that the resources which they contain are either commercially exploitable or free of environmental concerns. An important factor in all of these areas is likely to be their proximity to existing development. It appears that for soft sand, including specialist silica sand, although some of the preferred areas are free from major environmental designations and some of the safeguarded areas fall outside of the AGLV (west of Reigate and south west of Farnham), all of them fall within Aerodrome Safeguarding Areas (ASAs), which will limit the options for restoration and might therefore hinder the prospects for extraction.

**Oxfordshire** - focusing on the three strategic resource areas in Oxfordshire examined in this study, there appear to be prospects for future working of river terrace and/or sub-alluvial sands and gravels in areas that are free of major designations and existing built development. The most extensive prospects for relatively unconstrained future working would appear to be in Area 1, but none of the resources in any of the areas has yet been formally identified as preferred areas for future working. As noted above for Surrey, however, neither the BGS maps nor the identification of preferred areas necessarily mean that the resources are either commercially exploitable or free of environmental concerns. Subject to this uncertainty, and to the detailed resource exploration work that would need to be carried out in order to prove viable reserves, the Oxfordshire resources would appear to offer greater prospects for future sand and gravel extraction than those in Surrey, which are generally more affected by proximity to existing development. Whilst that in itself is not a designated constraint, it might well have a strong influence on the outcome of planning decisions. In some cases the areas involved fall within the Green Belt (not shown on the maps), although that again does not preclude mineral development, which is recognised as being a temporary land use. The evidence suggests that there is some opportunity to rebalance sand and gravel supplies in the South East region away from Surrey and towards Oxfordshire. However, that does not necessarily imply that the Oxfordshire resources could readily serve the markets currently supplied from Surrey.

### *Adequacy of geological data to support long-term mineral planning*

**Surrey** - all of the sand and gravel resources occur within river deposits, principally around the confluence of the River Thames and its tributaries the rivers Blackwater, Mole and Wey. Only the deposits of the Blackwater River, along the western boundary of the county, have been assessed at an indicated level (Appendix 9, Figure 51).

The river sand and gravel deposits in the northern part of the county are extensive. Their distribution there is well known from geological maps, existing quarries and abundant borehole data, but they are largely sterilised by urban development. Sand and gravel are mapped along the Mole and Wey valleys, but there is very little information on their quality and thickness (Benham *et al.*, 2006b).

In general, the geological data available in Surrey would not appear suitably detailed for defining site allocations. Where more detailed information does exist, areas of mineral resource are largely sterilised. Only the most basic level of data is typically available for the remaining resource areas, which require detailed study before a more reliable assessment could be made regarding the quality and volumes of available mineral resources.

**Oxfordshire** - the sand and gravel resources of the main valley of River Thames have been assessed at the indicated level in a series of IMAU studies. Only the river deposits along tributary valleys, such as the Ray and the Thame, were excluded but brief notes about these were later included in a desk-based summary of the sand and gravel resources of the Thames Valley (Hopson, 1982). This summary also presented some supplementary data on the physical properties of sand and gravel in the Thames Valley. The sand and gravel resources of the river deposits of Oxfordshire are amongst the most thoroughly assessed in the country. Although there is not county wide coverage for Oxfordshire from IMAU studies the main resource areas are covered in sufficient detail to aid in the delineation of preferred areas. This level of data is adequate to understand the volumes and qualities of resources in these areas for long-term mineral planning.

### **Case study pair 5: replacement of sand and gravel production in Staffordshire by Shropshire**

The traditional (historic market share) basis for sub-regional apportionment of sand and gravel provision within the West Midlands region has been challenged by Staffordshire County Council, on the basis that it does not reflect the most sustainable balance for aggregates supply in the region. Other counties in the region have stated, however, that they could not deliver the shortfall that a reduction in Staffordshire's contribution would create. This case study examines the extent to which one of the region's other main suppliers – Shropshire – might be able to increase its share of future sand and gravel provision, in terms of both resource availability and broad environmental implications. The comparison focuses primarily on particular areas of sand and gravel resources within Shropshire which have been investigated in the past by the former Institute of Geological Sciences (now the BGS). Historically, Shropshire has supplied around 8 % of the West Midlands regional sand and gravel apportionment. The reasons for this seemingly limited utilisation of a large scale resource are partly related to the distance of the resource from key market areas such as Birmingham and Wolverhampton (compared with the resources in Staffordshire) and partly to the nature of the mineral itself (Appendix 9).

#### *Environmental implications*

**Staffordshire** - with regard to bedrock sand and gravel, the quarries in the north Staffordshire area, (the active Freehay and Croxden quarries and the currently inactive Trentham Quarry), together with the wider areas of unworked resource in this area, are generally unconstrained by

major environmental and cultural heritage designations. Small areas of ancient woodland and occasional listed buildings are present in some parts of the resource, whilst some other areas are either sterilised by existing urban development or constrained by proximity to it. There are, nevertheless, significant areas which appear to be relatively unconstrained.

Bedrock resources at Cannock Chase and to the west of Cannock are largely covered by the AONB designation. Parts of this area are also affected by a variety of other designations including SAC, SSSI, Ancient Woodland, Country Park, Parks and Gardens, LNR, Scheduled Monument and, at the peripheries, listed buildings. Within the AONB are three active quarries, Rugeley, Pottal Pool and Huntington quarries. One additional inactive quarry within the same resource, at Saredon, is unaffected by any of these designations.

In the south-east Staffordshire area the active quarries are Hints, the Weeford complex and Cranebrook. This latter is a small quarry, located in an area where no resources are identified on the BGS *Mineral Resource Maps*. All three of these sites appear to be free of major environmental and cultural heritage designations, though they are bordered in some places by Ancient Woodland. Further apparently unconstrained resources are mapped to the south-west of the Weeford sites, towards (and beyond) the county boundary.

Superficial Quaternary river valley gravels (comprising sub-alluvial and river terrace deposits) are worked in the Trent and Tame Valleys at Alrewas, Barton, Manor Park (inactive) and Newbold quarries, and in the Dove valley at Uttoxeter Quarry. In these areas, the main potential constraints are existing urban development and major infrastructure (roads and railways), together with scheduled monuments and sporadic listed buildings. Beyond these features, there appear to be substantial areas of relatively unconstrained resources, although the Trent Valley in general is known to have considerable archaeological potential and Staffordshire County Council has noted that the cumulative impacts of mineral extraction on local communities here may also be significant. Although the unworked resources within the Trent Valley are not protected by any formal landscape designations, the valley has undergone large-scale landscape change as a result of previous and ongoing mineral extraction. It has also drawn benefits, however, from the habitats and recreational opportunities created through the restoration of former workings.

Older Quaternary (glacio-fluvial) sand and gravel is worked at the Seisdon, Enville Road and (until recently) Four Ashes quarries. The area of resource to the east of Seisdon is free from major environmental constraints, although the resource to the west is sterilised by existing urban development. The Enville Road works appear to be constrained to a limited deposit that becomes sterilised by development in the east. Designations found elsewhere within this resource area include a scheduled monument and listed buildings (generally within urban areas) and a SSSI designation which is also a Country Park covers a small area of the resource.

**Shropshire** - while it is acknowledged that other areas within Shropshire are known to contain additional resources, and that some of these have been identified as broad areas and sites of potential future working, the following analysis focuses on the area of IMAU investigations, simply as an example of the potential environmental and cultural heritage implications of additional future quarrying in Shropshire.

The IMAU-assessed resource area as a whole is largely free from major environmental constraints. As an indication of this, there are 19 SSSIs, each covering less than 0.5 km<sup>2</sup>, within the total resource outcrop of approximately 470 km<sup>2</sup>. Of these SSSIs, eleven are Ramsar sites and three are also SACs. The Meres and Mosses Ramsar sites are generally groundwater-supported habitats, linked to 'perched' and/or main aquifer units within the superficial sand and gravel bodies. As such, they may represent constraints to future workings if they fall within the hydrogeological zone of influence of any proposed quarrying activities.

There are no major landscape designations (National Parks or AONBs) within the IMAU-assessed resource areas. Urban areas, other than the main centres of Shrewsbury, Whitchurch and Wem, are limited and listed buildings are sparse within the intervening rural areas. Outside

of the urban areas, there are two parks and gardens in the south, near Shrewsbury. Other than these features there appear to be no local landscape designations. Few areas of Ancient Woodland are present and all of these are less than a quarter of a square kilometre in size. The area has one LNR, one battlefield and two Country Parks (one of which is also a Ramsar and SSSI).

*Opportunities for increased sand and gravel production*

**Staffordshire** - although much of Staffordshire's bedrock sand and gravel resources are constrained by AONB and other major designations, there are also areas where the resources are free of such designations. These areas would seem to offer scope for future resource development in line with MPS1 objectives. In the case of superficial sand and gravel resources there appears to be similar or greater scope for exploiting unworked resources without impinging on major designations. Although such workings will inevitably modify the landscape, the areas involved are not protected by landscape designations of any kind and could benefit, in many cases, from well-designed restoration schemes that provide landscape, amenity and biodiversity benefits.

**Shropshire** - by comparison with Staffordshire, Shropshire appears to have much greater availability (in terms of surface area) of unworked resources that are free of both major environmental constraints and local landscape designations. The IMAU-assessed resource area as a whole is largely free of such constraints: although a number of SSSIs, SACs and Ramsar sites are present, these affect only a minor proportion of the available resource. However, the resources in Shropshire are in many cases more complex, geologically, and more distant from the main regional areas of demand (in Birmingham and Wolverhampton). Industry preference will always be for deposits which are relatively simple (and, therefore, inexpensive) to develop, and which are closest to the markets. In this case (and often more generally), this economic preference is aligned with the Proximity Principle and with the more general concepts of energy and resource efficiency.

Even if Staffordshire's apportionment were to be reduced, and Shropshire's increased, industry may be reluctant to bring forward new proposals within Shropshire unless and until the actual supply from Staffordshire became sufficiently restricted to increase the level of demand in Shropshire. This would certainly be the case for the north Shropshire resources considered here. Greater interest might be seen in resources to the east of Telford, which are closer to Staffordshire and to the main markets.

Whilst this might eventually achieve a shift in the pattern of supply, it would also increase the delivered cost of construction aggregates and the environmental impacts of transportation, particularly carbon emissions. These effects would need to be balanced against any reductions in site-specific environmental impacts that might be achieved by reduced levels of extraction in Staffordshire.

*Adequacy of geological data to support long-term mineral planning*

**Staffordshire** - no systematic mineral assessment surveys have been conducted for Staffordshire and consequently, in comparison to Shropshire, sand and gravel resources are poorly understood. Borehole data is unevenly spread and concentrated in the urban areas of Stoke-on-Trent, Stafford and Cannock and along major roads. Where borehole data are comparatively abundant the boreholes, were generally sunk for site investigation or coal exploration and the information contained in the logs is generally unsuitable for sand and gravel assessment.

A BGS report '*Mineral resource information for Development Plans Staffordshire: resources and constraints*' (Highley and Cameron, 1995) describes the highly variable nature of the glacial deposits but was unable to elaborate further on their extent, thickness or overburden ratios throughout the county.



There appears to be limited information on the composition and thickness of the river sand and gravel deposits. The geological map shows their extent but it should be noted that Highley and Cameron (1995) suggest that the distinction between glacial sand and gravel and river deposits, as mapped, may be uncertain. These authors reported average and maximum thicknesses for river sand and gravel deposits but they appear to be based on very sparse data.

An earlier desk study examined in detail the data available for sand and gravel resources in the Dove-Derwent catchment. It included the eastern part of Staffordshire, in particular the valley of the River Dove above Burton-upon-Trent and adjacent areas, where it identified both river and glacial sand and gravel deposits. The report concluded that *'The [NGRC] borehole and well database for the most part comprises records reliable enough to be taken into account in evaluating resources. However, information is too unevenly spread to allow conclusions to be drawn about the detailed nature and distribution of the sand and gravel, except close to sample points. At the same time, it is not sufficiently random to permit reliable estimates to be made.'* Moreover, for glacial sand and gravel little could be said with any certainty and more detailed investigation was needed to enable evaluation. In respect of river deposits, although they appeared to contain workable sand and gravel, the data was described as *'not adequate...for long term planning'*.

**Shropshire** - by volume alone, most of the sand and gravel resources of Shropshire are within glacial deposits. From a mineral assessment point of view this is significant because, unlike sand and gravel in river deposits, glacial sand and gravel deposits are extremely variable, even chaotic, in composition, grading and thickness. They are frequently concealed beneath other, non-mineral, glacial deposits which also vary considerably. This means their distribution, variation and overburden ratios cannot be predicted with any degree of certainty without abundant and widespread borehole data.

Ideally, for strategic planning, systematic assessment surveys are desirable. Shropshire has been the subject of several IMAUs, covering an area of about 600 km<sup>2</sup> in the north of the county. This represents about 17 % of the total county area but a greater proportion of ground that is likely to be mineral-bearing. Outside of the surveyed area the distribution of borehole data varies considerably. In the north of the county, especially around Telford, it is relatively abundant and reasonably widely spread. However, very few of the boreholes were sunk for the purpose of identifying sand and gravel resources, therefore, their logs are unlikely to contain consistent information about the quality of the sand and gravel. Many were drilled for site investigation and will probably be too shallow to be of use for mineral assessment. Borehole data for the southern half of the county are, by comparison, sparse and unevenly distributed.

Unfortunately, while geological maps suggest that most of the unsterilised river sand and gravel deposits in Shropshire are probably outside the assessment survey areas, there is little consistent and suitable data on their resource potential.

There is currently a high level of minerals information regarding the sand and gravel resources of Shropshire, principally contained within IMAUs. It can make a significant contribution towards the delineation of preferred areas. Additional data may be required to estimate resource volumes accurately because of the complex nature of the deposits. Further data is required for fluvial deposits in the south of the county which are not covered by IMAUs.

## 6.4 DISCUSSION

- Constraints identified during this study will impact on supply over a range of times scales. The prominence of constraints affecting sand and gravel supply in the short-term, in many parts of the country is notable. Areas which face medium-term supply constraints generally indicate they have sufficient resources for the current *Guideline* period e.g. Surrey, but are likely to face a shortfall in supply beyond then. Medium-term supply risks are apparent for the nationally significant crushed rock resources in Leicestershire. The significance of the

resources affected and the consequent impact on future national supply warrant action now, in terms of policy development. Future shortages in land-won aggregate supply may result in increased aggregate prices with associated implications for the English economy.

- The general consensus from both the consultation and rundown analysis is that some traditional resources areas are unlikely to be able to sustain production at current levels, particularly in the medium- to long-term. In these cases there is a clear requirement to assess alternative sources of supply.
- Whilst a number alternatives to primary land-won aggregate supply exist and these currently make substantial contributions to aggregate supply in certain parts of the country, land-won supply of primary aggregates from outside National Parks and AONBS emerges as the most important source of future supply.
- The selected alternative supply scenarios considered in this study, demonstrate that in almost all cases any increase in future quarrying in the alternative supply areas, to compensate for reduced output from the constrained areas, would have landscape impacts.
- Increased production of crushed rock in Derbyshire outside the Peak District National Park may still have potential impacts on the National Park itself where large scale extraction takes place very close to the designation boundary. This applies to a number of large quarries within the Buxton area and to some of those located to the south east of the Park. Additionally, increased supply from at least some of these locations would conflict with the notion of reserving high purity limestone resources for industrial uses and cement manufacture. If quarries in Derbyshire were the only realistic sources for replacing the strategic rail output from the Leicestershire igneous rock quarries, consideration would need to be given not only to the availability of unconstrained resources but also to the capacity of these sources to match the output currently supplied by rail from Leicestershire. It seems that the concept of seeking a progressive reduction in aggregate production from within the Park will result in a further concentration of large scale quarrying activity in the Buxton area in the longer term, immediately adjacent to the Park boundary. This effect would be minimised if some of the shortfall was supplied from Derbyshire quarries to the south east of the Park, but that may not be feasible once the existing permitted reserves in that area begin to run out. Derbyshire's existing policy involves not permitting new reserves until the excessive landbank in the Buxton area is reduced. Quarries south-east of the Park are distinctly closer to some markets, offering reduced transport impacts, so expanding this area of production could offer alternative benefits to the Buxton area.
- Further development of existing rail-linked quarries in the Mendips, including the deepening of both Whatley and Torr quarries, and extensions to nearby quarries using the railhead facility at Torr, could result in additional capacity, amounting to about 90 % of existing rail-transported supplies from Leicestershire. However, this additional capacity could be maintained only for a limited period of time. It would reduce substantially (to less than 20 % of existing rail-transported supplies from Leicestershire) once the workable reserves at Whatley Quarry are exhausted. Furthermore, use of the Torr railhead by extending nearby quarries would be problematic because lengthy haul roads would be required, involving engineering to separate them from local roads and resolution of differing company ownerships. In the longer term, unless a new rail-linked quarry was to be developed elsewhere in the Mendips, the area would probably not be able to maintain such supplies. However, development of a new rail-linked quarry appears unachievable in terms of cost and present policy.
- In practice, output from the rail-linked Leicestershire quarries would reduce in stages, rather than all at once, and the need for alternative supplies might be offset for many years by the release of further reserves at one or more of those sites. Ultimately, however, the Leicestershire sources provide only limited scope for further expansion and alternative

supplies from one or more other areas will be needed. In reality, no one source would be expected to substitute for crushed rock supply from Leicestershire. A combination of the development of new igneous rock resources in Leicestershire and elsewhere, together with increased output from both Derbyshire quarries and the Mendips would be the most likely market response and, perhaps, the most sustainable solution.

- Within the South East region, Oxfordshire would appear to have better prospects than Surrey for future working of river terrace and/or sub-alluvial sands and gravels in areas that are relatively free of major designations and existing built development. However, this does not mean they are either commercially exploitable or free of environmental concerns. Furthermore, the SEAWP indicates that Oxfordshire has limited infrastructure and any additional development would be highly contentious.
- In the West Midlands, Shropshire appears to have a much greater area of unworked resources that are free of both major environmental constraints and local landscape designations than in neighbouring Staffordshire. However, the principal difficulties with utilising the seemingly large scale resource in Shropshire are the nature of the material itself (geologically more complex and difficult to work) and the distance to the key market areas such as Birmingham and Wolverhampton (compared with the resources in Staffordshire). Whilst a shift in the pattern of supply in the West Midlands might be achievable in the long-term, it would increase both the delivered cost of construction aggregates to existing major markets and the environmental impacts of transportation, particularly carbon emissions. These effects would need to be balanced against any reductions in site-specific environmental impacts that might be achieved by reduced levels of extraction in Staffordshire.
- Based on the examples examined in this study, the availability of geological data to support long-term planning for mineral supply and the identification of alternative resources is varied, at anything more detailed than the strategic planning level (Table 3). Given Leicestershire's importance to national crushed rock supply it is significant that industry suggested that the resource area is deficient in data to support long-term planning. This is reinforced by the BGS assessment during this study. In contrast the quantity and detail of geological data found in Derbyshire is the highest for any hard rock resource in the country and, therefore, suitable for the delineation of mineral site allocations. Minerals information for the Mendips is also extensive, though the limestones have not been systematically assessed for mineral resource purposes.
- In general, this study indicates that information on sand and gravel resources is deficient in quality and thickness data, which is a prerequisite for the identification of mineral site allocations. This is the case in Surrey, where only a basic level of data is generally available for those resource areas which are not sterilised. Detailed studies are required before accurate mineral volumes and qualities can be determined. Given the significance of Staffordshire to regional production, it is notable that no systematic mineral assessment surveys have been conducted and in comparison to Shropshire sand and gravel resources are very poorly known. In general, mineral information for Staffordshire appears limited and is not considered adequate for preferred area and specific site selection, due to a lack of information on mineral extent, thickness and overburden ratios.
- The paired case studies presented in this report illustrate some of the potential implications of alternative supply scenarios for land-won sand and gravel supply in England. The assessment forms a starting point for determining the implications of future changes in the pattern of aggregate supply. However, a more rigorous assessment of the practicalities of alternative supply patterns, including the social and economic implications is essential for making robust decisions in this respect.

**Table 3.** The general suitability of publically available minerals data in the paired case study areas for use in planning for mineral supply.

Area/Resource	Identifying specific sites	Identifying preferred areas	Strategic resource definition
Mendip Hills limestone	-	√ <sup>a</sup>	✓
Leicestershire igneous rocks	-	-	-
Derbyshire, outside the National Park	-	✓	✓
Peak District National Park limestone	-	✓	✓
Shropshire sand and gravel	-	√ <sup>a</sup>	✓
Staffordshire sand and gravel	-	-	✓
Oxfordshire sand and gravel	-	√ <sup>a</sup>	✓
Surrey sand and gravel	-	-	-

<sup>a</sup> Denotes may require input from industry or additional information in areas not covered by IMAUs or where information from such reports needs to be supplemented. - publically available data is considered deficient for preferred area and specific site selection based on the data reviewed in this study.

## 7 Key findings and recommendations

Securing continuity in the supply of aggregate minerals to the construction industry is an important feature of national minerals policy. This study has examined the likely pattern of aggregates supply over the next three decades, highlighting where reductions in productive capacity are foreseeable and exploring in some key cases the options available as a response. This analysis is against a background of the decline in recent years of permitted reserves of primary aggregates, highlighted by previous studies, and of the expiry on 21<sup>st</sup> February 2042 of all mineral permissions which did not have their own end date imposed upon them at the outset (being almost entirely pre-1982 permissions). Recognising weaknesses in the traditional landbank approach for securing continuity of supply, this study promotes a more accurate and useful method of monitoring future aggregate supplies, based on the productive capacity in each MPA. The study has reviewed the constraints on working primary aggregates resources, noting their potential impacts on supply rates in the short-, medium- or long-term (albeit from a sample of authorities rather than all). This has helped to inform whether individual MPAs are likely to be able to meet their apportionments of regional and national aggregates requirements.

### 7.1 PRINCIPAL CONSTRAINTS ON AGGREGATE SUPPLY IN ENGLAND

In accordance with the first two project objectives, consultation has identified constraints on future aggregate supply in England. The types of constraints are wide ranging and include those related to environmental protection and policy, resource quality, resource sterilisation, technical/logistical issues with resource development and a range of commercial factors. The constraints identified will impact on supply over varying times scales. The prominence of constraints affecting sand and gravel supply in the short-term (during the current *Guideline* period) is notable. Areas which face medium-term supply constraints generally indicate they have sufficient resources for the current *Guideline* period, but are likely to face a shortfall in supply beyond then. Areas which foresee problems with supply from specific resources during the next *Guideline* period generally do not appear to have given much consideration to alternative supply arrangements. Long-term supply issues (which have implications for supply from 2030 onwards) are apparent for some significant crushed rock resources. Although such issues are not of immediate concern in terms of material availability they do affect some of England's most important aggregate producing areas. The significance of the resources affected and the consequent impact on future national supply warrant a policy response now. Some cases studies demonstrate that shortfalls in supply are arising in specific types of aggregate even though overall supplies in that area appear to be plentiful or adequate.

In addition to constraints on specific aggregate resources, a clear theme identified during the consultation is uncertainty resulting from the planning system and the difficulties this creates, particularly for medium- to long-term planning for mineral supply. Accordingly, issues with the current planning system alone are perceived to represent a constraint to future aggregate supply. The principal issues include:

- confidentiality of data to support planning for mineral supply, particularly the provision of data on reserves and sales at individual sites;
- plans do not cover a sufficiently long period to encourage or facilitate medium- to long-term planning for mineral supply, i.e. beyond 15 years ahead, although some authorities have achieved more at the scale of the individual planning permission;
- reliance on outdated plans contributes to uncertainty for investors and communities regarding future development;
- in light of the provisions in the Localism Bill for the ending of regional spatial planning and the strengthening of local planning powers, the planning system may not be able to

- address effectively the continuing disparities in resource distribution in England and may result in an undersupply of aggregates at the national level;
- in the face of increasing supply shortfalls, planning for mineral supply and alternative supply options require co-operation across regional boundaries. Through the National Co-ordinating Group of the AWP's the Managed Aggregates Supply System can attempt to resolve this, although this is a mechanism rather than an executive body, and has no power to push through preferred solutions identified from an evidence base. In the absence of opportunities for inter-regional negotiation there is a tendency to place increased pressure on existing supply areas by carrying on with past practices, sometimes with environmental cost. A number of locations have been identified by this study where an effective negotiating procedure would have led to more desirable outcomes or where there is a need for such dialogue in the future;
  - commercial considerations add to the complexity of future planning for mineral supply and are largely beyond the control of the planning system; and
  - BGS *Mineral Resource Maps* are generally considered adequate for strategic level planning. However, these are frequently supplemented by information from industry. Geological information which can prove indicated resources, specifically mineral quality and volume, is considered vital for the delineation of preferred areas and specific sites. The data currently available from the BGS is insufficiently detailed for these purposes, with the exception of a few cases (those areas assessed by the IMAU). Reliance on industry for geological information can result in a natural bias towards particular areas. Some consultees indicated that a plan-led system should not rely on industry for strategy and the acquisition of additional independent data would provide authorities with a more reliable basis for planning for aggregates supply. Furthermore, the growing shortage of minerals planning expertise in local authorities may increasingly limit the appropriate utilisation of geological information.

### 7.1.1 Recommendations

- Increased dialogue between MPAs and AWP's will assist in anticipating increased requirements for cross-boundary aggregate supplies and facilitate long-term planning for aggregates. Based on the evidence presented a formal mechanism to discuss inter-regional issues and resolve disputes should be considered. The MASS could be extended to incorporate such a mechanism. This would aim to provide clear direction for any agreed change in the next round of regional aggregates *Guidelines* (although this would appear to oppose the Coalition Government's aim to reduce the volume and prescriptive detail in national planning policy). Co-operation across MPA boundaries within the same region should be resolved by the strategic planning process, currently under review by the Government.
- Area Action Plans to address the comprehensive working of localities should also be promoted to enable efficient use of mineral resources where more than one company and/or more than one MPA are involved.
- More opportunities for long-term aggregate supply planning should be pursued where evidence-based assessment confirms that the industry might be given a long-term future. Areas which exemplify good practice should be highlighted. A long term planning approach (beyond the *Guideline* period) for minerals is required, and should be included in Mineral Development Frameworks. This would allow for planning for comprehensive rather than piecemeal working in an area. This might include advance works like woodland planting decades ahead of quarrying, time-limited use of surface land before it is required for aggregates working, and appropriate means for sharing between interested parties the costs of investment in infrastructure for long-term use.

- MPS1 policy on 'Efficient Use' (particularly to ensure that high grade material is used for high grade end-uses) should be developed to ensure constrained HSA resources are used in the most sustainable manner. This may help to alleviate some of the political concerns raised during this study about unsustainable resource exploitation in certain areas.
- The construction sector is an important part of the national economy and the availability of high quality aggregates is integral to this industry. Given that sustainable growth is the overriding priority of this Coalition Government, certain aggregate resources, particularly those of high specification, should be accorded nationally strategic status, against which the significance of other interests can be appropriately assessed. The criteria for determining these nationally strategic resources would require detailed consideration, but would include their contribution to national supply.
- Whilst it is not practical to improve geological data coverage for the whole country a targeted approach to data acquisition is required, in areas where significant constraints on supply are demonstrated and clear deficiencies in the evidence base occur. This is particularly important for nationally significant resource areas e.g. Leicestershire igneous rock, where a thorough assessment of the broader geological resources of hard rock is required.
- Where practicable, material specification and end-use suitability data should be incorporated into resource and geological data sets to aid planners in matching market requirements with resource availability.

## 7.2 AGGREGATES SUPPLY PATTERNS TO 2042 AND BEYOND

In accordance with the second project objective, this study has developed an alternative approach to charting the availability of aggregate resources as a more effective means of highlighting threats to continuity of supply. It uses the same annual monitoring information as that already collected by MPAs throughout England, i.e. annual sales and the permitted reserves at the end of the year by mineral type.

The rundown charts show how successfully the method works, revealing details about the rundown in reserves that the landbank approach overlooks. The rundown in reserves is generally not evenly spread over time. The graphs, especially those showing estimated sales, do not step down evenly from one year to the next until the reserves are all used up. Rather, the declines tend to be focused on pronounced step changes, particularly when larger producing sites cease operations. The timing of these large step changes give a useful indication to mineral planners, industry and MPAs as to the dates by which alternative supply arrangements need to be established.

Rundown charts can also be used to assess issues related to productive capacity of sites and alert the relevant bodies as to when they need to find alternative production capacity. The rundown approach can also identify the impact on local supply of particular permissions expiring. Furthermore, rundown charts provide more insight into the contribution of reserves in inactive sites for the MPA than is provided by a landbank figure.

A key objective of this study has been to establish how significant the 2042 date is to the rundown of aggregates supplies in England. Although the study could only examine the experiences of a sample of MPAs, assuming that recent rates of working are sustained, these indicated that:

- existing sand and gravel permissions will generally be worked out well before 2042;
- whether reserves at currently inactive sites are used up before 2042 depends on whether these sites are reactivated, when and at what rate they are then worked;
- this also applies at dormant sites, with the added uncertainty of the scale of the reserves which will be approved for working at reopening; and

- there are several important crushed rock permissions with both large reserves and 2042 end dates. In this respect Derbyshire is the worst-affected authority assessed during this study.

In summary, the contrast between landbank information and rundown chart approach is profound. Landbanks fail to take any account of end dates and so over-estimate the availability of reserves which will in practice be lost completely when a permission expires still with workable mineral remaining within it. This is especially clear in authorities in which a large proportion of existing permitted reserves are at sites which are affected by the 2042 rule e.g. Derbyshire. Consideration of landbanks alone could be considered insufficient as a basis for policy making or deciding planning applications.

### **7.2.1 Recommendations**

- It would be helpful if rundown charts of the kind used in this study were instituted at the MPA level. They should also be applied at the regional level for certain aggregate types e.g. HSA, soft sand and materials which serve distant markets. A national rundown chart for key aggregate types would be beneficial, notably for HSA, ideally distinguishing regional contributions.
- Emerging medium- and long-term supply problems should be addressed now, so that solutions can be found in sufficient time to enable appropriate responses to be put in place, minimising the risk of short-term solutions, which can be more costly to the environment.

## **7.3 ASSESSMENT OF ALTERNATIVE SUPPLY SCENARIOS**

In accordance with the third project objective, the project has assessed the implications of alternative supply options for obtaining primary land-won aggregate. The general consensus from both the consultation and rundown analysis is that some established resource areas are unlikely to be able to sustain production at current levels, particularly in the medium- to long-term (e.g. some of Leicestershire's igneous rock quarries). In these cases there is a clear requirement to assess alternative sources of supply.

Adequate geological information is fundamental to defining alternative supply areas and this is assessed for the specific areas. Any change in supply pattern required to compensate for reduced output from a constrained resource area will have environmental, social and economic implications. These implications need to be appropriately assessed and balanced.



## Appendix 1 Consultation meetings

Organisation	Representatives	Date
South East AWP and London	Chris Waite	01/09/10
South West AWP	Phil Hale	22/09/10
East Midlands AWP	Ian Thomas	23/09/10
West Midlands AWP	Jasbir Kaur, Tony Lyons	24/09/10
North East AWP	Kevin Tipple	27/09/10
North West AWP	Anne Mosquera	29/09/10
Yorkshire and the Humber RAWP	David Parrish	30/09/10
East of England AWP	Roy Leavitt, Lesley Stenhouse	08/08/10
Mineral Products Association (mpa)	Ken Hobden (mpa), Tim Deal (Lafarge), Alan Everard (Tarmac)	26/10/10
British Aggregates Association (BAA)	Peter Huxtable	22/10/10
Planning Officers Society (POS)	Nigel Hunt (Leicestershire County Council), Wayne Allum (Nottinghamshire County Council)	26/10/10
Derbyshire County Council	Richard Stansfield	23/11/10
Peak District National Park	David Bent	23/11/10

### Correspondence was also undertaken with:

- Staffordshire County Council
- Shropshire County Council
- Surrey County Council
- Oxfordshire County Council
- Hampshire County Council
- Yorkshire Dales National Park
- Northamptonshire County Council
- North Yorkshire County Council
- Nottinghamshire County Council
- Leicestershire County Council
- Milton Keynes Council
- Somerset County Council
- Gloucestershire County Council
- Kent County Council
- Worcestershire County Council

## Appendix 2 Consultation questions

The following questions were used as a framework for consultation.

1. If the sub-regional apportionment of the 2005-20 *Guidelines* recommended by your RAWP is accepted by each MPA have any concerns been raised regarding the ability to identify resources to meet requirements during that period?
2. During the sub-regional apportionment process have any concerns emerged regarding the ability of MPAs to meet likely requirements in the period after 2020 (or the plan period) if demand remains at about the same level?
3. If there are concerns over constraints on specific (either in terms of geographic location or specification of material produced) aggregates resources (sites or type of resource) within the region affecting the ability to meet future (medium- to long-term) aggregates supply, where might any shortfall be made up from? i.e. will there be an increased reliance on imports from other regions/landings via wharves (where appropriate)?
4. Are there any specific plans within any of the MPAs in your region for replacing large output sites known to be closing? If so what are these plans?
5. Are there any issues within your region regarding the ability to continue to supply material of a specific quality in the future?
6. What effect may the new 'localism' agenda have on securing future aggregates supply from the region?
7. Is sufficient geological information available to support long-term planning for aggregates supply in your region, bearing in mind the need for all plans to be founded on a robust and credible evidence base?
8. If the answer to question 7 is no, precisely what additional geological information is required?
9. Does any information exist in the public domain regarding aggregates supply in your region that might be useful to us?
10. Are there any MPAs you think we should ask for run-down information for that we haven't already asked?
11. Are there any other questions you feel we ought to ask other RAWP Secretaries or yourself?

A modified set of questions addressing the above issues were used for consultation with the aggregates industry and planning officers.

## Appendix 3 Supplementary information for issues raised regarding the future supply of aggregates

The following sections provide background information to some of the key issues raised during the consultation, which relate to the future supply of aggregates. The appendices have been divided into sections based on the region where the issue is most pertinent. Comments and opinions expressed during consultation are highlighted in italics.

### The South East region and London

#### **CONCERN OVER THE PROVISION OF UNCONSTRAINED SAND RESOURCES IN HAMPSHIRE, WEST SUSSEX AND IN THE SOUTH DOWNS NATIONAL PARK**

*Industry representatives raised concern during the consultation that the extent of unconstrained resource in Hampshire, now it has two National Parks (New Forest and South Downs) has been reduced. The MPA agrees that access to resources in Hampshire is heavily constrained by designations. A significant proportion of the commercially viable soft sand resource in Hampshire, West Sussex and East Sussex is within the South Downs National Park. Furthermore, concern was expressed regarding the uncertainty about the policy direction of the South Downs National Park and its future impact on supply.*

*During the consultation the SEERAWP indicated that the new South Downs National Park further constrains the already limited extent of unconstrained resources in West Sussex, with future access to sand reserves being the principal concern. Industry representatives indicated that as the South Downs National Park is primarily based on the Greensand boundary, most of the resource now lies within the National Park boundary.*

#### **Background information Hampshire**

During 2008, Hampshire had the highest reported sales of sharp sand and gravel in the region, amounting to 980,000 tonnes and representing 19 % of the Regions sales. Reserves of sharp sands and gravels in Hampshire at the end 2008 were 4.7 Mt. Total reserves of all sand and gravels in Hampshire at the end 2008 were 7.6 Mt, representing at landbank of only 2.9 years based on the apportionment method and 5.3 years based on average sales for the period 2004–2008 inclusive. Hampshire has the smallest landbank in the South East, followed by Oxfordshire, Surrey and West Sussex, which also have landbanks of less than seven years. No new permissions were granted in Hampshire during 2008 (SEERAWP, 2008).

#### **Background Information West Sussex**

West Sussex had a sand and gravel landbank of 5.7 years at the end of 2008 (SEERAWP, 2008). In a background paper to its Minerals and Waste Development Framework, West Sussex County Council indicates that primary aggregates production within the county has declined substantially in recent years, falling by more than 40 % between 2001–2006: *‘This decline may make delivery of the apportionment figure for primary aggregates more challenging’*. West Sussex County Council examined three different scenarios to illustrate the amount of primary aggregates that would be required to meet the current apportionment figure (0.91 Mt) until the end of the plan period (2026). Even under the best case scenario (if all remaining allocated Minerals Local Plan sites came forward and were granted permission) there would be a shortfall of 5.23 Mt during the plan period up to 2026 (if the current apportionment figure remains the same) (West Sussex, 2008).

## **Background Information to the South East Plan and the South Downs National Park**

The South Downs National Park Authority is to become a full Authority on April 1<sup>st</sup> 2011. Until then, the Authority is obliged to adopt the emerging Development Plan Documents from the Local Authority areas that are within the Park. Future National Park policy and its impact on supply is, therefore, as yet unclear.

There was sympathy for the views of industry about the increased constraint on mineral resources (as a result of the impending South Downs National Park designation) in the South East Plan published in March 2009:

*‘the growth in the number of specially designated areas, notably the shortly to be designated South Downs and recently established New Forest National Parks, and the extent of environmental constraints generally is likely to cause difficulties in maintaining some minerals reserves across the region. Accordingly, the potential for mineral extraction to take place as carefully considered exceptions to national policy in areas subject to these constraints should be kept under review, especially if provision for land-won aggregates is to be maintained in line with national guidance’* (paragraph 10.65).

The report of the Panel which heard the Examination in Public (EiP) of proposals to change Policy M3 of the South East Plan, on aggregates supply, explained in 2009:

‘4.6. At the EiP it was acknowledged that a significant proportion of the soft sand resource of Hampshire, East and West Sussex is located in the proposed SDNP area. We recognise this in the context of the proposed National Park area extending beyond the area covered by the two existing AONBs, and have already considered the provision of a separate soft sand apportionment in dealing with Matter C2, concluding that separate apportionment is unnecessary at the RSS level. From the evidence submitted it appears the deposits constitute all of the soft sand resource within the National Park area for the MPAs concerned. Furthermore, evidence in the statement for West Sussex CC drew attention to the lack of alternative economic supplies outside the National Park area and the contribution of the resource to maintaining local identity and distinctiveness.

4.7. Much evidence was presented to the Panel in terms of the extent of soft sand capacity within the proposed National Park area, with all of this resource for East Sussex being located there. West Sussex CC indicated the National Park area amounted to 90 % of their own resource, with some 80 % of sand and gravel production within or near to the proposed National Park area. Consequently six out of seven locations for soft sand extraction being assessed for possible inclusion in the West Sussex CC MDD as site allocations are within the proposed National Park area, the majority being extensions to existing pits. Hampshire CC explained how their soft sand contribution would be similarly affected although they indicated there was some limited scope to extract (albeit lower quality) soft sand in other areas, notably East Hampshire. Hampshire CC were concerned that the inclusion of what may be considered the ‘natural’ extension of the productive Kingsley Quarry would fall under the remit of the new National Park and were anxious this should not be compromised by the new status, due to the lack of deliverable alternatives....’

West Sussex pressed at the Examination of the revised Policy M3 for this to continue, but were opposed by the South Downs Joint Committee (precursor to the National Park Authority which comes into being on 1 April 2011). The Panel decided that the policy approach to working in the National Park should be left to local decision rather than set out in the regional Plan (paragraph 4.8). The matter has therefore been deferred for future resolution, primarily by the National Park Authority.

In The South East Plan, The Secretary of State’s Proposed Changes (March 2010) it is stated that “a significant proportion of the viable soft sand resource in Hampshire, West Sussex and East Sussex is within the South Downs National Park” and that “these resources are recognised as being of regional significance for high quality construction sands” (paragraph 10.94).

## CONCERN OVER THE PROVISION OF CONCRETING AGGREGATE IN SURREY

*In its Primary Aggregates Development Plan Document Surrey indicates that “available resources for concreting aggregates are becoming increasingly difficult to identify”. Surrey suggests ‘The likely outcome is that identified potential reserves of concreting aggregate will be almost fully exploited before 2026...’. The DPD also indicates that resources of sand and gravel in Surrey available for future extraction ‘have been significantly reduced by the scale of previous working’ and ‘production cannot be sustained indefinitely at current levels of apportionment without unacceptable impact on social and/or environmental considerations’ (Surrey Primary Aggregates DPD, 2009). This issue was reiterated during the consultation by the SEERAWP Secretary and it was suggested that although Surrey should be capable of meeting its apportionment during the current plan period problems are likely beyond this point. Other consultees argue that although there is a shortage of permitted reserves there is no resource shortage in Surrey, and the principal constraint is the planning framework and political issues in the South East. Dialogue with the Mineral Products Association (mpa) indicates that it questions the size of the estimated resource that Surrey has put forward in its Mineral Plan, and also questions the suggestion that Surrey has identified all ‘potential reserves’. Some consultees were also concerned that Surrey seemed to be applying criteria in the selection of preferred areas which would ordinarily be used at the planning application stage. Concern was also raised that Surrey has tried to apply AONB policies to land designated as Area of Great Landscape Value (AGLV) and that this has led to permissions not being granted.*

### Background information

With respect to the national decline in sand and gravel reserves, the South East is one of the worst affected regions, with a 50 % decline been the mid 1990s and 2005 (Thompson *et al.*, 2008). The sand and gravel landbank in the South East was just under seven years at the end of 2008 and consequently does not meet requirements stipulated in MPS1. Surrey (3.9 years) is one of four authorities with a landbank of less than seven years (SEERAWP, 2008). The South East RAWP indicates ‘if sales continue at the average of the last three years, reserves would apparently last more than 10 years, but in practice difficulties in supply would be seen much earlier if further permissions were not granted’ (SEERAWP, 2008). Cemex’s submission to Surrey’s Mineral Plan (2009) states that ‘It is common knowledge that reserves of concreting aggregates in the County are virtually exhausted’. This point was reiterated during consultation with SEERAWP who suggested that although Surrey should be capable of meeting its apportionment during the current plan period, issues are likely beyond this point.

Surrey has identified Preferred Areas for future primary aggregate extraction for the period 2010–2026, with an estimated concreting aggregate resource of 13.05 Mt (Surrey DPD, 2009). Surrey indicates “that the Preferred Areas represent the extent of the resource that has been identified as suitable to contribute to regional aggregates supply” (Surrey DPD, 2009).

Surrey indicates that it has undertaken a detailed assessment exercise considering all sites in the ‘Surrey Minerals Local Plans 1993 and 1989’ and ‘North West Surrey Minerals Local Plan 1985’ for ‘remaining unworked reserves’, economically viable deposits identified by the Councils geologist and other land put forward by industry (Surrey DPD, 2009). These sites have been appraised in terms of the social, environmental and economic effects against the objective of securing a prudent use of natural resources, outlined in MPS1 – Good practice guide, paragraph 23 (Surrey DPD, 2009).

The concern raised over the size of estimated resources which Surrey County Council has put forward in its Mineral Plan, and the suggestion that it has identified all ‘potential reserves’, is supported by previous BGS work (Benham *et al.*, 2006b) which estimates resources of concreting sand and gravel in Surrey not constrained by national or international environmental designations and excluding urban areas and infrastructure to be 495 Mt. Although this work was based on a simplistic approach and no account was taken of resource quality and properties it

would suggest that additional resources may be available in the county. Although Surrey County Council acknowledged during consultation that there are considerably more potential resources in the county, they also stated that they don't envisage allocating any additional sites and think it is unlikely that the situation will change in the future./

Surrey has received numerous representations commenting on its Primary Aggregates Plan Document Commenting (Surrey Minerals Plan Schedule of Representations). Commenting on the plan CEMEX highlights a number of concerns including '*the County Council may have underestimated the number of sites that it requires to satisfy even the lower apportionment figure*' and '*more sites should have been identified*' (Surrey Minerals Plan Schedule of Representations). They suggest the '*aspiration to enable the production of concreting aggregate at an average 1 Mtpa ... is not achievable in the medium and long term plan period without the identification of further reserves*'. They suggest '*if the County Council does not meet its minimal apportionment requirements then it will increase pressure for sites to come forward in the counties that surround it*' (Surrey Minerals Plan Schedule of Representations).

Surrey has never met its apportionment from 2003 of 2.62 Mtpa of land-won sand and gravel. The output requirement was substantially reduced in March 2010 with a revised apportionment of 1.27 Mtpa in the Secretary of State's Proposed Changes to the South East Plan, (which was subsequently endorsed for aggregates planning purposes by the new Government [letter of 6 July 2010 from the CLG Chief Planner to all English local authorities]). This reflects the limited resources of concreting sands and gravels, concentrated in the north-west of the County, which are available to be worked in acceptable locations. The new apportionment is also the latest acknowledgement of this and reflects a process (begun first in the Surrey Structure Plan 1989 through Policy MN10 and again in its 1994 version through Policy DP25) establishing a 3 % per annum rundown in the productive capacity of north-west Surrey. The 1989 policy was elaborated in the Surrey Minerals Local Plan 1993. Policy 9 states:

'In order to achieve a balance in the regional need for aggregates and environmental and other considerations the authority will control the release of land for mineral working so as to secure a decline of approximately 3 % per annum, in the total productive capacity of minerals workings in North West Surrey. Insofar as is compatible with this rundown in productive capacity the authority will seek to maintain a total level of permitted reserves greater than the total level of productive capacity required for the following six years. The operation of the policy will be monitored, but no modification of the policy will be made until such time as this plan is reviewed. Some variation above or below the intended level of productive capacity is to be expected, and the 3 % rundown figure will be regarded as a guide rather than a ceiling or a target in any one year.'

In regard to the issue of the AGLV being treated as an AONB, Surrey Hills AONB Board believe a boundary review of the Surrey Hills AONB is required and that the review should incorporate land outside the designation which is currently designated as AGLV. Surrey County Council have endorsed this view and, within its Minerals Plan Core Strategy (2009) submitted for inspection, have incorporated a policy of a presumption against new working of soft sands within the AGLV (as well as the AONB) until such time as a review of the AONB boundary is complete. Policy MC2: Spatial strategy – protection of key environmental interests in Surrey states that 'New mineral working that may have direct or indirect significant adverse impacts on land designated within the Area of Great Landscape Value will, pending review of the boundary of the Surrey Hills AONB, need to satisfy the criteria [applied to the AONB]...'. The aggregates industry in Surrey was strongly opposed to this policy proposal. The matter was addressed by the Inspector holding the Examination of the Minerals Plan in October-December 2010. Natural England have responsibility for undertaking a review of protected landscapes' boundaries, but has no timetable for the review of the Surrey Hills AONB at present. Whether the policy to treat the AGLV as an AONB will get through examination is yet to be determined.

## **MILTON KEYNES - SAND AND GRAVEL PROVISION IN A SMALL MPA**

*Concern was raised in the consultation that Milton Keynes may have an issue in meeting its apportionment of sand and gravel in the future given the small size of the MPA. Concerns were raised about over utilisation of mineral bearing land on the outskirts of the MPA in comparatively 'attractive landscape'. It was intimated that just because land isn't designated, it doesn't mean that the land is not valued in much the same way by local residents as if it were designated. The issue raised was essentially that Milton Keynes (because of its tight administrative boundary and geological resource availability) effectively has little choice in where to allocate sites and this has a disproportional effect on landuse. It was suggested that there might not have been an obligation in the area at all if the apportionment requirement for Milton Keynes had been merged with an adjacent MPA.*

### **Background Information**

Although the river terrace deposits of the Great Ouse and River Ouzel have been extensively worked for aggregate around Milton Keynes, significant potential aggregate resources remain in the lower terrace deposits of the Great Ouse downstream from Milton Keynes with mean thicknesses of 2.9 m and 2.3 m for overburden to mineral ratios of 1:1 and 3:1 respectively (Harrison *et al* 2005). Before the current recession hit, it was predicted that by the end of 2021, 200 000 new homes are expected to have been built within the Milton Keynes and South Midlands Growth Zone. Massive improvements to transport links were also proposed, including improvements to rail travel (Harrison *et al* 2005).

The Milton Keynes Local Plan (adopted 2006) retains the adopted Borough of Milton Keynes Local Plan (1995) policy to "safeguard and protect the Areas of Attractive Landscape" and therefore Policy MLP11 states that "Permission will not be granted for mineral development in the Areas of Attractive Landscape, where such development would result in a detrimental impact on the landscape quality of the area, unless it can be shown that it is necessary to meet an essential need which cannot be met by any other means". The adopted plan also retains policies to safeguard land for a rail depot.

## **The South West region**

### **CRUSHED ROCK IN THE SOUTH WEST**

*The South West is the second largest crushed rock supplying region in the country, with production being dominated by Somerset (Mankelow *et al.*, 2007). The overall permitted reserves in the region are high (899 Mt at the end 2008), amounting to a landbank of more than 30 years, based on the apportionment method. All crushed rock producing MPAs except Gloucestershire (10.3 years at end 2008, based on the apportionment method) have a substantial landbank of permitted reserves. Gloucestershire accounted for 8 % of regional crushed rock sales in 2008 (SWRAWP, 2008).*

*During the consultation the SWRAWP indicated that there is a shortfall of crushed rock in Gloucestershire and that there is an AONB in a main supply area. In Somerset there are sufficient reserves, but these are associated with the East Mendips where there are aquifer constraints. The Somerset Minerals Local Plan emphasises the conflict between the need for minerals and the requirement for water in the Mendip Hills (Somerset County Council, 2010). The SWRAWP indicated that high PSV stone comes from a single quarry (Moons Hill) in the Mendips and approximately 20 years supply from basalt remains.*

## **Background Information**

Gloucestershire's crushed rock resources can be divided into two specific types of limestone in different geographical locations. Limestone aggregate is predominantly quarried from Carboniferous limestones, near Yate and Cromwell in South Gloucestershire and in the Forest of Dean. However significant quantities are also sourced from Jurassic limestones of the Cotswolds. The Carboniferous limestones have important commercial differences from those in the adjacent Mendip Hills, for example the Black Rock Limestone is dolomitised and significantly stronger than most Carboniferous limestones. In addition at Wickwar, the Clifton Down Limestone is more siliceous (i.e. it is sandy) than in Somerset, enabling a stone with a relatively high PSV to be produced that can be used for road surfacing and concrete products. The Jurassic limestones are less hard and durable than the Carboniferous limestones but are worked on a small scale for building stones or low quality aggregates such as constructional fill and agricultural purposes (Benham *et al.*, 2006a).

Recent work by Capita Symonds for South West Councils demonstrates that crushed rock reserves of Carboniferous Limestone in the Forest of Dean in Gloucestershire have a lifetime of around 10 years, based on annual apportionment figures. Much of the resource in Gloucestershire is located within the Forest of Dean AONB. However, there are outcrops outside the AONB boundary which are also free of other major designations. The County Council indicate, however, that there are other constraints and practicalities to working the resources in these areas e.g. highways constraints, water resource protection areas, high grade agricultural land and existing settlements.

## **SAND AND GRAVEL SUPPLY IN THE UPPER THAMES VALLEY**

*During the consultation the SWRAWP indicated concerns in supplying the current sand and gravel apportionment, as well as beyond 2020. In Gloucestershire, Wiltshire and Dorset there is a shortfall of sand and gravel. Consultees indicated that geographical constraints in the region include the spread of designations and airport safeguarding zones, so sand and gravel producing authorities will find it hard to find non-constrained resources. It was indicated that industry generally prefers larger sites and limited yield may be seen as a reason for not justifying the expense of a planning application.*

## **Background Information**

The sand and gravel landbank for the region is 9.5 years based on average past sales, falling to 6.04 based on the apportionment method. Accordingly, the decline in regional landbank between 1992 and 2005 highlighted by Thompson *et al.* (2008) has persisted. Wiltshire's sand and gravel landbank is the most critical having fallen from only 5.6 years in 2007 to 4.5 years in 2008 with those in Gloucestershire and Dorset at about 10 years based on the past sales method. Landbanks reduce considerably when based on the apportionment method with Gloucestershire falling below 7 years and Dorset at 7.2 years (SWRAWP, 2008).

With reference to future availability of sand and gravel in Wiltshire, recent work by Capita Symonds for South West Councils (2005) suggests there are extensive outcrops of unworked resources which are not constrained by major designations. In practice, however, the likelihood of these being considered acceptable in land use planning terms may be far more limited. Wiltshire MPA indicates that resources within the Wiltshire part of the Upper Thames Valley might be able to provide supplies up to 2026 (subject to further detailed assessments) but not much beyond that point. The MPA has also observed that there are no realistic alternative sources of sharp sand and gravel within Wiltshire and Swindon, other than in areas that are too far removed from the main areas of demand. The Cretaceous Greensand resources around Calne are 'soft' sands which would not represent a suitable substitute for sharp sand and gravel.



In Gloucestershire, Quaternary deposits are most economically important. Recent work by Capita Symonds for South West Councils indicates that the urban areas of Gloucester and Cheltenham constrain large areas of the potential resource. The main area of accessible resources is the Upper Thames Valley where there are unworked Preferred Areas on the Gloucestershire side of the border.

## The East of England region

### **CRUSHED ROCK RESOURCES IN THE EAST OF ENGLAND**

*Supply of hard rock was raised in the consultation as a major concern for the East of England during the plan period. There is not a great quantity of hard rock in the region and the rock that is present is of low quality and does not meet the specifications for 'hard rock'. The hard rock in Peterborough was given as an example (in Essex hard rock is imported by rail from Leicestershire and Somerset and imported by ship through Thurrock from Europe).*

*In relation to the East of England apportionment exercise, the EERAWP Secretary said that although there are sufficient resources in Peterborough, they are inactive and that the resource was also considered to be of low quality. According to the Secretary, although Cambridgeshire and Norfolk have included hard rock figures in their apportionment it is unlikely that they will be able to meet them. However, it was suggested that the shortfall in hard rock is likely to be made up by sand and gravel.*

#### **Background Information**

The East of England has very limited resources of material suitable for crushed rock aggregate and where they are available these are confined to limestone in Cambridgeshire and 'Carstone' (a type of sandstone) in Norfolk. The suitability of a sandstone for aggregate use depends mainly on its strength and durability. Variations in the aggregate properties (and thus aggregate potential) of sandstones are related to differences in composition, grain size, texture, burial history and tectonic setting, metamorphism and weathering. Individual sandstone units also vary in thickness and lateral extent. Many types of sandstone are too porous and weak to be used other than as sources of constructional fill. There is a lack of hard rock in the region and the rock that is present is of low quality. Consequently supply of hard rock is a major concern during the current plan period.

The quantities of crushed rock aggregate production and corresponding reserves are extremely small (Thompson *et al.* 2008).

## The East Midlands region

### **SUPPLY OF IGNEOUS ROCK FROM LEICESTERSHIRE**

*The East Midlands AWP, industry representatives and importing regions expressed concern regarding the medium to long term ability of Leicestershire to supply crushed rock, at existing levels, particularly to areas like the South East and London. It was indicated that the long term reliance of other regions on the East Midlands may result in problems as reserves run down. This issue has been documented by the East Midlands AWP which states "Action (needs) to be taken to address medium to long term concerns over future supplies of igneous rock from Leicestershire and in particular, bearing in mind the nationally strategic and uncertain nature of the Leicestershire resources beyond the existing permissions..." (EMRAWP, 2010). Industry representatives indicated that the quality of resource was a constraint in some deposits, as a single size product may be difficult to achieve. They also remarked that considerable investment*

would be needed at some sites to improve processing efficiency but that there would need to be sufficient reserve to justify such expenditure.

### Background Information

Leicestershire accounts for 53 % of the East Midlands rock production, with 58 % of production being exported outside the region (Mankelov *et al.*, 2007). Extraction is now concentrated at four very large, rail connected quarries around the flanks of Charnwood Forest and to the south-west of Leicester: Bardon Hill (Aggregate Industries); Cliffe Hill (Aggregate Industries); Croft Hill (MQP) and Mountsorrel (Lafarge) (Leicestershire County Council MDF, 2009). These four large igneous rock quarries are of importance, not only because of the volume of material they supply into the market (both locally and into other regions), but because they are able to supply High Specification Aggregates of which there are relatively few alternative sources in England (and which cannot be supplied by Carboniferous Limestone, the principal source of crushed rock aggregate). Accordingly, EMRAWP (2009) indicates that it is critical that igneous rock is analysed separately from limestone, as the latter cannot be substituted for the former.

Arithmetically, the landbank of igneous rock permitted in Leicestershire is sufficient for more than 22 years supply, until around 2030, which is beyond the 10 year minimum stipulated in MPS1 and is more than adequate to meet the requirements of the plan period (2005–2020) (EMRAWP, 2010). Whilst short term (2005–2020) provision is assured, shortfalls in supply can be expected around 2020 (see Figure 16) and the long term (>2030) availability of igneous rock supplies from Leicestershire is uncertain because of a variety of constraints detailed below:

- **Logistical issues** – these must be overcome at two of the four large sites to enable access to 24 Mt of reserve. Furthermore, at a third operation not all the reserves are controlled by the operator (EMRAWP; 2009);
- **Technical** - the cost of extraction rises significantly as the Leicestershire quarries reach their planned maximum working depth (in excess of 170 m in some instances), potentially causing problems with slope stability (EMRAWP; 2009). Overburden management is also considered an issue due to the depth of operations in Leicestershire; The East Midlands RAWP cautions that that as a result of these two factors 20 % of the permitted reserves (250 Mt) in Leicestershire may in practice not be recoverable (i.e. 50 Mt) (EMRAWP; 2009).
- **Geological** - exploitation will naturally start with outcrops of rock and areas that are easy to access. Options for lateral extensions to existing sites are limited by depth of overburden and knowledge of the geology. There are reported issues with defining the extent of the mineral resource at depth and respondents which suggest better geological data is needed regarding quality and variability of Leicestershire's resources at depth i.e. the extent of the igneous rocks under the Permo-Triassic cover;
- **Environmental** - respondents indicated that the sizeable footprint of the existing Charnwood operations causes constraints regarding their future ability to expand laterally. Options are reportedly considerably limited by bio-conservation and local amenity factors (EMRAWP; 2009). This is illustrated by Bardon Quarry, which is severely constrained resulting in submission of an application for a nearby area, rather than a lateral extension. In addition, Mountsorrel is surrounded by SSSIs at approximately 60 % of its rim;
- **Infrastructure** - in addition to the four main rail linked units 98 Mt of permitted igneous rock reserves exist in inactive sites. However, none of these are rail-linked or have a realistic proposition of being so (EMRAWP; 2009);
- **Lag time** – it is suggested that even if new permissions or major extensions were granted, a minimum of five to seven years would be required for such large units to reach full production (EMRAWP; 2009).

Given the national importance of Leicestershire's resources (depended on by the East Midlands region and at least four other regions (Mankelow *et al.*, 2007) and the uncertainty regarding long term provision, the East Midlands RAWP recommends that: a comprehensive assessment of alternative resources is carried out; areas identified are rigorously safeguarded; and such resources are accorded a 'nationally strategic status, against which the significance of other environmental interests is appropriately weighted'. In order to support longer term planning the East Midlands RAWP generally indicates "a need to liaise with those regions anticipating supplies from the E Midlands, to identify in broad terms, their potential needs..." (EMRAWP, 2010).

The medium- to long-term concerns expressed regarding crushed rock supplies from Leicestershire are supported by rundown data collated for this study (Appendix 5).

### **SUPPLY OF LIMESTONE FOR CRUSHED ROCK AGGREGATE FROM DERBYSHIRE AND THE PEAK DISTRICT NATIONAL PARK (PDNP)**

*Concern has been raised by Industry regarding the policy approach taken by the PDNP in their core strategy to activate what appears in the industries view to be an outright ban on mineral development (except in regard to fluorspar). The PDNP Core Strategy is focussed on working towards the gradual reduction of aggregates working (and other land-won minerals) within the National Park but states that 'the ability to achieve this policy aim is limited by the high level of extant permitted mineral reserves within the Park'. The Authority has, therefore, taken a stance within its Core Strategy to 'not allow new sites or extensions to existing sites for aggregates working' (although it does propose an exception with regard to fluorspar and some building stone) (mpa, 2009).*

*Industry contests the approach of not permitting any new mineral extraction or extensions in the Park. During consultation they indicated that 'not permitting any new mineral extraction or extensions to current working is contrary to national policy' which 'does not seek an outright ban on minerals development' (mpa, 2009).*

*The Mineral Products Association (mpa) and the British Aggregates Association (BAA) also raised the issue of sustainability with increased haulage distances if minerals are sourced from outside the National Park and the effect of increasing haulage through the park from Buxton to Sheffield (MPA, 2009).*

*During the project consultation, the National Park Authority had concerns that some professionals within the minerals industry (and bodies supporting the minerals industry) continue to place significant emphasis on the extent of the limestone resource covered by the designated landscape, as a justifiable reason to alter the restrictive national and local policies formulated to protect these areas, to allow further aggregate extraction. The PDNP believe that too much emphasis is being place on the area factor given that limestone deposits extend to considerable depths (200m +). As such, only a small surface area of working has the potential to release significant quantities of hard rock mineral. The Authority defends its approach not to permit new sites or extensions to existing sites for aggregates working in its Core Strategy highlighting that even within the Park current permitted reserves of limestone for aggregates working amount to 11 Mt (at the end of 2008) and are sufficient for 27 years supply, based on its current apportionment. The Authority is confident that there is the capacity available within existing permissions for the Authority to satisfy its future apportionments. The Authority considers that if overall demand remains the same, other areas outside the National Park can be expected to provide aggregates instead (PDNP Core Strategy, submission version September 2010). According to the National Park Authority the principal knock-on effect of a gradual rundown in aggregates output from the National Park over the next 30 years is likely to be to increase supplies from Derbyshire instead (unless demand declines significantly), given the substantial permitted reserves within Derbyshire (827 Mt end of 2008, sufficient for 86 years supply, based on its current apportionment, EMRAWP, 2008). The National Park Authority*

*suggests that the process of Derbyshire substituting supplies for the Peak District is supported by Derbyshire County Council and does not appear to present any risk to overall supply (PDNP Core Strategy, 2010).*

*Operators have expressed concern that the operations within the Park likely to close before 2020 are all located along the eastern flank of the main limestone outcrop. However, the concentration of both the remaining extensive reserves in the Park and more significantly, Derbyshire's permitted reserves, lie generally in the north western area, near Buxton. Industry reiterated the concern documented in the EMRAWP (2009) that "drawing upon either of these permitted reserves would result in even greater volumes of aggregate crossing the PDNP area en route to reach customers in the remainder of Derbyshire and the East Midlands, i.e. the main areas served by the depleted quarries", and questioned the environmental sustainability of this.*

*The National Park Authority reported in the consultation that it is aware that Derbyshire County Council is looking to negotiate with the operators to give up some of the permitted reserves in the west of Derbyshire around Buxton in exchange for sites in the east (Bolsover area) in order to increase the geographic distribution of aggregate sites. Whilst such an approach would address the issue, the Authority raised concerns that there could be no guarantee that the eastern quarries wouldn't supply markets in the west, resulting in a potential continuation of cross-Park traffic.*

### **Background Information**

The Carboniferous limestone is by far the largest source for crushed rock aggregates in England. Limestones of Carboniferous age occur extensively in the Peak District and Derbyshire forming the characteristic and attractive scenery of the White Peak. The limestones occur as thick, flat-lying, uniform beds that are relatively cheap to extract and process. Being relatively soft they do not consume as much energy to crush or cause the same degree of abrasion on plant as other rock types and usually produce strong, low porosity aggregates. Some of the limestones are of high chemical purity (>97 % CaCO<sub>3</sub>) and the East Midlands is the principal source of high purity limestone for industrial applications in the UK. Carboniferous limestones are also worked for cement manufacture, though the major proportion (about 65 %) of the limestone/dolomite output in the East Midlands is for aggregate use. The limestone can be used for all aggregate uses except road-surfacing because of their poor skid resistance properties.

The Peak District National Park Authority is the third largest crushed rock producer in the East Midlands, accounting for 17 % of the region's production, with 53 % of material being exported outside the region (77 % of which, according to the AM2005 survey, is exported to markets in the North West and 10.9 % to markets in the Yorkshire and the Humber) (Mankelow *et al.*, 2007). Almost all aggregate reserves in the National Park are limestone, the bulk of which are located at Old Moor and Ballidon quarries. Smaller quarries are located in and around Stoney Middleton, Grangemill and near Bakewell and Buxton. Within about five to seven years' time permitted reserves at number of smaller units will become exhausted. It is therefore proposed not to replace these by permitting further reserves in the National Park. Sites coming to the end of their permitted life are Longstone Edge West (Stoney Middleton area) (2010), Ivonbrook Quarry (Grangemill) (2011), Goddards Quarry and Darlton Quarry (Stoney Middleton) (2012) and Shining Bank Quarry (Bakewell) (2016). All these sites lie in the eastern part of the National Park. In addition, Topley Pike Quarry (Buxton) is running out of permitted reserves although the permission for working does not expire until 2042 (EMRAWP, 2010). Figures from the 2005 EMRAWP survey suggest that of the five quarries at which permissions for extraction come to an end within National Park by 2016 (and which lie on the eastern side of the Park) 77 % of the aggregate material is distributed to East Midlands markets, 21 % is distributed to Yorkshire and the Humber markets and 1 % is distributed to West Midlands markets. On average these sites cumulatively produce a total of around 1.2 Mtpa (EMRAWP, 2010).

Derbyshire is the third largest producer of crushed rock aggregates in England, and the second largest producer of crushed rock for aggregate in the East Midlands accounting for 25 % of the region's production, with 63 % of material being exported outside of the region (AM Survey 2005 - Mankelov *et al.*, 2007). Derbyshire, with an 86 year landbank of crushed rock based on apportionment at the end of 2008 (EMRAWP 2008), has especially large reserves of land with planning permission for aggregates working. There is a major concentration of Carboniferous Limestone working around Buxton, on the fringes of the Peak District National Park, including major rail-connected quarries at Doveholes, Dowlow and Tunstead. Tunstead is a super quarry serving multiple purposes (high purity limestone for industrial purposes and cement manufacture as well as aggregates provision). With extensive high purity limestone in the County, reserves can sometimes be difficult to allocate between aggregates and non-aggregates uses.

Derbyshire has agreed in principle, through the 2009 East Midlands apportionment, to accept 77 % of the 1.2 Mtpa output expected to be lost when quarries in the Peak District close in the period 2010-20, i.e. about 0.92 Mtpa. The EMRAWP agreed a revised figure for Derbyshire of 8.74 Mtpa (limestone and dolomite) during in the 2009 apportionment. This represents a small reduction in Derbyshire's share of supply obligations from 9.61 Mtpa (29.4 % ) of the East Midlands crushed rock total (in the 2004 apportionment) to 28 % (East Midlands RAWP, *Sub-Regional Apportionment 2009*). The East Midlands RAWP indicates that in terms of environmental sustainability there is a need for discussion with South Yorkshire's MPAs to determine whether their demand could be sourced locally. It also indicates that drawing upon the extensive reserves in the north-west area of Derbyshire could result in greater volumes of aggregate crossing the National Park en route to markets, and in the concentration of the remaining regional reserves around Buxton. Transport of material to markets in the Yorkshire and the Humber would either have to be through the Park or through mainly sub-standard urban routes in the north east of the County (EMRAWP, 2010).

## **ENVIRONMENTAL CONSTRAINTS AFFECTING THE SUPPLY OF SAND AND GRAVEL IN NORTHAMPTONSHIRE**

*During consultation for this project, industry representatives commented that protection of river valley resources has resulted in a downturn in capacity in the County.*

### **Background Information**

The supply of aggregate in Northamptonshire has been a longstanding issue having been highlighted by the EMRAWP from the 1980s onwards and echoed in work by the BGS (Harris, 1993). Furthermore, the Nene Valley in Northamptonshire was quoted by Thompson *et al.* (2008) as a specific example of an area where environmental constraints are having a significant impact on the diminishing area of unworked resources. Northamptonshire County Council recently reported that "It is becoming increasingly difficult to identify new sites for soft sand extraction in the county" (Northamptonshire County Council, 2010).

During the late 1980s, Northamptonshire produced around 2.5 Mtpa of sand and gravel. By 2000 this had fallen to under 1 Mt and has continued to fall (Harrison *et al.*, 2005). Sales during 2008 were only 0.25 Mt (EMRAWP, 2008). The landbank in Northamptonshire has been under four years for at least the past 20 years. County 'landbanks' of permitted sand and gravel suggest that known supplies of sand and gravel in Northamptonshire are simply running out (Harrison *et al.*, 2005).

Since 1991, attempts have been made in Northamptonshire to direct more working away from river valleys, specifically the Nene Valley and into areas of glacial deposits elsewhere in the county (Harrison *et al.*, 2005). The concerns were that past extraction from the Nene Valley and its restoration to lakes had adversely altered the landscape character, and that further extraction in river valleys would continue to do so.

The EMRAWP has commented that “Sand and gravel extraction has focused upon the middle reaches of the Nene Valley, either side of Northampton. Mindful of the difficulties of obtaining suitable fill material, (without which the whole area could become a ‘waterpark’ by default), over the last 20 years the County Council has operated a policy of discouraging extraction in the valley and directing proposals to the topographically higher ‘drift’ deposits” (Sub-Regional Apportionment 2009, 2010, page 11).

It was considered that there would not be the same impact on overall landscape character if extraction took place in the glacial areas (Northamptonshire County Council, 2010). Attempts to focus working on glacial deposits have met with difficulties. This includes a lack of geological information regarding the quality and quantity of the glacial deposits (Harrison *et al.*, 2005).

When the move away from river valleys was first set out in policy in the mid 1990s, the view was that the glacial areas, when added to supplies from the pre-glacial areas, would provide a reasonable alternative supply of minerals to the river valleys. However, glacial deposits for potential extraction have not been put forward by the minerals industry because the quality of resources is variable, therefore reducing the economic viability of extraction (Northamptonshire County Council, 2010). This is supported by BGS studies which indicate glacial sand and gravel in the County are typically clayey to very clayey (Bloodworth *et al.*, 2000). It is also now acknowledged that the landscape and other impacts in the pre-glacial, and in particular the glacial areas, can be as significant in their own way, as such there would need to be either restoration to agriculture through bringing in replacement fill or alternatively for the land to be re-shaped following extraction (Northamptonshire County Council, 2010).

The Northamptonshire case is an illustration of the danger of placing reliance in plans on deposits of unknown extent and quality, in this case glacials. Harrison *et al.* (2005) indicate that the River Terrace Deposits of the Nene Valley have been extensively worked for sand and gravel, but still represent a potential resource. However, possible future extraction may be limited by local planning considerations. The report concludes that ‘...Northamptonshire appears unlikely to be able to respond to higher levels of aggregate demand’ as ‘...the remaining unconstrained resources are becoming scarce.’ (Harrison *et al.*, 2005).

## **SAND AND GRAVEL PROVISION IN NOTTINGHAMSHIRE AND THE IMPACT ON OTHER REGIONS**

*During the consultation, the EMRAWP indicated concern over the ability of Nottinghamshire to continue to supply sand and gravel to markets in South Yorkshire. They believe that future planning should attempt to limit the dependence on Nottinghamshire’s sand and gravel resources in order to reduce the burden placed on the Trent Valley and prevent environmentally costly transportation.*

### **Background Information**

Nottinghamshire is the largest sand and gravel producer in the East Midlands, accounting for 37 % of the region’s production. The County has a sand and gravel landbank of 9.1 years, based on the apportionment method (EMRAWP, 2008). Sand and gravel extraction in Nottingham is concentrated in two distinct areas, the Trent and Idle valleys. Given the position of the Idle Valley in the north of the County it is well placed to serve markets in Yorkshire and Humberside. The EMRAWP indicates that reserves in the Idle Valley amount to just over two years supply based on 2007 figures and the MPA indicates that new supplies will be difficult to locate, thus it is suggested that production in the Idle Valley will decline rapidly in the near future due to lack of resources. It is suggested that at such time production will either become concentrated in the Trent Valley, a significantly greater distance from markets in South Yorkshire, or move across the regional boundary. It is suggested in the EMRAWP report (2009) that future planning should attempt to limit the dependence placed on Nottinghamshire’s sand and gravel resources in order to reduce the burden on the Trent Valley and prevent

environmentally costly transportation, as this is contrary to national and regional attempts to reduce carbon emissions. Therefore, whilst Nottinghamshire is in a relatively strong position with regards to its overall sand and gravel landbank, the run-down of a specific resource area has implications for the sustainability of future supply to areas in the north of the County and particularly markets outside the region.

## The West Midlands region

### CONCERN OVER THE PROVISION OF SAND AND GRAVEL FROM STAFFORDSHIRE AND STOKE-ON-TRENT

*Consultation with the WMAWP and industry indicated that future supply of sand and gravel in the West Midlands is likely to be a problematic if disputes over apportionments between Staffordshire and Stoke and other MPAs in the region are not resolved. The WMAWP indicated that during the apportionment exercise there was no agreement in the West Midlands regarding how any shortfall could be made up by other authorities. The WMAWP indicated that during the sub-regional apportionment of 2005–20 Guidelines Staffordshire and Stoke-on-Trent County Councils expressed concern regarding their ability to deliver the resources required during the plan period at an ‘acceptable environmental cost’. Staffordshire County Council has expressed concern over ‘specific resource areas’ in the county to maintain production capacity. It considered a method of apportionment based on projected sales trends is inappropriate because it doesn’t necessarily identify where ‘sustainable replacement resources’ can be found.*

*With regard to future supply from within Staffordshire, industry consultees expressed concern regarding the work undertaken within the West Midlands on apportionment options, which led to Staffordshire refuting the past sales apportionment approach.*

*In relation to this industry, consultees suggested that any MPA can challenge its apportionment on environmental grounds, but this needed to be underpinned by robust evidence. Consultation with the WMRAWP suggested that their aggregates apportionment process became very politicised with the RAWP being used to validate the apportionment process even though only a minority of members supported the proposed methodology.*

*With regard to alternative sources of supply of land-won sand and gravel from within the region, during consultation the WMRAWP indicated that insufficient applications have been coming through the planning process in Warwickshire and Worcestershire and that the landbanks in these counties are well below the Guideline figures (see rundown analysis for Worcestershire in Appendix 6). Justification given for not maintaining their landbanks were that industry are not forthcoming with major applications in these areas. The WMRAWP noted that Warwickshire has identified recent supply problems given its rapidly declining landbank (4.6 years at end 2008) including closures of Blythe Hall and Middleton Hall quarries, while Walsall and Solihull have identified potential shortages after 2020. Additionally, an application for an extension at Ling Hall (Walsall Metropolitan Borough Council) has been withdrawn. Quality of resources in Warwickshire was cited as a justification for sites not coming forward by Industry.*

*Industry consultees considered that Shropshire could potentially have more sand and gravel resource than Staffordshire. The main concern with increasing supply from Shropshire was felt to be transporting material to market.*

*The WMRAWP indicated that industry naturally focuses on the best resources and if there is a high quality deposit in Staffordshire this is likely to be their primary target, rather than working a lower quality resource elsewhere. Economies of scale and transportation were also highlighted as big factors in the choice of industry to invest in an area but that political mood also had a bearing. In contrast, concern was raised, however, that if industry continued to concentrate operations in one locality, it could cause a problem with blight in that locality and, since there*

wouldn't be an even distribution of operations across the region, aggregate would need to be transported further distances to markets across the region.

### **Background Information**

In 2005, over 9.1 Mt of land won sand and gravel was sold in the West Midlands. This represented over 15 % of the national sales, making it the fourth largest producer after the East of England. The level of permitted reserves of sand and gravel in the West Midlands continues to show a steady decline from 133.8 Mt in 2005 to 123.8 Mt in 2006 to 112.5 Mt in 2007 (WMRA, 2010). The region's reserves are dominated by Herefordshire, Staffordshire and Shropshire, whilst the landbanks in Worcestershire and Warwickshire are below the national guidelines (WMRAWP, 2008).

Staffordshire is one of the most significant mineral producing areas in England containing 59 sites with permitted reserves. Quarries in Staffordshire produced 10 % of England's land-won sand and gravel in 2007. Staffordshire accounts for more than 65 % of the region's sand and gravel production and had a landbank of 12 years based on 2008 reserves (WMRAWP, 2008). Shropshire has the second largest permitted reserves, 12.2 Mt in 2008, in the region and the second largest landbank at 14.9 years, at the end of 2008.

Government guidance for the sub-regional apportionment of the new guidelines (2005-2020) advised the WMRA to consult the MPAs and the RAWP to determine whether the regional guideline can be met at "acceptable environmental cost" (Planning Committee, 2010). The new guidelines (2005-2020) for the West Midlands are 10.3 Mtpa, an increase compared with the previous plan period of 10.125 Mtpa (WMRAWP, 2007). These guidelines are based on the assumption that there will be a contribution of 100 Mt from alternative aggregates such as recycling construction and demolition waste (Planning Committee, 2010). Currently Staffordshire County Council is required by regional policy to plan for the development of sand and gravel resources on the basis of providing 6.6 Mtpa (65.2 % of the regional guideline) (Planning Committee, 2010).

In September 2009 the West Midlands Regional Assembly (WMRA) agreed to undertake the sub-regional apportionment of aggregates provision in the West Midlands. The WMRA considered a number of technical options for the sub-regional apportionment of aggregates. The WMRA requested that the West Midlands RAWP Technical Secretariat prepare options based on past sales trends. In recognition of the fact that these apportionment options essentially reflected "historical shares" or trends in past sales (rather than an appraisal of future needs), the WMRA also commissioned consultants (Land Use Consultants) to develop "alternative" apportionment options which sought to address a change in policy direction, by taking account of the likely availability of materials, future patterns of development, environmental and other considerations (LUC, 2010). The WMRA undertook a technical consultation with WMRAWP members. During the technical consultation Staffordshire, Stoke-on-Trent and Warwickshire did not think the regional guideline could be met at "acceptable environmental cost". Warwickshire's view was based on the declining landbank. Staffordshire's view supported by Stoke-on-Trent was that "the overall Guideline figure does not reflect the most sustainable balance of aggregates supply in the region and, therefore, it should be reduced due to declining need for construction materials, the economic downturn and the increasing concentration of extraction for the region in the county which is creating unacceptable environmental impacts in some areas". It challenged the process, and contended that the established approach to the apportionment of the guidelines be revised or replaced to establish a new pattern of aggregates supply. Staffordshire and Stoke consider that some of the Options '*...are not flexible and that past figures are not the best way to plan future production...that past sales apportionment perpetuates the current unfair distribution of environmental impacts in Staffordshire....*' (WMRA, 2010).

The technical consultation with the WMRAWP did not produce a consensus view on a preferred option. There was a polarisation of views, with particularly marked differences of opinion



between Staffordshire and Stoke favouring an option based on the alternative proposed methodology and the other MPAs and industry representatives favouring an option based on past sales trends prepared by the WMRAWP (WMRA, 2010).

The majority of the WMRAWP members (with the exception Staffordshire and Stoke-on-Trent) subsequently agreed to recommend that the WMRA consider a ten year average approach as one of the options for determining the apportionment. The WMRAWP agreed that, if the Assembly was minded to use an alternative apportionment methodology, then two new options (Option F – based 70 % on past sales and 30 % other factors and Refined Option F - which introduces a phased change – 100 % on past sales initially, reducing to 90 %, and then 70 % over time) should be subject to consultation. The options incorporate environmental factors such as transportation distances, avoidance of adverse environmental/ ecological impacts and ensuring the scale of development is appropriate to the infrastructure available. Option F was not supported by the majority of WMRAWP because, in their opinion, the evidence base was not sufficiently robust to justify the proposed redistribution of sand and gravel provision across the region.

## Yorkshire and the Humber region

### **SHORT- TO MEDIUM-TERM SAND AND GRAVEL SUPPLY IN THE REGION**

*During consultation with the Y&HRAWP Secretary raised the shortage of concreting sand across the whole region as a key issue. The reason for this is considered by the Y&HRAWP to be a function of geological factors (quality and size of deposits) and planning and economic considerations. Future supply into West Yorkshire was deemed to be the principal concern.*

#### **Background information**

Sand and gravel deposits are worked in the region from the valley of the River Swale in the north, through the Vale of York and in areas around the Humber Estuary in the south (Y&HRAWP, 2008). Yorkshire and Humber's Guideline figure for land-won sand and gravel has increased from 73 Mt (2001–2016) to 78 Mt (2005–2020) over the current apportionment period (Y&HRAWP, 2008). North Yorkshire accounts for 64 % of the region's sand and gravel, with 19 % of production being exported outside the region (Mankelov *et al.*, 2007). Reserve figures across the region display a 26 % decline between 1997 and 2005 and the landbank, for the region as a whole fell from 14.3 years to 9.3 years during the same period (Thompson *et al.*, 2008). This regional figure obscures important differences between individual MPAs and the proportion of aggregate suitable for concrete production:

- Within North Yorkshire those sand and gravel sites with a southwards distribution have a landbank of only five years;
- A very small landbank remains at the only sand and gravel quarry in West Yorkshire;
- The landbank in East Riding/Lincolnshire is 4.2 years;
- Reserves in South Yorkshire are predominantly composed of soft sand, unsuitable for concrete production (Y&HRAWP, 2008).

The BGS indicate that on the basis of geology alone West Yorkshire contains the mineral resources required to accommodate an increase in sub-regional apportionment (Bide *et al.*, 2009). However, because of the following constraints the likelihood of developing new sites in West Yorkshire is low:

Population density/sterilisation – industry representatives consider that sterilisation by built development has significantly reduced access to adequately sized sand and gravel deposits and severely constrains the potential for the extraction in the region. This is principally a commercial issue relating the minimum size of site that is economically viable.

Landscape/environmental designations – the Wharfe Valley has some of the largest areas of unworked sand and gravel in the region. Furthermore, the West Yorkshire river valleys display the highest quality resources and the resources are least affected by urban development. However, industry representatives regard the Wharfe Valley as unviable for new developments due to the proximity of landscape/environmental designations to the area, coupled with the potential for relatively strong opposition from local communities. Industry representatives regard the possibility of gaining a planning permission in this area as extremely low and the cost of submitting an application extremely high, so the possibility of a new quarry being developed is minimal.

Infrastructure – industry indicate that most prospective areas in the Calder, Aire and Wharfe valleys have limited access to major A roads. Furthermore, industry suggests that the fragmentation of the resource areas by waterways results in a need for expensive infrastructure to either work areas to their full capacity or link areas to form economically viable resource sizes (Bide *et al.*, 2009).

### **SUPPLY OF HIGH SPECIFICATION AGGREGATES (HSA) FROM YORKSHIRE AND THE HUMBER**

*The Y&HRAWP indicated some concerns regarding future (beyond 2020) availability of high PSV material, as this is only available from the Yorkshire Dales National Park. The NWRWP has also expressed concern regarding the medium to long term supply of hard rock, and more specifically HSA, given what it views as the ‘restrictive policies’ within the soon to be abolished regional spatial strategy documents applying to national parks and AONBs, and limited distribution of HSA resources (NWRWP, 2010).*

#### **Background Information**

A number of rock types are worked in the Yorkshire and Humber Region, including Lower Palaeozoic greywackes (‘gritstones’), which occur beneath Carboniferous strata in the Yorkshire Dales and are worked to produce high specification aggregate for road surfacing (Y&HRAWP, 2008). Although the RAWP indicates that levels of permitted reserves (40–120.2 Mt) and landbanks (21.7–36.0 years) for crushed rock are high throughout the region except in East Riding and North Lincolnshire, HSA material is only available from the Yorkshire Dales National Park (the region exports 35 % of crushed rock produced in the Yorkshire Dales National Park, Mankelow *et al.*, 2007).

The Yorkshire Dales is second largest producer of crushed rock in the country, with 35 % of production being exported outside the region (Mankelow, *et al.*, 2007). The Yorkshire Dales National Park had reserves of 120.2 Mt of crushed rock for aggregate use at the end of 2008, equating to a landbank of 29.1 years, based on their sub-regional apportionment (Y&HRAWP, 2008). The overall healthy reserves for crushed rock in the National Park mask considerably lower figures for HSA. Total reserves of HSA in the Park have fallen from 15.62 Mt in 2001 to 8.76 Mt in 2008. With HSA sales averaging approximately 1 Mt for the period 2004–2008 inclusive, the landbank of HSA within the National Park has fallen to only 8.7 years (based upon figures from Y&HRAWP Annual Monitoring Reports 2001–2008). Thompson *et al.*, (2008) indicate that although these reserves are located within the National Park, there are no alternative sources of these materials elsewhere in the region.

Significantly the Yorkshire and Humber Regional Plan (Policy ENV4: Minerals) endeavours “to maintain a landbank for all nationally and regionally significant minerals”, which includes HSA aggregate (RSS, 2008). However, the Localism Bill currently in parliament proposes to abolish regional plans. The North West RAWP and particularly Cumbria have expressed concern regarding the potential for extra pressure to be exerted on them because of neighbouring authorities who they view as working under more restrictive policy regimes in e.g. Yorkshire Dales National Park. The Yorkshire Dales National Park Authority indicates a key issue that will

need to be considered in its Core Strategy is “to progressively keep reducing aggregate quarrying in the Park because it is essentially a destructive use of land that conflicts with the conservation of the landscape and is the biggest generator of HGV traffic in the Park.” (Yorkshire Dales, 2010).

## The North West region

### **SAND AND GRAVEL SUPPLY IN THE NORTH WEST**

*The NWRAP indicates that the region does not have an adequate landbank, based on current apportionment guidelines, for land-won sand and gravel and it will experience a deficit towards the end of the apportionment period (Evans and Mosquera, 2010). Cheshire is by far the highest sand and gravel producing MPA in the region and would struggle to meet its proposed revised apportionment. It had a sand and gravel landbank of 9.9 years at the end of 2007, using the apportionment method (NWRAP, 2008). During the consultation the RAWP Secretary explained that the Delamere and Oakmere quarries (key sites for sand in Cheshire) are both associated with SPAs and SSSIs and that there is also an issue here with the hydrology due to the high water table. Concern was also raised that some sand and gravel sites in Cheshire have been sold for non-mineral uses or mothballed and they still have large reserves.*

It was reported that since some construction sand in Cheshire is derived from silica sand sites, the exhaustion of reserves or closure of these sites could present potential issues for construction sand supply in the future.

### **Background Information**

The region as a whole has not met the apportionment figures for sand and gravel since publication of the current guidelines in 2003. Average sales of land-won sand and gravel from the region amounted to 2.92 Mt between 2004 and 2008, 0.51 Mt below the annual requirement of 3.43 Mt. Between 2004 and 2008 Cheshire (1.97 Mtpa) and Lancashire (0.5 Mtpa) have not met their percentage share of apportionment for land-won sand and gravel. On average between 2004 and 2008 Cheshire accounted for 46.73 % of land-won sand and gravel sales in the North West (Evans and Mosquera, 2010).

The North West Region’s revised Guideline (2005–2020) figure for land-won sand and gravel is 52 Mt, resulting in an annual requirement of 3.2 Mt. The Guideline compares with a reserve of 46 Mt in 2008, and a landbank of 14.1 years. According to Evans and Mosquera (2010) Cheshire is unable to meet its proposed revised apportionment (ranging from 1.5–1.9 Mtpa depending on the methodology used) under any of the three methods used for calculating sub-regional apportionments in the North West.

There are eight construction sand quarries within the Cheshire sub-region and five silica sand quarries, some of which produce varying quantities of construction sand. The majority of the construction sand quarries lie within the Delamere Sand sheet. Working within the sand sheet has been investigated with regards to the impact upon natural hydrology and Ramsar designations. Consultees indicated that the possible impact upon natural hydrology and Ramsar designations could impact upon the potential for Cheshire to meet its apportionment in the future. It is suggested that extensions to existing quarries may also be restricted due to the presence of SAC, SSSI and Ramsar sites within the vicinity (Evans and Mosquera, 2010).

# The North East region

## QUALITY OF SAND AND GRAVEL SUPPLY

*During consultation the North East RAWP indicated that there are quality limitations on sand and gravel resources in the south of the region. Consequently there is little commercial interest in developing deposits in this area, as industry tends to focus on the better quality resources in North Yorkshire, which supply the southern parts of the North East. Better quality resources are found in the northern part of the North East. However, this area is relatively isolated, resulting in additional transportation costs to feed markets in the south. The ability to meet the minimum required landbank for sand and gravel in the region beyond 2020 was also raised as a concern, with doubts whether Tees Valley and Tyne & Wear in particular will be able to maintain sufficient landbanks of sand and gravel after 2020. The RAWP Secretary reported that there was concern amongst some MPAs in the region about the Tees Valley Authority wanting mineral extraction to cease because of its urban nature, and if they were given a lower apportionment this would discourage industry to invest in the area.*

## MAGNESIAN AND CARBONIFEROUS LIMESTONE IN THE NORTH EAST

*Concern has previously been expressed regarding the extent to which the limestone crushed rock landbank in Durham and the Tees Valley is dominated by magnesian limestone and the way this inhibits the release of new reserves of more versatile Carboniferous limestone (Thompson *et al.*, 2008). This situation would now appear critical as reserves of Carboniferous Limestone fell to record lows in 2008 and forecasts suggest a gradual reduction in remaining permitted reserves to exhaustion by 2024, in the absence of further permissions. The NERAWP indicates that concern has also been expressed regarding future magnesian limestone supplies, since without further permissions over time remaining permitted reserves of magnesian limestone will become bound up in a small number of sites under limited ownership.*

### Background Information

In 2007 magnesian limestone accounted for 46 % of the North East's production of crushed rock for aggregate use (NERAWP, 2007). County Durham produced 94 % of this (based on 2007 production figures from NERAWP, 2007 and sales from County Durham, 2010).

The permitted crushed rock reserve at the end of 2008 in the North East Region was 217 Mt, representing a crushed rock landbank of 29.9 years (NERAWP, 2008). Although these figures suggest a strong overall position they conceal geographical differences in the region and also between types of aggregates, as highlighted by Thompson *et al.*, (2008). Durham and Northumberland had landbanks of 28.8 and 34.5 years respectively, whilst the combined landbank for Tees Valley and Tyne and Wear was only 5.3 years. This was not previously considered a major problem, given the much higher landbanks in adjoining MPAs (Thompson *et al.*, 2008).

Thompson *et al.*, (2008) indicate that the industry has expressed serious concerns about the extent to which the limestone crushed rock landbank in Durham and the Tees Valley is dominated by Magnesian Limestone (109.6 Mt at end 2008 or 50 % of permitted crushed rock reserves, County Durham, 2010). This is a relatively weak rock which, in most but not all areas, is suitable only as a low grade aggregate and not for concrete or asphalt production. This has so far inhibited the release of new reserves of more versatile Carboniferous Limestone within the region (Thompson *et al.*, 2008). Durham County Council indicates that permitted reserves of Carboniferous limestone have fallen to historical lows (8.7 Mt at end 2007 and 7.36 Mt at end 2008). Forecasts suggest a gradual reduction in remaining permitted reserves to exhaustion by 2024, in the absence of further permissions. Durham County Council indicate that as quarries become exhausted and close, sales of Carboniferous Limestone will naturally decline. This is

suggested to present a serious issue given that Carboniferous Limestone currently contributes about 28 % (based on production from NERAWP, 2008 and sales from County Durham, 2010) of the County's crushed rock production for aggregate use (County Durham, 2010 and NERAWP, 2008).

Durham County Council suggests that there is a real potential for the seven other magnesian limestone quarries in the Region to compensate for loss of sales from those operations due to close by the end of 2015. However, Durham County Council indicates that without further permissions the remaining permitted reserves of magnesian limestone will gradually become bound up in a small number of sites under limited ownership (Tarmac, Lafarge and Sherburn Stone). This is contrary to paragraph 4.1 of Annex 1 of MPS1, which advises '*A large existing landbank bound up in very few sites should not be allowed to stifle competition*', though Durham County Council considers that additional permissions should not be granted when significant quantities of permitted reserves remain to be extracted (County Durham, 2010).

## Appendix 4 The rundown approach

Part of the evidence gathering for this project was to establish a more detailed understanding of the pattern of future rundowns in reserves held in existing permissions to assess where and when continued supply issues are likely to be a problem. Given the timeframe and resources available, the project team identified a number of MPAs which it considered (using existing knowledge) likely to be 'critical' to the future supply of aggregates or where the rundown approach might highlight particular issues relating to future supply. The following MPAs were included in this list and were, therefore, contacted by the project team in order to gather information for the rundown analysis of aggregate reserves in that MPA:

- Essex County Council
- Derbyshire County Council
- Leicestershire County Council
- Northamptonshire County Council
- Peak District National Park
- Herefordshire County Council
- Staffordshire County Council
- Worcestershire County Council
- North Yorkshire County Council
- Yorkshire Dales National Park
- Hampshire County Council
- Kent County Council
- Oxfordshire County Council
- Dorset County Council
- Gloucestershire County Council
- Somerset County Council
- Surrey County Council

Following consultation with the nine English RAWP Secretaries, a number of other MPAs were subsequently highlighted as possible authorities to contact for rundown information. These included:

- Shropshire County Council
- Cumbria County Council
- Durham County Council
- Milton Keynes Unitary Authority
- Buckinghamshire County Council
- Nottinghamshire County Council

The project team contacted all 23 Authorities mentioned above for information regarding the rundown of aggregate reserves in their Authority. Supply and reserve data for 2007 for sites which had permitted reserves in that year were requested through an anonymised proforma to respect confidentiality. Information about dormant and inactive sites was also requested. The year 2007 was chosen for data collation in order to reflect sales conditions immediately prior to the recession and, therefore, reflect 'normal' conditions.

Understandably, many MPAs were not able to supply information to the project team for the project due to a lack of resources and their own work commitments. Several MPAs were also

concerned about breaching possible confidentiality agreements with Industry. In such cases, data was either not supplied or Industry were contacted in order to request permission to release data about their sites for the purpose of this study. Alternatively data was collated based on knowledge of the site by the MPA itself. In order to respect and protect confidentiality, data was collated anonymously (i.e. the name of the quarry was not supplied) and aggregated to produce the graphs included in this report.

Rundown data was collated for the following ten MPAs and, with the exception of Milton Keynes for confidentiality reasons, is presented in the subsequent appendices:

- Derbyshire County Council
- Leicestershire County Council
- Northamptonshire County Council
- Worcestershire County Council
- North Yorkshire County Council
- Hampshire County Council
- Oxfordshire County Council
- Surrey County Council
- Milton Keynes Unitary Authority
- Nottinghamshire County Council

Appendix 5 provides an analysis of those MPAs where rundown data for crushed rock aggregate was obtained whilst Appendix 6 provides an analysis for those MPAs where sand and gravel for aggregate data was obtained.

The information presented is based on the data supplied by the MPAs/industry. In some instances output and reserve information was estimated based on MPA knowledge of the site. Whilst the project team has tried to identify and rectify any issues which were evident from the data provided, it would be impossible in the timeframe to identify all issues and was, therefore, reliant on the accuracy of data provided. In some instances, where output data was not provided, an assumption that the site would operate at the output required to work (and sell) the remaining reserve before the permission expired was applied for the purposes of analysis. In reality, sites are often limited by a maximum output (capacity to supply) and may, therefore, seek to extend the permission. Again for the purposes of analysis, inactive sites were brought in to production at 2020. This date was chosen simply to clearly demonstrate the amount of reserve within inactive sites by a spike in the graph. In reality, these sites are more likely to come online when market forces require them to (i.e. when existing sites have become exhausted or demand rises significantly).

Sales and reserve figures can change between years in any one MPA depending on market forces and the granting of new permissions. Whilst taking a snapshot of the situation in 2007 helps portray the pattern of supply in an MPA, examining rundown graphs on an annual basis could provide a more informed analysis.

### **Proposals for a standardised template for using rundown approach**

The rundown approach to highlight the future availability of permitted reserves and the aggregates sales rates they are likely to be able to support will be particularly useful if all MPAs were to use it and apply the same assumptions. We offer below initial proposals for what those assumptions should be, plus a brief discussion. In some cases these differ from the approach used in this report, as the objective of the report has been to demonstrate the principles of the methodology and because the study has also been constrained by data limitations in some cases. The proposals are presented as a basis for discussion. The context for the rundown approach is of

course the principal assumption that no further planning permissions will be given: the aim is to indicate the likely pattern of future supply making use only of existing permitted reserves. This is clearly unrealistic in most MPAs, but that does not diminish the merit of the rundown charts for what they are in being based on known permissions. Also central to appreciating the method is that information at the MPA level represents the sum of information provided from individual quarries. If information is not provided for any quarry, the method depends on assumptions being made by the MPA about its output and reserves. All the assumptions below refer to the collated information at the MPA level, not to the treatment of figures for each individual quarry.

#### 1. Sales rates at active sites

**Proposal.** The sales rates used to generate the rundown charts (both the sales chart and the reserves chart) should use the average of the last three years' sales.

**Discussion.** No-one knows what the sales will be from quarries in future years, so an assumption must be made. The most recent year's sales data may be the most indicative for the short term. However, in the context of broader market fluctuations over time, there is some merit in attempting to even out the effect on sales of rising or declining overall demand, as this avoids giving an unduly optimistic or pessimistic view on for how long sales can be sustained.

This proposal differs from the approach used in this study. Here sales data from 2007 were used, indicating the likely effects on future supplies and reserves if activity continued at pre-recession rates in a 'worst case scenario'. Although this suggests that reserves will be used up more quickly than now seems likely, it does highlight foreseeable shortfalls (which will now be postponed somewhat). In a few cases sales data from a later year were used where the 2007 figures were unavailable. Other options for sales rates include the policy rate of supply in the MPA's development plan, or the sales rate needed to achieve the supply rate in the MPA's apportionment from the regional *Guidelines*.

#### 2. Reserves at inactive sites

**Proposal.** The reserves at all inactive sites should be included in the reserves rundown chart from the outset (left-most column), but should ideally be indicated by a separate notation at the top of the column. The best available estimate should be made of the reserves likely to be workable at a site if it were to come into operation.

**Discussion.** There can be real uncertainty whether - or when - currently inactive sites will ever be brought back into use and, if that does happen, the scale of the workable reserves likely to be present in the site. At one end of the spectrum, a previously-worked but long-neglected site may be retained by mineral companies only to 'trade' with the MPA for permission elsewhere. At the other end, a new permission may be inactive pending only the completion of operations at another site. Likewise the quantity of workable reserves in a site can vary from the conjectural (perhaps in the case of a long-suspended site) to the specific (in the case of a new permission). Including all the permitted reserves in a rundown chart from the outset is probably the best method of presentation; this is simply because hypothesising a start date and counting the reserves only from that date can be even more problematic. There is little choice but to make the best estimate of workable reserves at an inactive site, recognising that this may change as activation of the site approaches; mineral companies should provide this information annually in response to monitoring surveys by MPAs.

This study presented data on inactive sites as a 'spike' in reserves in 2020 on the assumption they were brought into use that year. This was accepted as arbitrary, but did indicate the significant impact which the reactivation of inactive sites could have in some authorities. This approach also avoided dampening down the apparent rate of rundown in reserves between 2007 and 2020. In this approach the end date of the permissions at the inactive sites had to be ignored,



as some of them had end dates soon after 2020 or even shortly before. In other cases the reserves at inactive sites were included in the 2007 data to demonstrate the misleading impression which such sites could give on the apparent availability of reserves (see crushed rock in Northamptonshire in Figures 5 and 6). Perhaps the best way to avoid giving that misleading impression is to include all reserves at inactive sites in all columns of the reserves rundown chart, but to highlight them separately in each column, distinct from the reserves in active sites. Placing the reserves at inactive sites above those for active sites would continue to give a good visual impression of the likely rundown of active sites while indicating the possible contribution in future years from currently inactive sites.

### 3. Sales rates at inactive sites

**Proposal.** At sites waiting to commence for the first time, the assumed sales rate should be that anticipated in the planning permission; at sites which might recommence, the assumed sales rate should be based on typical previous sales figures.

**Discussion.** This is particularly difficult to estimate at previously worked sites and a pragmatic approach is needed. This study requested information from MPAs on the sales rate at inactive quarries in the last year prior to working being suspended. This was intended to provide an indicator of the rate at which future working might take place. However, companies were found sometimes to be in the process of running down their output at that time, to rates well below that which would be needed to justify reopening in future. In some cases it was possible to obtain a more realistic estimate based on previous sales figures and information supplied by the MPA. Where information for output at inactive sites when last worked was unavailable, a figure for output was not included at all (e.g. Nottinghamshire sand and gravel, Figure 32). In such cases this information has no impact at all on the rate of rundown in reserves. Regardless of the information currently available, when it becomes clear that a site will soon reopen, the likely rate of sales can be updated to take into account the plant being made available for the purpose and other advice from the operator.

### 4. Reserves and sales at dormant sites

**Proposal.** The reserves at and possible future sales from dormant sites should be neglected in the rundown charts: if dormant sites are reopened they should be treated in effect as completely new permissions.

**Discussion.** Dormant sites are highly problematic for forecasting because there are even more uncertainties involved than with inactive sites. Dormant sites cannot be re-opened without a conditions review, and modern conditions will inevitably impose greater constraints than when they were last worked, reducing the available reserves but to an unpredictable extent. It is even more true than for inactive sites that new investment will be required to enable production to resume. Any run-down analysis that includes dormant sites, therefore, has to be extremely cautious about forecasting what the permitted reserves and sales are from this source, and at what rate. Neglecting dormant sites completely is compatible with the approach used when calculating landbanks. Given these factors, the project team have not included dormant sites in the rundown charts, but have produced a commentary about dormant sites where data are available.

## Appendix 5 Rundown analyses of reserves for crushed rock aggregate

This appendix provides a commentary for the reserve and sales information for crushed rock aggregate using data collated by the MPAs. Where appropriate, and to illustrate specific points, rundown charts are included. It should be noted that dormant sites have not been included in the rundown charts, given the issues discussed in Section 2.4.

### DERBYSHIRE CRUSHED ROCK

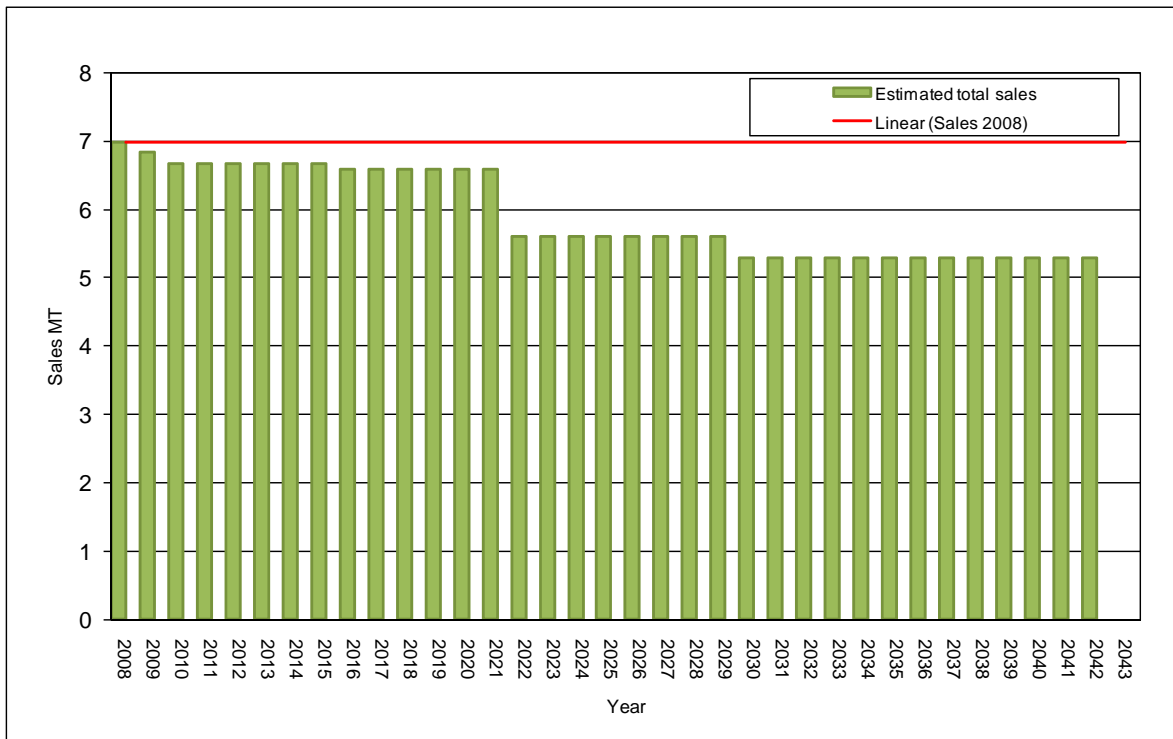
Derbyshire is the third largest producer of crushed rock aggregates in England, supplying 9.1 Mt of limestone in 2007 plus a very small (and confidential) amount of sandstone. There is a major concentration of carboniferous limestone working around Buxton, on the fringes of the Peak District National Park, including major rail-connected quarries at Tunstead, Doveholes and Dowlow. There were 15 active quarries in 2007.

2007 saw a large spike in Derbyshire's sales of aggregates to the highest this century, up by over 1.5 Mt on the 2006 figure and which fell away again by even more to 6.9 Mt in 2008 in the recession. Until the recession, sales had been rising gradually from a low point in 2003. The East Midlands Regional Assembly agreed in 2004 an apportionment within the region of the National and Regional Guidelines, giving Derbyshire a requirement of 9.6 Mtpa (limestone and dolomite). Derbyshire never achieved this figure, and in the apportionment in 2009 a revised figure of 8.7 Mtpa (limestone and dolomite) was agreed by EMRAWP. This represented a small reduction in Derbyshire's share of supply obligations from 29.4 % of the East Midlands crushed rock total to 28.0 % (East Midlands RAWP, *Sub-Regional Apportionment 2009*).

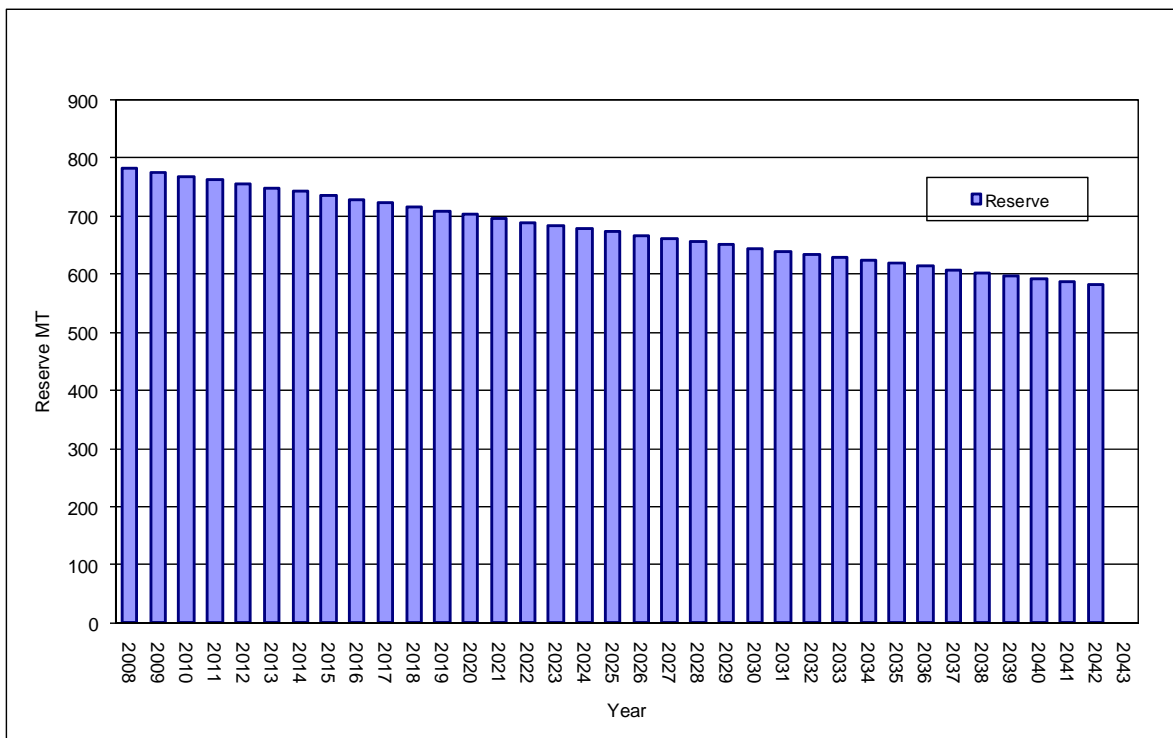
Derbyshire has especially large reserves of land with planning permission for aggregates working. The EMRAWP Annual Monitoring Report for 2007 records limestone & dolomite reserves as totalling 760 Mt at the end of 2007, though information provided by the County Council for this project suggests that by the end of 2008 reserves comprised 782 Mt in active sites and 203 Mt in inactive sites (though not all of the latter need necessarily be for aggregates end-uses).

#### *Rundown Assessment*

Figure 13 shows that Derbyshire has one of the most gradual prospective declines in output of any MPA examined; the 2008 output could nearly be sustained until 2021 from sites active in 2008, and over 5 Mtpa could be supplied until 2042. This does not take into account either such scope as there may be to increase output above 2008 rates at some quarries or the use of material at sites inactive in 2008. Figure 16 shows that large amounts of productive capacity are clearly located within sites which have 2042 end dates. The Old Moor extension of Tunstead into the Peak District National Park has an end date of 2040, which might affect sales, but the figures have not been amended in view of the expiry of the Tunstead permission so soon afterwards and to protect confidentiality.



**Figure 13.** Estimated decline in sales of crushed rock for aggregate from active sites - Derbyshire



**Figure 14.** Estimated decline in reserve of crushed rock for aggregate from active sites - Derbyshire

As Derbyshire has numerous major quarries with large reserves and distant end dates, plus substantial reserves in inactive sites, it is well-placed to satisfy demands from the market. The

'rundown' in supplies is therefore a somewhat theoretical exercise, as this will be conditioned more by the market than by loss of productive capacity as sites go out of use.

The rundown will also be influenced by the speed with which supplies from the Peak District National Park decline. The policy intention there is generally not to grant permission for major aggregates quarrying, so neighbouring MPAs can be expected to be first in line to make up for any production lost from the National Park. Derbyshire is well placed to do this, and has agreed in principle, through the 2009 East Midlands apportionment, to accept 77 % of the 1.2 Mtpa output expected to be lost when quarries in the Peak District close in the period 2010-20, i.e. about 0.92 Mtpa.

#### *Inactive sites*

Given the scale of reserves in active sites, rundown charts and commentary for inactive sites are not presented.

#### *Development proposals post 2007*

As the EMRAWP AMR for 2008 shows, permission to extract a further for 27.4 Mt of limestone over a period of 27 years was granted at Brassington Moor in 2008, a proportion of which may be used as aggregate where the quality is unsuitable for industrial uses.

#### *Dormant sites*

There were four dormant crushed rock aggregates sites in Derbyshire in 2007, all with 2042 end dates. The reserves in their current permitted areas sum to approximately 32 Mt; that would be a maximum amount which could be returned to the market if these sites were authorised to resume. Although small in a Derbyshire context, that is nonetheless a substantial quantity of mineral, especially when added to the opportunities presented by currently inactive sites. However, in view of the capacity at active sites and the greater ease of reopening inactive sites, it is difficult to see which markets these sites might be expected to serve that could not more readily be supplied from sites with usable permissions.

#### *The impact of permissions expiring in 2042*

The impact of numerous quarries having very large reserves and 2042 end dates is that there will in February 2042 be a dramatic loss of reserves with planning permission; about 600 Mt at sites active in 2008 would be lost, together with 200 Mt in sites which were inactive in 2008 (assuming that there had been no market enabling them to reopen and be worked down before that date). Derbyshire is the MPA worst-affected by this 2042 rule in the whole of England.

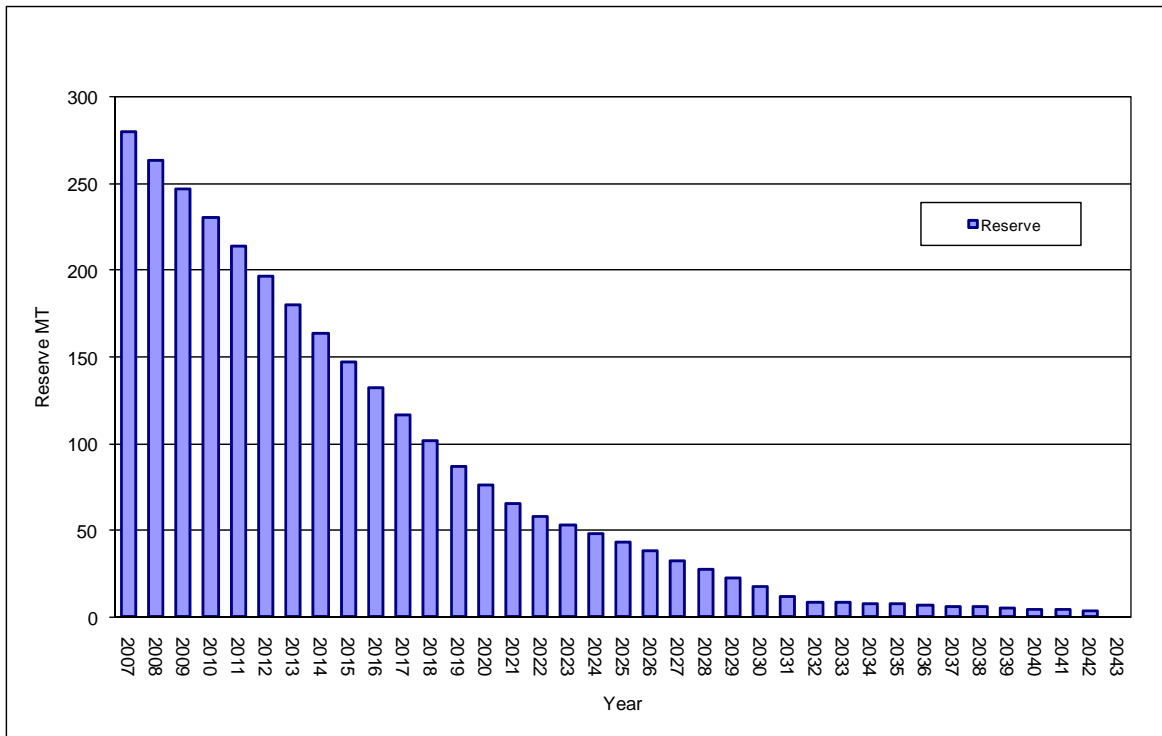
## LEICESTERSHIRE CRUSHED ROCK

The small outcrops of igneous rock found in Leicestershire provide a source of hard rock in the Midlands which are also well placed to serve markets in the South East. The deposits are of considerable economic importance out of proportion to their relatively small size and account for over 70 % of total igneous rock production in England, making Leicestershire by far the largest producer of igneous rock in the country (Figures from Aggregate Minerals Survey, 2005, in Mankelov *et al.* 2008). Extraction is now concentrated at four main sites around the flanks of Charnwood Forest and to the south-west of Leicester: Bardon; Cliffe Hill; Croft and Mountsorrel. Breedon Hill and Cloud Hill in north-west Leicestershire are also important limestone quarries in the County (Leicestershire County Council MDF (2009)).

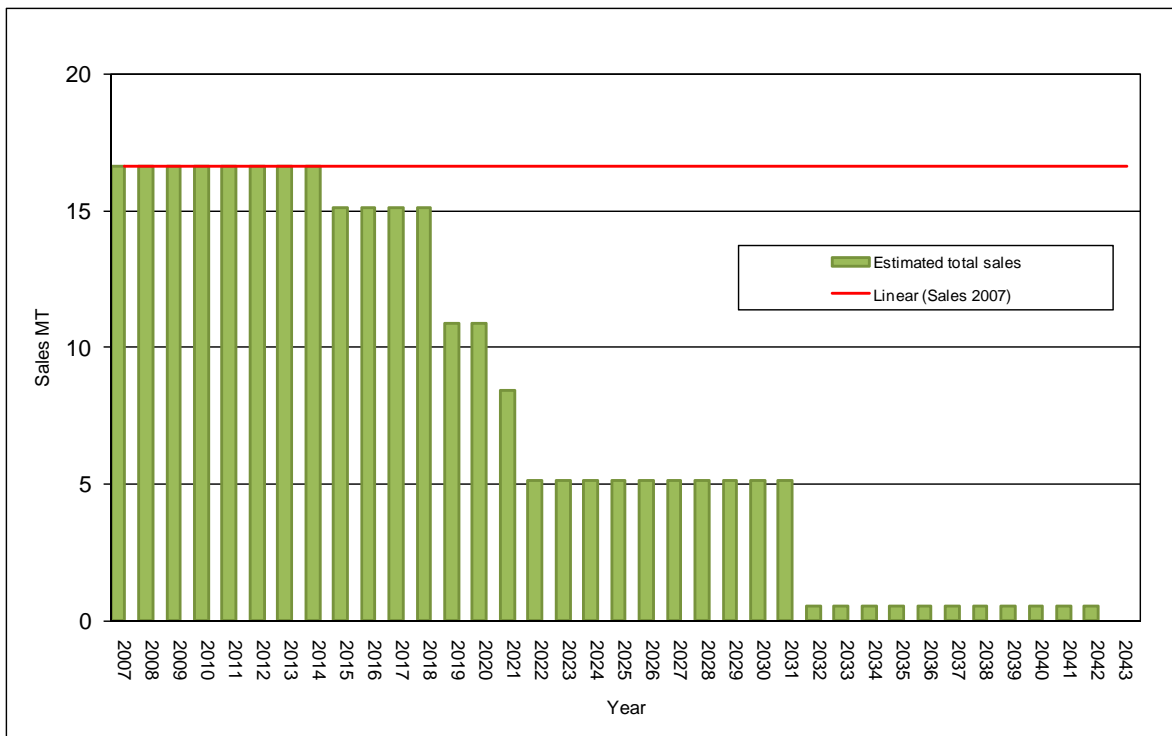
The East Midlands RAWP agreed in 2009 an apportionment of its revised regional *Guideline* figures from the Government based on past rates of sales in all MPAs in its areas, with only minor amendments. This fixed the requirement for crushed rock from Leicestershire at 53.1% of regional output, amounting to 265.5 Mt over the 16 year period 2005-2020, i.e. 16.6 Mtpa (East Midlands RAWP, *Sub-Regional Apportionment 2009*). This compares with an actual rate of crushed rock sales of 16.2 Mt in 2007 (i.e. 1.556 Mt of limestone and 14.623 Mt of igneous rock). This had fallen to 14.9 Mt in 2008 in the recession (i.e. 1.4 Mt of Limestone and 13.4 Mt of igneous rock) (East Midlands RAWP Survey and Annual Report for the Calendar Year 2008).

### *Rundown assessment*

Based on data collated from consultation with the MPA, total reserves of crushed rock at the end of 2007 in active sites were approximately 280 Mt. Approximately a further 90 Mt of reserve was held within inactive sites in 2007. Based on the data collated, Figure 16 and Figure 15 show that Leicestershire could continue to supply its 2007 sales rate for a further seven years from its active sites, though output would then fall to just over 15 Mtpa for the four further years 2015-2018 unless further permissions were granted.



**Figure 15.** Estimated decline in reserves of crushed rock for aggregate from active sites - Leicestershire.



**Figure 16.** Estimated decline in sales of crushed rock for aggregate from active sites - Leicestershire.

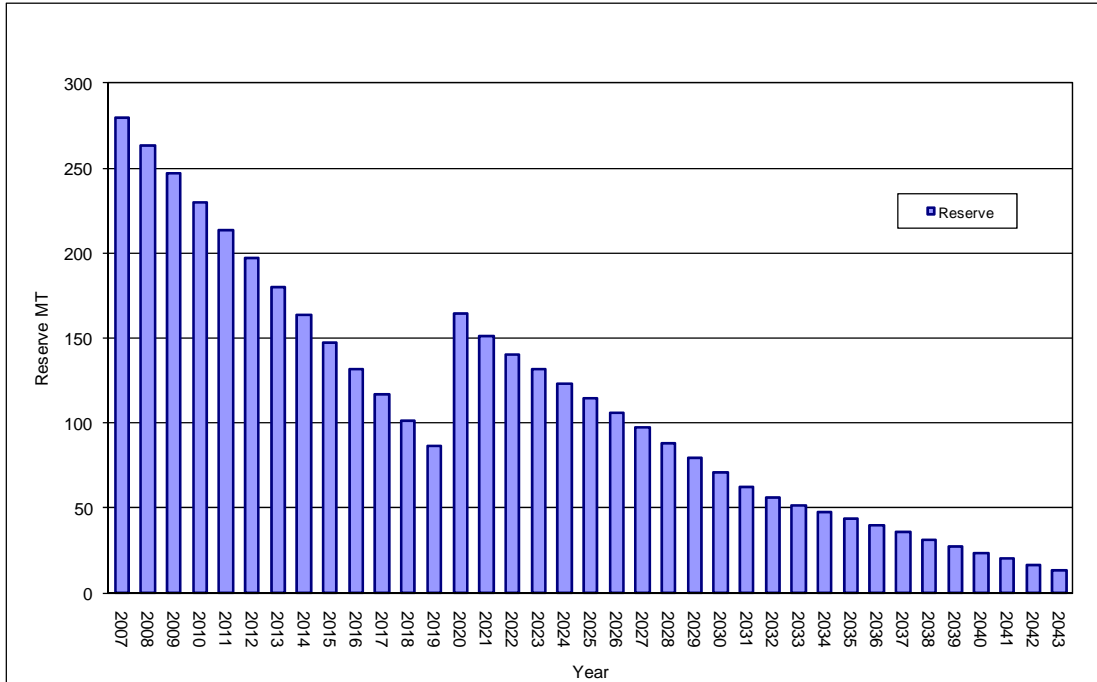
The first major quarry to cease production, after 11 years (2018), is likely to be Croft. Cliffe Hill and Bardon follow next in 2020 and 2021, with only Mountsorrel lasting until 2031. In all cases these sites would be worked out (based on 2007 sales) slightly before their planning permission end dates.

As a result of the variety of constraints detailed earlier, there may be some loss of the reserves at the four major sites. The East Midlands RAWP cautions that together 20 % of the permitted reserves may in practice not be recoverable in the worst circumstances. This would bring forward the closure dates for the quarries and reduce their ability to meet production levels anticipated in Leicestershire's apportionment. In contrast to this, the decline in demand in the current recession will have the effect of extending the lifetime of the permitted reserves available.

#### *Inactive sites*

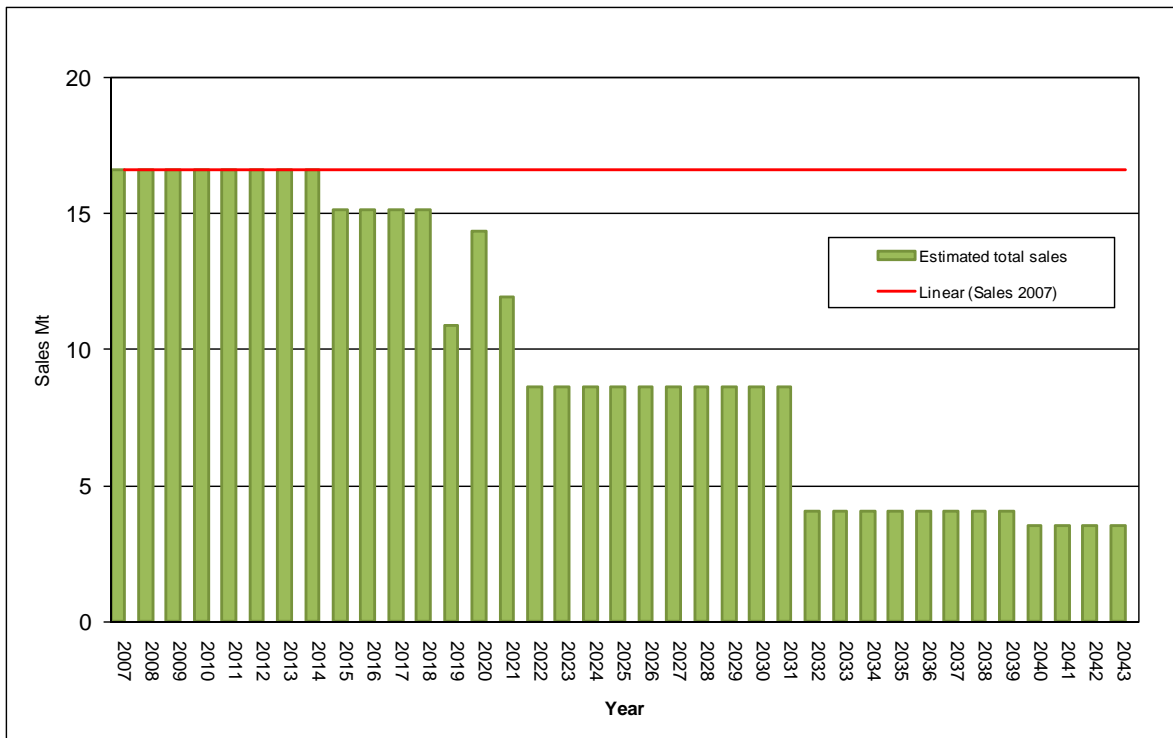
According to the 2007 East Midlands RAWP report, 89 Mt of reserve of igneous rock resided within inactive sites at the end of 2007. The impact of bringing these inactive sites back into production is demonstrated through Figure 17 and Figure 18, which take 2020 as a nominal year to bring all the sites back into production.

The East Midlands RAWP, *Sub-Regional Apportionment 2009*, January 2010, however, identifies slightly larger reserves at inactive sites. It reports that inactive igneous quarries at Charnwood, Groby and Whitwick offer the prospect of bringing back into production substantial reserves of rock, especially at Groby with 90 Mt of permitted reserves (p21), together with a further 30 Mt of limestone in inactive sites (p20). However, none of these are rail-connected (unlike the four sites currently in production).



**Figure 17.** Estimated decline in reserve of crushed rock if inactive sites reactivated in 2020 - Leicestershire.

*\*Data does not take into consideration permission end dates*



**Figure 18.** Estimated decline in sales of crushed rock for aggregate if inactive sites are reactivated in 2020 - Leicestershire.

*\*Data does not take into consideration permission end dates*



The reopening of these quarries is not expected to have much impact on reducing future shortfall in supply based on their output when they were last worked<sup>2</sup>, as Figure 18 shows. However, if the output supplied from each inactive quarry increased to a greater amount than when they last worked (assuming there was capacity to do so), there would be scope for meeting part of the shortfall when existing quarries close (as is apparent from the spike in reserves shown in Figure 17). However, this would still fall short of the level of reserves and productive capacity needed to enable Leicestershire to meet its apportionment in the medium to longer term.

#### *Development proposals post 2007*

Since the end of 2007 permission has been given for a further development of 4.3 Mt at Cloud Hill, a large Carboniferous Limestone quarry. The largest development by far ‘in the pipeline’ has been submitted at Bardon for an extension containing 132 Mt of rock, which awaits determination. New permissions ensure that the pattern of rundown shown by the charts would in practice be less rapid and also reduce any future shortfall in supply. The Bardon application, if approved, would consolidate production in Charnwood Forest far into the future, adding over 40 years to the site’s life at recent output rates (i.e. until around 2065). Although this would help to maintain Leicestershire’s landbank of permitted reserves, an overall shortfall in supply is still likely unless output at the site, or at other active sites increased, (or production was concentrated at Bardon).

Considering future options for the continued supply of aggregate, the East Midlands RAWP (see East Midlands RAWP, *Sub-Regional Apportionment 2009*, January 2010, p20 - 21) has raised the following issues:

- Groby might supply rock along a trunk road to Cliffe Hill (operated by the same company) to take advantage of the rail connection, though the economics of this are unclear. A parallel MIRO project by Colin Buchanan and Partners highlights the disproportionately high cost of short road distances at the distribution end of a rail-served supply chain. This would apply equally to feeder road hauls at the source end. Moreover, the only feasible way of containing costs and minimising handling would be to use quarry-scale dump trucks. That would be incompatible with a trunk road, and would suffer the cost-penalty of having to use DERV rather than red diesel. Furthermore, feeding into a rail-head from multiple quarry sources, assuming it could be made cost-effective, would require dedicated haul roads on private land.
- opportunities at Cliffe Hill and Croft are constrained by geology and the amenities of local residents;
- Although physical/geological options for extending Mountsorrel exist, all are likely to be relatively expensive to develop and pose environmental issues to a greater or lesser degree.

#### *Dormant sites*

Eleven dormant sites (each having 2042 permission end dates) were recorded by the MPA in the consultation. All except one are ironstone permissions (low grade aggregate) and, therefore, are not a suitable substitute in terms of volume or quality of aggregate. The Granitethorpe, or Sopewell, quarry at Sapcote is a dormant igneous site (diorite) which is now flooded. It is also a

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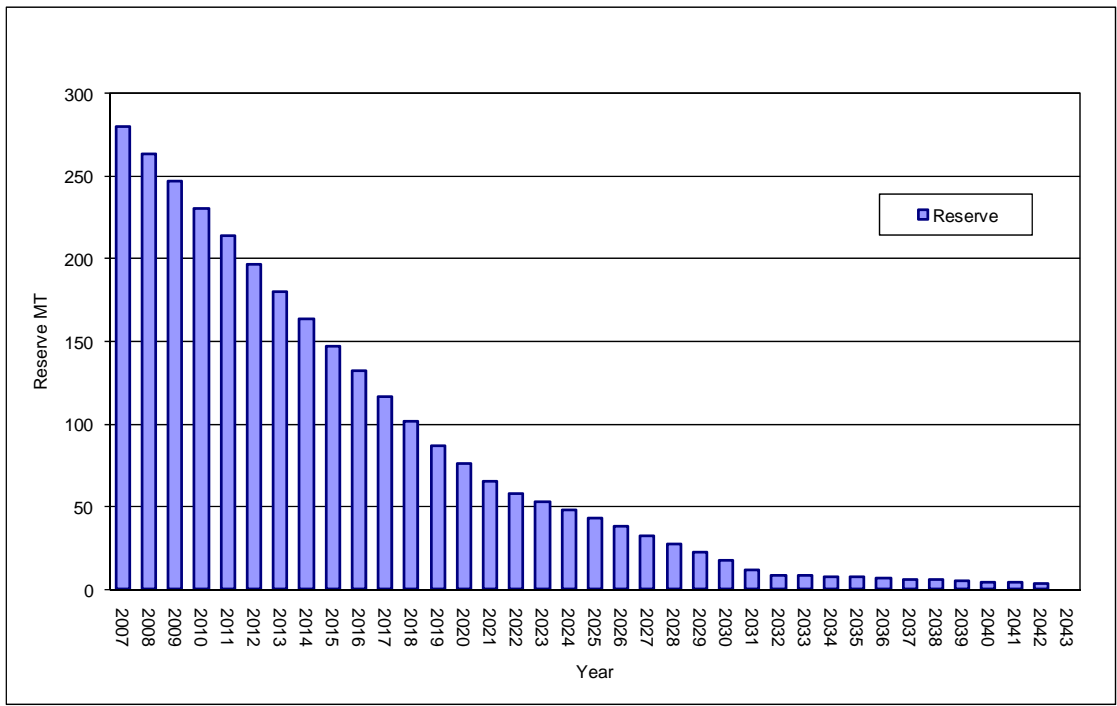
<sup>2</sup> Sales figures used for inactive sites were based on when they were last worked. In some cases, the figures when last worked may be lower than they potentially could be, reflecting a ramp down in extraction prior to inactivity.

Regionally important Geological Site (RIGS) (Leicestershire County Council Geological Site Report).

*The impact of permissions expiring in 2042*

Figure 19 shows the predicted decline in permitted reserves from active sites should sales remain constant at 2007 levels at each quarry still operating. The figure assumes no additional reserves are granted, inactive sites are not brought into use, and existing permissions cease operating when their planning permission expires. The analysis indicates that virtually all permitted reserves in the 2007 active sites (all but 4.14 Mt out of 279.94 Mt in 2007) would have been used up by the end of 2041.

Based on the same assumptions, total sales at the sites remaining by the end of 2041 are predicted to have declined to 0.529 Mtpa (Figure 16). However, these sites currently have 21<sup>st</sup> February 2042 permission end dates, so much of these few remaining reserves of 4.14 Mt would be lost in 2042 unless permissions were extended in time. This means that in Leicestershire the loss of permissions as a result of the 2042 rule would have very little impact as almost all the rundown in supply would have happened before that date.



**Figure 19.** Estimated decline in reserve of crushed rock for aggregate incorporating permission end date (active sites only) - Leicestershire

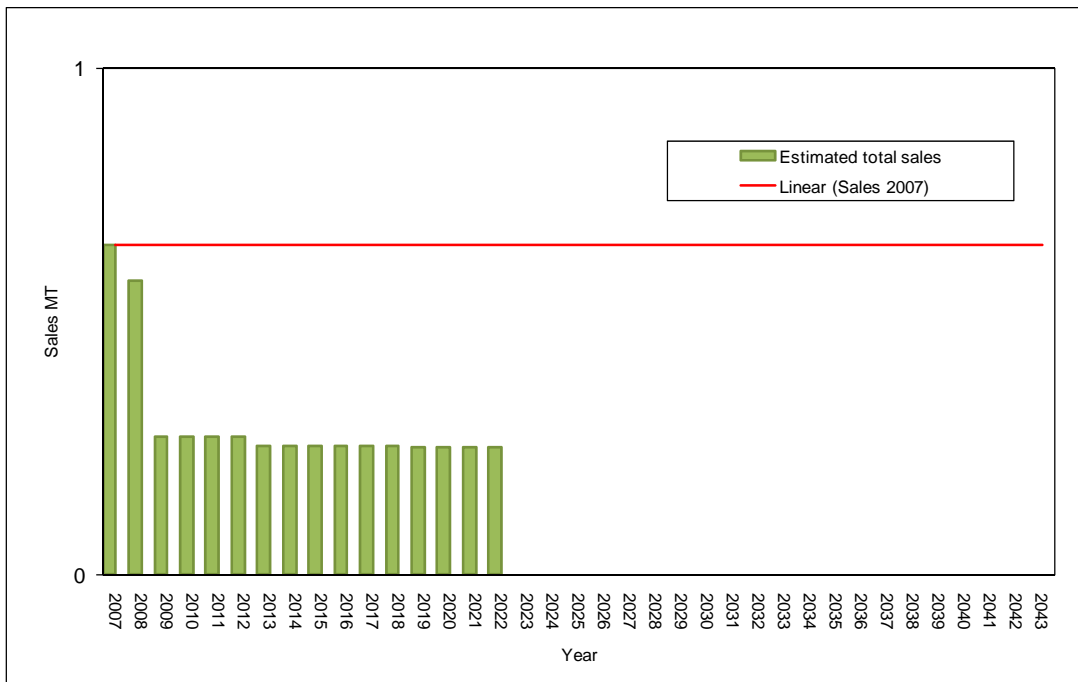
## OXFORDSHIRE CRUSHED ROCK

Oxfordshire is a small producer of crushed rock aggregates, with eight active sites supplying 0.72 Mt in 2007 (about 44 % of regional supply). SEERAWP Annual Monitoring Reports show that this was a somewhat larger amount than usual, as output had not exceeded 0.6 Mtpa since 2003 (and fell back below that level subsequently). The 2009 crushed rock apportionment to Oxfordshire is 0.66 Mtpa, 45.8 % of a total South East allocation of 1.44 Mtpa, (though the regional allocation is down from 2.2 Mtpa in the previous allocation in 2003).

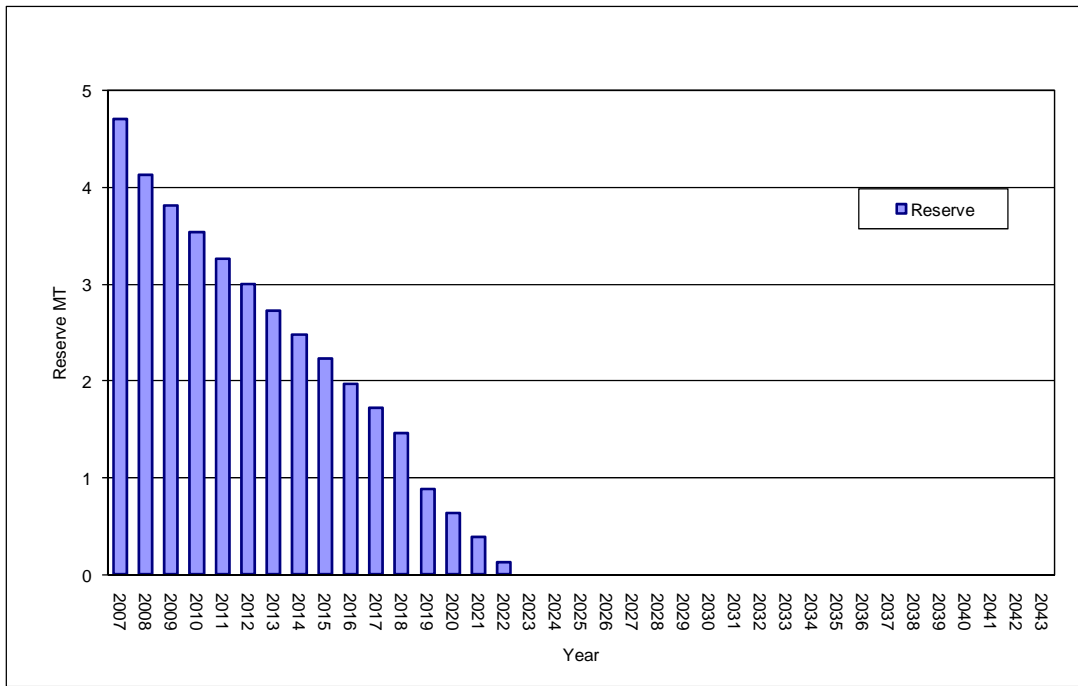
Permitted reserves of crushed rock were 13.1 Mt at the end of 2007. In view of the small scale of crushed rock production in the South East, Oxfordshire is the only county in the region with sufficient activity to be able to report sales and reserves without breaching confidentiality. As a result, it is only practicable to report at the regional level on progress against obligations to provide for crushed rock supply. The 2003 crushed rock allocation to the South East region was 2.2 Mtpa, a level of sales which has not been achieved since 2001. This was revised downwards to 1.56 Mtpa in the 2009 allocation, which is much closer to sales in recent years which have been in the range 1.3-1.6 Mtpa. Regional landbanks were in the range of 22-24 years' supply against the 2003 allocation, and over 30 years against the 2009 allocation.

### *Rundown assessment*

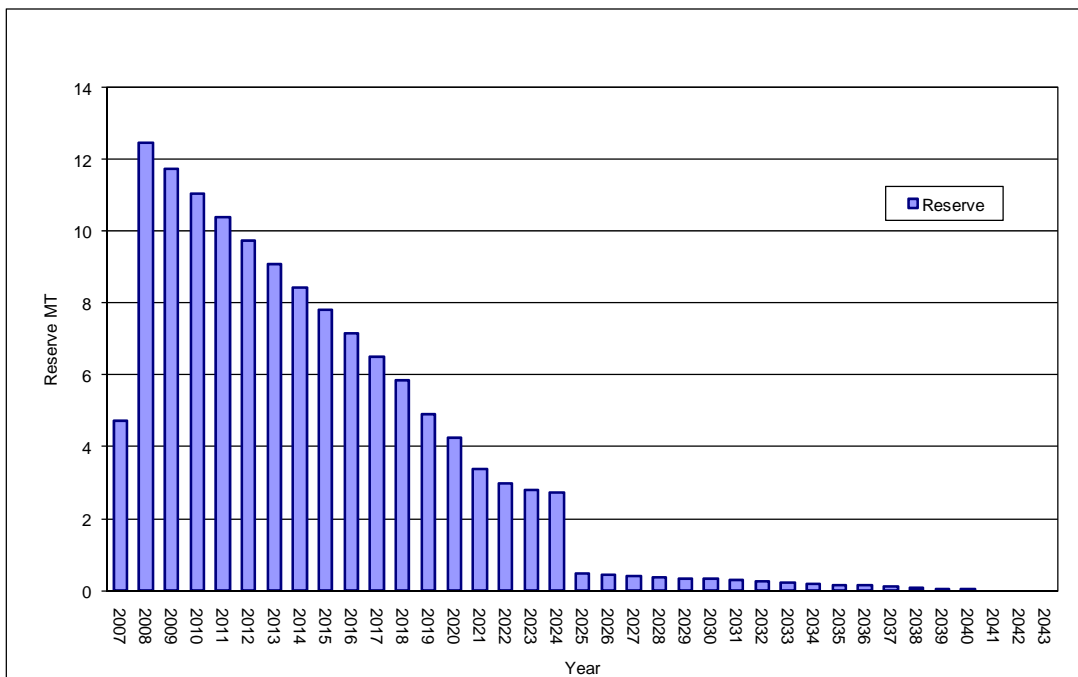
Based on data collated from consultation with the MPA, Figure 20 shows that Oxfordshire was unable to sustain its 2007 level of sales from sites active. More than half the county's sales would be lost within two years from sites active in 2007, and production would cease altogether by 2022. Figure 21 shows the pattern of rundown in reserves in this scenario, taking into account the end-dates of permissions as well as when reserves are worked out at individual sites. The reason for this dramatic loss of capacity is attributable to just 4.71 Mt of the county's permitted reserves being within sites active in 2007. The remaining 8.35 Mt was in sites inactive at that time. Only a tiny proportion of the loss of sales capacity from active sites is attributable to permissions expiring before their reserves are worked out.



**Figure 20.** Estimated decline in sales of crushed rock for aggregate (active sites) - Oxfordshire



**Figure 21.** Estimated decline in reserve of crushed rock for aggregate (2007 active sites) - Oxfordshire



**Figure 22.** Estimated decline in reserve of crushed rock for aggregate if inactive sites reactivated in 2008 - Oxfordshire

*Inactive sites*

There were five inactive crushed rock sites in Oxfordshire during 2007, three of which were sites where working had not started at that time – one of which is now in production. Another is adjacent to an active site controlled by the same company and has been mothballed due to a lack of market demand.

The relatively large reserves at inactive sites could, numerically, enable the 2007 sales rate to be continued into the 2020s without new permissions being granted. The actual contribution that these sites could make to supply would depend on whether (or if) they were reopened and their subsequent sales rates. Figure 22 shows the pattern of rundown in reserves if, for illustrative purposes, all inactive sites were available from 2008 and the 2007 sales rate was sustained for as long as possible. This shows that sales would only begin to tail off in 2021 when sites either run out of reserves or meet their permission end-dates (with a notable loss due to end-date after 2024). The actual pattern of rundown is likely to be different, with a blend of reopened inactive sites, different quantities of sales at each existing site, new permissions coming on-stream (whether greenfield sites or extensions to existing sites), and perhaps extensions in time when sites would otherwise expire with reserves remaining.

#### *Dormant sites*

Two crushed rock sites were dormant in Oxfordshire in 2007. One of these has since been granted permission to recommence, making available a further 0.45 Mt of reserves. The other, with a 2042 end date, is expected to be reactivated shortly.

#### *Development proposals post 2007*

In addition to the reactivation of a dormant site after 2007, three other small permissions have been granted with combined reserves of 0.62 Mt.

#### *The impact of permissions expiring in 2042*

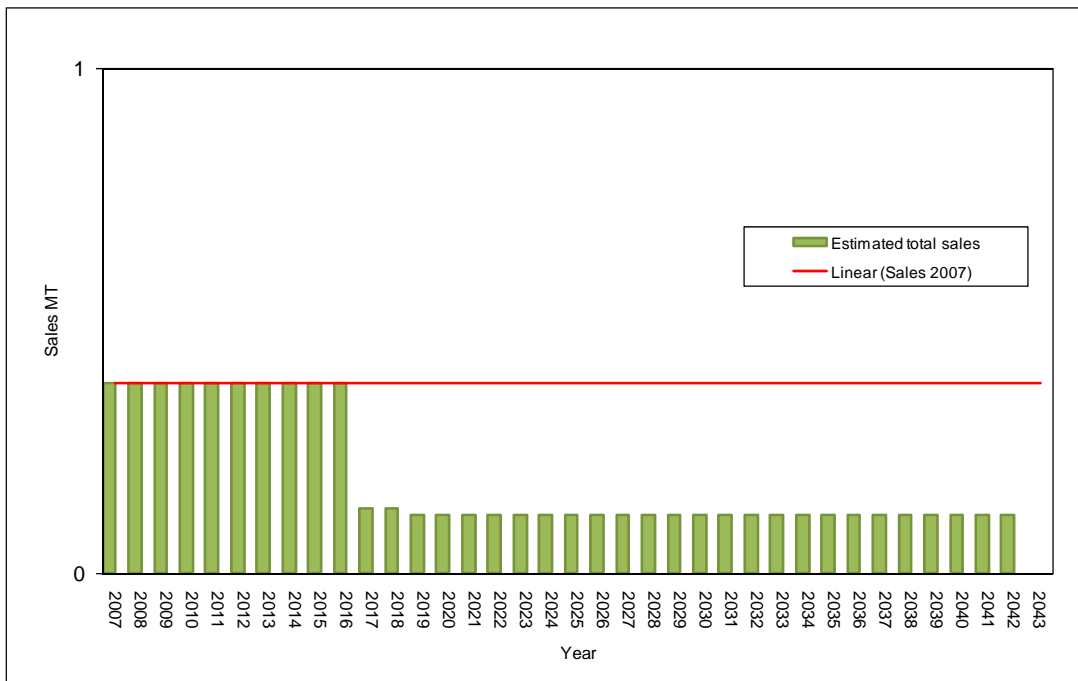
Loss of crushed rock permissions or reserves in Oxfordshire due to the 2042 rule would be minimal at about 0.3 Mt, as almost all the rundown in supply would have happened before that date. This assumes that two inactive sites with 2042 end dates are brought back into use in sufficient time for their reserves to be worked.

**NORTHAMPTONSHIRE CRUSHED ROCK**

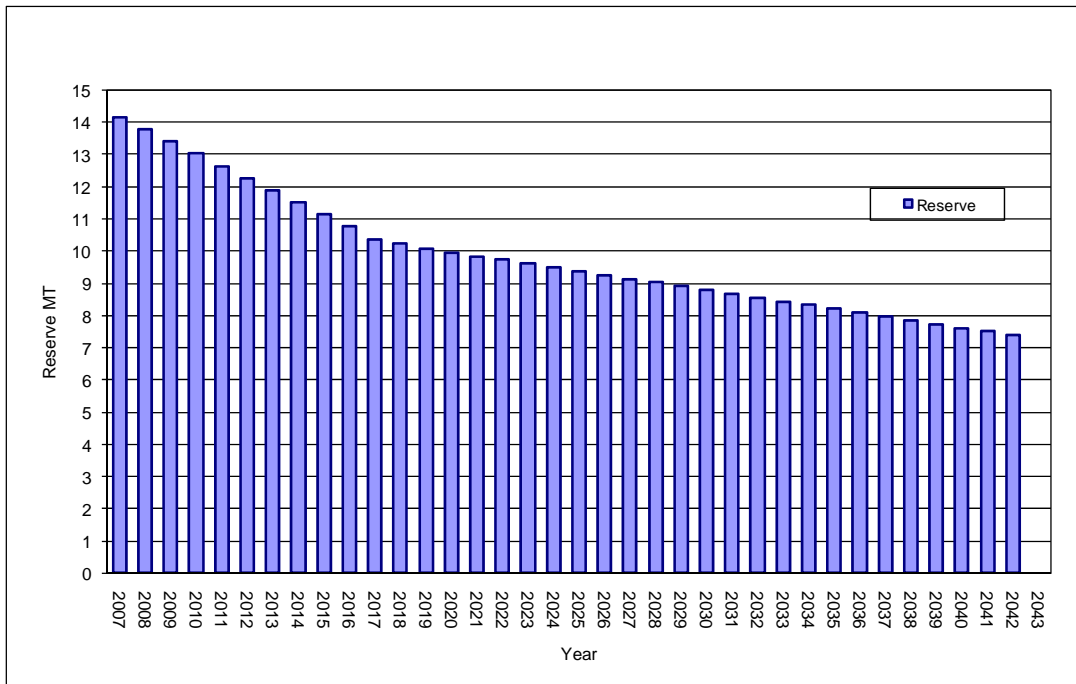
Northamptonshire is a modest supplier of crushed rock with three active sites having an output of 0.378 Mt in 2007. Sales had been at a steady rate in recent years, until a marked fall with the recession in 2008 (to 0.208 Mt). With the major suppliers of Derbyshire, the Peak District and Leicestershire in the same region, Northamptonshire’s share of the East Midlands supply was just 1.2 % of all crushed rock. Likewise, its apportionment of the regional crushed rock requirement was decided in 2004 at 0.39 Mtpa, also 1.2 %, which it has generally satisfied or been close to satisfying. In the revised apportionment in 2009, Northamptonshire took 0.31 Mtpa (1 % of the regional requirement).

*Rundown assessment*

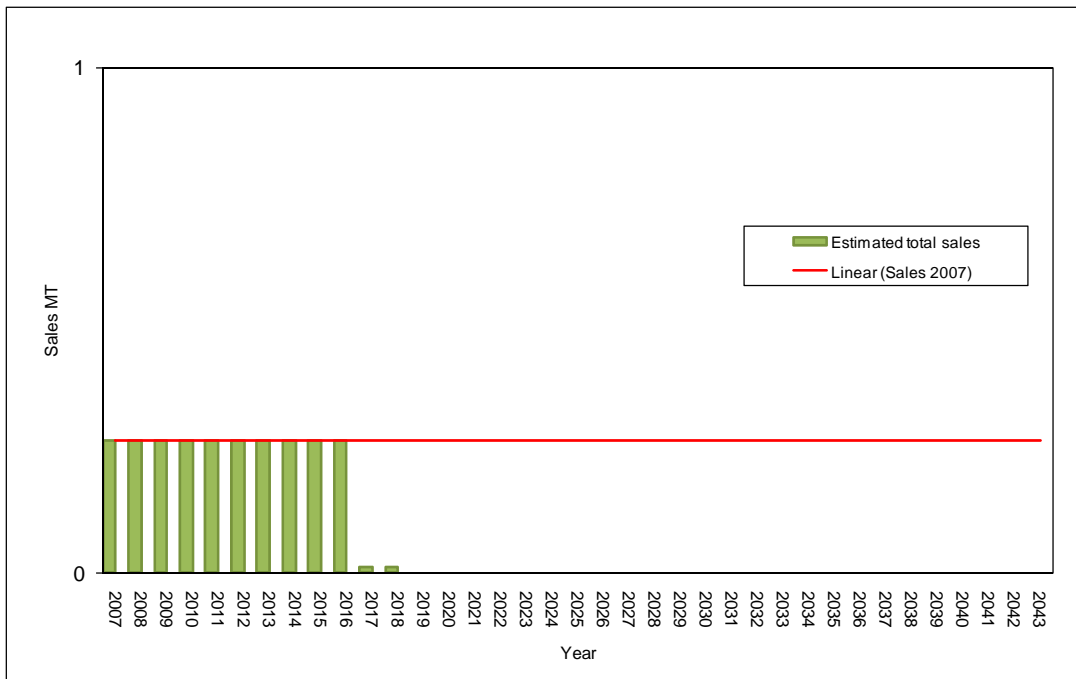
Permitted reserves of rock in Northamptonshire 14.16 Mt at the end of 2007, sufficient for a landbank of 36.3 years at the apportionment rate at the time, or 45.6 years at its revised rate. The rundown of sales and reserve is shown in Figure 23 and Figure 24. However, the reserves figure includes an estimated 10 Mt locked in a mostly inactive former ironstone working. If this site is excluded the remaining reserves of approximately 3 Mt would provide a landbank of 9.6 years at the 2004 apportionment rate or 13.4 years at the 2009 rate. The rundown of reserves and sales when inactive sites are excluded are demonstrated by Figure 25 and Figure 26.



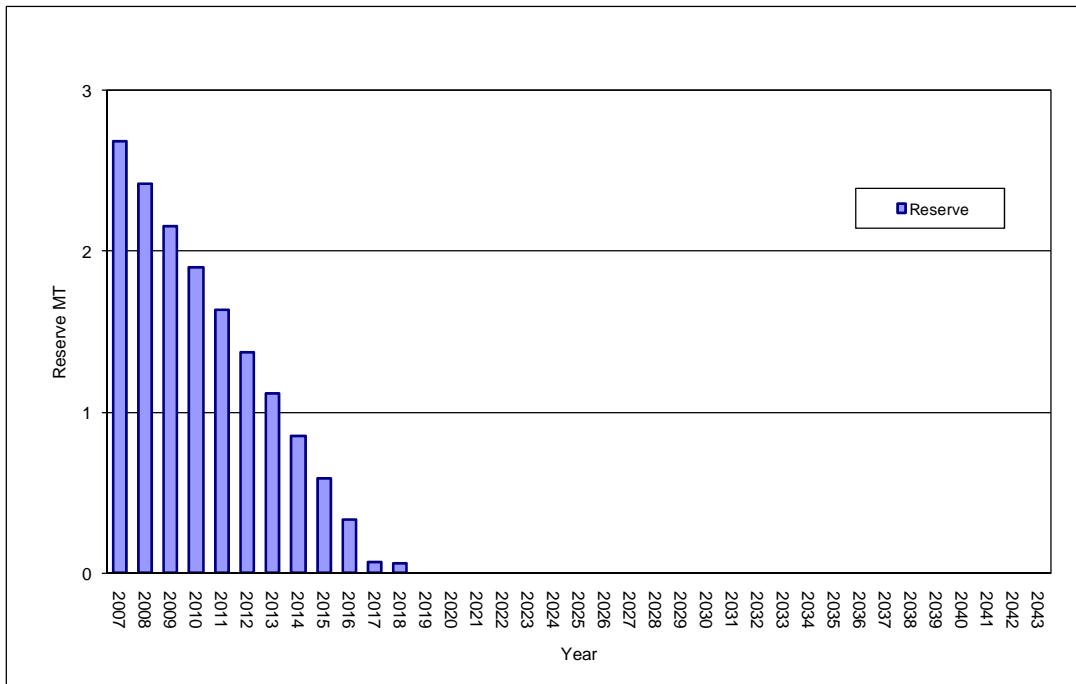
**Figure 23.** Estimated decline in sales of crushed rock for aggregate from active sites and one inactive site with approximately 10 Mt reserve - Northamptonshire



**Figure 24.** Estimated decline in reserves of crushed rock for aggregate from active sites and one inactive site with approximately 10 Mt reserve - Northamptonshire



**Figure 25.** Estimated decline in sales of crushed rock for aggregate from active sites - Northamptonshire



**Figure 26.** Estimated decline in reserve of crushed rock for aggregate from active sites - Northamptonshire

#### *Inactive sites*

There are five inactive sites capable of supplying crushed rock, though four of these are ironstone permissions where there is uncertainty about the viability and practicability of returning the sites to use. There is information available on reserves for just two of the five sites (one of them the inactive ironstone quarry with the estimated 10 Mt reserves noted above). Permissions were granted at the other quarries at a time when reserves information did not have to be provided.

The contribution, if any, which inactive sites as a whole might make to the market, or when they might do so, is unclear.

#### *Dormant sites*

There are 26 dormant sites in Northamptonshire theoretically capable of supplying aggregates. However, all of these are ironstone sites with associated minerals of possible suitability. As with inactive ironstone sites, there is a lack of clarity as to whether or when these sites might be economic to reopen. Not only is there insufficient detailed knowledge of their physical properties to say whether they would be capable of functioning as anything more than specialist building stones or bulk fill, but these ironstones lie beneath limestone's making extraction costly. They are, therefore, unlikely to be viable as aggregate (Harrison, A *et al.* 2007).

#### *Development proposals post 2007*

A planning application to extract 11.25 Mt of limestone at Geddington near Wakerley was submitted in March 2008 and remains undetermined. This application is related to an extant permission at an inactive site to extract ironstone and overlying minerals granted in 1962.



## Appendix 6 Rundown analyses for reserves of sand and gravel for aggregate

This appendix provides a commentary for the reserve and sales information for sand and gravel aggregate using data collated by the MPAs. Where appropriate, and to illustrate specific points, rundown charts are included. It should be noted that dormant sites have not been included in the rundown charts, given the issues discussed in Section 2.4.

### **DERBYSHIRE SAND AND GRAVEL**

Derbyshire is a modest supplier of sand and gravel (1.22 Mt in 2007) when six sites were in production. Its output of sand and gravel declined slowly but consistently over the years 2001-07, from 1.58 Mt in 2001, and never achieved the County's apportionment obligation within the region of 1.66 Mtpa. As a result, the apportionment agreed by EMRAWP in 2009 reduced Derbyshire's contribution from 16% of regional requirements to 14%, in the amount of 1.49 Mtpa (EMRAWP: *Sub-Regional Apportionment 2009*, January 2010, p13).

With permitted reserves at 16.9 Mt at the end of 2007 (EMRAWP: *Survey and Annual Report for the calendar year 2007*, May 2009), the County had a landbank of 10.2 years against its 2004 apportionment of 1.6 Mtpa. Measured against the revised apportionment, the 2007 landbank would now be calculated as 11.4 years. The landbank at that time was above the national policy level of at least seven years supply. As actual sales are below apportionment rates, landbanks against recent sales rates would be larger. Against this, however, reserves were reassessed at the end of 2008 to a significantly lower level, at 10.5 Mt, taking one third off the quantity that would have been expected simply by deducting sales of 1.11 Mt in 2008 from the previous year's reserves. The 2008 figures are used as the starting point for the graphic analysis. The County Council has also been able to distinguish between reserves of approximately 7.8 Mt in active sites, with the remainder in inactive sites.

#### *Rundown assessment*

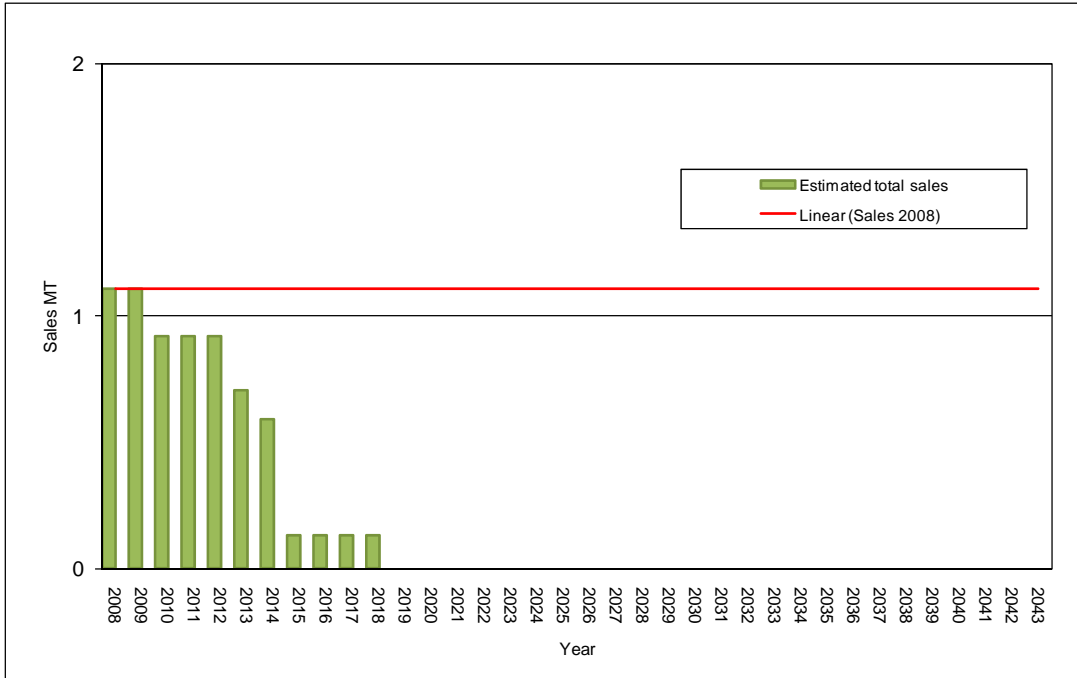
Figure 27 shows that output from all active sites will unsurprisingly decline quickly due to the limited reserves. All sites have either end dates or reserves which expire by 2018, and Figure 17 shows that most of their reserves are expected to be exhausted by 2014. Reserves at inactive sites could bolster output by about 3 years worth of production at 2007 levels, but this is of little strategic importance. As one of the two inactive sites at the end of 2008 was a new one awaiting commencement, there is clearly some modest scope for output to be sustained.

#### *Inactive sites*

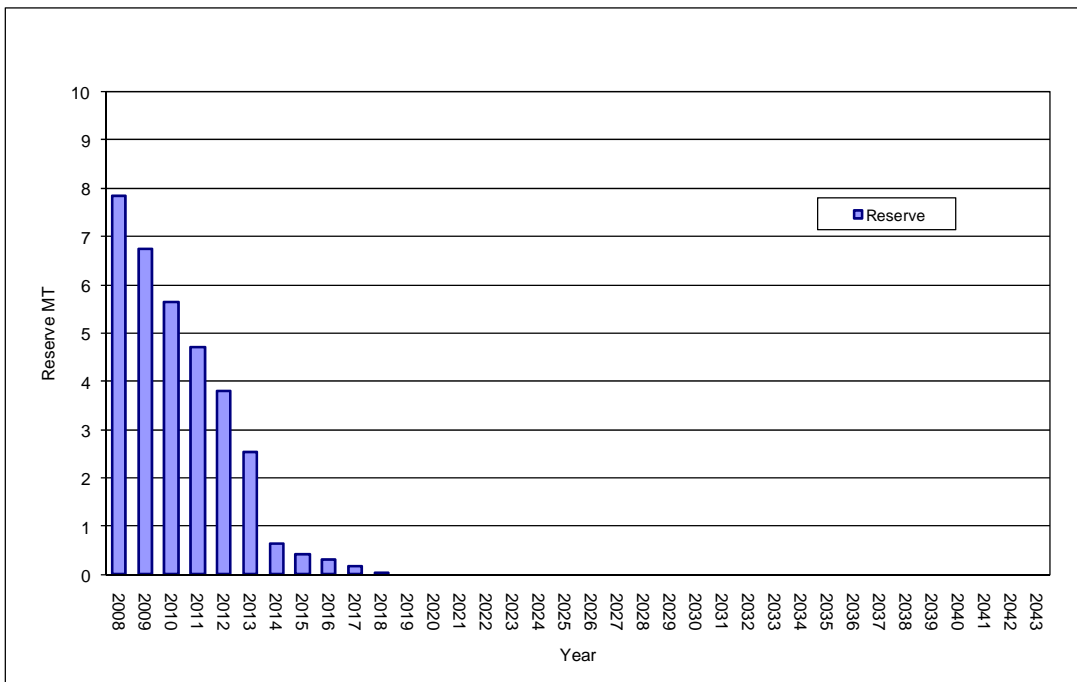
Confusion over the classification of inactive and dormant sand and gravel sites in the data limited analysis to active sites only.

#### *Dormant sites*

According to Derbyshire MPA There are currently two dormant sand and gravel sites within Derbyshire, Egginton and Mugginton.



**Figure 27.** Estimated decline in sales of sand and/or gravel for aggregate from active sites - Derbyshire



**Figure 28.** Estimated decline in reserve of sand and/or gravel for aggregate from active sites - Derbyshire

*Development proposals post 2007*

Three sand and gravel planning applications were 'in the pipeline' awaiting determination at the end of 2008, having a combined reserve of 4.91 Mt, though all had been submitted long before (in 2004, 2005 and 2007). They include two extensions and one greenfield site (EMRAWP: *Survey and Annual Report for calendar year 2008*, December 2009). So far a decision has been taken to approve a proposal for working 1.9 Mt at Trent Farm, Long Eaton, subject to a legal agreement.

*The impact of permissions expiring in 2042*

All existing permissions expire well before 2042, and reserves would be used up promptly too. The 2042 rule will therefore have no impact on sand and gravel supply in Derbyshire.

**LEICESTERSHIRE SAND AND GRAVEL**

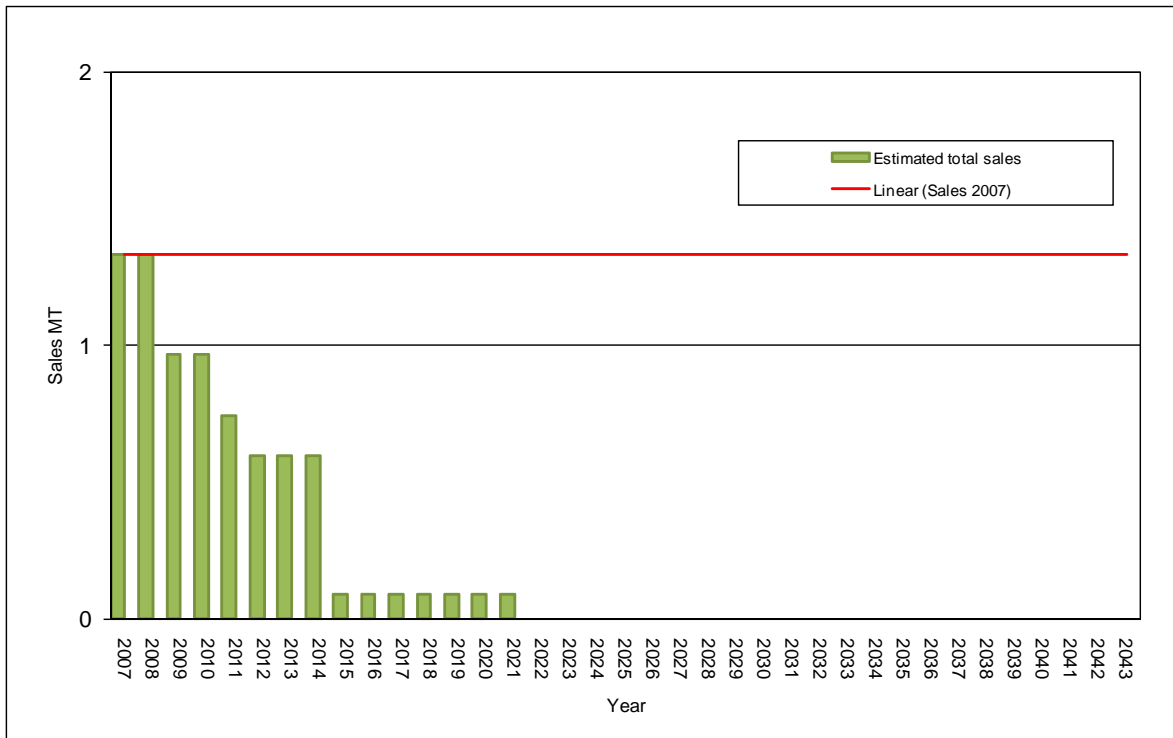
Sand and gravel deposits occur in the valleys of the River Trent, Soar and Wreake and in a series of isolated glacial deposits in areas to the south and west of Leicester. At the end of 2007, there were five active sites in Leicestershire: Cadeby, Husbands Bosworth, Lockington, Shawell and Brooksby. There were two further permitted sites, one of which had not commenced extraction, Syston (Fosse Way) which is linked to Brooksby, whilst the other, Slip Inn Quarry, was inactive. Two of the five active sites involve the working of alluvial and river terrace deposits, while the remainder work glacial deposits. (Leicestershire County Council *Minerals Development Framework* (2009)).

Leicestershire supplied 14.9 % (1.33 Mt) of the East Midlands total sand and gravel sales (8.91 Mt) in 2007 (EMRAWP *Survey and report for the calendar year 2008*, p12). Its output of sand and gravel in the years 2001-07 was consistently above the County's agreed apportionment within the region of 1.25 Mtpa, and this has been reflected in the revised 2009 apportionment of 1.51 Mtpa. Within an overall increase in the allocation to the East Midlands region as a whole (from 10.31 Mt in 2004 to 10.88 Mt in 2009), the sand and gravel apportionment to Leicestershire has risen only slightly, from 12.1 % to 13.9 % of regional obligations (EMRAWP: *Sub-Regional Apportionment 2009*, p13).

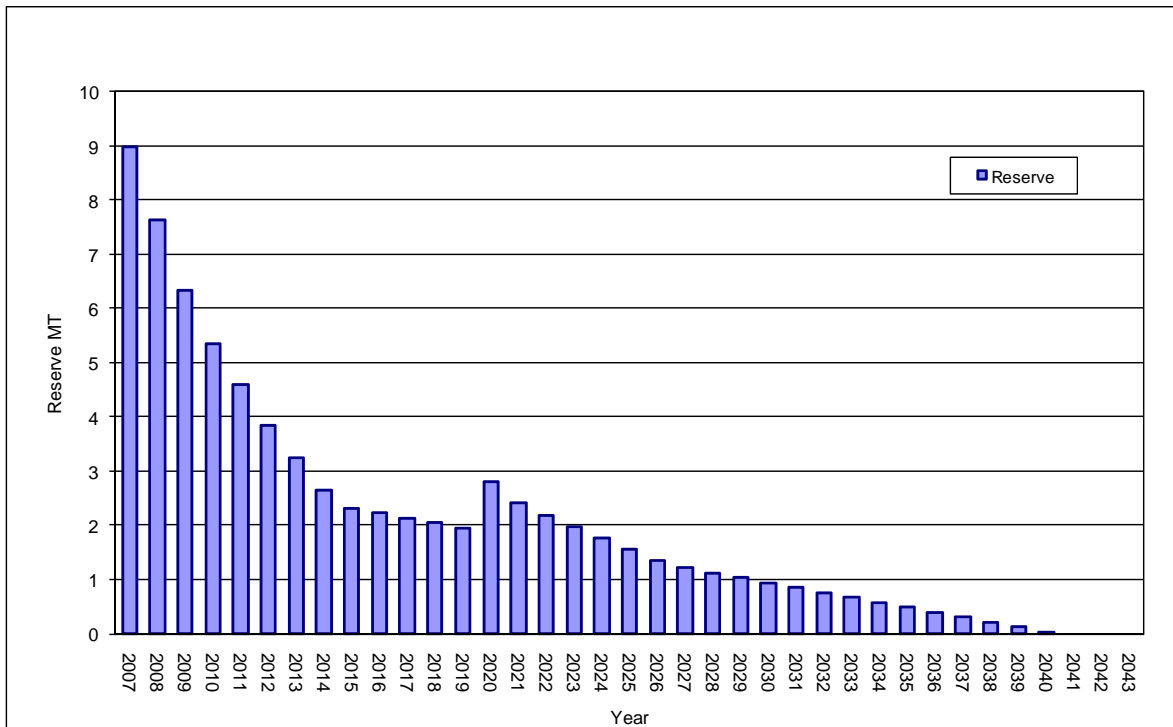
With permitted reserves at 9.92 Mt at the end of 2007, the County had a landbank of at least 7.9 years, which was just above the national policy level (EMRAWP: *Survey and Annual Report for the calendar year 2007*, p15). However, measured against the revised apportionment, the 2007 landbank would now be calculated at below seven years supply (at 6.6 years).

*Rundown assessment*

Based on data collated from consultation with the MPA, Figure 29 shows that Leicestershire could only have continued to maintain its 2007 output (from reserves available in active sites at the end of 2007) to the end of 2008. Output would then fall to just under 1 Mtpa for two years before further declines appeared. From 2015 the last quarry would be able to supply a small amount at around 0.1 Mtpa until its permission expired in 2021, although analysis suggests that output could continue at that scale to 2040 if an extension of time was granted for working the reserves remaining in the site. Sales in 2008 during the recession fell by 18 % to 1.09 Mt (EMRAWP: *Survey and Annual Report for the calendar year 2008*, p12), extending for just a year or two the period over which the reserves available at active sites at the end of 2007 could satisfy market demand.



**Figure 29.** Estimated decline in sales of sand and/or gravel for aggregate from active sites - Leicestershire



**Figure 30.** Estimated decline in reserve of sand and/or gravel if inactive sites reactivated in 2020 - Leicestershire

*\*Data does not take into consideration permission end dates*

*Inactive sites*

Figure 30 shows that reserves at inactive sites amounted to less than 1 Mt. Whilst bringing the two sites involved into use would make a small contribution to demand, this would be far short of enabling output to return to 2007 levels and would not extend the overall life of the County's sand and gravel sites beyond 2040.

*Dormant sites*

There are no dormant sand and gravel sites which might be able to contribute to supplies.

*Development proposals post 2007*

A major extension has been permitted since the end of 2007 to the sand and gravel site at Lockington, comprising 3.9 Mt. This permission will have helped to raise the landbank to a higher level than at the end of 2007, and secures output from the site for some years. However the long term pattern of supply from Leicestershire depends on whether arrangements are made to replace output which will be lost from three other quarries by about 2015. At the time of the consultation, two applications awaited determination for the quantities of 0.605 Mt and 0.12 Mt which together only equate to less than a year's worth of the County's total sand and gravel output.

*The impact of permissions expiring in 2042*

Figure 29 showed that if output from active sites in 2007 continued at the same rate as in 2007 all would cease by 2021 and even if a time extension was granted to one quarry this too would be worked out by 2040. Figure 30 showed that bringing into use inactive sites did not substantially change this pattern of rundown. As a result, all reserves from active sites in 2007 are likely to be worked out by 2040 (assuming no allowance is made for the current recession). Only one sand and gravel site in the County has a post 2042 end date, and that would be worked out before 2042 if worked at its 2007 rate.

**NOTTINGHAMSHIRE SAND AND GRAVEL**

Nottinghamshire is the largest supplier of sand and gravel in the East Midlands and the fourth largest in England, supplying 3.521 Mt from nineteen sites in 2007 (*EMRAWP Survey and Annual Report for the calendar year 2007*). Sand and gravel is worked from alluvial resources in the Trent and Idle Valleys and also from the Sherwood Sandstone. Sand and gravel also occurs in the Soar Valley, other minor tributaries and in isolated glacial deposits scattered across the county (Nottinghamshire Minerals Local Plan adopted December 2005).

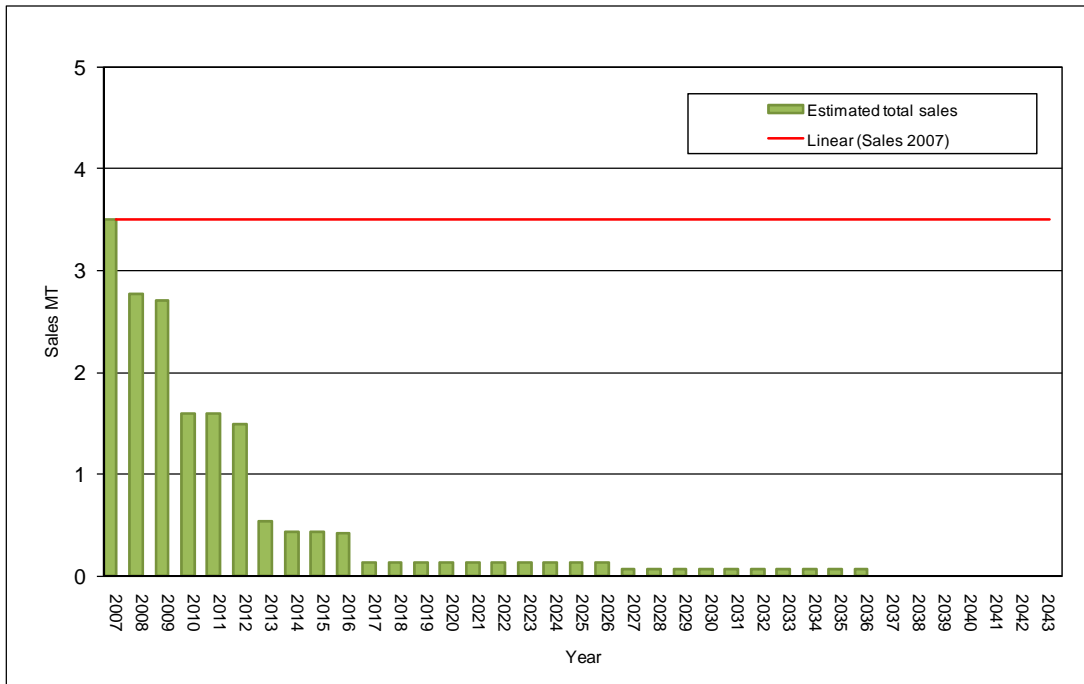
Nottinghamshire sold an average of 3.66 Mt of sand and gravel in the years 2001-07 which was, therefore, consistently above the County's apportionment of 3.37 Mtpa for the region. There was a peak of sales at 3.94 Mt in 2003, since when output has declined slowly but consistently each year. Despite this decline, Nottinghamshire's share of regional supply rose from 36.5 % of regional output to 39.5 % between 2003 and 2007 (*EMRAWP sub regional apportionment 2009, p 10*).

Within an overall increase in the allocation to the East Midlands, the sand and gravel apportionment to Nottinghamshire has been increased in the revised 2009 apportionment to 3.82 Mtpa. This represents an increased share of the regional obligation, from 32.7% to 35.1% (*EMRAWP: Sub-Regional Apportionment 2009, p14*). This obligation is one percentage point lower than it would have been, based on the average of sales over the last seven years, in recognition of the difficulty that Nottinghamshire would have in sustaining recent levels of output from current sources of supply over the period of the *Guidelines*.

Nottinghamshire had permitted reserves of 23.59 Mt at the end of 2007 (of which 18.33 Mt were within active sites) providing a landbank of exactly 7 years supply. Measured against the revised apportionment, the 2007 landbank would have been 6.2 years and, therefore, below the national policy level of at least seven years supply. (*EMRAWP Survey and Annual Report for the calendar year 2007*).

*Rundown Assessment*

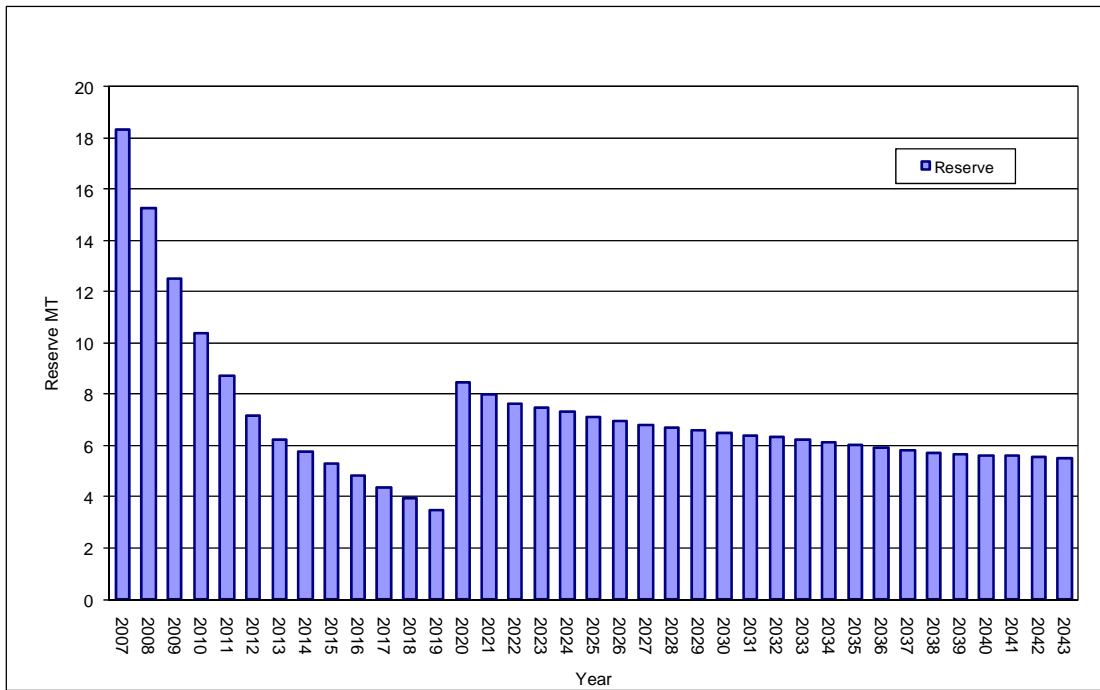
Based on data collated from consultation with the MPA, Figure 31 shows that the shortage of reserves in Nottinghamshire at the end of 2007 would have prevented the 2007 level of output being sustained: output would necessarily fall below 3 Mtpa in 2008, drop again to around 1.6 Mt in 2010 for three years and then plummet to around 0.5 Mtpa in 2013. Output would decline in steps and cease in 2036, though if extensions in time were given to sites with remaining reserves at their end dates, then a very low output – under 0.1 Mtpa – could continue to at least 2043. Allowing for the recession, the decline in output over the years ahead would be less pronounced up until 2015, but after that would be barely distinguishable from the decline otherwise expected.



**Figure 31.** Estimated decline in sales of sand and gravel for aggregate from active sites - Nottinghamshire

*Inactive sites*

Figure 32 shows that reserves at five sites included as ‘inactive’ in the analysis (Cromwell [yet to commence], Mattersey (two sites), Styrrup and Carlton in Lindrick) accounted for approximately 5.41 Mt of the permitted reserve.



**Figure 32.** Estimated decline in reserve of sand and gravel if inactive sites reactivated in 2020 – Nottinghamshire \*Data does not take into consideration permission end dates

However, no information for output at these sites when last worked, or estimates of expected output for those sites yet to commence working, were included in the analysis (since, in this case they were too difficult to estimate). As a result, the slow subsequent rundown in these reserves is at the same rate (after 2020 on the graph) as would have arisen in any event from sites active in 2007.

*Dormant sites*

According to the adopted Minerals Local Plan (2005), policies to reduce the number of old dormant sites in Nottinghamshire were included in the previous plan and ‘were effective in seeing most of these dormant planning permissions revoked as a condition for new reserves being permitted in more suitable locations’. Dormant sites are not, therefore, considered an issue for Nottinghamshire MPA.

*Development proposals post 2007*

Permission has been given for working 8.95 Mt of reserves since the end of 2007. Of this by far the largest is a reserve of 7.5 Mt on a greenfield site at Sturton-Le-Steeple.

*The impact of permissions expiring in 2042*

Figure 31 showed that all output from sand and gravel sites with permission in 2007 would cease by 2036, though if time extensions were granted to sites which had not used up their reserves by the date they had to cease, then a tiny output could be sustained to at least 2043. Therefore, virtually all reserves from 2007 can be expected to be worked out before 2042, and the rundown would not be affected in any way by the 2042 rule.

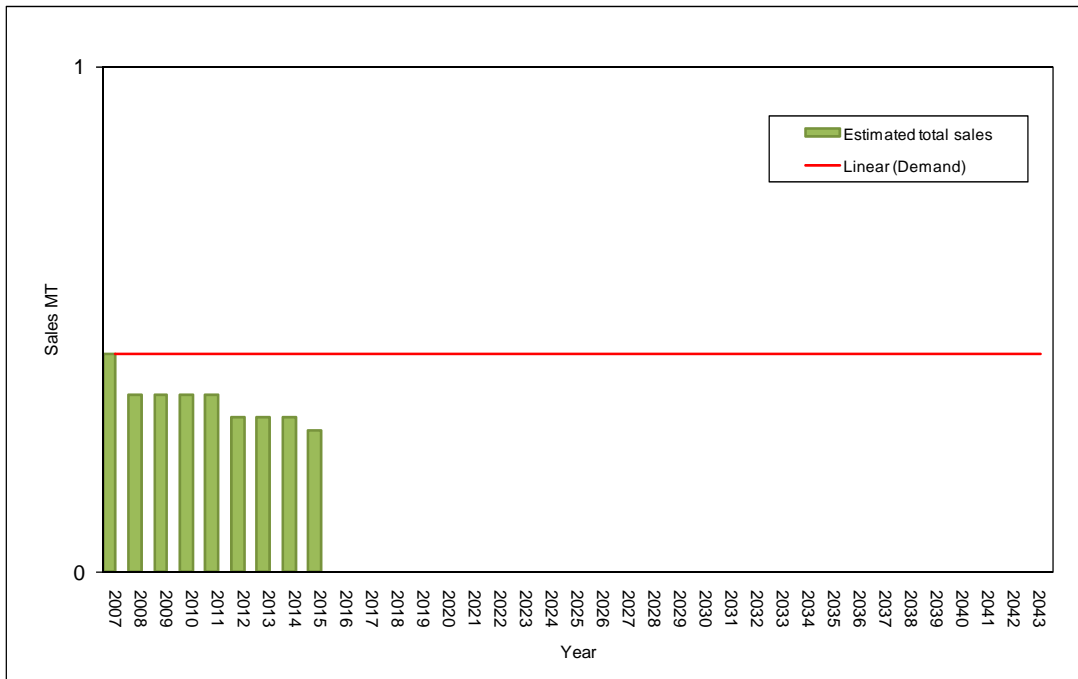
**NORTHAMPTONSHIRE SAND AND GRAVEL**

Northamptonshire is a minor supplier of sand and gravel (0.36 Mt in 2007) from four small sites, contributing 4 % of the regional output. Its output of sand and gravel has declined steadily from 0.91 Mt in 2002 and its 2004 apportionment figure of 0.97 Mtpa has never been achieved. Nonetheless, a modest revival in Northamptonshire’s output is expected as new sites are allocated, including in the Nene Valley where working has generally been resisted in recent years (EMRAWP: *Sub-Regional Apportionment 2009*, p11). As a result, under the 2009 apportionment, Northamptonshire will take 1 % more than suggested by its share of regional sales 2001-07, at 0.78 Mtpa (EMRAWP: *Sub-Regional Apportionment 2009*, p14).

Northamptonshire had permitted reserves of just 3.3 Mt at the end of 2007, providing a landbank of just 3.4 years compared with the national policy level of at least seven years supply. Measured against the revised apportionment, the 2007 landbank would still have been only 4.2 years. Permitted reserves of sand and gravel in Northamptonshire at the end of 2008 amounted to 3.6 Mt, representing a landbank of 3.8 years based on the apportionment (0.97 Mt) method. However, sales in the county have been considerably lower than the apportionment, resulting in a landbank of more than ten years on this basis (EMRAWP, 2008).

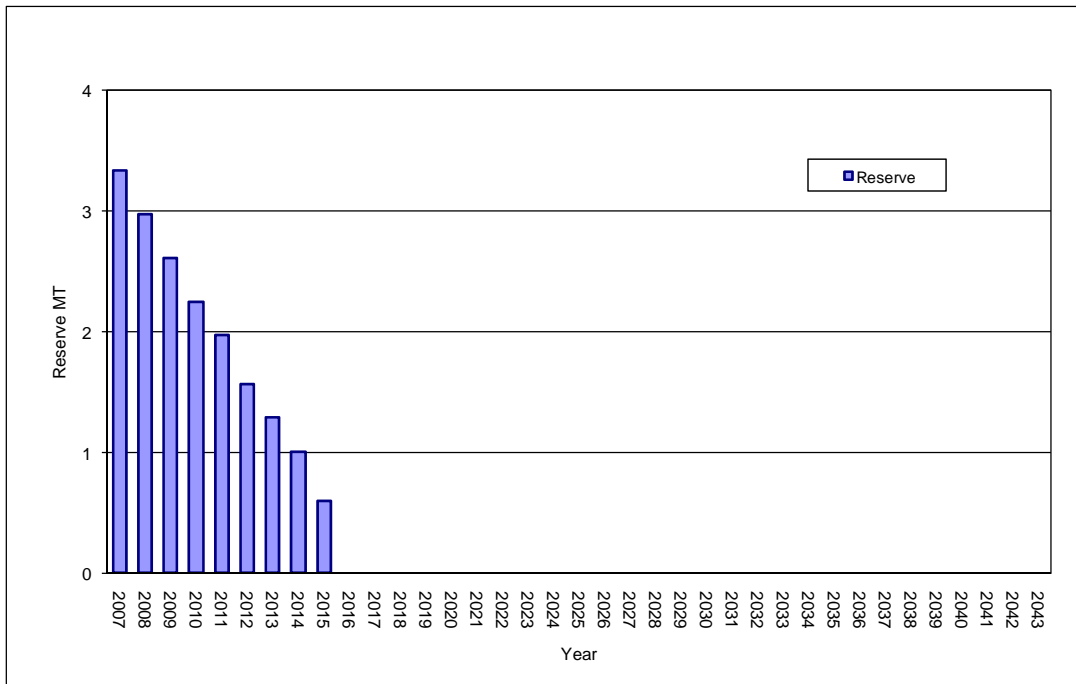
*Rundown assessment*

The four sand and gravel permissions in Northamptonshire have expiry dates in 2012, 2015, 2016 and 2017, indicating the precarious nature of supply. Based on data collated from consultation with the MPA, Figure 33 and Figure 34 show that production from the limited reserves from active sites in 2007 would cease by the end of 2015. However, analysis showed that output at the level at that time could be sustained for two further years if extensions in time were allowed where reserves remained to be worked. Sustaining output in the short term will be a challenge, as will be more than doubling the 2007 output to achieve the supply anticipated in the apportionment to Northamptonshire.



**Figure 33.** Estimated decline in sales of sand and/or gravel for aggregate from active sites - Northamptonshire





**Figure 34.** Estimated decline in reserves of sand and/or gravel for aggregate from active sites - Northamptonshire

*Inactive sites*

No data was obtained for inactive sand and gravel sites in Northamptonshire in 2007.

*Dormant sites*

EMRAWP lists 28 dormant sites which could theoretically provide aggregate. These are discussed under the rundown analysis for Northamptonshire crushed rock.

*Development proposals post 2007*

Permission has been given for working 3.74 Mt of reserves at two sites since the end of 2007, one as an extension to an existing site and the other a greenfield site. This should help alleviate any issues with Northamptonshire meeting its apportionment of 0.78 Mtpa for approximately five years.

*The impact of permissions expiring in 2042*

Figure 33 showed that all output from sand and gravel sites with permission in 2007 would cease by the end of 2015. Even if time extensions were granted to sites which had not used up their reserves by the date they had to cease, remaining reserve would likely to be worked out by around 2017. The rundown in supplies would, therefore, be completely unaffected in any way by the 2042 rule.

## HAMPSHIRE SAND AND GRAVEL

Hampshire (consisting of Hampshire, Portsmouth, Southampton and the New Forest) is now the third largest supplier of land-won sand and gravel in the South East (1.49 Mt in 2007) from 13 sites. Output has fallen every year since 1998 (until a very small increase in 2007), and fell behind Kent as well as Surrey from 2003 onwards (Hampshire County Council *Minerals and Waste Development Framework Annual Monitoring Report 2007/08* and South East Partnership *Aggregates Monitoring Report 2008*).

For the last decade Hampshire's share of regional output has fluctuated between about 14 % and 19 %, (SEERAWP Annual Monitoring Reports 2001-2008). In the context of declining regional demand, Hampshire has never satisfied the apportionment of 2.63 Mtpa given to it in 2003. The aggregates apportionment to Hampshire was reduced in March 2010 to 2.05 Mtpa in the Secretary of State's Proposed Changes to the South East Plan, (which was subsequently endorsed for aggregates planning purposes by the new Government).

Hampshire had permitted reserves of 9.22 Mt at the end of 2007, providing a landbank of only 3.5 years compared with the national policy level of at least seven years supply. Measured against the revised apportionment, the 2007 landbank would still have been just 4.5 years. The principal market for aggregates is the south Hampshire conurbation (the cities of Southampton and Portsmouth together with large towns such as Havant, Gosport, Fareham and Eastleigh), but this large county has separate markets in different parts of its area, such as Aldershot, Farnborough and the Blackwater Valley towns in the north east, Winchester in the centre and Andover in the north west. Beyond the west side of the New Forest National Park, the Avon Valley has long been an important source of sand and gravel for the Poole, Bournemouth and Christchurch conurbation across the county boundary in Dorset (and across the regional boundary in the South West), which remains the principal producing area within the County.

### *Rundown Assessment*

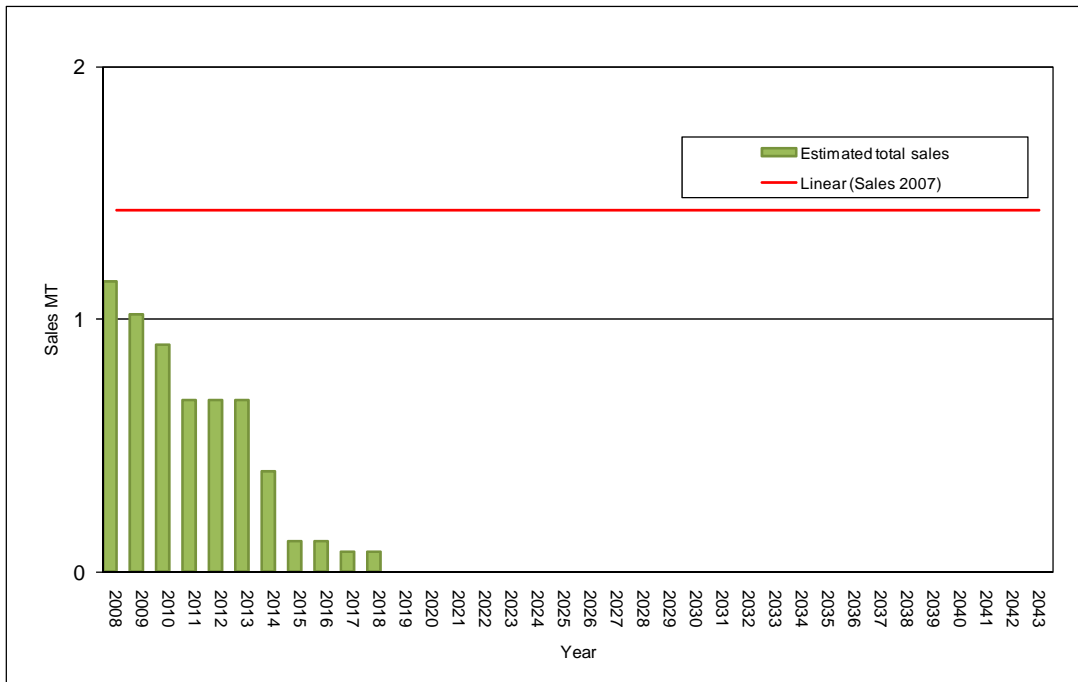
*Based on data collated from consultation with the MPA, Figure 35 shows that the output from active permissions available in 2007 would decline quickly thereafter so great is the shortage of permitted reserves in Hampshire. As no sand and gravel permissions were given in 2008, the rundown in the landbank continued. All output would cease by the end of 2018, though if extensions in time were given to sites with remaining reserves at their end dates, then a very low output – under 0.1 Mtpa – could continue to 2038.*

### *Inactive sites*

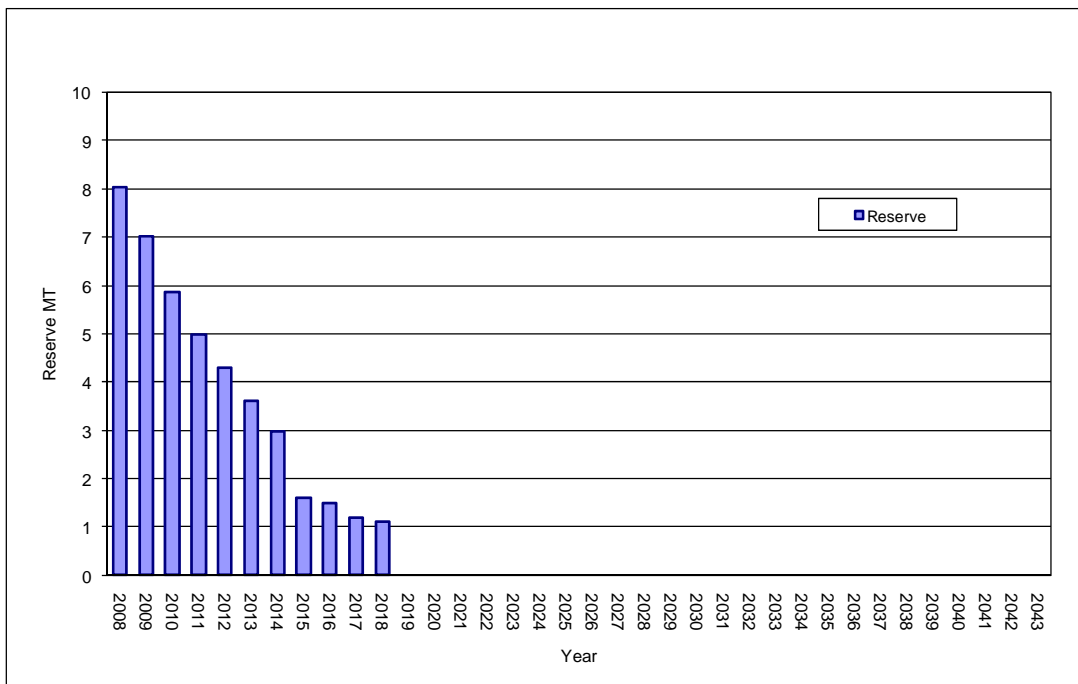
The only inactive site in Hampshire comprises mineral beneath the plant used by an adjoining extraction site as this has been declared no longer viable. Figure 36 shows the pattern of rundown of reserves without a top-up at any point from the reopening of inactive sites.

### *Dormant sites*

The MPA consider that the three dormant sand and gravel sites, all with 2042 end dates, are very unlikely to be reopened.



**Figure 35.** Estimated decline in sales of sand and/or gravel for aggregate - Hampshire



**Figure 36.** Estimated decline in reserve of sand and/or gravel – Hampshire

*Development proposals post 2007*

Permission was been given to open two new sand and gravel sites in Hampshire in 2009. Plumley Wood and Nea Farm, Ringwood contains 6.34 Mt, while Roke Manor, Shootash contains 0.78 Mt (where final approval is subject to a legal agreement being signed). By the end of 2010 these would have raised the landbank to around 6 Mt.

*The impact of permissions expiring in 2042*

Figure 35 showed that all output from sand and gravel sites with permission in 2007 would cease by 2018, though if time extensions were granted to sites which had not used up their reserves by the date they had to cease, then a tiny output could be sustained to 2038. Therefore, all reserves from 2007 can be expected to be worked out before 2042. The rundown would not be affected in any way by the 2042 rule unless it caught reserves contained within any of the four dormant sites, if these were to be reactivated and not worked out by that date.

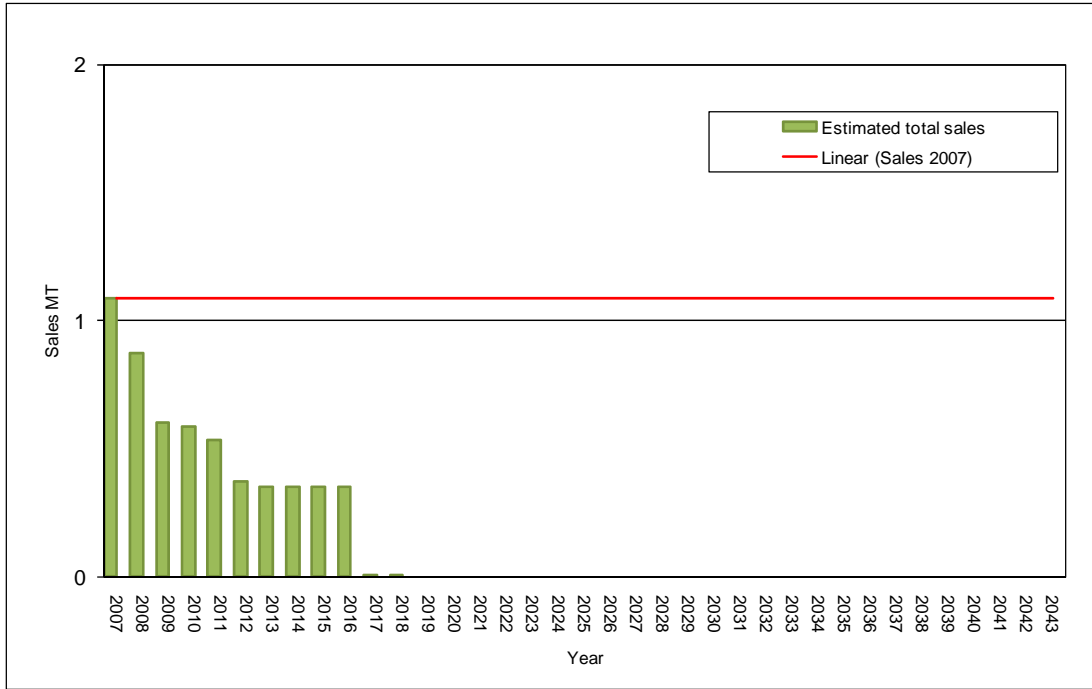
## **OXFORDSHIRE SAND AND GRAVEL**

Oxfordshire supplied 1.09 Mt of sand and gravel in 2007 from fourteen sites. In addition, the planning permission on the one inactive site in the County expired that year. The County's output has declined every year since 2001 when sales of sand and gravel were 1.92 Mt. Due to the general decline in demand for land-won sand and gravel from the South East region, Oxfordshire's share of regional supply fell only from 15.5 % in 2001 to 12.7 % in 2007 (SEERAWP Annual Monitoring Reports and returns for this project). The previous Secretary of State's Proposed Changes to Policy M3 of the South East Plan proposed a revised allocation to the region and its apportionment between MPAs. This was endorsed by the new Government for immediate mineral planning purposes, (letter of 6 July 2010 from the CLG Chief Planner to all English local authorities), requiring Oxfordshire to plan for a significant increase in output to 2.1 Mtpa. This reflects the greater geological availability of sand and gravel in the County compared with many other South East authorities, even though these deposits are in areas where working would be controversial. Although the Secretary of State reduced the allocation to the South East from 13.25 Mtpa in the 2003 publication to 11.12 Mtpa in the 2009 version, Oxfordshire's share of regional requirements rose from 15.1 % (2.0 Mtpa) to 18.9 % (2.1 Mtpa), also well above the County's historic share of actual output.

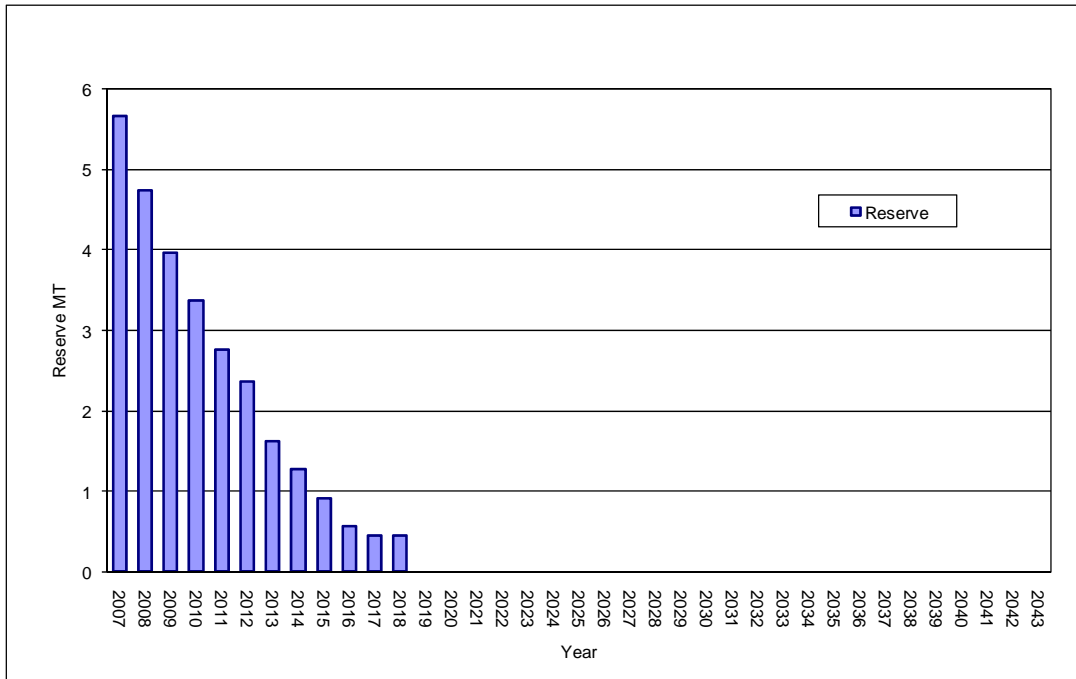
Oxfordshire had permitted reserves of 5.79 Mt at the end of 2007, providing a landbank of just 3.2 years against the apportionment of 1.82 Mtpa at the time, introduced in 2003, compared with the national policy level of at least 7 years' supply. Measured against the revised apportionment, the 2007 landbank would have been just 2.8 years. Oxfordshire at the end of 2007 as a result had one of the lowest landbanks for sand and gravel of all MPAs in England.

### *Rundown assessment*

Based on data collated from consultation with the MPA, Figure 37 and Figure 38 show that the remarkably low level of sand and gravel permitted reserves in Oxfordshire at the end of 2007 would have caused supply to tail off rapidly thereafter well short of recent sales rates, let alone the County's apportionment.



**Figure 37.** Estimated decline in sales of sand and/or gravel for aggregate from active sites - Oxfordshire



**Figure 38.** Estimated decline in reserve of sand and/or gravel for aggregate from active sites - Oxfordshire

*Inactive sites*

Since only one inactive site was reported by the MPA in 2007, and the permission end date was in 2007, we have not included this site in the analysis.

*Dormant sites*

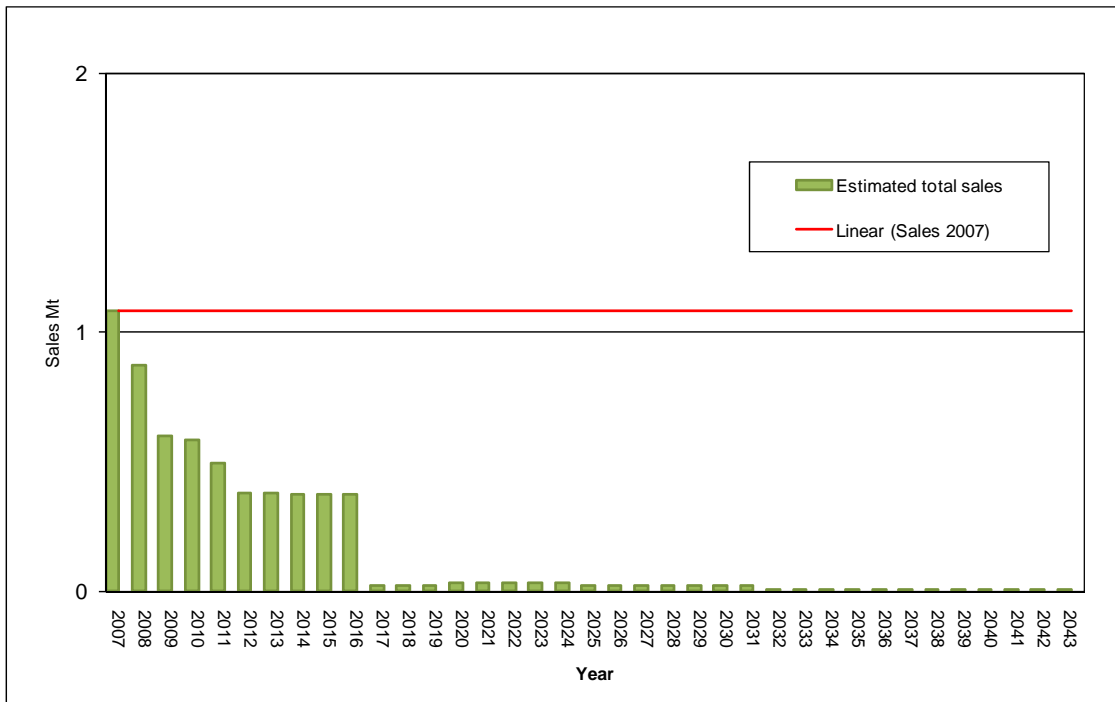
There were no dormant sand and gravel sites in Oxfordshire in 2007.

*Development proposals post 2007*

Applications have been submitted for working 6.59 Mt of reserves spread over 8 sites since the end of 2007. With the permissions granted so far, the County Council’s *Minerals and Waste Annual Monitoring Report 2010* records that the sand and gravel reserves at the end of 2009 had risen to 9.05 Mt. This raised the landbank to 4.3 years, which is an improvement but still well short of the policy objective of at least seven years supply.

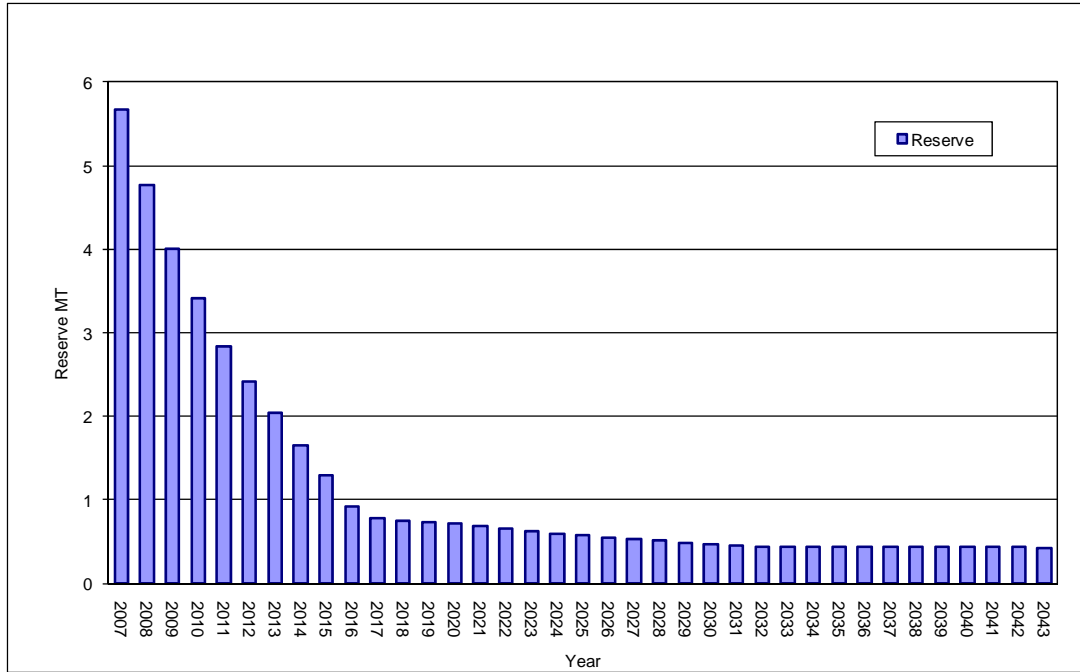
*The impact of permissions expiring in 2042*

Figure 37 shows that all output from active sand and gravel sites with permission in 2007 would cease by 2018. However, if time extensions were granted to sites which had not used up their reserves by the date they had to cease, then a tiny output could be sustained to at least 2043 (see Figure 39) – though by then there would be few reserves left (Figure 40). Therefore, even if extensions in time were given when permissions expired, virtually all reserves from 2007 can be expected to be worked out before 2042. The rundown would not be affected by the 2042 rule.



**Figure 39.** Estimated decline in sales of sand and/or gravel if active sites are allowed to continue working at 2007 sales levels beyond their planning permission end date - Oxfordshire

*\*Data does not take into consideration permission end dates*



**Figure 40.** Estimated decline in reserve of sand and/or gravel if active sites are allowed to continue working at 2007 sales levels beyond their planning permission end date- Oxfordshire

*\*Data does not take into consideration permission end dates*

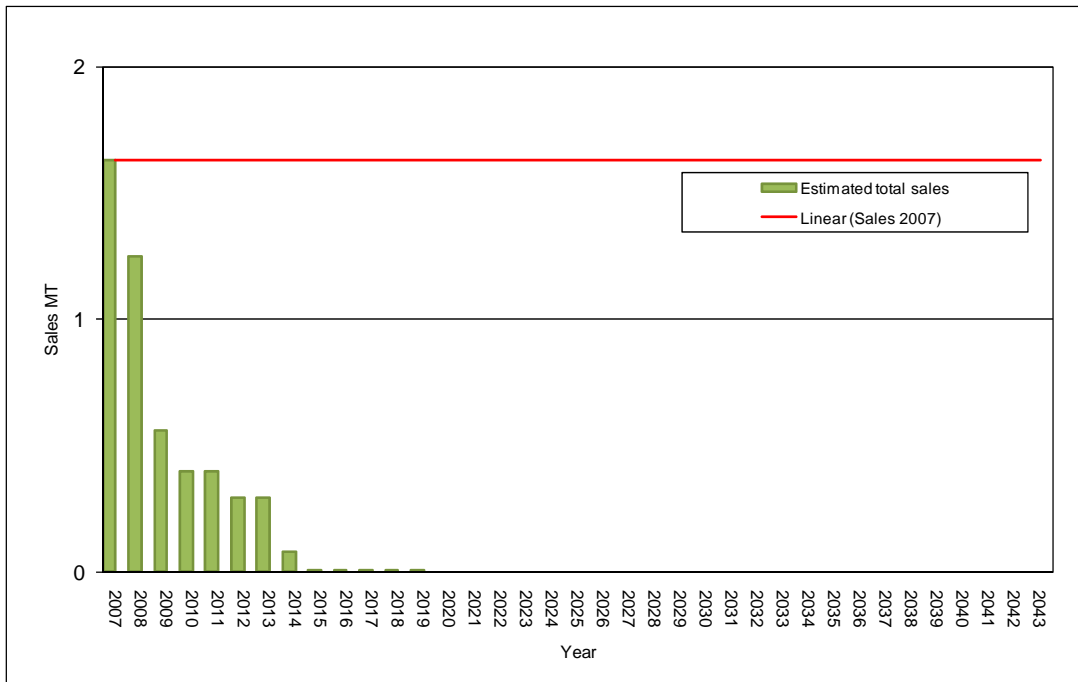
**SURREY SAND AND GRAVEL**

Surrey was until 2006 the largest supplier of sand and gravel in the South East region, but has seen its output fall to 1.63 Mt in 2007 from twelve sites, which is now lower than Kent’s. Against a background of declining demand for land-won sand and gravel in the South East, Surrey’s output of 2.42 Mt in 2002 supplied 21.4 % of regional land-won sand and gravel supplies, but this share had declined slightly to 19.2 % by 2007 and 17.1 % in 2008 (1.4 Mt out of a regional supply of 7.9 Mt), (SEERAWP Annual Monitoring Reports 2002-2008). Cemex’s submission to Surrey’s Mineral Plan (2009) states that *‘It is common knowledge that reserves of concreting aggregates in the County are virtually exhausted’*.

Surrey had permitted reserves of 9.7 Mt at the end of 2007, providing a landbank of only 3.71 years against its apportionment at the time. Measured against the revised apportionment, the 2007 landbank would have been 7.7 years. (Surrey County Council 2008 pg 47)

*Rundown assessment*

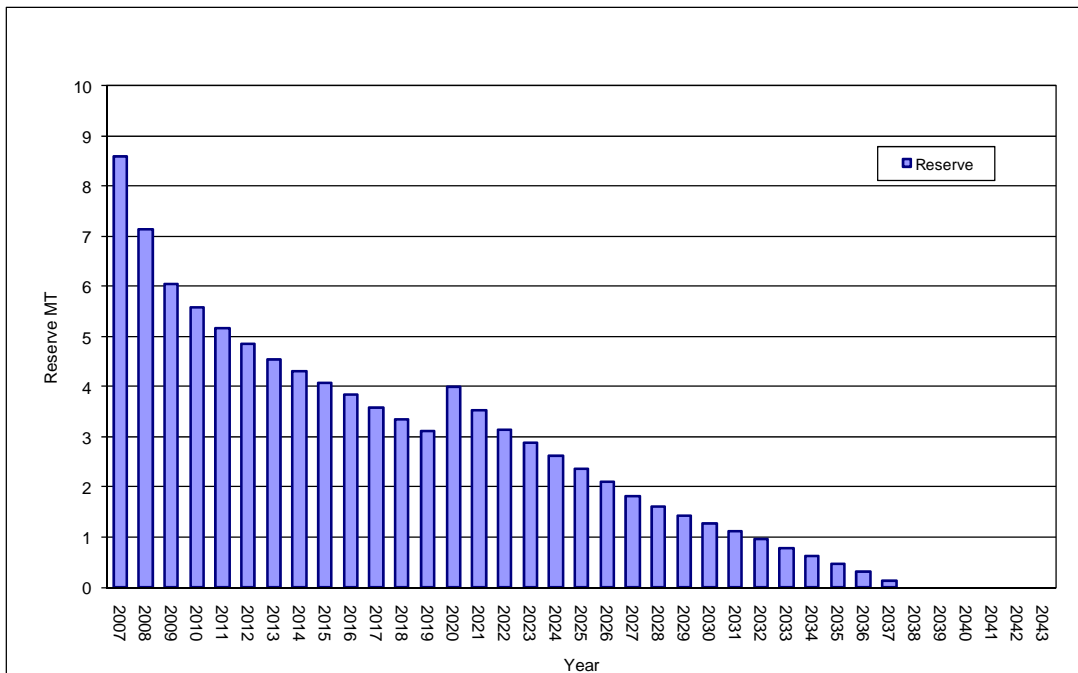
Based on data collated from consultation with the MPA, Figure 41 shows that the shortage of reserves in Surrey at the end of 2007 would have prevented the 2007 level of output being sustained: output would necessarily fall below 3 Mtpa in 2008, drop again to around 1.6Mt in 2010 for three years and then plummet to around 0.5 Mtpa in 2013. Output would decline in steps and cease in 2036, though if extensions in time were given to sites with remaining reserves at their end dates, then a very low output – under 0.1 Mtpa – could continue to at least 2043. Allowing for the recession, the decline in output over the years ahead would be less pronounced up until 2015, but after that would be barely distinguishable from the decline otherwise expected.



**Figure 41.** Estimated decline in sales of sand and/or gravel for aggregate - Surrey

*Inactive sites*

Reserves at two inactive sites in 2007 equated to approximately 1.1 Mt. Both are expected by the MPA to come into use soon. Figure 42 shows the impact on the rundown pattern if the two sites were not brought back into use until 2020. Output data for one inactive site was not supplied and therefore the project team used a combined annual output of 0.3 Mtpa for the inactive sites for the analysis.



**Figure 42.** Estimated decline in reserve of sand and/or gravel if inactive sites reactivated in 2020 - Surrey



*\*Data does not take into consideration permission end dates*

*Dormant sites*

There are no dormant sand and gravel sites in Surrey.

*Development proposals post 2007*

Permission has been given for working at least 2.5 Mt of reserves since the end of 2007.

*The impact of permissions expiring in 2042*

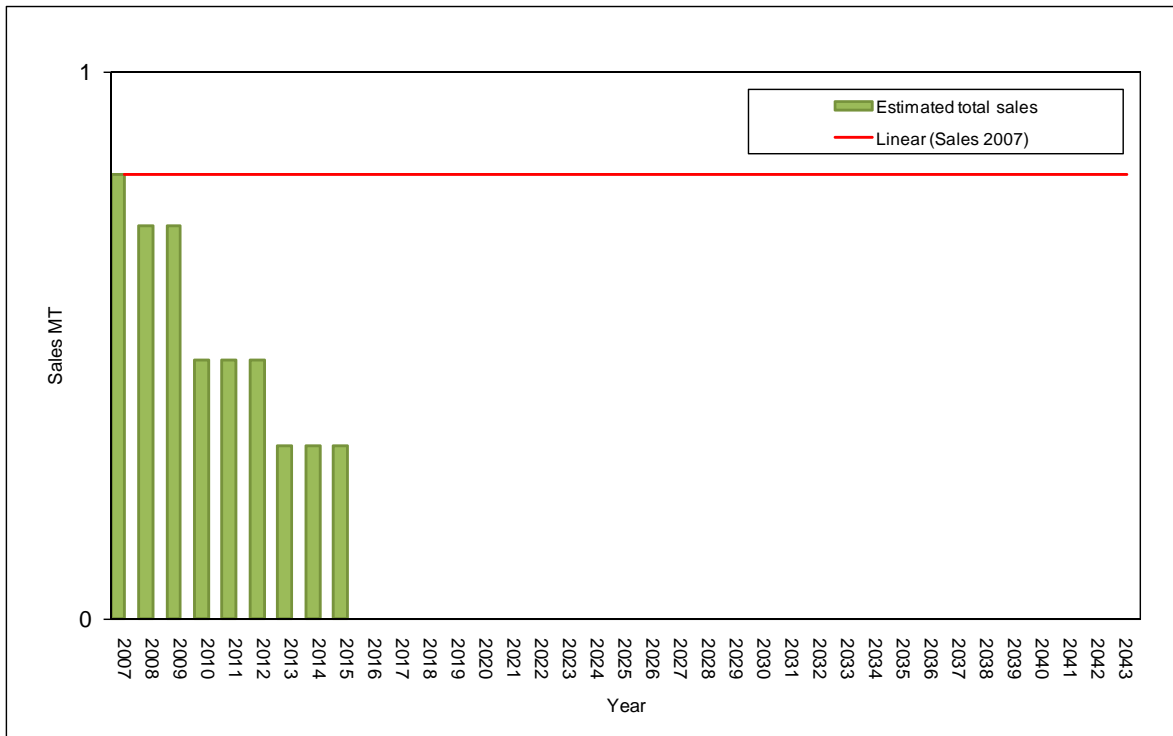
All the sand and gravel permissions in Surrey would be worked out by 2019 at the latest on basis of continuation of each quarry's 2007 output until its end date, or by 2037 if extensions in time were allowed where necessary to use up the reserves permitted. Therefore, the rundown would not be affected in any way by the 2042 rule.

**WORCESTERSHIRE SAND AND GRAVEL**

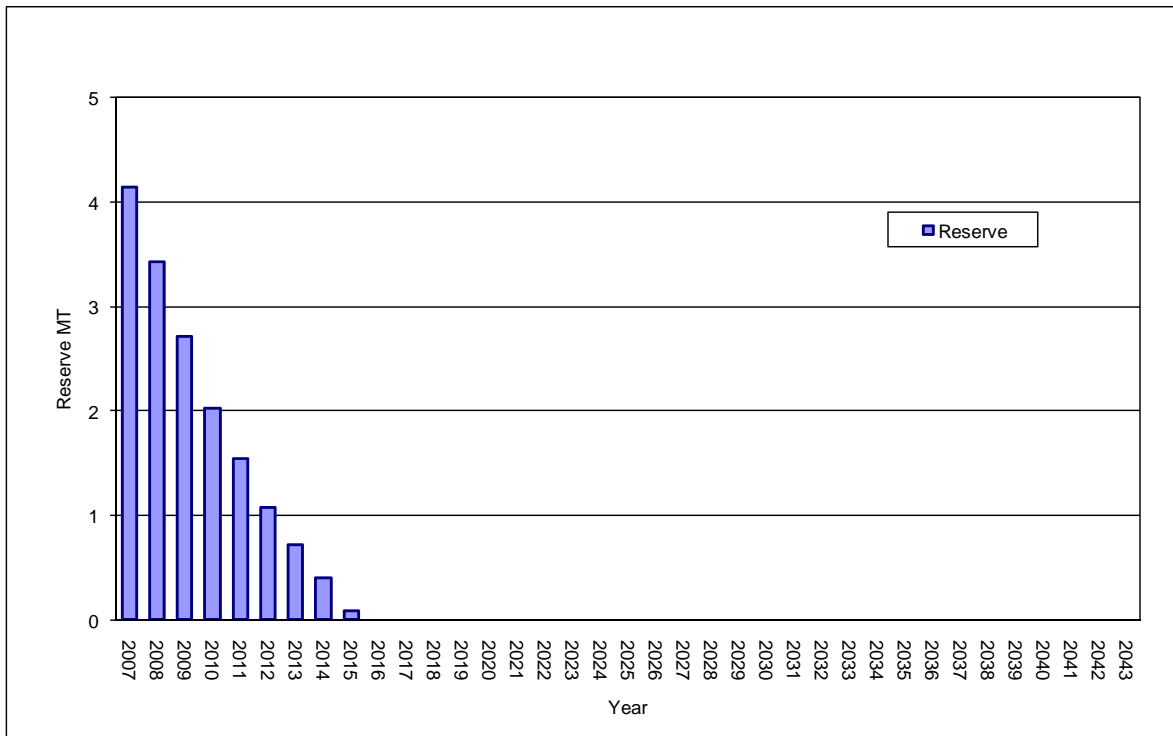
Worcestershire is a small supplier of sand and gravel in the West Midlands (0.81 Mt in 2007), contributing eight percent of regional supply from five sites. The County's apportionment for the period 2001-2016 was agreed at 0.871 Mtpa (8.1 %). With sand and gravel reserves at the end of 2007 of 4.1 Mt, the County had a landbank of 4.7 years, distinctly below the national policy objective of at least seven years supply (WMRAWP Annual report 2007). The apportionment between MPAs of the West Midlands regional allocation in the national guidelines of June 2009 has, as yet, not been agreed by all parties.

*Rundown assessment*

Based on data collated from consultation with the MPA, Figure 43 and Figure 44 shows that the limited reserves in active sites in Worcestershire at the end of 2007 would cause output to decline quickly and cease altogether after 2015, though this might be delayed for two years by the reduced demand in the recession. None of the sites have end-dates which would impede the use of all their remaining reserves.



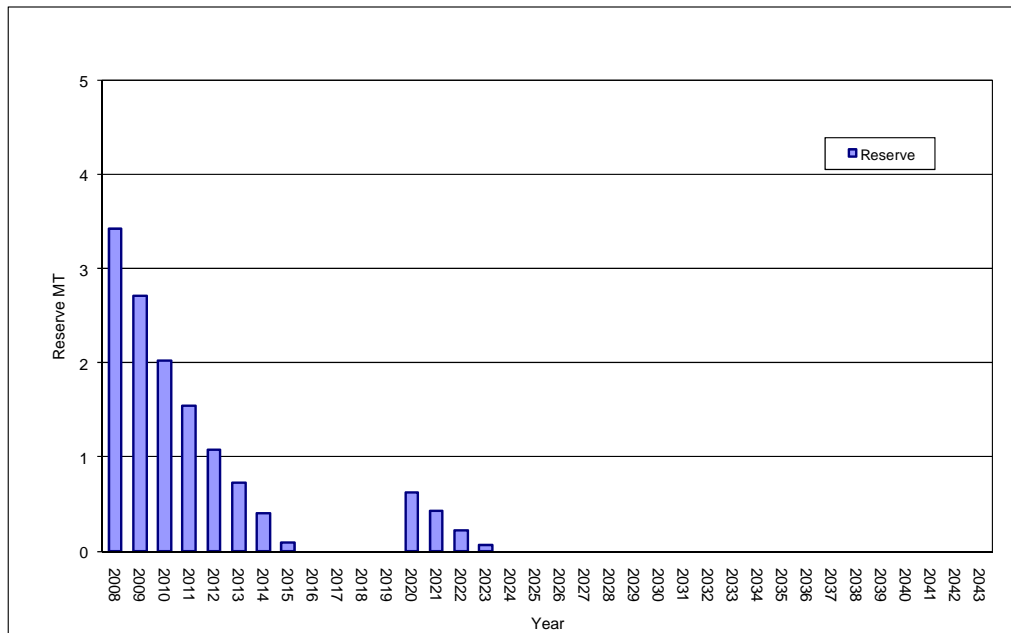
**Figure 43.** Estimated decline in sales of sand and/or gravel for aggregate from active sites - Worcestershire



**Figure 44.** Estimated decline in reserve of sand and/or gravel for aggregate from active sites - Worcestershire

*Inactive sites*

There were two small inactive sites during 2007 with combined reserves of 0.63 Mt. Figure 45 shows how the reserves at these sites might be used up if they were reopened in 2020, their contribution to overall demand would clearly be very small.



**Figure 45.** Estimated decline in reserve of sand and/or gravel if inactive sites reactivated in 2020 - Worcestershire

*\*Data does not take into consideration permission end dates*

*Dormant sites*

There are no dormant sand and gravel sites in Worcestershire.

*Development proposals post 2007*

Worcestershire County Council granted permission in 2009 for an extension to Ball Mill Farm, Grimley at Church Farm West (0.51 Mt), on condition that there would be no working at Church Farm South (0.55 Mt). However, the mineral company appealed against the condition and the result of the appeal on the entire development is not yet known. A planning application for an extension to Chadwich Lane Quarry (1.28 Mt) is also awaiting determination. If these applications were to be permitted, there would be an important boost to continuity of supply, though the county landbank would still barely reach seven years supply.

*The impact of permissions expiring in 2042*

Figure 43 showed that all output from sand and gravel sites with permission in 2007 could be expected to cease by 2015. The life of the inactive sites would depend on when these came back into use, though all or virtually all reserves from 2007 can be expected to be worked out before 2042. The rundown would, therefore, not be affected by the 2042 rule.

**NORTH YORKSHIRE SAND AND GRAVEL**

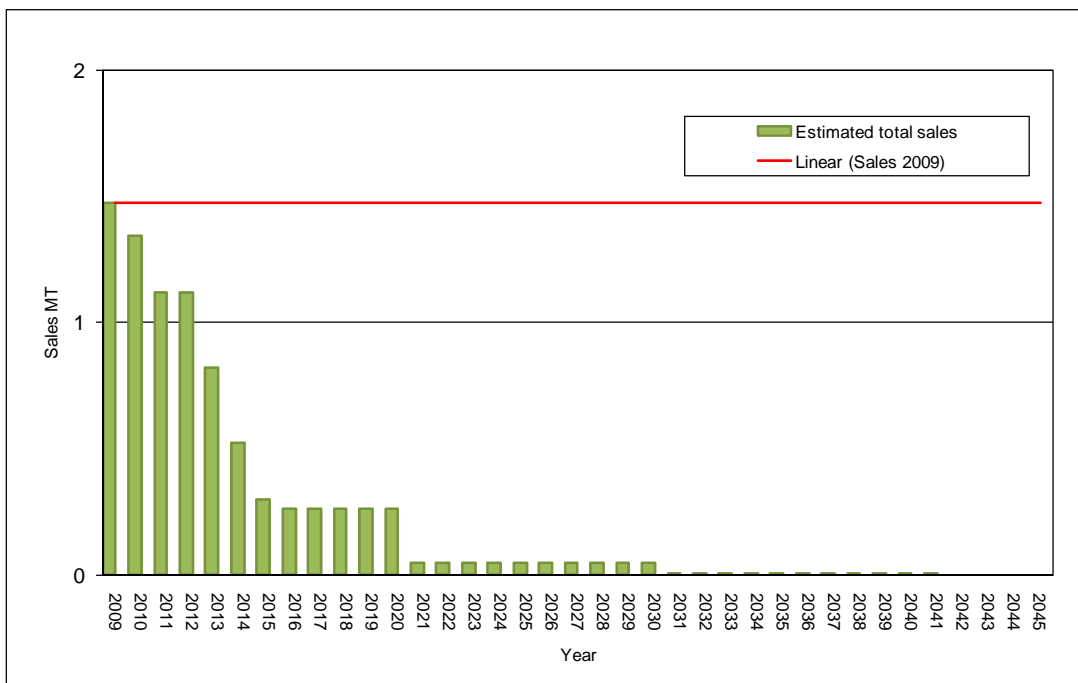
In recent years North Yorkshire has had a stable sand and gravel output at 2.5-2.7 Mtpa, with 2.70 Mt in 2007. Sales have dropped since then with the recession to under 1.5 Mt in 2009, with four of the 17 sites becoming inactive. These figures include supply from the National Parks (North York Moors and Yorkshire Dales, though in practice there were none in either in 2007). Together they supplied 62 % of the sand and gravel output of the Yorkshire and Humber region in 2007.

The Yorkshire and Humber Plan gives North Yorkshire an apportionment of 2.63 Mtpa, 57.7 % of the Government’s allocation of land-won sand and gravel to the region in 2003. With a reserve of 20.65 Mt at the end of 2007, the County had a landbank of 7.9 years. However, in practice, the North Yorkshire apportionment is further subdivided between soft sand and two categories of sharp sand and gravel: the latter distinguish quarries in locations which are suited either to dispatch to markets either northwards or southwards. Whilst there are ample landbanks of soft sand (19.7 years reserves at the apportionment rate) and sand and gravel for northward distribution (11.6 years), the landbank for sand and gravel for southward distribution was only 4.75 years at the end of 2007. This sector, the largest of all three, had reserves of 7.75 Mt and an apportionment of 1.63 Mtpa. At the same time, there has been declining output and reserves of sharp sand and gravel in Doncaster, West Yorkshire and East Riding/North Lincolnshire.

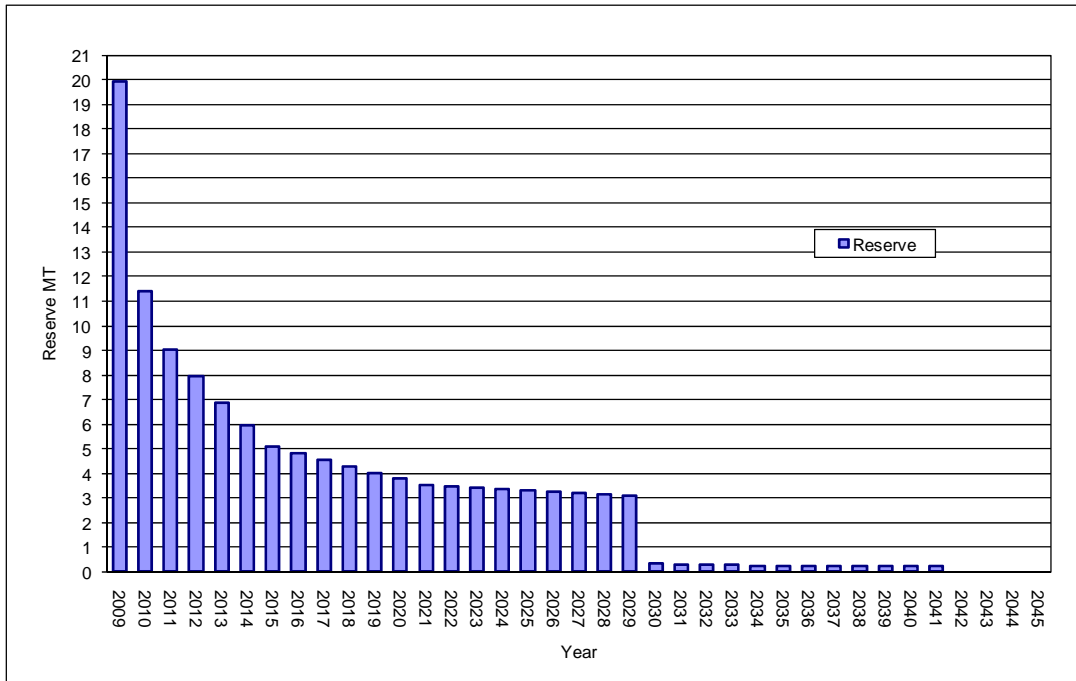
DCLG’s revised *National and Regional Guidelines for Aggregates Provision* in 2009 increased the allocation of sand and gravel to Yorkshire and Humber from 73 Mt over 16 years to 78 Mt over 16 years. However, this requirement has not yet been apportioned to individual MPAs.

*Rundown assessment*

Figure 46 shows the anticipated rundown in sales from active sites. Due to the limited remaining reserves these are exhausted by 2022, though sales quickly fall well below even the historically low rate achieved in 2009.



**Figure 46.** Estimated decline in sales of sand and/or gravel for aggregate from active sites - North Yorkshire



**Figure 47.** Estimated decline in reserve of sand and/or gravel for aggregate from active and inactive sites - North Yorkshire

Figure 47 shows the decline in the County’s reserves at both active and inactive sites combined, but assuming no output from inactive sites. By the end of 2009, there was a very substantial loss of reserves compared with 20.65 Mt at the end of 2007. This is explained principally by the permission expiring at one site, which had been inactive, with the loss of about 6.7 Mt of reserves. Within the overall quantities shown in the chart, four sites becoming inactive in 2009 transferred reserves from active to inactive sites. At the end of 2009 reserves in active sites totalled just 9.4 Mt. Clearly with the reduction in reserve particularly after 2009, the landbank will have dropped accordingly.

*Inactive sites*

The inactive sites can be expected to be brought back into use as reserves at active sites are worked out, though this would only make a modest change to the pattern of the rundown by increasing slightly the annual sales achievable and, possibly, extending the period of supply.

*Dormant sites*

There are four dormant sand and gravel pits in North Yorkshire, though the contribution they might make to future supplies is not immediately clear.

*Development proposals post 2007*

Information on recent permissions is not readily available (and is not included in annual Regional Aggregates Monitoring Reports).

## Appendix 7 Control of mineral working – 2042 end dates

The problem of old mineral workings, which might apparently go on for hundreds of years into the future, was one of many long-standing concerns about mineral working when the Government commissioned a committee under the chairmanship of Sir Roger Stevens to hold an inquiry into planning control over mineral working. The Stevens Committee's report in 1976 was a *tour de force* which included a comprehensive assessment of time limits (paragraphs 7.5-16). It concluded that an end date should be imposed for two reasons:

- to ensure that restoration takes place where this is only practicable at the end of operations (as without the condition an operator could always claim that more mineral would be extracted); and
- permissions should not be granted now which authorise activity far into the future: it should be left to our successors to decide whether a particular operation should be allowed without the burden of compensation if they considered a site should cease.

So far as the duration of permission is concerned, the committee wished to achieve a balance which would “recognise the right of our successors not to be saddled forever with our decisions while at the same time giving an operator reasonable security” (paragraph 7.14). They chose 60 years. This was a period over which capital investment would be amortised, the net present value of the right to work mineral beyond that time would be negligible, and it was an appreciable period in terms of changing attitudes and the needs of society.

Legislation implementing the committee's proposal was passed in the Town and Country Planning (Minerals) Act 1981 (section 7), which came into effect on 22 February 1982. Circular 1/82, which explained the Act, stated:

“26. .... The section makes every planning permission for the winning and working of minerals subject to a time limit. Where the mineral planning authority fail to impose a limit, a 60-year limit will automatically come into force. If at the expiration of 60 years, the deposit still contains workable minerals, then it may be appropriate for a new planning permission to be granted....

29. A 60-year time limit will also apply to mineral planning permissions granted before 22 February 1982 and will run from that date unless, in a particular case, there is already a time limit on the permission.”

The law at present is set out in the Town and Country Planning Act 1990, Schedule 5 paragraph 1.

Whilst 2042 is considered a key date for the expiry of planning permission for extraction of aggregates at several quarries, in reality new permissions will be granted which will alleviate the loss of reserves and a possible ‘cliff edge’ effect.

## Appendix 8 Assessment of minerals information in the planning process

**Table 4.** Specifications required for some common aggregate uses that may need to be considered by planners

Application	Properties	Specification
<b>Concreting aggregate</b> British standard: BS EN 12620 National Guidance: PD8882-1	Grading	Grading must be consistent (measured by particle size distribution)
	Resistance to fragmentation and durability	The amount of resistance required is dependent on end-use and is measured by the Los Angeles test. Aggregate must also be able to withstand weathering, measured by the magnesium sulphate test
	Particle shape and texture	Particles need to be smooth and round; this is measured by the flakiness index. Flaky aggregates are weaker and require more cement.
	Abrasion and skid resistance	Specification depends on end-use but material must be resistant to skidding as measured by its Polished Stone Value (PSV) and resistance to abrasion as measured by its Aggregate Abrasion Value (AAV). High PSV and low AAV are desirable
	Voids	Smooth particles with minimum voids to reduce water and cement consumption
	Fines content and quality	Low proportions of fine-grained particles and low clay contents
	Contaminants	Low (or absence of ) clay, chalk, coal, lignite, mica, alkaline chemicals and pyrite
	Water absorption	Low water absorption is desirable. Generally for concreting aggregate it will be below 1%: if water absorption is above 4% aggregate may be susceptible to frost damage.
<b>Aggregates for mortar</b> British standard: BS EN 13139 National Guidance: PD8882-3	Grading	Grading must be consistent (measured by particle size distribution)
	Durability and hardness	Aggregate for mortar needs to be sufficiently hard and durable to meet specifications but these properties are not as essential as for concreting aggregate
	Fines content and quality	Low proportions of fine-grained particles and low clay contents
<b>Asphalt and surfacing aggregate</b> British standard: BS EN 13043 and BS EN 13242 National Guidance: PD8882-2 and PD8882-6	Grading	Grading must be consistent (measured by particle size distribution)
	Fines content and quality	Low proportions of fine-grained particles and low clay contents
	Aggregate shape	After crushing particles must not be too elongate or thin, this is measured by the flakiness index: flaky aggregates will be weaker and more difficult to compact
	Resistance to fragmentation	Aggregate must not break down upon impact, this is measured by the Los Angeles test
	Resistant to polishing and abrasion	For road surfacing material aggregate must not polish and form a skid-resistant surface. This is measured by its Polished Stone Value (PSV): over 60 is considered acceptable. Resistance to abrasion, measured by its Aggregate Abrasion Value (AAV). Depending on the use

		values of below 14-10 are considered acceptable
	Resistance to stripping	When used in asphaltting applications aggregate must adhere well to the binder

### ADEQUACY OF DATA IN PAIRED CASE STUDY AREAS

This section outlines the extent of the minerals information available for area selected as case studies, based upon the consultation evidence. All of these area have complete coverage by 1:50 000 geological maps and the BGS *Mineral Resource Maps* and accompanying reports. Data held by the minerals industry is usually confidential and has not been included unless specifically mentioned during consultation.

### Hard-rock resources for crushed aggregate in Leicestershire

‘Hard-rock’ in this context refers to various igneous and metamorphic rock types with a range of different physical properties but which are all suitable for use as concreting aggregate. **Table 5** gives a summary of the main rock types that are currently being quarried, or which have recently been extracted from principal quarries that are either temporarily or permanently disused.

**Table 5.** Summary of igneous rock resources in Leicestershire.

Resource type	Unit name(s)	Age	Quarries	General area
Quartz-diorite	<i>South Charnwood Diorite</i> (or ‘Markfieldite’)	Precambrian	1. ‘Old’ Cliffe Hill* 2. ‘New’ Cliffe Hill* 3. Bradgate 1-3 (‘Old Wood’ and ‘Lawn Wood’) 4. Bluebell 5. Sheet Hedges 6. Hill Hole	Western side of Charnwood Forest (3-5 are in the Groby area and 6) is at Markfield)
Quartz-diorite	<i>North Charnwood Diorite</i>	Precambrian	1. Newhurst 2. Longcliffe	North-eastern side of Charnwood Forest
Andesite, andesitic breccia	<i>Bardon Breccia</i> ‘Bardon Good Rock’ (Bardon Volcanic Complex)	Precambrian	<b>Bardon Hill*</b> Whitwick*	Western side of Charnwood Forest
Porphyritic dacite	<i>Peldar Dacite; Peldar Dacite Breccia</i> (Bardon and Whitwick Volcanic Complexes)	Precambrian	1. Whitwick* 2. <b>Bardon Hill*</b> (but now inaccessible to quarrying here)	Western side of Charnwood Forest
Volcaniclastic sedimentary rock	<i>Charnian Supergroup, undivided</i>	Precambrian	1. Newhurst 2. Longcliffe 3. <b>Bardon Hill*</b> 4. ‘Old’ Cliffe Hill* 5. ‘New’ Cliffe Hill*	See above
Granodiorite	<i>Mountsorrel Complex</i>	Ordovician (Caradoc)	<b>Buddon Wood*</b>	Mountsorrel
Quartz-diorite	<i>South Leicestershire Diorite</i>	Ordovician (Caradoc)	<b>Croft *</b>	Southern Leicestershire

**Bold text** denotes currently working quarries. \*Denotes quarries with rail linkage.

The area in which these rock types occur has been geologically mapped in considerable detail. These rocks have also long been the subject of intensive scientific research resulting in an extensive associated literature. However, the research was not directed at assessing mineral



resources and so the results are largely unsuitable for that purpose. Nevertheless, the combined results of geological surveys and research do provide valuable indicators to the character, occurrence and general distribution of this group of rock types in Leicestershire. Published geological data include detailed geological descriptions of the rocks exposed in the quarries, mapped outcrops of the rocks, and shallow geophysical data. Freely available borehole data that relate to these rocks are generally sparse and inappropriately distributed (i.e. locally concentrated for construction-related site investigations while absent or rare elsewhere). Quarry operators for planning extensions have undertaken their own site investigations and evaluations, but the results are commercially sensitive and are not published. Only the most basic level of information regarding mineral resources exists for the igneous rocks of Leicestershire. Supplementary geological data does exist which could aid in the understanding of these resources but it is generally not aggregate focused and fragmented into numerous datasets and reports. It would be challenging with this current level of information to plan for long-term mineral supply for these resources even on a strategic level.

The following is a brief summary of geological data that are available for Leicestershire hard-rock resources:

#### CHARNWOOD FOREST (GENERAL)

There are abundant outcrops of volcanoclastic rocks, which make up the Charnian Supergroup. Many form craggy hills, and thus are extremely amenable for quarrying. However, Charnwood Forest is classified as a major conservation and recreational area, and there are initiatives to apply for AONB or Geopark status.

#### SOUTH CHARNWOOD DIORITE (CHARNWOOD FOREST)

*Old and New Cliffe Hill quarries:* outcrops suggest there is good potential for expansion and deepening of both quarries, and possibly for underground extraction between them. Little information is available regarding thickness of overburden,

*Lawn Wood - Groby area:* outcrops on BGS maps suggest potential for new quarrying at Lawn Wood (SK 506 096), and north of Groby Pool (SK 520 088). Geophysical work and site investigation drilling have recently been carried out by 'Waste Recycling Group' to determine the thickness of Triassic overburden and depth to the south Leicestershire diorite around the Lawn Wood/Groby quarries but the data have not been published. Major outcrops exist in Bragdate Park to the north, but this is an important recreational and conservation area.

#### NORTH CHARNWOOD DIORITE

*Newhurst and Longcliffe quarries:* potential for SE expansion of Newhurst Quarry, but a) rate of deepening of overburden is not known, and b) the resource would be in Charnwood Supergroup volcanoclastic rocks only.

Unquarried outcrops are present at Carters Rough (SK 495 147) and Bawdon Rough (SK 496 143).

#### BARDON BRECCIA AND PELDAR DACITE

*Bardon Hill quarry:* potential for expansion westwards, towards Rise Rocks, but this would include significant areas of Charnian Supergroup volcanoclastic rocks. Overburden depth in that area has been assessed by the company owning Bardon Hill (unpublished data). A seismic reflection survey across the overburden was carried out on the southern margin of Bardon Quarry. Andesitic rock, which appears similar to the Bardon Breccia, is presently unquarried at Birch Hill, 1.5 km west-north-west of Bardon Hill. No information is available on overburden thicknesses in the intervening ground.

## PELDAR DACITE BRECCIA

*Whitwick quarry*: Attempts were made to expand the resource north-westwards, but abandoned due to unanticipated, rapidly varying overburden thicknesses. The quarry floor remains wide, and seems capable of being deepened further, with expansion also possible to the north.

## MOUNTSORREL COMPLEX (GRANODIORITE)

*Buddon Wood quarry*: the quarry has recently been expanded to the south-east and north-east; its greater resulting width would thus allow further deepening. Outcrops suggest the potential for further expansion following removal of overburden to the south-east and north-west.

Shallow geophysical investigations involving magnetic, seismic and gravity techniques were carried out to the west of Buddon Wood Quarry. They enabled estimates to be made of the depth of Triassic overburden and the likely sub-surface extent of the Mountsorrel Complex. Deep geophysical modelling of ground including the Mountsorrel Complex was carried out.

## SOUTH LEICESTERSHIRE DIORITE (QUARTZ-DIORITE)

*Croft quarry*: outcrops suggest potential for expansion into the current processing area to the south-east, and also to the north-east, but rate of overburden thickening would be a major consideration.

## OTHER FORMERLY QUARRIED OUTCROPS:

- *Huncote* (SP 525 975). Unrestored; potential for further expansion and deepening
- *Enderby* (SP 536 999). Potential for further expansion to the east (however, this is into 'The Park')
- *Barrow Hill and Yennards* (SP 489 971) Potential for further expansion (see below), but resource may be narrow and its edge may plunge steeply beneath Triassic overburden.
- *Clint Hill, Cary Hill, Stoney Stanton, Stoney Cove, Sapcote and Calver Hill* (SP 490 950 – 497 931). Best potential for expansion is from Stoney Cove southwards to Calver Hill, and west of there (see below). Resource may be narrow and its edge may plunge steeply beneath Triassic overburden

## CONCEALED EXTENSIONS TO THE SOUTH LEICESTERSHIRE DIORITE

Geophysical studies involving gravity and magnetic measurements supplemented by a National Coal Board (NCB) seismic reflection line indicate a ridge-like mass of diorite buried beneath about 40 metres of Triassic strata and centred on Elmesthorpe, to the west of the Clint Hill-Calver Hill line of diorite outcrops.

**Crushed limestone aggregate resources in the Peak District**

The limestone resources of Derbyshire were the subject of detailed mineral assessment surveys undertaken by the British Geological Surveys in the 1970s and 1980s. These surveys were based on detailed large-scale (1:10560 scale) geological mapping supplemented by data from over 100 specially commissioned cored boreholes of various depths, and numerous sections in natural exposures and quarries. The results were published in six mineral assessment reports. Each report describes the geology of the area, delineates the categories of limestone and reports the results of investigations of chemical and mechanical properties. These are presented with outline borehole logs and the statistically analysed data for the stratigraphic units described. Accompanying 1:25 000 scale maps show the distribution of limestones classified by their purity, and the occurrence of dolomite and dolomitised limestone. Subsequently, the data from these reports was collated, synthesised and summarised in a Guide to the limestone and dolomite resources of the Peak District (Harrison and Adlam, 1984).

The Guide, which is the most comprehensive review of the mineral resource potential of the limestones of the area to date, concluded that the limestones exhibit little regional or stratigraphical variation in their aggregate properties. However, the dolomites, dolomitised limestones and shale-dominated sequences may not be suitable for aggregate. Locally, the quality of the resources may be adversely affected by mineralisation or waste deposits occurring within them but excessive overburden is rarely an issue.

These IMAU assessment surveys were primarily focused on chemical properties of the resources for industrial uses, so a re-evaluation of the data in a form appropriate for a crushed aggregate end-use might be desirable. Nevertheless, the data are sufficient to separate areas of high quality and low quality aggregate (that is, softer dolomitic rock or geological units with a high mudstone content), categories that are not currently captured in landbank figures for the East Midlands.

Accurate volume estimates for the limestone resources would be difficult to calculate using current data, especially at a site-specific level. A detailed 3D model would be required because of the structural and geological complexities. The construction of such a model is probably feasible although it would be a challenging and costly task.

This level of geological data found in Peak District is the highest for any area of hard rock resource in the UK and is suitable for the delineation of mineral site allocations. However, because of the structural complexity of the area resource volume calculations though difficult, could be possible on a site specific bases, especially with supplementary information from the minerals industry.

### **Crushed limestone aggregate resources in Derbyshire outside the Peak District National Park**

These areas were included in the assessment surveys and synthesis for the wider region described above. Consequently, the data are similar and, as the Guide concluded that regional and stratigraphical variation of aggregate properties is slight, the level and quality of information are broadly comparable.

### **Crushed limestone resources of the Mendip Hills**

The geology of the Mendip Hills is well-known and has long been the subject of scientific investigation. Numerous publications and papers, including the maps and memoirs of the BGS, cover a wide range of aspects of Mendips geology.

Unlike the Peak District, the limestones of the Mendip Hills have not been systematically assessed for mineral resource purposes. Nevertheless, they have long been quarried for a variety of end-uses, including as an aggregate, from over 50 quarries (Booth, 2007) of which eight are still actively extracting limestone for aggregate. Consequently, there is a considerable amount of data relating to the chemical and physical properties of the limestone formations. Much of it is site-specific, however, because the geology of the limestones is so well understood, it can to a considerable extent be extrapolated to inform any an evaluation of potential limestone resources.

In the early 1990s, the Department of the Environment commissioned the BGS to provide information on the geology and resource potential of the limestones of the Mendips and their hydrogeology. The result was an exhaustive collation and synthesis of data from BGS maps, memoirs, archives, academic works and industry sources presented as a report entitled 'Limestone resources and hydrogeology of the Mendip Hills' (Harrison *et al.*, 1992). Although primarily a desk study, some samples were collected to provide additional data on aggregate and chemical properties of the rocks. In addition, a small amount of hydrogeological fieldwork was undertaken to collect water samples and carry out geophysical logging of certain boreholes. This report is the most thorough and up-to-date description of limestone resources in this district, and should form the basis of any future mineral planning strategies.

Dolomitisation is of particular significance as it is undesirable for concreting aggregates. A BGS report and accompanying map (Booth, 2007) attempted to delineate and describe the extent of dolomitic limestones in south-west Britain, including those of the Mendip Hills. It presented chemical analyses of samples from a range of limestone formations and quarries and highlights the varying degrees of dolomitisation.

Minerals information for the Mendips is extensive and the level of available data could not be improved upon unless a substantial drilling and testing survey was undertaken. The available data is suitable to aid in the delineation of preferred areas, although extra information may be needed for accurate volume calculations.

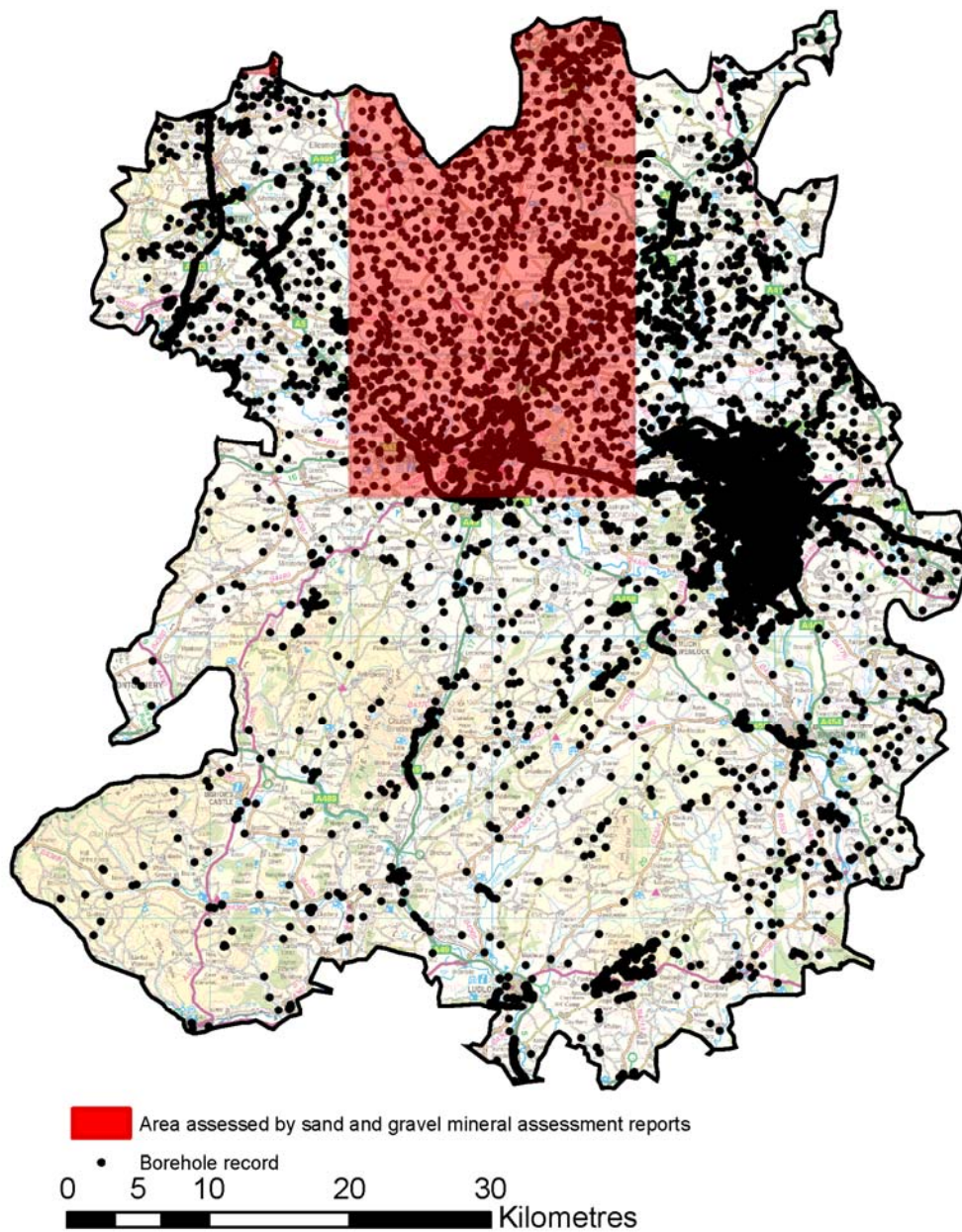
### **Sand and gravel resources in Shropshire**

By volume alone, most of the sand and gravel resources of Shropshire are within glacial deposits. From a mineral assessment point of view this is significant because, unlike sand and gravel in river deposits, glacial sand and gravel deposits are extremely variable, even chaotic, in composition, grading and thickness. They are often concealed beneath other, non-mineral, glacial deposits which also vary considerably. This means their distribution, variation and overburden ratios cannot be predicted with any degree of certainty without abundant and widespread borehole data.

Ideally, for strategic planning, systematic assessment surveys are desirable. Shropshire has been the subject of several such surveys (IMAU), carried out by BGS in the 1970s and early 1980s, covering an area of about 600 km<sup>2</sup> in the north of the county (Figure 48). This represents about 17 % of the total county area but a greater proportion of ground that is likely to be mineral-bearing. Outside of the surveyed area the distribution of borehole data held in the National Geoscience Records Centre (NGRC) varies considerably. In the north of the county, especially around Telford, it is relatively abundant and reasonably widely spread. However, very few of the boreholes were sunk for the purpose of identifying sand and gravel resources: their logs are unlikely to contain consistent information about the quality of the sand and gravel. Many were drilled for site investigation and will probably be too shallow to be of use for mineral assessment. Borehole data for the southern half of the county are, by comparison, sparse and unevenly distributed (Figure 48).

The BGS assessment surveys showed that glacial sand and gravel deposits in the northern part of the county are thick (locally exceeding 25 m) and include extensive concealed resources. However, although the grading of the deposits varies, the greater proportion is sand. By contrast, where river sand and gravel deposits were encountered they tended to be thinner (rarely exceeding 5 m), much more consistent and comparatively gravel-rich (more than 50 % gravel). Unfortunately, while geological maps suggest that most of the unsterilised river sand and gravel deposits in Shropshire are probably outside the assessment survey areas, there is little consistent and suitable data on their resource potential.

There is currently a high level of minerals information regarding the sand and gravel resources of Shropshire, principally contained within IMAU studies. It is adequate for mineral safeguarding and can contribute a great deal towards the delineation of preferred areas. Additional data may be required to accurately estimate resource volumes because of the complex nature of the deposits. Extra data is also needed for fluvial deposits in the south of the county which are not covered by IMAUs.



**Figure 48.** The distribution of boreholes and Mineral Assessment Reports in Shropshire.

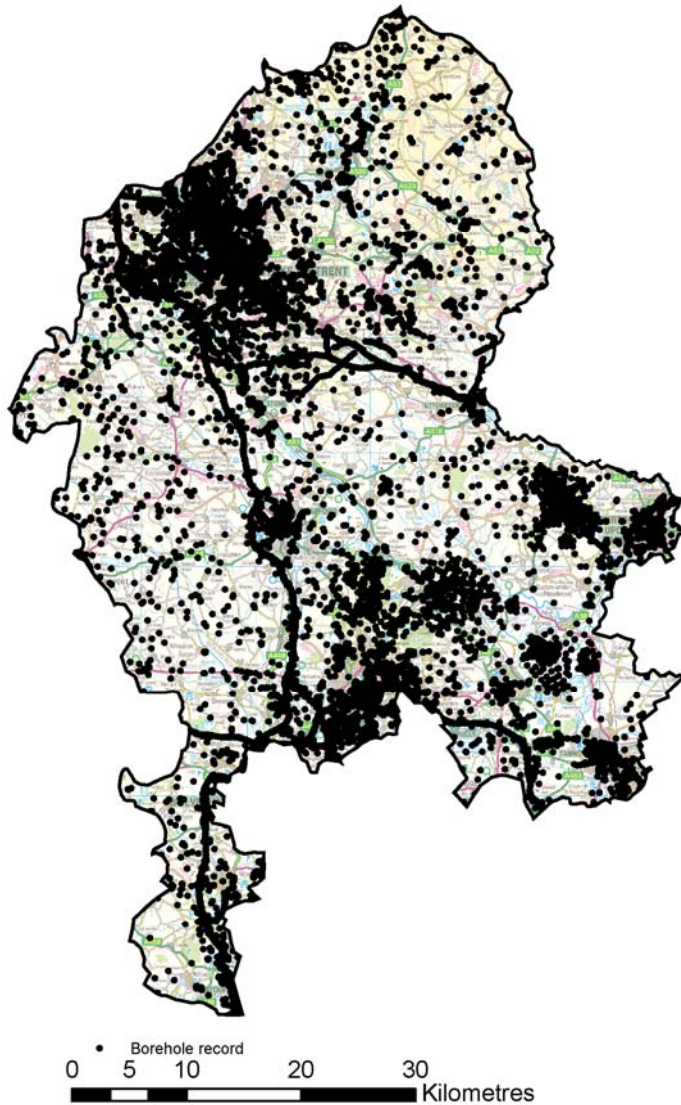
**Sand and gravel resources in Staffordshire**

No systematic mineral assessment surveys have been carried out for Staffordshire and consequently, in comparison to Shropshire, sand and gravel resources are very poorly known as can be seen in Figure 49. Borehole data held by the NGRC tend to be unevenly spread and are concentrated in the urban areas of Stoke-on-Trent, Stafford and Cannock and along major roads (Figure 49). Where borehole data is comparatively abundant the boreholes were generally sunk for site investigation or coal exploration and the information contained the logs is generally unsuitable for sand and gravel assessment.

Like Shropshire, sand and gravel resources in Staffordshire are within both glacial and river deposits and have broadly similar characteristics. A BGS report 'Mineral resource information for Development Plans Staffordshire: resources and constraints' (Highley and Cameron, 1995) describes the highly variable nature of the glacial deposits. However, beyond stating that glacial sand and gravel deposits are known to locally extend beneath or within other, non-mineral, glacial deposits, but was unable to elaborate further on their extent, thickness or overburden ratios throughout the county.

There appears to be little information on the composition and thickness of the river sand and gravel deposits. The geological map shows their extent but it should be noted that Highley and Cameron (1995) suggest that the distinction between glacial sand and gravel and river deposits, as mapped, may be uncertain. These authors reported average and maximum thicknesses for river sand and gravel deposits but they appear to be based on very sparse data. They also speculated on possible geographical variation in gravel composition but this is based largely on their knowledge of the bedrock of the river catchments, which is the likely source for much of the sand and gravel.

An earlier desk study (Croft and James, 1984) examined in detail the data available for sand and gravel resources in the Dove-Derwent catchment. It included the eastern part of Staffordshire, in particular the valley of the River Dove above Burton-upon-Trent and adjacent areas, where it identified both river and glacial sand and gravel deposits. The report concluded that '*The [NGRC] borehole and well database for the most part comprises records reliable enough to be taken into account in evaluating resources. However, information is too unevenly spread to allow conclusions to be drawn about the detailed nature and distribution of the sand and gravel, except close to sample points. At the same time, it is not sufficiently random to permit reliable estimates to be made.*' Moreover, for glacial sand and gravel little could be said with any certainty and more detailed investigation was needed to enable evaluation. In respect of river deposits, although they appeared to contain workable sand and gravel, the data was '*not adequate...for long term planning*'. These conclusions, although referring to a small part of eastern Staffordshire, could equally apply to the whole of the County and reflect the very basic nature of the minerals information available for this area.



**Figure 49.** The distribution of boreholes in Staffordshire.

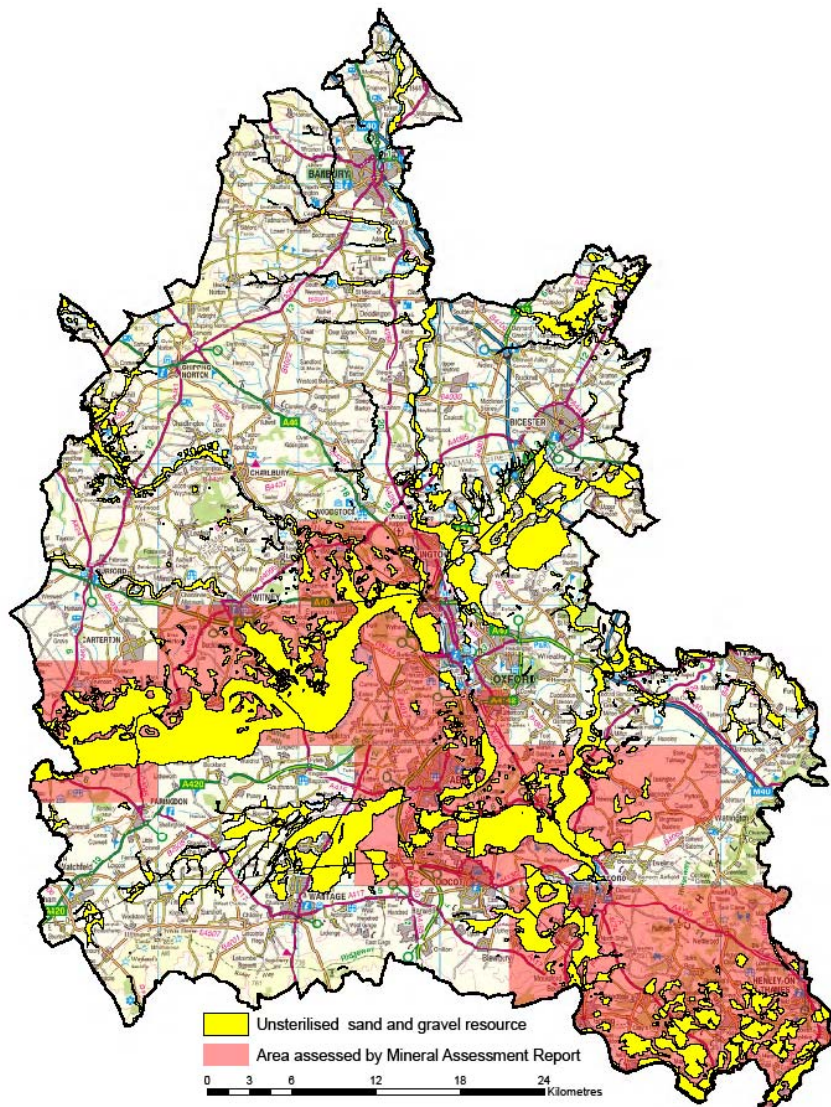
### **Sand and gravel resources of Oxfordshire**

Sand and gravel resources of Oxfordshire occur within bedrock formations and superficial deposits. The former are worked primarily for building sand so will not be considered in this review. Superficial deposits can be further subdivided into river deposits, glacial deposits and head deposits. Of these, by far the greatest proportion of the sand and gravel resources lie within river deposits, particularly those of the River Thames and its principal tributaries. Sand and gravel in head deposits are confined to the chalk slopes east of Wallingford where, although they have a high proportion of 'fines', they have been extensively worked. The only significant spread of glacial sand and gravel is in the north-east of the county around Finmere.

The sand and gravel resources of the main valley of River Thames have been assessed at the indicated level in a series of IMAU studies undertaken during the 1970s as can be seen in Figure 50. Only the river deposits along tributary valleys, such as the Ray and the Thames, were excluded but brief notes about these were later included in a desk top summary of the sand and gravel resources of the Thames Valley (Hopson, 1982). This summary also presented some supplementary data on the physical properties of sand and gravel in the Thames Valley. In

particular, it showed that the limestone-dominated gravels of the Thames Valley above Oxford are relatively weak compared to the increasingly flint-dominated gravels downstream.

In short, sand and gravel resources of the river deposits of Oxfordshire are amongst the most thoroughly assessed in the country. Only the glacial sand and gravel deposits around Finmere have not been assessed in some form. Geological maps show a moderately-sized spread and imply that the deposits continue beneath overburden of non-mineral glacial deposits. They have been worked but borehole data are too sparse to permit an evaluation of quality or full extent. Although there is not county wide coverage for Oxfordshire from IMAU studies the main resources areas are covered in sufficient detail to aid in the delineation of mineral site allocations. This level of data is adequate to understand the volumes and qualities of resources in this area for longer term mineral planning.



**Figure 50.** Minerals information in Oxfordshire, unsterilised resource area is as identified by Benham *et al.*, 2006b.



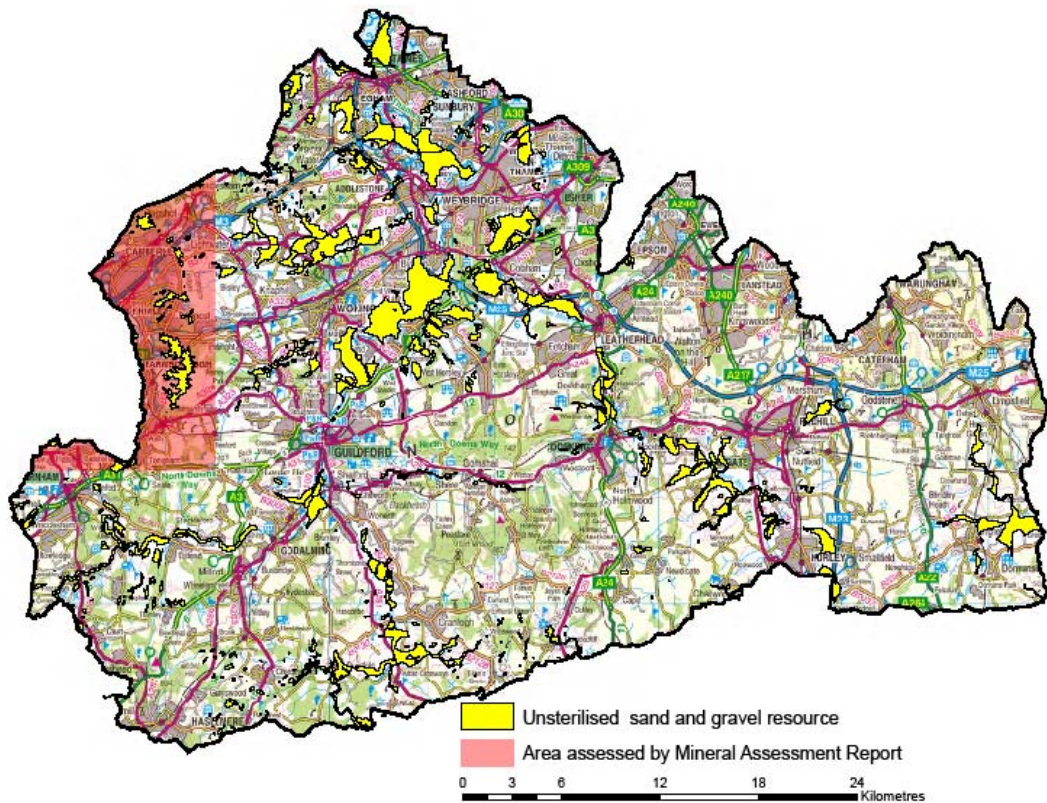
### Sand and gravel resources of Surrey

Sand and gravel resources of Surrey occur within bedrock formations and superficial deposits. The former are primarily worked for building sand or silica sand so will not be considered further in this review.

All of the sand and gravel resources occur within river deposits, principally around the confluence of the River Thames and its tributaries the rivers Mole and Wey. Only the river deposits of the Blackwater River, along the western boundary of the county, have been assessed at an indicated level (Figure 51).

The river sand and gravel deposits in the northern part of the county are extensive. Their distribution there is well known from geological maps, existing quarries and abundant borehole data, but they are largely sterilised by urban development. Sand and gravel are mapped along the Mole and Wey valleys but there is very little information on their quality and thickness (Benham *et al.*, 2006b).

The geological data available Surrey is not suitably detailed for defining site allocations. Where sufficient information does exist, areas of mineral resource are largely sterilised. Only the most basic level of data is available for the remaining resource areas, which require detailed study before accurate mineral volumes and qualities are known.



**Figure 51.** Minerals information in Surrey, unsterilised resource area is taken from Benham *et al.*, 2006b.

## Appendix 9 Paired case studies

### INTRODUCTION

The following text explains the minerals planning policy position as regards the various natural and cultural heritage designations (as mapped in Figure 52–Figure 61) and provides guidance on the use and interpretation of the case studies and the supporting figures. The case studies below should be read in conjunction with this text.

### CASE STUDIES AND SUPPORTING FIGURES

The case study discussions and figures are purely derived from desk-based-studies. The maps are not intended for any use other than to give a general overview of the various types of major designations and other potential constraints to future mineral development within the areas involved. These include features of the natural environment (biological, geological and landscape quality), and features of the historic environment (including archaeological, built environment and cultural heritage). Each case study, depending on its subject, is discussed in varying degrees of detail. It should be noted that, while an overview of the types of constraints that may be faced in future quarrying scenarios can be given, each application for minerals extraction is assessed on its merits, including proposals for the mitigation or avoidance of potential impacts. The presence (or otherwise) of environmental or other constraints therefore does not necessarily preclude or permit future aggregate extraction.

As regards the mapped information (on which the case studies are largely based), international and national designations (see below), plus Ancient Woodland, Country Parks and Local Nature Reserves were available for all areas and were supplied by Natural England and English Heritage. Other information (such as Local Geological Sites, see below) is held locally by individual planning authorities and was more difficult to obtain within the timeframe of this study. Where such information has been obtained it has been included within the figures and has informed the case study discussion, but the absence of such information does not mean that such sites do not exist.

Similarly, landscape areas that are of local or regional importance, but not included within national designations, are shown where the information could be obtained.

### PLANNING POLICY AND ENVIRONMENTAL DESIGNATIONS

Key references that have been relied upon in preparing the following text are Minerals Planning Policy Statement 1 (MPS1) *Planning and Minerals*; Planning Policy Statement 9 (PPS9: *Biodiversity and Geological Conservation*) together with the accompanying joint ODPM/Defra Circular<sup>3</sup>; PPS1 (*Delivering Sustainable Development*); PPS7 (*Sustainable Development in Rural Areas*); and PPS5 (*Planning for the Historic Environment*).

The designations for which mapping could be obtained are highlighted in bold. Where it is pertinent to mention other designations that could not be mapped, these are included within the relevant text. Other aspects that have not been mapped or discussed under each case study but that, nevertheless, may act as constraints to minerals development (and that are mentioned within National Policy) are briefly noted at the end of this text. It should be noted that the order in which the designations are described does not reflect the weight they are given within the planning process.

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<sup>3</sup> CLG Circular 06/2005, Defra Circular 01/2005 to accompany Planning Policy Statement 9.

## International Designations

International designations have been divided on the maps into two broad categories – those based on natural heritage features and those based on cultural heritage.

### NATURAL HERITAGE

These designations include **Special Protection Areas (SPAs)**, **Special Areas of Conservation (SACs)** and **Ramsar** Convention sites.

SACs are protected sites designated under the EC Habitats Directive. These sites form an important network of high quality conservation areas contributing to conserving the habitats and species identified in Annexes I and II of the Habitats Directive.

SPAs are protected sites (classified for rare and vulnerable birds and regularly occurring migratory species) in accordance with Article 4 of the EC Birds Directive.

MPS1 states that where minerals development is proposed within, adjacent to, or where it is likely to significantly affect SPAs, SAC and Ramsar sites planners must take account of the advice contained in PPS9 and the accompanying circular.

Potential SPAs and candidate SACs (cSACs) which have been submitted to the EC but not yet adopted do not have statutory protection under the Habitats Regulations but are to be treated the same as confirmed sites when considering development proposals that may affect them. Listed Ramsar sites, wetlands of international importance designated under the Ramsar Convention, are also to be protected to the same level as designated SPAs and SACs.

### CULTURAL HERITAGE

**World Heritage Sites (WHSs)** are inscribed by the UNESCO World Heritage Committee for their Outstanding Universal Value. MPS1 states that major mineral developments should not be permitted in WHSs except in exceptional circumstances and that applications for such developments should be subject to the most rigorous examination and be demonstrated to be in the public interest<sup>4</sup>. MPS1 dictates that consideration of applications within such sites should “include an assessment of:

- (i) the need for the development, including in terms of national considerations of mineral supply and the impact of permitting it, or refusing it, upon the local economy;
- (ii) the cost of, and scope for making available an alternative supply from outside the designated area, or meeting the need for it in some other way;
- (iii) any detrimental effect on the environment, the landscape and recreational opportunities and the extent to which that could be moderated.”

The development and all restoration of permitted sites should be carried out to high environmental standards, supported by appropriate conditions, and be in character with the local landscape and its natural features.

Where proposals which are not considered to be major these should be carefully assessed, “with great weight given to the conservation of the natural beauty of the landscape and countryside, the conservation of wildlife and the cultural heritage and the need to avoid adverse impacts on recreational opportunities”.

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<sup>4</sup> Further advice on the planning and protection of WHSs is given in *Planning Policy Guidance 15: Planning and the Historic Environment (PPG15)* and *CLG Circular 07/09: Protection of World Heritage Sites*.

## National Designations

### LANDSCAPE

The national landscape designations include the 10 English **National Parks** (including the **Broads**) and the 35 English<sup>5</sup> **Areas of Outstanding Natural Beauty** (AONBs). National Parks are protected areas because of their beautiful countryside, wildlife and cultural heritage. The most recent addition to the list of Parks is the South Downs National Park, having been designated as an authority on 31st March 2010. Both National Parks and AONBs are areas of countryside that include towns and villages. The Parks have their own planning authorities and planning controls, while the AONBs are looked after by local community and local authority partnerships.

As with WHSs, MPS1 states that major mineral developments should not be permitted except in exceptional circumstances, demonstrably within the public interest before being allowed and should be assessed according to need, alternatives and detrimental effects.

### NATURAL HERITAGE

The national natural heritage designations are **Sites of Special Scientific Interest** (SSSIs), which at national level also encompass<sup>6</sup> **National Nature Reserves** (NNRs). SSSIs contain examples of the country's very best, rarest and threatened wildlife and geological features. In England they account for 8 % of the land area and play a unique part in helping to conserve biodiversity and geodiversity.

MPS1 advises that planning permission should not normally be granted on land within or outside a SSSI, if it is likely to have an adverse effect on the SSSI (either individually or in combination with other developments). Guidance on SSSIs is given within PPS9 and the accompanying circular that a high degree of protection should be given to SSSIs, or those features of SSSIs, that are not already covered by an international designation. Where an adverse effect on the site's notified special interest features is likely, an exception should only be made where the benefits of the development, at this site, clearly outweigh both the impacts that it is likely to have on the features of the site that make it of special scientific interest and any broader impacts on the national network of SSSIs.

Subject to the interest for which it is designated, and the nature of the extraction operation, there may be potential to mitigate any effects of quarrying. There is also the potential for mineral sites to contribute to nature conservation, for example, quarries may extend habitats through appropriate restoration and, depending on the type of site<sup>7</sup>, may provide accessible exposures of the geological features and substituting any removed features.

### CULTURAL HERITAGE

'Designated heritage asset' is defined by PPS5 as referring to **Listed Buildings, Scheduled Monuments, Parks and Gardens** and **Registered Battlefields**. It also includes Protected Wreck Sites and Conservation Areas, although these have not been assessed in the case studies.

Listed buildings are designated under the *Planning (Listed Buildings and Conservation Areas) Act, 1990* by the Secretary of State for their special architectural or historic interest; Scheduled monuments are designated under the *Ancient Monuments and Archaeological Areas Act, 1979* by

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<sup>5</sup> One site is partially within Wales.

<sup>6</sup> The Natural England website notes that: "NNRs are a selection of the very best parts of England's Sites of Special Scientific Interest. It is this underlying designation which gives NNRs their strong legal protection. The majority also have European nature conservation designation".

<sup>7</sup> See Prosser, C., Murphy, M. and Larwood, J. 2006. *Geological Conservation: a Guide to Good Practice*. Natural England.

the Secretary of State for their national importance; Registered parks and gardens are designated by English Heritage under the *Historic Buildings and Ancient Monuments Act*, 1953 for their special historic interest, and; Registered Battlefields are designated by English Heritage on a non-statutory basis.

While the *Register of Historic Battlefields* is non-statutory, it is recognised as a material consideration in planning terms. Thus, following an application for a development which may affect a battlefield, local planning authorities must take into account the historic interest of the site when determining the application.

In addition to Listed Buildings, Conservation Areas are designated under the 1990 Act, primarily by local authorities, for their special architectural or historic interest the character or appearance of which it is desirable to preserve or enhance. These are not mapped on the appendix figures.

MPS1 requires adopting “a presumption in favour of the preservation of listed buildings, nationally important archaeological remains (including scheduled ancient monuments) in situ, and their settings, if mineral proposals would cause damage or have a significant impact on them, unless there are overriding reasons of national importance for the development to proceed”.

PPS5 identifies that the setting of cultural heritage features is important and may make a positive, negative or neutral contribution to the significance of the feature itself. The extent of ‘setting’ is not fixed and may change as the cultural asset and its surroundings evolve.

### **Regional, Local and other Sites**

Regional and local sites include a wide variety of sites that are designated for various landscape, cultural, and natural heritage reasons. Those sites included as ‘local’ within PPS9 are Sites for Importance for Nature Conservation (SINCs), **Local Nature Reserves** (LNRs), County Wildlife Sites and **Local Geological Sites** (LGSs)<sup>8</sup>.

MPS1 requires the careful consideration of mineral proposals within or likely to affect regional and local sites of biodiversity, geodiversity, landscape, historical and cultural heritage. PPS9 states that criteria-based policies should be established in local development documents against which proposals for any development on, or affecting, such sites will be judged. These policies should be distinguished from those applied to nationally important sites.

Other wildlife sites of local conservation interest, variously called Listed Wildlife Sites (LWS), Local Nature Conservation Sites (LNCS), Sites of Importance for Nature Conservation (SINCs)/Sites of Nature Conservation Importance (SNCIs)<sup>9</sup> are defined in local plans and are a material consideration in the determination of planning applications.

**Country Parks** are statutorily declared and managed by local authorities under the Countryside Act 1968. The parks primarily provide recreation and leisure opportunities close to population centres however, many are in areas of semi-natural habitat, thus forming a valuable network of sites where informal recreation and the natural environment coexist<sup>10</sup>.

Areas of **Ancient Woodland**, that do not have statutory protection (for example, as SSSIs) are identified by local planning authorities. MPS1 states that mineral proposals that would result in loss or deterioration of ancient woodland, not otherwise statutorily protected, should not be permitted, unless the need for (and benefits of) the development in that location would outweigh the loss of the woodland habitat. Authorities should also take account of the value that existing woodland offers in terms of amenity and habitat, when considering mineral proposals.

<sup>8</sup> This term, used throughout this report, has generally replaced and encompasses Regionally Important Geological/Geomorphological Sites (RIGS) and other locally designated sites that have geological importance.

<sup>9</sup> See ‘Local Sites - Guidance on their Identification, Selection and Management’ (Defra 2006) for a fuller list of local sites.

<sup>10</sup> <http://www.jncc.gov.uk/page-1527>

**Areas of Great Landscape Value** (AGLVs), Special Landscape Areas and **Regional Parks** are regionally or locally developed landscape designations, protected through local policy. Two examples of such areas are encountered within the case studies are the Charnwood Forest proposed Regional Park and the Surrey Hills AGLV. Both of these areas are provided for within the emerging local policy framework.

## Unmapped Considerations

### WIDER ENVIRONMENT

In all locations that have been investigated as case studies, there may be aspects of the wider landscape, natural heritage and cultural heritage which are important. MPS1 requires that authorities “take account of the value of the wider countryside and landscape, including opportunities for recreation, including quiet recreation, and as far as practicable maintain access to land” and that the impact of minerals operations on its quality and character should be minimised while also considering “the cumulative effects of local developments”.

With regard to the wider landscape, outside the national designations, PPS7 states that: “there are areas of landscape outside nationally designated areas that are particularly highly valued locally. The Government believes that carefully drafted, criteria-based policies in LDDs [Local Development Documents], utilising tools such as Landscape Character Assessment, should provide sufficient protection for these areas, without the need for rigid local designations”. Thus, local authorities use landscape character assessments to cross reference to specific planning policies. Natural England’s ‘Character of England Landscape Character Areas’ provide a high level statement of the components and dynamics of the landscape to consider in series with site specific assessments.

PPS9 also notes that appropriate weight should be attached (by planners) to “geological interests in the wider environment” as well as to designated sites of international, national and local importance.

As well as covering *designated* heritage assets, PPS5 covers those that are not designated but which are of heritage interest –these are thus a material planning consideration.

### WATER ENVIRONMENT

The water environment comprises groundwater and surface water bodies and the water resources within them, together with the ecosystems, habitats, species, water users, existing land use and development, and archaeological features that are either dependent on those resources or sensitive to changes in their conditions<sup>11</sup>. The water environment is protected by European legislation of the Groundwater Directive (80/68/EEC), the Water Framework Directive (2000/60/EC) (which sets up an overarching system for the protection of all water and sets a series of environmental objectives) and the Groundwater Daughter Directive (2006/118/EC)<sup>12</sup>. This legislation is implemented in England and Wales by the Environment Agency (EA).

Mineral extraction can potentially have a range of positive and negative impacts on the water environment and these are material planning considerations. These effects may be associated with various aspects of mineral working, from initial ground investigations through to excavation, dewatering (where required) and reclamation.

The EA are responsible for regulating permits for the extraction and discharge of water which may be an integral requirement in the operation of an extraction site. Key to the regulation of

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<sup>11</sup> Thompson, A., Howarth, C., Goodwin, A., Buckley, C. and Harris, K. (2007). *Recommendations for Draft Policy for Annex 3 to: Minerals Policy Statement 2: Controlling and Mitigating the Environmental Effects of Minerals Extraction in England. The Water Environment*. Report to CLG / MIRO. Capita Symonds Ltd, East Grinstead.

<sup>12</sup> Groundwater Protection: Policy and Practice (GP3), 2008.

groundwater sources, from which wells, boreholes and springs produce public drinking water supply, are Source Protection Zones (SPZs). There are three levels of protection – inner (SPZ1), outer (SPZ2) and catchment source (SPZ3). In most cases, any adverse effects can be anticipated and prevented, or reduced to an acceptable level by means of assessment, planning, monitoring and appropriate mitigation measures and the mineral planning authority will consider these factors when deciding on a planning application.

#### PROTECTED SPECIES/HABITATS

Statutory protection is given to many individual wildlife species under a range of legislative provision. MSP1 requires that the special protection afforded to European protected species is fully taken into account when considering mineral proposals which might affect them. PPS9 states that, “through policies in plans, local authorities should also conserve other important natural habitat types that have been identified in the Countryside and Rights of Way Act 2000 section 74 list, as being of principal importance for the conservation of biodiversity in England and identify opportunities to enhance and add to them”. Protection may also extend to a species’ natural range for foraging, commuting and cover habitat connectivity, for example Ecological Zones of Influence (EZIs).

#### GREEN BELT

MPS1 notes that “mineral extraction need not be inappropriate development [within the Green Belt], nor conflict with the purposes of designating Green Belts” and that “all mineral-related developments in the Green Belt should be assessed against the policies in PPG 28”.

#### AGRICULTURAL LAND

Where significant development of agricultural land is unavoidable, MPS1 requires that areas of poorer quality land should be sought in preference to that of a higher quality, except where this would be inconsistent with other sustainability considerations and that, in order to achieve the intended after-use, a high standard of restoration would be required.

#### COMMUNITIES

MPS1 requires that regard is paid to the positive or negative effects that minerals operations may have on rural communities and the extent to which adverse impacts of such operations could be moderated. The policy also recognises that such developments can often also offer opportunities for these communities especially at the restoration stage.

## CASE STUDY PAIR 1: LEICESTERSHIRE AND DERBYSHIRE

### Introduction

This case study pair looks at an alternative supply scenario for the current provision of aggregate by rail from Leicestershire to London and the South East. It should be read in conjunction with case study pair 2, which examines a different alternative, relating to sources of supply in the Mendip Hills, rather than Derbyshire.

The Leicestershire quarries supply igneous crushed rock aggregate of varying types, ranging from general purpose aggregate suitable for a wide range of end-uses including concrete production, to higher specification end-uses such as rail ballast and high PSV (Polished Stone Value) aggregate that is capable of being used in skid-resistant road surfacing applications.

The Leicestershire Minerals Development Framework (Core Strategy & Development Control Policies up to 2021), notes that around 30 % of the county's total igneous rock sales were transported by rail. From other sources, including the operating companies' own publicity material, the typical current output by rail from Leicestershire amounts to approximately 5.5 million tonnes per annum (Mtpa). It is not known what proportion of this rail-transported aggregate is used for specialist (e.g. road surfacing) rather than general purpose applications.

If aggregate supply from one or more of the existing Leicestershire igneous rock quarries were to cease (e.g. because of the exhaustion of workable resources and/or the failure to replenish existing permitted reserves), one alternative scenario for replacing that material would be from existing rail-linked quarries in neighbouring Derbyshire.

This case study examines the geological resource and environmental implications of that scenario.

### Rail-linked crushed rock production in Leicestershire

Four quarries in Leicestershire supply igneous rock aggregate of various types by rail to markets in London and the South East. They comprise:

**Croft** (Aggregate Industries)

**Cliffe Hill** (Midland Quarry Products)

**Bardon Hill** (Aggregate Industries)

**Mountsorrel** (Lafarge Aggregates)

These quarries, together with their respective geological resources and potential environmental constraints are shown in Figure 52. Note that Figure 52 shows the known resources with a buffer of 100 m applied. The dashed green boundary for Charnwood Forest is based on the Character Area which, it is understood, may form the basis of a landscape value designation of Regional Park<sup>13</sup>, having been identified regionally as a priority area for protection and referred to in Policy MCS13 of the Core Strategy.

#### CROFT QUARRY

Croft Quarry produces aggregate from of a relatively limited outcrop of the South Leicestershire Diorite Complex. This material has a typical PSV of 56 and, as such, may be used as skid resistant road surfacing aggregate in many (but not all) situations. The Environmental Statement for Croft Quarry (ROMP submission, Non Technical Summary, May 2010) indicates that approximately 30% of the output of the quarry is distributed by rail.

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<sup>13</sup> Revised Vision Statement for a Charnwood Forest Regional Park ,June 2009



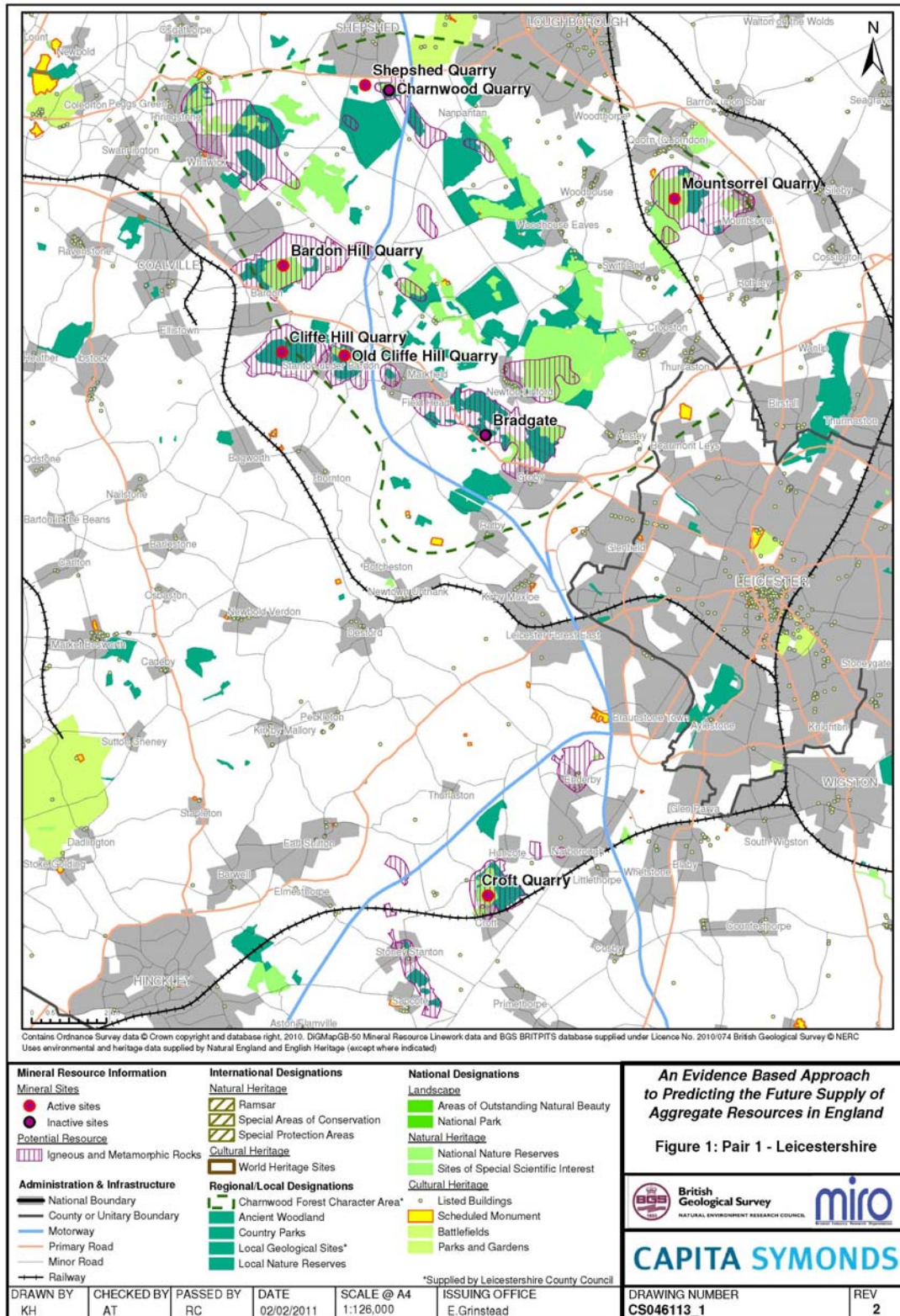


Figure 52. Relationship between geological resources and environmental constraints in Leicestershire (case study pair 1).

The current planning permission is valid until 2029, although the operator has stated (in the Environmental Statement submitted in conjunction with the recent application to extend nearby Bardon Quarry<sup>14</sup>) that the permitted reserves at Croft have an estimated life of only 10 years at current rates of output. Additional reserves exist beneath the present plant area, but the prospects for extending the quarry in this and other directions are severely limited by a combination of physical, economic and environmental constraints.

The quarry itself is designated as a geological SSSI and a slightly wider area extending eastwards across the resource area is defined as a Local Geological Site (LGS), though neither of these would necessarily preclude further quarrying. To the north and west the site has been developed close to the edge of the identified resource area and against a partially residential minor road. Resources remain beneath Croft Hill, immediately west of the quarry boundary, but this is an important local landmark where quarrying is unlikely to be acceptable. Major restoration works including a large, planted landscaping bund, have been completed on the northern and north-eastern margins of the quarry, beyond which, to the north is the village of Huncote. Although further resources may be present beneath the plant site to the east of the quarry, these are covered by an increasing thickness of overburden, which could make exploitation uneconomic. To the south, the resource is constrained by the built development of Croft village and the railway line. Unless the lateral extent of the quarry can be increased, the scope for deepening is also limited.

A separate small outcrop of diorite occurs beneath and to the north of the village of Enderby. This area also contains the former non rail-linked sand and gravel quarry of Enderby Warren (now a buried SSSI). All other areas of diorite resource in this area are small, are partially sterilised by development, or have been worked and restored, including (to the south west of Croft Quarry) the former quarry and now diving centre of Stoney Cove, at Sapcote.

In summary, although the potential environmental and heritage constraints at Croft are relatively few, the scope for future resource development would seem to be limited. Significant lateral extension of the existing quarry is likely to be restricted by practical and economic constraints relating to the thickness of overburden, and, as a direct consequence of this, the scope for further deepening will be limited through geotechnical side-slope considerations.

#### CLIFFE HILL QUARRY

The Cliffe Hill site comprises the quarries of New Cliffe Hill (to the west) and Old Cliffe Hill (to the east). The two quarries are linked by a tunnel, constructed in 2005, and operate as a combined unit under a single planning permission. The site exploits the South Charnwood Diorites which have a PSV of around 55. The aggregates produced are utilised for a wide range of end-uses including concrete manufacture, asphalt production and rail ballast. The moderate PSV allows the aggregate to be used in some road surfacing applications. The operator, Midland Quarry Products, notes on its website that this quarry produces 4.5 million tonnes of aggregate per year including some 600,000 tonnes per year of asphalt. Around 900,000 tonnes of aggregate is transported from the site via rail<sup>15</sup>.

New Cliffe Hill has industrial development to the west and residential development to the east. The quarry also has extensive restoration bunds to the south and east and, with the exception of reserves remaining beneath the plant area, appears to be nearing the exhaustion of available resources. This, indeed, was the reason for constructing the tunnel, to access the additional unworked reserves within Old Cliffe Hill quarry<sup>16</sup>. The rival company, Aggregate Industries, has

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<sup>14</sup> Application number 2010/0470/01

<sup>15</sup> Application number 2007/1059/04

<sup>16</sup> Article in Quarry Management, October 2005

estimated (within the Bardon Quarry Environmental Statement<sup>17</sup>) that the Cliffe Hill site has less than 15 years' of permitted supply remaining.

Part of Old Cliffe Hill quarry is designated as a geological SSSI and both quarried areas are candidate LGSs.

Other nearby areas that are underlain by comparable diorite resources are located to the east of the M1 motorway, near the inactive non rail-linked site of Groby Quarry. This quarry retains its coating and concrete plants. This area of resource has designations that include ancient woodland, parks and gardens, country park, listed building, LGS and biological SSSI. There are, nevertheless, some locations within this zone that appear to be unconstrained by environmental or cultural designations. It should be noted, however that this whole area (the majority of the Cliffe Hill quarries and unworked resources to the south east and east) lie within the Charnwood Forest character area, and may thus be affected by the impending landscape designation.

#### BARDON HILL QUARRY

This quarry exploits resources of andesite and dacite within a localised outcrop of the Charnian Volcanics sequence. These are quite different to the diorites quarried at Croft and Cliffe Hill and have a higher PSV (60), enabling the aggregates to be used more extensively in road surfacing applications, as well as in other asphalt products, concrete and other uses. Approximately 25 % of the output from this site is moved by rail.

At the end of 2009, Aggregate Industries submitted an application for the extraction of 132 million tonnes of mineral in an extension to the existing quarry from an area to the south east of the current site (an area of resource not shown on the map). At the time of submission it was anticipated that the existing permitted reserves remaining within the current quarry would be exhausted in around 10 years time.

Developments at this site may be constrained by raised land that acts as screening to the residential estate to the north. The quarry site is a geological SSSI and LGS, and it is bordered to the east by Bardon Hill, a biological SSSI and ancient woodland. To the west and south west are the processing plant, factory and offices, and also the main road. Much of the site and the proposed extension falls within the Charnwood Forest character area. Potential environmental constraints in the general area of the proposed extension (other than the Forest) include a scheduled monument and a listed building, for which the setting provided by the surrounding grounds may be important.

Other outcrops of the Charnian Volcanics occur in the area around Whitwick Quarry. The site is currently inactive though it retains an asphalt plant and an application was submitted in November 2010 for continued quarrying operations until 2042. The site has not been rail linked since the 1960s. Whitwick Quarry is itself a LGS and areas of identified resource to the north contain a further LGS plus several parts (management units) of a SSSI which contain geological features of interest and represent the best remaining examples of the formerly extensive Charnwood Forest heaths. Resources may exist to the east and south east of this quarry site. The submitted application is for quarrying within the confines of the current extracted boundary, focused on the 'Peldar Dacite Breccia' (as aggregate from other units in the extreme northern part of the quarry have reportedly been poorer in quality<sup>18</sup>).

A separate, and very limited outcrop of syenite was formerly worked within the Charnwood Quarry complex at Shepshed. This comprises Newhurst Quarry (to the west of the motorway), which is a geological SSSI and LGS. Part of the site has been the subject of an application for

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<sup>17</sup> Application number 2010/0076/07

<sup>18</sup> Environmental Statement for application numbers 2010/1031/07 & 2010/1032/07 (Whitwick Quarry)

waste management facilities. Longcliffe Quarry (east of the motorway) is also a LGS. Workable resources at both sites appear to have been exhausted.

#### **MOUNTSORREL QUARRY**

Mountsorrel Quarry sources aggregate from the Mountsorrel Granodiorite. This has a PSV of 53, limiting its use in road surfacing applications to a relatively small number of situations on lightly trafficked roads. Instead, the aggregate is primarily used as a general purpose aggregate, including concrete production but is also important for use as rail ballast. The quarry is connected to the railway sidings in the east by conveyor and approximately 60 % of the product is thus distributed by rail<sup>19</sup>. Around 20 years of permitted reserves remain at the site, at typical recent rates of production, although this is subject to the technical viability of safe working at the base of the current permitted excavation. Additional reserves within a small area to the east of the present excavation (currently occupied by quarry infrastructure) have been applied for.

The current quarry site is situated within a biological and geological SSSI and part of the old quarry site, to the east, is designated as a geological SSSI. There are three LGSs within the resource area, including the quarry itself. Ancient woodland borders the site to the north and north west. Areas of resource are identified on Figure 1 as extending to the south east of the current excavation and there are notably sparser environmental and heritage designations in this direction.

#### **Summary of rail-linked crushed rock production in Leicestershire**

Large scale crushed rock production in Leicestershire is currently of strategic importance to the national economy, particularly by virtue of the supplies by rail into London and the South East. However, production is heavily focused on four rail-linked sites with a combined rail output of some 5.5 Mtpa. The scope for continued long-term production at these sites is primarily limited, in most cases, by the availability of workable resources, rather than by environmental designations. Designations which could be affected by future working are primarily of a geological nature, including both SSSIs and LGSs. To varying degrees some of the quarries are also bordered by other designations including biological SSSIs, Ancient Woodland, Parks and Gardens, and/or by existing built development. Although there are no formal landscape designations, all of the quarries to the north west of Leicester and almost all of the identified resources fall within the proposed Charnwood Forest Regional Park.

Any long term strategy for replacing crushed rock production in this area would need to allow for the supply of high PSV aggregate for road surfacing, as well as rail ballast and general purpose aggregate for concrete manufacture.

#### **Rail-linked crushed rock production in Derbyshire and the Peak District**

In contrast to the situation in Leicestershire, Derbyshire has very extensive unworked crushed rock resources. These are primarily of Carboniferous Limestone, rather than igneous rock, but are capable of substituting for Leicestershire aggregates in all except the higher specification end-uses road surfacing and rail ballast). They occur both within and outside the Peak District National Park.

Outside the National Park, the resources are currently worked at three active rail-connected limestone quarries:

**Tunstead** (Tarmac)

**Dowlow** (Lafarge Aggregates)

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<sup>19</sup> Application number 2009/1443/02, determination of new conditions.

**Dove Holes (CEMEX UK)**

In addition, there are two inactive quarries outside the Park which are either rail connected or potentially rail-connected. These comprise:

**Hillhead** (Tarmac)

**Hindlow** (L'Hoist).

Within the Park, there are two additional active rail linked sites: **Topley Pike Quarry** and **Hope Limestone Quarry**, the latter being primarily devoted to cement production. In addition, **Old Moor Quarry** is rail linked by virtue of being an extension to Tunstead Quarry. Similarly, the inactive site **Beelow** is rail linked through Doveholes Quarry.

All of the above-named quarries, together with their respective geological resources and potential environmental constraints are shown in Figure 53.

Within the limestones are localised outcrops of igneous rock, including both basalt and dolerite. These were formerly worked for roadstone at a number of sites, most recently at Waterswallows near Tunstead, but all such quarries have now closed and there are no remaining permitted reserves. The reserves previously worked at Waterswallows extended to the resources' lateral limits and no other workable resources are known within the mineral planning area<sup>20</sup>. Waterswallows is partially designated as a geological SSSI and has been identified as a potential waste management site. In order to fully substitute for the Leicestershire quarries, the Derbyshire limestone quarries would therefore need to be augmented by increased output from other sources of high PSV aggregate, elsewhere in the country. The nearest of these would be Mancetter and Griff quarries, in Warwickshire, neither of which is rail-linked. Consideration of these or other additional sites, however, is outside the scope of this assessment.

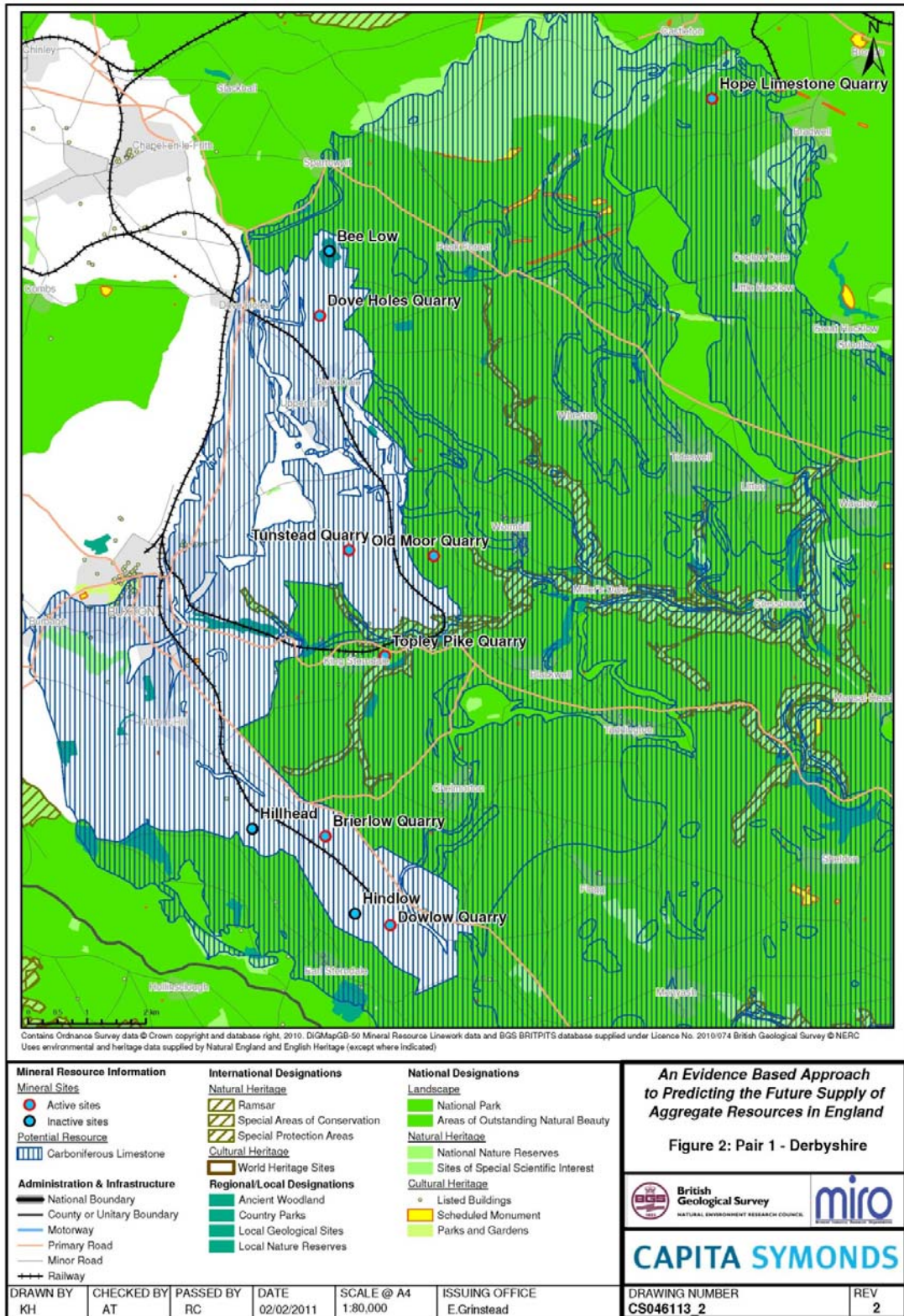
The environmental implications of increased production from the rail linked limestone quarries in Derbyshire are dominated in all cases by the National Park.

For those quarries within the Park this represents a direct constraint. Whilst this would not *necessarily* preclude future lateral or depth extensions at those sites, depending on the quality of mitigation for environmental and landscape effects, in practice such extensions would be contrary to the general concept within the National Park Authority of seeking an 'exit strategy' for aggregate quarrying within the Park, and are thus unlikely. Policies precluding new permissions for working construction aggregates other than in exceptional circumstances have been in place for a number of years, and there have been no major proposals for extensions since those at Topley Pike and Eldon Hill were rejected on appeal in the 1980s. For unworked resources elsewhere within the National Park, there would still not be any absolute constraint, though the chances of a new greenfield permission being granted, or even applied for, are considered likely to be extremely small.

For the existing and prospective rail-linked quarries outside the National Park, the designation would still exert an influence on future planning decisions, by virtue of the fact that the quarries are in all cases close to the National Park boundary and, to varying degrees, are visible from within the Park. The level of constraint would, however, be significantly less and, importantly, there is a degree of acceptance within the Derbyshire Minerals Planning Authority that the county should contribute to the goal of reduced quarrying within the National Park by taking on an increased share of the regional apportionment for aggregates provision.

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<sup>20</sup> Derbyshire Minerals Local Plan, 2000 - 2006



**Figure 53.** Relationship between geological resources and environmental constraints in Derbyshire (case study pair 1).

Another environmental factor that is common to all of the limestone quarries (both within and outside the National Park) is the sensitivity to potential impacts on the water environment – particularly but not only in relation to the effects of quarry dewatering. Whilst such effects can theoretically be mitigated, that task is especially difficult within areas of karstic limestone, where groundwater movement is both rapid and difficult to predict. The degree of sensitivity to such impacts is not represented by any mapped environmental designation, and would need to be assessed in detail on a site-specific basis. As a sweeping generalisation, however, the level of sensitivity would be substantially greater than is the case for the igneous rocks of Leicestershire.

In addition to the foregoing general comments, more specific observations relating to other environmental constraints at each of the rail-linked limestone quarries are set out below:

#### TUNSTEAD QUARRY AND OLD MOOR QUARRY

Tunstead Quarry, in combination with Old Moor Quarry, is the largest producer of limestone in the Peak District, and the largest producer of high purity limestone in Europe. The principal product is industrial limestone. The Environmental Statement for Old Moor Quarry<sup>21</sup> states that around 54 % of the materials distributed from the (combined) site are moved by rail (some 2.45 million tonnes per annum). The site also produces lime and has a cement works which utilises the processing ‘waste’ from industrial limestone production. Although the limestone is capable of being used as construction aggregate, its high purity characteristics are such that it is primarily reserved for industrial processes – this being a specific condition of the planning permission at Old Moor. Substantial additional limestone resources exist beyond the existing permitted reserves but again there is likely to be a priority for using these for industrial purposes rather than as aggregates.

To the south of the Tunstead site is a SAC and SSSI, an area of ancient woodland and the National Park boundary. Old Moor Quarry is entirely within the Park and to the south and south east is additionally constrained by the SAC and SSSI.

#### DOWLOW QUARRY

Dowlow Quarry, operated by Lafarge Aggregates, lies immediately adjacent to the National Park boundary on its south side. To the east, the Park boundary is approximately 400 m away from the current excavations. As well as aggregate production, part of the site is leased by Cadeby Stone for the production of dimension stone. It is likely that this site has around 24 years reserves remaining<sup>22</sup>. Outside of the current quarry footprint the resources can be seen to extend towards the National Park boundary to the east and north. No other mapped constraints (environmental and heritage) are shown within these areas, however, roads and sparse farm buildings are present.

#### DOVE HOLES QUARRY

Dove Holes Quarry, operated by CEMEX UK, and the inactive Beelow Quarry are also outside the Park but adjacent to the Park boundary. Dove Holes is the company’s largest quarry, supplying aggregate by rail to depots throughout the country. In 2010 the rail facilities were upgraded and 60 % of the material is now transported by rail.

The potential resource extends on all sides of the site and continues within the Park. Excavation has taken place almost to the Park boundary, although an area of unworked resource exists between the two quarried areas. Development of Dove Holes to the west is constrained by built

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<sup>21</sup> Accompanying the ROMP submission in 2004, application number R1/1197/11

<sup>22</sup> in relation to building stone reserves (Assessment of Dowlow Limestone for Use as Dimension Stone, Arup Materials Consulting, 2004)

development. With the exception of a notified LGS at Beelow Quarry, no other mapped constraints are found in the quarry's immediate surrounds.

#### TOPLEY PIKE

This quarry is located at the edge of, but entirely within, the National Park. It is bordered on the north, east and south by a SAC/SSSI. The valley to the south is also an LGS. To the west is the hamlet of King Sterndale. The quarry is worked primarily for construction aggregates. An application in 1985 to extend the quarry through the release of further permitted reserves was refused by the Secretary of State, following an appeal and a public inquiry. Despite the applicant's arguments that the output would be transported by rail, rather than road, the National Park Authority successfully argued that there are alternative sources outside the National Park and that dust would have an adverse effect on wildlife within the adjoining SSSI. In view of that decision it is unlikely that Topley Pike would be able to offer a long-term replacement for aggregates from Leicestershire.

#### HOPE LIMESTONE QUARRY

Hope Limestone quarry, located near Castleton within the National Park, produces limestone for use within the associated cement works. 60 % of the cement output is transported by rail. The Peak District Minerals Strategic Action Plan (dated 2009) states that the quarry has around 30 years of permitted reserves remaining. In the longer term, the prospect of additional permitted reserves being granted at this site would face considerable opposition, even if such reserves were exclusively devoted to cement production. The chances of future aggregates production at this site would thus be even more unlikely.

#### HINDLOW

This inactive quarry has historically supplied industrial limestone products for the chemical industries. The site currently receives and processes limestone moved by rail from Tunstead<sup>23</sup>. From a planning perspective, this site could be reactivated at short notice.

#### HILLHEAD QUARRY

Hillhead is a dormant site, having closed temporarily for an indefinite period. Although not currently rail-linked, this may be possible but would require some investment. This site, along with three other quarries (Brierlow, Hindlow and Dowlow), is located within a strip of land excluded from the National Park. Formerly, much of the output of road stone and construction aggregates was transported to the north west of England. This quarry could theoretically be reactivated at short notice as new operating conditions would not need to be proposed and agreed for quarrying to recommence at the site<sup>24</sup>.

### **Summary of opportunities for increased rail-linked crushed rock aggregate production in Derbyshire**

Any future increase in crushed rock production by rail from within the National Park, to compensate for any long term future reduction in supply from the rail-linked igneous rock quarries in Leicestershire, would seem to be extremely unlikely, because of the National Park Authority's strategy for seeking a reduction rather than any increase in future aggregate production within the Park, in order to protect the natural beauty and recreational opportunities which the area affords.

<sup>23</sup> Consultation document 'Derby & Derbyshire Minerals Core Strategy: Key Issues & Options'

<sup>24</sup> Derbyshire Minerals Core Strategy Key Issues and Options Paper, Evidence Base Papers, April 2010



The only realistic prospects for substitution would be from the three large rail-linked quarries outside the Park (Tunstead, Dowlow and Dove Holes) and perhaps from future reactivation of two further inactive sites (Hillhead and Hindlow). Even here, increased quarrying activity may have potential impacts on the adjoining National Park, for example in terms of visual intrusion and potential effects on the water environment. Moreover, the increased supply of construction aggregates would conflict with the concept of reserving high purity limestone resources for industrial uses and cement manufacture – especially but not only at Tunstead and Hindlow, which have both been primarily associated with industrial use in the past.

If Dowlow, Dove Holes and the potential reactivation of Hillhead were the only realistic sources for replacing the strategic rail output from the Leicestershire igneous rock quarries, consideration would need to be given not only to the availability of unconstrained resources but also to the capacity of these sources to match the output currently supplied by rail from Leicestershire (totalling 5 Mtpa).

## **CASE STUDY PAIR 2 LEICESTERSHIRE AND THE MENDIPS**

This case study pair looks at an alternative supply scenario for the current provision of aggregate by rail from Leicestershire to London and the South East. It should be read in conjunction with case study pair 1, which examines a different alternative, relating to sources of supply in Derbyshire and the Peak District National Park, rather than the Mendip Hills.

As noted in case study 1, the Leicestershire quarries supply igneous crushed rock aggregate of varying types, ranging from general purpose aggregate suitable for a wide range of end-uses including concrete production, to higher specification end-uses such as rail ballast and high PSV (Polished Stone Value) aggregate that is capable of being used in skid-resistant road surfacing applications

The Leicestershire Minerals Development Framework (Core Strategy & Development Control Policies up to 2021), notes that around 30% of the county’s total igneous rock sales were transported by rail. From other sources, including the operating companies’ own publicity material, the typical current output by rail from Leicestershire amounts to approximately 5.5 million tonnes per annum (Mtpa). It is not known what proportion of this rail-transported aggregate is used for specialist (e.g. road surfacing) rather than general purpose applications.

If aggregate supply from one or more of the existing Leicestershire igneous rock quarries were to cease (e.g. because of the exhaustion of workable resources and/or the failure to replenish existing permitted reserves), one alternative scenario for replacing that material would be from existing rail-linked quarries in the Mendip Hills.

This case study examines the geological resource and environmental implications of that scenario.

### **Rail-linked crushed rock production in Leicestershire**

An analysis of Leicestershire’s rail-linked aggregates supply situation and the supply scenario based on extending the existing rail-linked sites, is provided in Case study Pair 1 and Figure 52.

### **Rail-linked crushed rock production in the Mendips**

The Mendip Hills are already of similar importance to Leicestershire in supplying crushed rock aggregates by rail into London and South East England. Unlike the Leicestershire quarries, however, they supply Carboniferous Limestone rather than igneous rock. As explained in relation to the Derbyshire quarries in Case Study Pair 1, this limestone can substitute for igneous rock in general purpose applications, including concrete production, but not in road surfacing applications, because limestone has a far lower PSV. Of the seven active limestone aggregate quarries in the Mendips, only two are rail-connected:

## Whatley Quarry (Hanson)

### Torr Quarry (Aggregate Industries)

Both of these quarries already supply large quantities of aggregate by rail into London and the South East, subject to output limits set out in planning conditions. At present, both quarries have the capacity to substantially increase rail output within these limits but, in order to maintain such an increase over a sustained period of time, the quarries would need to expand, as discussed below.

Within the Mendips there is also one large igneous rock quarry, at **Moons Hill**, which is able to supply PSV 56 aggregate for use in road surfacing applications. This, however, is not a rail connected quarry, so could not substitute for the Leicestershire sites in the scenario being considered here.

The geological resources and environmental and heritage designations associated with Whatley and Torr quarries are shown on Figure 54. LGS data, groundwater Source Protection Zones (SPZs) and Ecological Zones of Influence (EZIs) are not shown on this figure but commentary on these is given in the text below.

### Whatley Quarry

Around 75% of the aggregates produced from this quarry are transported by rail to a series of depots throughout London and the South East. The total output of the quarry is limited by planning conditions to 8 million tonnes per annum (Mtpa). This represents a 'spare capacity' of around 4 Mtpa compared with the estimated typical existing output of around 4 Mtpa. All of this output could, in theory, be transported by rail, though in practice there would continue to be local markets that would be served by road.

Based on estimates provided by the operators of neighbouring Torr Quarry, in connection with their recent planning application (as reported in Thompson 2010), the existing permitted reserves at Whatley Quarry are sufficient for around 30 years' supply at typical existing rates of output. This timescale would be halved if output were increased to the theoretical maximum (to compensate for reduced output from Leicestershire), necessitating the release of further reserves.

As noted in the recent 'ecosystems report' on long term quarrying in the Mendips (Thompson *et al.*, 2010), lateral extension of Whatley quarry is precluded on the southern flank by geological constraints (transition from limestone to shales) and by land ownership and existing rural development on the north. Limited opportunities exist to extend the quarry further to the west and (via a tunnel beneath the road) to the east. There also remains substantial scope for deepening the quarry within the existing permission boundary. The ecosystems report examined two theoretical scenarios of deepening the quarry to 37 m below sea level with steep side slopes and to 13 m below sea level with shallower gradients. The first of these would release sufficient reserves to maintain typical levels of output until around 2073, whilst the second option may be able to maintain such supplies until around 2056. Once again, these timescales would be substantially reduced if output levels had to increase to compensate for a reduced output from Leicestershire. If increased to the theoretical maximum of 8 Mtpa, the end dates associated with these two scenarios at Whatley would be 2042 and 2034, respectively (i.e. production at this level would be maintained for a period of 32 or 24 years, from 2010).

Although the geological resources here extend to much greater depths, the maximum practical depth of quarrying may ultimately be limited by the fuel costs and carbon emissions involved, and by the environmental, cost and regulatory implications of dewatering to progressively greater depths. The quarry is already operating below the water table, by means of pumped dewatering of the limestone aquifer. The quarry also lies wholly within the outer Source Protection Zone (SPZ3) of a public water supply borehole downstream, necessitating detailed mitigation works and compensation arrangements. Whilst, in theory, any impacts on this and

other aspects of the water environment can be addressed through such mechanisms, the issue is a highly sensitive one and, in practice, may restrict the future development of the quarry.

The quarry also sits wholly within an EZI for the UK BAP species of Greater Horseshoe Bats from the nearby Mells Valley SAC. The EZI relates to the foraging areas of the bats and is regarded by Somerset County Council's ecologist as being of comparable significance to the SAC itself. At Whatley, the designation would probably not preclude further deepening of the quarry (since the vegetation has already been removed), but it would present difficulties in extending the quarry further to the west or east, unless potential impacts could be adequately mitigated by providing suitable alternative foraging areas in advance of future extensions of the quarry.

#### TORR QUARRY

Torr Quarry also transports 75 % of its aggregates by rail to depots throughout London and the South East. The total output of the quarry is limited by planning conditions to 6 Mtpa. This represents a 'spare capacity' of around 1Mtpa compared with typical existing output of around 5 Mtpa. As with Whatley, all of this could, in theory, be transported by rail, though in practice there would continue to be local markets served by road.

In 2010, Aggregate Industries submitted an application to deepen the quarry to a level of 3 m AOD, this being the maximum achievable depth, taking account of completed perimeter restoration work and geotechnical safety considerations on excavation side slopes. If the additional reserves associated with this application are permitted, the quarry would be able to maintain its typical levels of production until 2043<sup>25</sup>. This timescale would clearly be foreshortened, however, if the quarry were required to increase output to compensate for reduced supplies from Leicestershire. For that to be a practical proposition for a similar or longer period, further additional reserves would be required.

Further lateral extensions at Torr Quarry itself are largely precluded by geological constraints (major faults, thrusts and karstic groundwater conduits) as well as by completed restoration works around most of the perimeter and by proximity to a wooded area to the east which is designated as an SAC, SSSI and Ancient Woodland. An additional area of Ancient Woodland lies immediately to the south west of the site, although this coincides with the southern limit of the limestone resource. Much of the surrounding area also falls within the EZI for Greater Horseshoe Bats from the nearby Mells Valley SAC. As noted above, for Whatley, there could be ways of mitigating potential impacts by providing suitable alternative foraging areas for the bats in advance of future quarrying. This concept has been examined in some detail in the 2010 report 'An Ecosystems Approach to Long Term Mineral Planning in the Mendip Hills: Phase II'<sup>26</sup>, which demonstrated how substantial additional resource areas to the east of Torr Quarry's existing Leighton Extension (encompassing existing permissions at Westdown, Colemans and Cloford quarries) could theoretically be worked in future in an integrated way, delivering aggregate by conveyor to the existing processing plant and railhead at Torr Works.

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<sup>25</sup> Thompson, A., 2010: *Torr Quarry Proposed Deepening: Assessment of Need and Alternatives*. Report to Aggregate Industries UK Ltd. by Cuesta Consulting Limited. January 2010 (25pp + Appendices)

<sup>26</sup> Thompson, A., Knapman, D., Harris, K., Birch, J. and Jarvis, D. (2010): *An Ecosystems Approach to Long Term Minerals Planning in the Mendip Hills. Phase II Final Report*. Report to Defra and the Minerals Industry Research Organisation. Published by Capita Symonds Ltd., East Grinstead. (40pp + appendices)

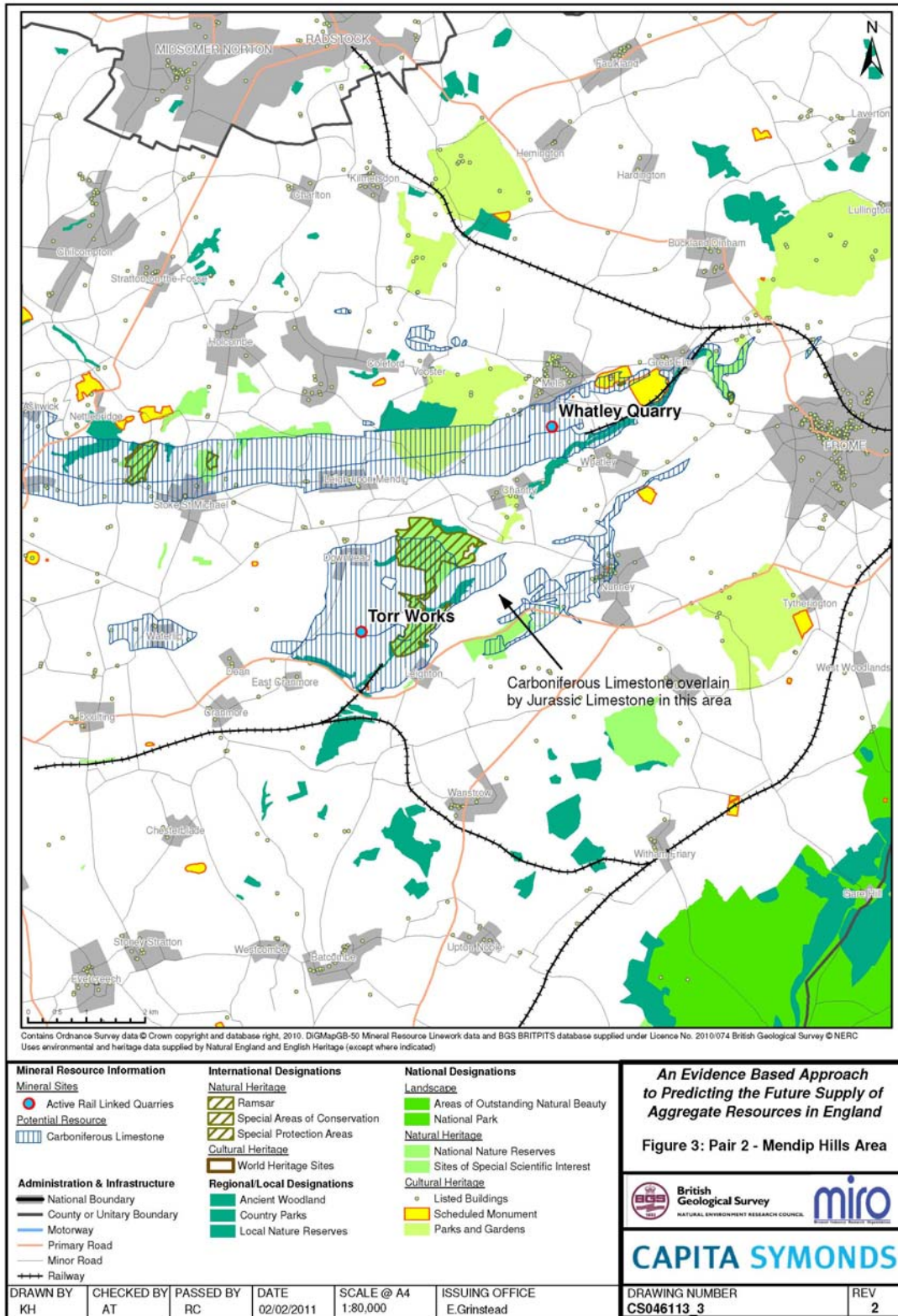


Figure 54. Relationship between geological resources and environmental constraints in the Mendips (case study pair 2).

Torr Quarry also has to deal with concerns relating to the water environment, and the north eastern-most part of the Westdown/Colemans complex falls within the inner Source Protection Zone (SPZ1) of another public water supply borehole. As with Whatley, although potential impacts can generally be mitigated, dewatering issues are likely to limit the depth to which the limestone resource in these areas can be exploited. Allowance for this has been taken into account, to differing extents, in the two theoretical scenarios for long term quarry development in this area, in the ecosystems report previously referred to. Based on the detailed modelling calculations developed in support of that work, the total reserves associated with the proposed extension of Torr quarry and the hypothetical future development of the Westdown, Colemans and Cloford sites may enable this group of quarries to maintain a notional output of 6 Mtpa, via the railhead at Torr, for at least 68 years from 2010 (i.e. until at least 2078). However, a parallel MIRO project by Colin Buchanan and Partners highlights the disproportionately high cost of short road distances at the distribution end of a rail-served supply chain. This would apply equally to feeder road hauls at the source end.

### **Summary of rail-linked crushed rock production in the Mendips**

Subject to future planning applications and decisions, especially regarding the mitigation of potential impacts on protected bats and on groundwater resources, the future development of Whatley quarry may be able to provide a maximum additional 4 Mtpa output by rail (in addition to its typical existing output) for at least 24 years. Similarly, subject to the mitigation of potential impacts on protected bats, SAC woodland and groundwater resources being acceptable, the railhead facilities at Torr Works may be able to provide an additional 1 Mtpa (in addition to its typical existing output) for at least 68 years.

Together, these increases would amount to a maximum of 5 Mtpa additional output capacity from Whatley and Torr quarries, over and above their existing commitments, for a limited period of time. This represents only 91 % of what would be needed if the strategic rail-transported supplies from Leicestershire were to be 'switched off'. Moreover, the spare capacity in the Mendips would reduce dramatically to only 1 Mtpa (less than 20 % of the shortfall requirement) once the reserves from deepening Whatley run out, leaving a very big gap in the strategic supply figures thereafter. In practice, output from the rail-linked Leicestershire quarries would reduce in stages, rather than all at once, and the need for alternative supplies might be offset for many years by the release of further reserves at one or more of those sites. Ultimately, however, the Leicestershire sources provide only limited scope for further expansion and alternative supplies from one or more other areas will be needed.

The foregoing analysis suggests that, even with new reserves being made available via the existing Whatley and Torr railheads, the length of time for which those operations can continue will be limited. In the longer term, unless a new rail-linked quarry was to be developed in the Mendips, that area would probably not be able to maintain such supplies. Most of the Mendips resource area is heavily constrained by a variety of designations but some areas in the Central Mendips are relatively free of constraints and may offer some potential in this regard, subject to the provision of a new rail link. Provision of a new rail link would require reinstatement of the Torr Works/East Somerset Railway branch past Shepton Mallet and Wells and into the Cheddar area, which would result in significant conflicts with landscape and tourism. As such this option would appear unachievable in terms of cost and present policy.

### **CASE STUDY PAIR 3: PEAK DISTRICT NATIONAL PARK AND DERBYSHIRE**

This case study examines the environmental implications of shifting aggregate production from within the Peak District National Park to alternative locations in Derbyshire, outside the Park.

The concept of reducing the future contribution of the National Park to the overall regional apportionment for aggregates provision in the East Midlands (with consequent increases for

neighbouring MPAs) has been considered at length by the Regional Aggregates Working Party (RAWP) and in the preparation of the PDNP Local Development Framework (LDF)<sup>27</sup>.

### **Aggregate extraction within the Peak District National Park**

Carboniferous Limestone is the principal source of construction aggregates extracted within the Peak District National Park. The extent of the resource outcrop within the National Park and the active and inactive quarries in these areas are shown in Figure 55, along with the extent of the main environmental designations.

As noted previously, in relation to Case study pair 1, some parts of the resource are classed as high purity limestone and some (but not all) of the quarries in those areas have traditionally supplied material primarily for industrial purposes and/or for the manufacture of cement, rather than supplying lower value construction aggregates. The high purity limestone is distinguished from other parts of the limestone resource on Figure 55.

The key environmental constraint to future aggregate extraction within the Peak District is the National Park designation itself, although a number of the quarries are also adjacent to other designations including SACs, SSSIs, scheduled monuments and LGSs. National planning policy for minerals, as set out in MPS1 seeks to preclude major mineral development within all National Parks, other than in exceptional circumstances. This general stance has been reflected in successive Minerals Local Plans for the Peak District, and in the emerging Core Strategy (September 2010) of the PDNP Local Development Framework, which is scheduled for Examination in Public during April 2011.

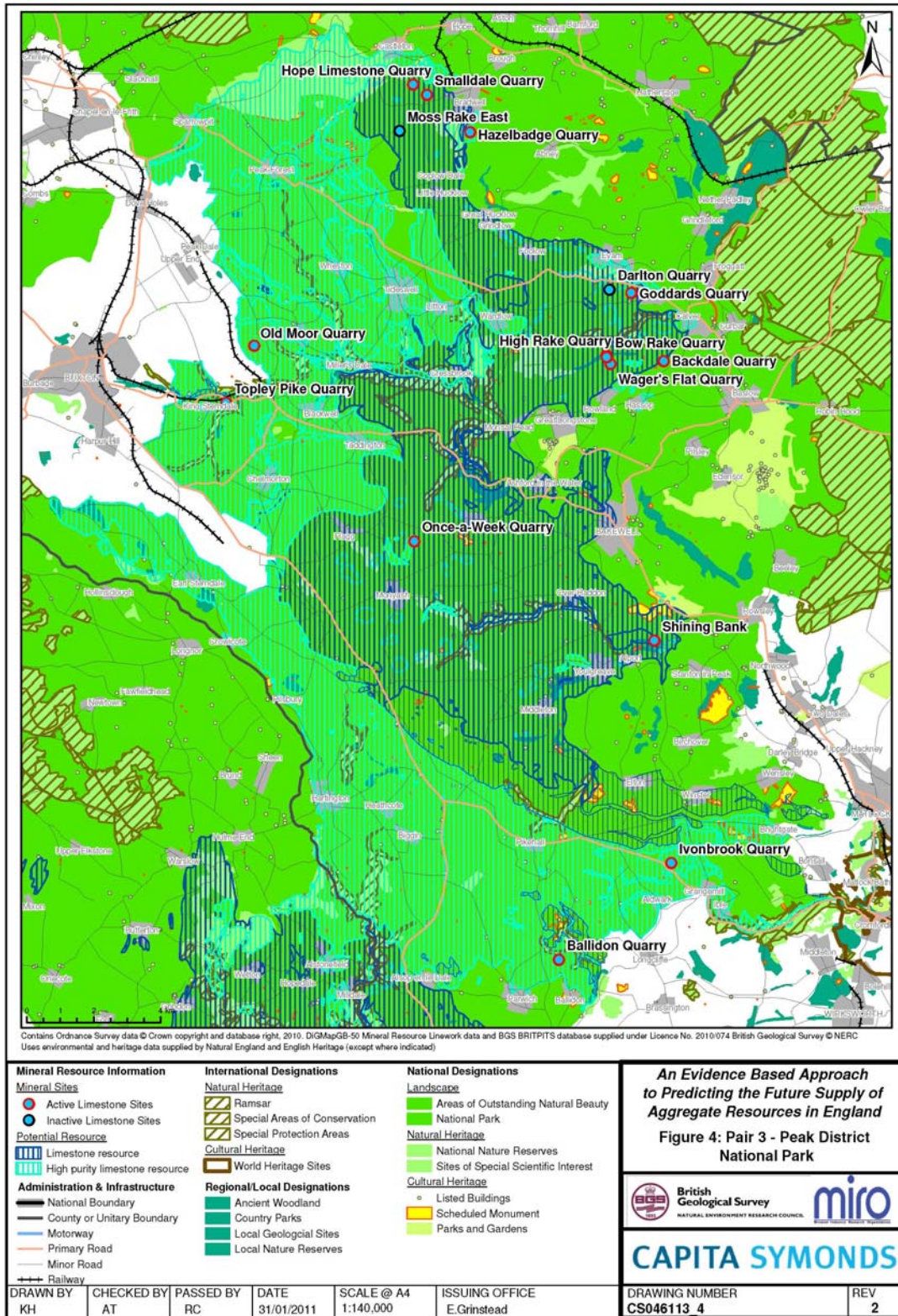
Although extant minerals planning permissions are still present within the Park, the Core Strategy seeks to achieve a gradual reduction in future limestone extraction by not permitting new sites or extensions to existing sites. This ‘exit strategy’ does not *necessarily* preclude future permissions being granted, but it makes them very unlikely. In recent decades, no new permissions for large scale mineral development have been granted within the National Park, and a number of applications for extensions to existing sites have been defeated at public inquiries following appeal. As well as the need to protect the landscape of the National Park, key arguments at these inquiries have included the need for high purity limestone to be reserved for high specification (industrial) end-uses, rather than being ‘squandered’ as low value construction aggregate. Although applications for high specification end-uses would, perhaps, be more likely to succeed, the LDF evidence base points out that similar resources and substantial permitted reserves exist at a number of quarries outside the Park.

A report by the East Midlands RAWP<sup>28</sup> notes that five quarries within the eastern part of the Peak District National Park are coming to the end of their permitted life, such that, by 2016, their combined output (amounting to an average of some 1.2 Mtpa) would be lost. The report suggests that Derbyshire County Council should be expected to increase output to compensate for the proportion of this amount which is currently supplied from these quarries to Derbyshire and other parts of the East Midlands (this being around 77 % of the total output from those quarries). The report also recommended that the options for supplying the remaining 23 % of the shortfall (mostly to South Yorkshire) would need to be investigated. The report also noted, however, that the bulk of Derbyshire’s remaining permitted reserves lie to the west of the Park and that supply to the East Midlands (and if necessary to South Yorkshire) from that area would involve increased quantities of stone being transported through the Park.

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<sup>27</sup> Peak District National Park Authority Local Development Framework – Evidence Base: Minerals Background Paper (updated to July 2010).

<sup>28</sup> East Midlands Regional Aggregates Working Party (2009) EM Sub Regional Apportionment Paper, Appendix 3 (Revised Version 8)



**Figure 55** Relationship between geological resources and environmental constraints in the Peak District National Park (case study pair 3).

This would clearly have adverse environmental effects and would not be desirable, but could not be controlled through planning because the reserves within the replacement areas (outside the Park) already have planning permission. Whether or not future supplies from the replacement sites would necessarily involve increased transportation through the National Park is not certain, however. Supplies to South Yorkshire might be able to be replaced by increased output from sources within that area, and supplies to those parts of the East Midlands which are currently served by the National Park quarries that are due to close, would probably be accommodated by increased output from quarries to the south east of the National Park boundary – at least until the reserves at those sites are exhausted (see below for further discussion).

As noted in Case study pair 1, another environmental factor that is common to all of the limestone quarries (both within and outside the National Park) is the sensitivity to potential impacts on the water environment – particularly but not only in relation to the effects of quarry dewatering. Whilst such effects can theoretically be mitigated, that task is especially difficult within areas of karstic limestone, where groundwater movement is both rapid and difficult to predict. The degree of sensitivity to such impacts is not represented by any mapped environmental designation, and would need to be assessed in detail on a site-specific basis.

### **Aggregate extraction within Derbyshire, outside the National Park**

The Minerals Core Strategy for Derbyshire is currently in preparation<sup>29</sup> but the consultation version of the Key Issues & Options paper is available. This explores the question of progressively increasing production from Derbyshire quarries in order to compensate for reduced extraction within the National Park. It also states that Derbyshire has a landbank of 98 years crushed rock and that, even if allowances are made for those quarries unlikely to be active within the plan period, there is still 48 years of permitted reserves in the county.

Figures 5a & 5b show the two main areas of Carboniferous Limestone resources within Derbyshire outside the National Park boundary, together with the active and inactive limestone quarries in these areas and the distribution of mapped environmental constraints.

#### **BUXTON AREA**

Figure 5a covers the resource and quarries to the west of the National Park, around Buxton. The National Park boundary here was deliberately drawn to exclude this area of intensive quarrying and, to that extent, there is a much greater degree of acceptance of quarrying here than within the Park itself. The environmental implications associated with the continued working and future extension at most of these quarries (Dowlow, Hillhead, Hindlow, Tunstead, and Dove Holes/Bee Low) have already been described in Case study pair 1. In all cases the dominant environmental issues at these sites are likely to be proximity to the National Park boundary, potential impacts on the water environment, appropriate use of high purity limestone for industrial purposes and potential impacts associated with transportation. Although all of these quarries either are, or could be, rail-linked, at least some of their output is (or would be) transported by road, and this would invariably involve movement through adjoining areas of the National Park (especially, but not only if aggregate is supplied from these quarries to markets in the East Midlands and South Yorkshire, as noted above).

In addition to the quarries named above there are two additional active quarries in the Buxton area, as described below.

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<sup>29</sup> Derbyshire Minerals and Waste Development Framework, February 2009



*Ashwood Dale Quarry*

This is a small quarry, located to the east of Buxton and alongside the railway, but not linked to it. The site was listed<sup>30</sup> as active in 2009. Opportunities for future extensions, however, would appear to be constrained by physical as well as environmental factors. The quarry lies close to the National Park boundary (to the east) and to a SAC/SSSI, (to the north). The quarry itself is an LGS and to the south is the River Wye, the railway line and a main road.

*Brierlow Quarry*

This active site lies adjacent to the railway between Hillhead and Hindlow quarries, within a strip of land excluded from the National Park. As with the other quarries in this area, the main constraints are proximity to the National Park boundary (both to the north and south) and potential impacts on the water environment. The area is already extensively scarred by past quarrying, however, and there might be scope for imaginative long-term planning to create an improved landscape through well-designed future proposals.

## SOUTH EAST OF THE PEAK DISTRICT NATIONAL PARK

Figure 5b shows the Carboniferous Limestone resource and quarries in the second area of Derbyshire, to the south east of the National Park. Many of the existing quarries here lie close to the National Park boundary and some of them are also constrained by European designations and/or by the Derwent Valley Mills World Heritage Site.

Some of the largest quarries in this area including Grange Mill and Brassington Moor<sup>31</sup> supply aggregates as part of a wide range of products including agricultural lime and calcium carbonate products. Dene Quarry, another large operation near Matlock, primarily supplies construction aggregate. Ball Eye and Slinger Top quarries primarily produce vein minerals but also supply limestone aggregate. Bone Mill Quarry supplies aggregate and a proportion of its limestone goes to industrial uses. Middleton Mine and Middle Peak are both inactive but could be reactivated at short notice without the requirement for new conditions of working.

Overall, this area is believed to contain a relatively small proportion of Derbyshire's landbank of Carboniferous Limestone reserves (the majority being located in the Buxton area). Thus, although there are extensive areas of unworked and unconstrained resources adjacent to existing quarries in this area, the prospects for sustaining any significant increase in output from these sites may well be limited by the availability of existing permitted reserves elsewhere (within the Buxton area). For these reasons, although at least some of the existing quarries in this area would be able to pick up the lost production from the National Park, this would only be feasible while ever permitted reserves remain at those sites. Once those reserves are exhausted, the quarries involved would not be able to be extended unless the 'excess landbank' policy could be challenged by a need argument based on the proximity principle (and, specifically, the avoidance of transport impacts within the National Park)

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<sup>30</sup> Derbyshire Key Issues & Options paper, April 2010

<sup>31</sup> Brassington Moor is the parent pit to the inactive Pyro and Barnfield sites

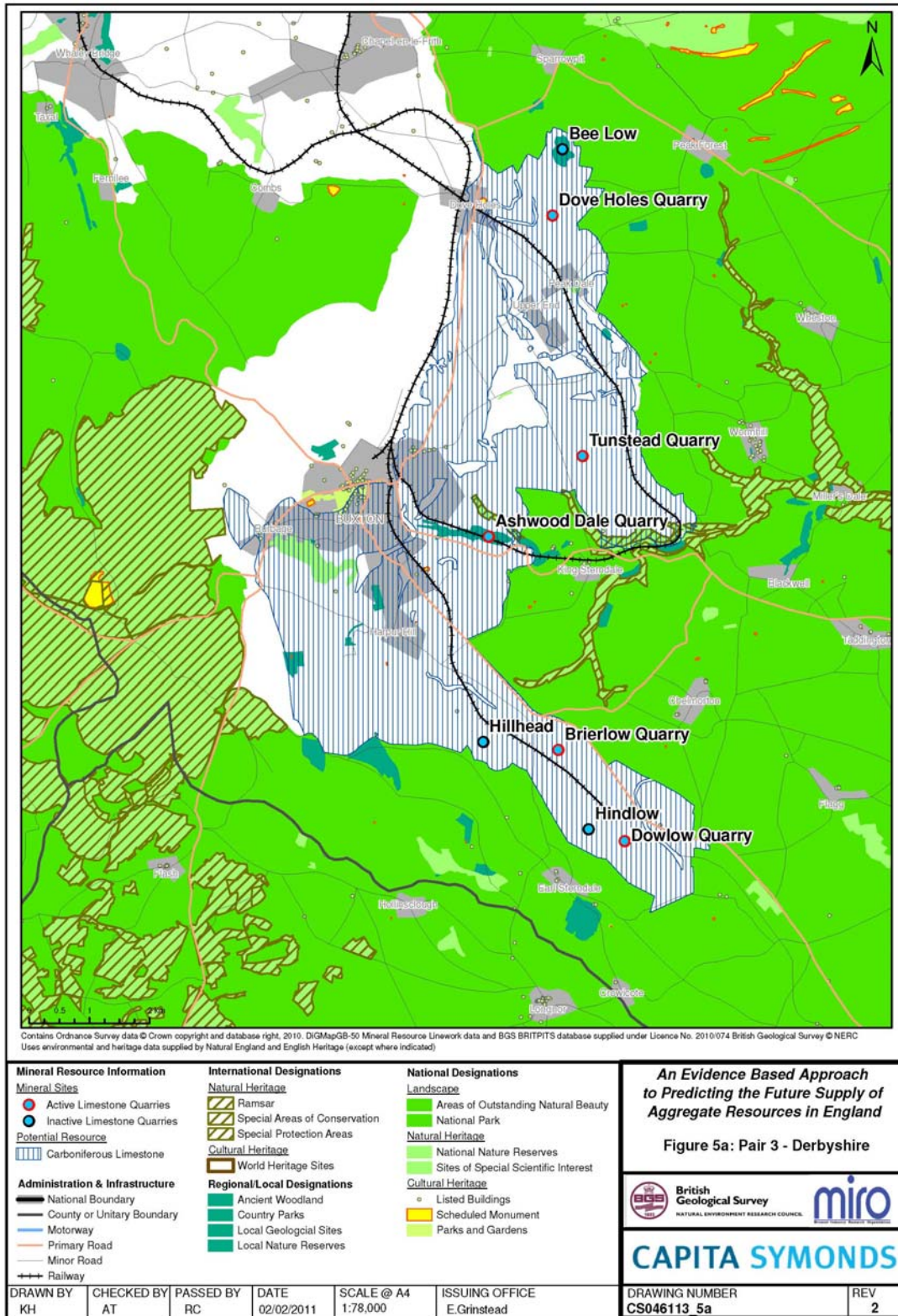
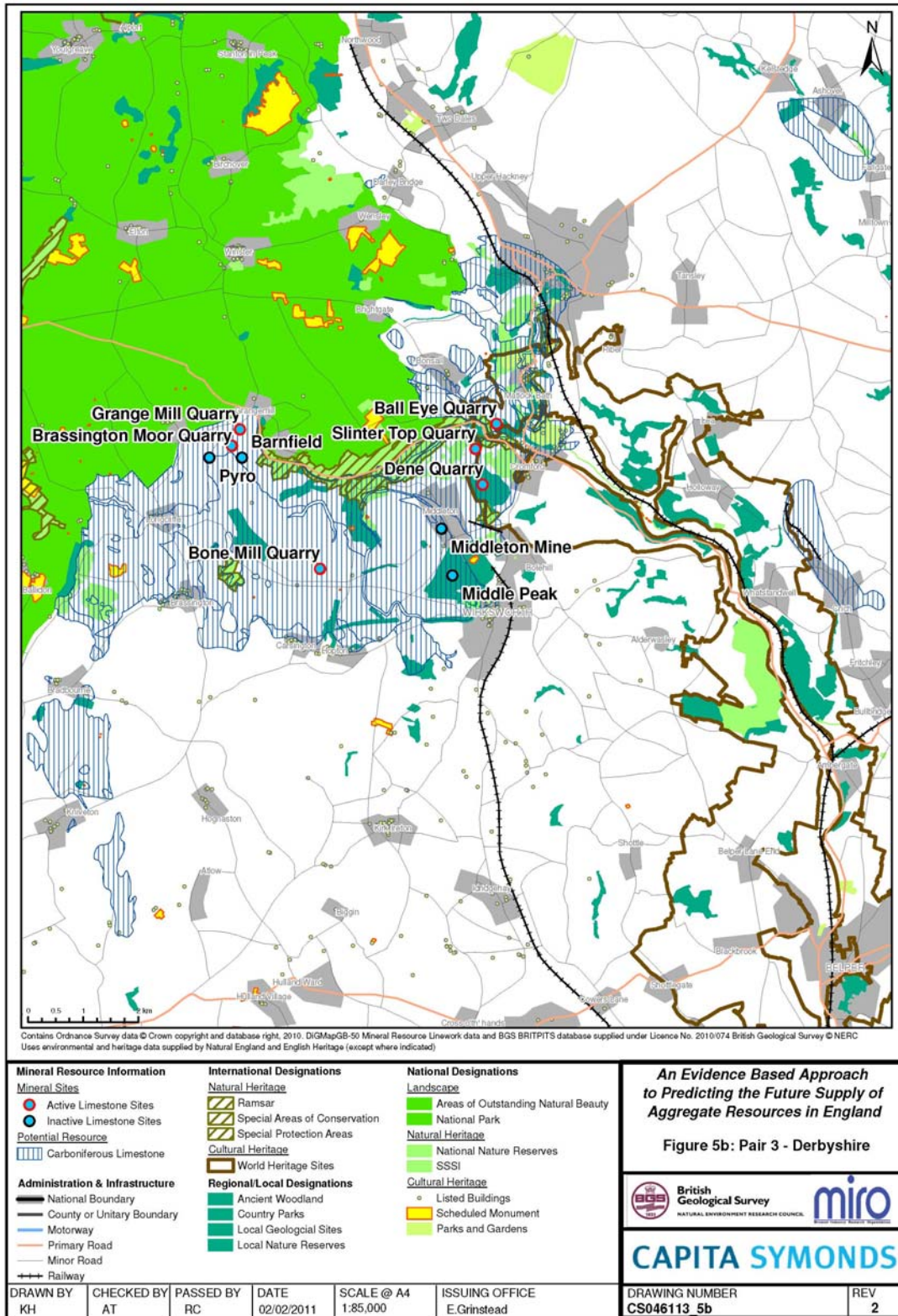


Figure 56. Relationship between geological resources and environmental constraints in Derbyshire (case study pair 3).



**Figure 57.** Relationship between geological resources and environmental constraints in Derbyshire (case study pair 3).

## Summary

Taking the foregoing information into account it seems that, unless Derbyshire's landbank policy can be challenged by arguments relating to transport distances and routes, the concept of seeking a progressive reduction in aggregate production from within the Peak District National Park will eventually result in a further concentration of large scale quarrying activity in the Buxton area, immediately adjacent to the Park boundary. Whilst there is scope, at several of those quarries, for the aggregate to be transported by rail rather than road, not all markets can be served by rail. For those which cannot, there will be an inevitable increase in the extent to which stone is carried by road through the National Park. Opportunities also exist to increase production from existing quarries or new sites in the area to the south east of the National Park. In the short to medium term, these opportunities probably represent the most likely market response, but in the longer term they are likely to be limited by the availability of existing permitted reserves and the difficulty of obtaining additional reserves unless the obstacle of the large existing landbank in the Buxton area can be overcome.

In both areas, any increase in future quarrying, to compensate for reduced output from the National Park, would have landscape impacts, both in relation to proximity to the National Park boundary and in relation to the quality and character of the land outside the Park. Although this land is not specifically designated for its landscape value, further quarrying would inevitably result in additional landscape changes. Whilst this would not be desirable if carried out by conventional approaches to quarry design, there may be scope to create long term landscape and environmental improvements in these areas, through well-designed future proposals for both quarrying and restoration (along similar lines to those previously examined in the Mendips – see Thompson *et al* 2010).

## CASE STUDY PAIR 4: SAND AND GRAVEL IN SURREY AND OXFORDSHIRE

This case study pair is based on the notion that many parts of the South East are beginning to run out of sand & gravel resources that can be worked without unacceptable levels of environmental impact, whereas Oxfordshire might have a greater availability of relatively unconstrained resources. Partly in recognition of this argument, the sub-regional apportionment for Oxfordshire was recently increased by 15 %, following intervention by the Secretary of State. As an example of the issue involved, this case study compares the situation in Surrey (which has historically been the largest provider of sand & gravel within the South East), with the situation in Oxfordshire, in terms of both resource availability and the extent of major environmental constraints.

### Sand and gravel extraction in Surrey

The Surrey Minerals Plan Core Strategy and Primary Aggregates development plan documents were submitted for examination in June 2010. The Core Strategy notes that concreting aggregate extraction will be concentrated on the river terrace gravels of north-west Surrey and that soft sand extraction will be concentrated in the south west and east of Surrey. This is primarily a reflection of the geological resource distribution and the differences between the deposits in terms of end-use suitability. The superficial (Quaternary) river terrace deposits comprise sharp sand & gravel suitable for making concrete, whilst the Cretaceous 'Greensands' comprise finer-grained soft sands that are used primarily as building sands but also, in places, as higher grade silica sands. The terrace deposits are found primarily within the Thames valley and tributary valleys, whilst the Greensands occur along an east-west trending ridge, parallel to and to the south of the North Downs.

Figure 58 shows the distribution of these resources together with existing quarries and the principal environmental designations.

Major environmental designations within this area include the Surrey Hills AONB, which covers much of the Greensand outcrop, except in the east and far west of the county, and a large number of European designations and SSSIs, which affect some parts of the Greensand and some parts of the terrace deposits. More extensive than the AONB, is the Surrey Hills Area of Great Landscape Value (AGLV). Also important in this region are the Aerodrome Safeguarding Areas (ASAs) of Heathrow, Gatwick and Farnborough. These areas represent a 13 km radius within which the local planning authority must consult on any proposed developments that have the potential to increase bird-strike risk. Extraction sites that are restored for habitat creation are considered as such developments. The ASAs are not shown on the map.

In addition to these environmental constraints, substantial parts of the river terrace resource, and some parts of the Greensand outcrop in the east are sterilised by existing urban development, the main areas of which are shown on Figure 58.

#### MAIN QUARRIED AREAS

Thirteen preferred areas for sand and gravel are identified within the Primary Aggregates Development Plan Document (eleven for concreting sand and two for soft sand). All of these fall within two of three broader areas that are currently worked for sand & gravel. These broad areas are the Thames Valley Area in the north-west and two Lower Greensand areas in the west and middle to east of the county. Each of these areas is considered in more detail below.

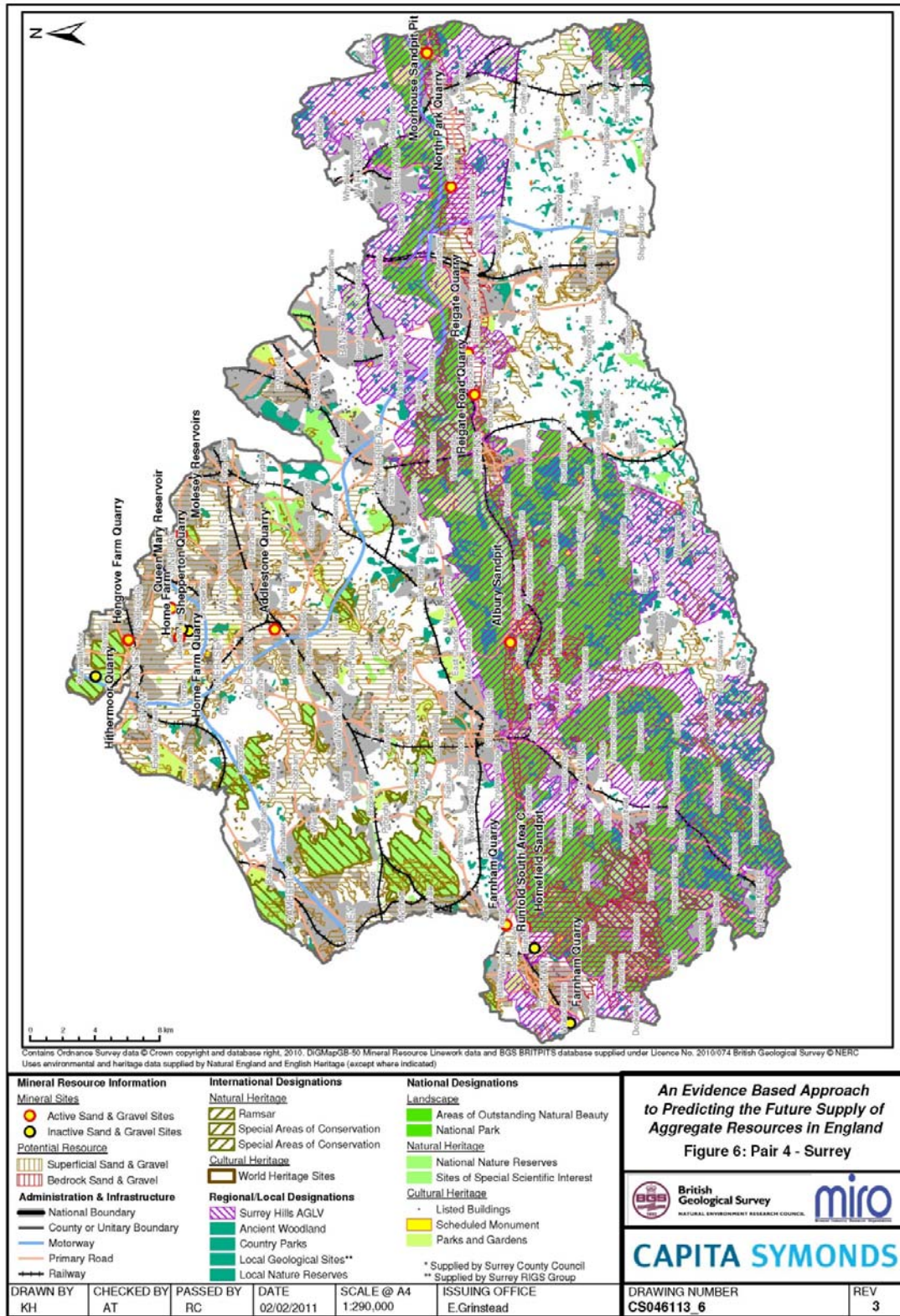
##### *Thames Valley Area – Superficial sand and gravel*

Five active sites and three inactive sites are listed in this area, along with eleven preferred areas for future working. One additional preferred area was rejected following the outcome of a Habitats Regulations Assessment which identified that extraction could not take place without an adverse impact on the South West London Waterbodies SPA. Several SSSI designations also occur in this area and all of the existing quarries are within the Aerodrome Safeguarding Area for Heathrow. Many of the quarries are close to built-up areas and urban development sterilises much of the unworked resource outcrop. Nevertheless, there appears to be a number of locations, within the preferred areas, where future mineral extraction is neither sterilised by existing development nor hampered by major environmental constraints.

##### *Mid to east Surrey – Lower Greensand*

Five active pits exist in the Dorking, Redhill and Oxted area, supplying sand from the Folkestone Formation of the Lower Greensand Group. Three of these supply building sand but the two others supply higher grade (purer) silica sand for a variety of specialist applications.

Two of the existing quarries are within the Surrey Hills AONB and one other is partially within the AONB (ancient woodland is also situated to its north west). The whole of the resource outcrop lies adjacent to, and in places within the AONB. Four of the existing sites also fall within the Surrey Hills AGLV.



**Figure 58.** Relationship between geological resources and environmental constraints in Surrey (case study pair 4).

Mineral Safeguarding Areas (MSAs) for soft sand and silica sand cover much of the accessible (i.e. unsterilised) resource in these areas, and two small<sup>32</sup> preferred areas for future working of primary aggregate have been identified in the eastern-most part of the outcrop (Mercer's Farm and Oxted Sandpit Extension). An area of potential silica sand resource, which appears to be less constrained (it is outside of the AONB and AGLV), is found to the east of Redhill and part of this resource is included within the Chilmead Farm Preferred Area. An additional Preferred Area and wider Area of Search is located adjacent to the M25 at Pendell Farm. However, this is within the AONB and AGLV, and an area of Ancient Woodland is also present. Three out of the five existing sites, and three of the preferred areas (Mercer's Farm, Chilmead Farm and Pendell Farm) fall within the ASA for Gatwick Airport (situated to the north of Crawley in West Sussex). In addition, the Oxted Sandpit Extension site is within the ASA for Biggin Hill Airport in Greater London.

#### *Farnham Area – Lower Greensand and superficial sand and gravel*

Four sites are identified in the Britpits database for this area, two active and two inactive. All of them fall within the ASA for Farnborough. Three of the sites produce soft sand from the Lower Greensand and one active site exploits the superficial terrace gravels of the River Blackwater to supply sharp sand & gravel. Of the Greensand sites, one is within the AONB and all three fall within the Surrey Hills AGLV. The inactive sand site to the east of Farnham appears to be situated within a resource area that extends further than the currently excavated area and for which the only mapped environmental constraint is the AGLV (though it is also within the ASA for Farnborough). However, no Preferred Areas have been identified for the west of Surrey<sup>33</sup>.

#### *Other areas*

Outside of the three currently quarried areas, described above, there are other parts of the county in which sand & gravel resources have been identified by the BGS, and which appear to include unconstrained areas. These are considered below.

#### *Guildford to Esher area and north-west of Woking*

There appears to be unconstrained river terrace gravel resources within the area bounded by the railway lines between Guildford in the south west and Esher in the north east and also to the north west of Woking. Some parts of these two areas are affected by various designations, including Ancient Woodland, Parks and Gardens, SPAs, LNRs and SSSIs (including the former gravel pit of Papercourt), and are also part of the Defence Estates. However, there are areas of unworked resource outside of the main areas of built development, that remain free of major designations. In addition, both of these areas of resource are outside of the ASAs for Gatwick and Heathrow and, although not identified as preferred areas, both of them contain concreting aggregate Mineral Safeguarding Areas (MSAs)<sup>34</sup>.

#### *The Wey Valley*

To the south east of Godalming are sand and gravel resources of river terrace and inferred sub alluvial deposits. Part of the resource is within the AGLV and other designations include small areas of ancient woodland at the edges of the resource area and listed buildings. The Dunsfold

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<sup>32</sup> In comparison to the MSA

<sup>33</sup> a former preferred area 'R', an extension to the Runfield South quarry, that had been identified within the earlier issues and options phase of preparing the Core Strategy, was granted planning permission in 2007. Preferred area 'M', Monkton Lane, was dropped after a development proposal on this land was called in by the Secretary of State and subsequently granted permission.

<sup>34</sup> Surrey Minerals Proposals Map, November 2009.

Aerodrome is also located within this area. However, the majority of the resource appears to be unconstrained. These deposits do not appear to be included with an MSA on the 2009 Minerals Proposals Map for Surrey.

#### *Dorking/Reigate and Lingfield areas*

To the south west of Reigate and the south east of Dorking lies an area of potential river terrace resource that appears largely unconstrained. Likewise, to the east of Lingfield is an area of generally unconstrained river terrace deposits. Both of these areas are within the ASA for Gatwick. An area of potential concreting aggregate resource is also present to the north of Dorking<sup>35</sup>, however this particular area is also covered by the designations of AONB, AGLV and intersects areas of LGS, Parks and Gardens, Country Parks and Listed Buildings. SACs/SSSIs and ancient woodland also exist on the peripheries of the BGS identified resource. None of these areas is defined as a concreting aggregate MSA by Surrey County Council on the 2009 proposals map.

#### **Summary for sand and gravel extraction in Surrey**

From the information presented above it would seem that Surrey still has significant areas of unworked potential resources of sharp sand & gravel, in areas which are not sterilised by existing urban development and which are free of major designations and outside the AGLV. A number of these areas are identified as Preferred Areas for future working, although this does not necessarily mean that the resources which they contain are either commercially exploitable or free of environmental concerns. An important factor in all of these areas is likely to be their proximity to existing development, which, as well as the physical constraint, brings the potential for increased visual impact and objection.

It appears that for soft sand, including specialist silica sand, although some of the preferred areas are free from major environmental designations and some of the safeguarded areas fall outside of the AGLV (west of Reigate and south west of Farnham), all of them fall within ASAs, which will limit the options for restoration and might therefore hinder the prospects for extraction.

#### **Sand and gravel extraction in Oxfordshire**

Oxfordshire's sand and gravel resources comprise both superficial (Quaternary) river terrace deposits (similar to those in Surrey), and Jurassic Corallian Group sands. The terrace deposits are found primarily within the Thames valley and tributary valleys, whilst the Jurassic deposits occur mainly in an area between Farringdon and Oxford.

Figure 59 shows the distribution of these resources together with existing quarries and the principal environmental designations. It also shows three strategic areas for possible future sand & gravel extraction beyond the current plan period. These areas were identified by the BGS as part of the long term phase of the proposed 'Option 3' of the Oxfordshire Country Council Spatial Strategy<sup>36</sup>. Option 3 takes account of the full spread of potential sand and gravel resources (whereas the other options concentrated on resources within close proximity to the main market areas). The three strategic areas were defined using the BGS identified resource, with the application of a 500 m buffer. The following broad assessment of environmental implications focuses on these three areas.

#### AREA 1 – CLANFIELD/BAMPTON/BRIGHTHAMPTON

The potential resource in this area is within the river terrace gravels of the middle reaches of the Thames (the Isis). Extraction has historically occurred in a continuation of the same deposits to

<sup>35</sup> Geology of Surrey, Background Paper, 2009

<sup>36</sup> Land-won aggregates: Spatial Strategy Options Presentation to Stakeholders, 2010



the east of this area near Standlake, most recently at the now inactive Stanton Harcourt Quarry. Within the strategic area itself there appear to be quite extensive areas of resource which are both free of major environmental designations and away from major built up areas. The most numerous designations in this area are listed buildings and scheduled monuments. There are also three SSSIs, two on the alluvial meadows of the River Thames and one adjacent to a tributary. There is also one small area defined as parks and gardens.

One additional potential constraint for this area that is not mapped is the presence of the Brize Norton Airfield to the north. The published advice<sup>37</sup> on ASAs is that these should be defined as a 13 km radius which would encompass all of the strategic area. This could limit the potential for future extraction, unless restoration options could be found which did not increase the risk of birdstrike. While the appropriate transport infrastructure is not generally in place for extraction in this area and it is some distance from the urban market areas, it has been suggested that aggregate may potentially be moved by boat along the rivers<sup>38</sup>.

Quarrying is not a feature of the landscape in this specific area of Oxfordshire and, as a result, minerals extraction may be considered as a potential local landscape pressure.

#### AREA 2 – ABINGDON

This relatively small area of potential resource is defined around the river terrace gravels and indicated sub-alluvial material of the River Thames to the east of Abingdon and to the south of Oxford. The superficial gravels and the area has historically been worked for gravel at the active Thrupp Lane Quarry and adjacent former pits (restored to Radley Lakes and low-level land). In this area the potential resource intersects three scheduled monument designations relating to settlement sites and ancient woodland. The resource is also partially sterilised by built development. Within the buffered area of resource lies Nuneham Common (Parks and Gardens).

While some resource does appear to remain for potential future exploitation in this area, in the long term, Area 1 (outlined above) would appear to offer greater prospects in terms of resource availability.

#### AREA 3 – WALLINGFORD

This area contains river terrace gravels (some concealed) and sub alluvial (inferred) resources. Much of the defined strategic area falls within or closely adjacent to the adjoining AONBs of the North Wessex Downs and the Chilterns. Significant parts of the resource in the south are sterilised by existing development within and around Wallingford. The northern part of the resource, however, is more distant from the AONB designations and relatively free of urban development.

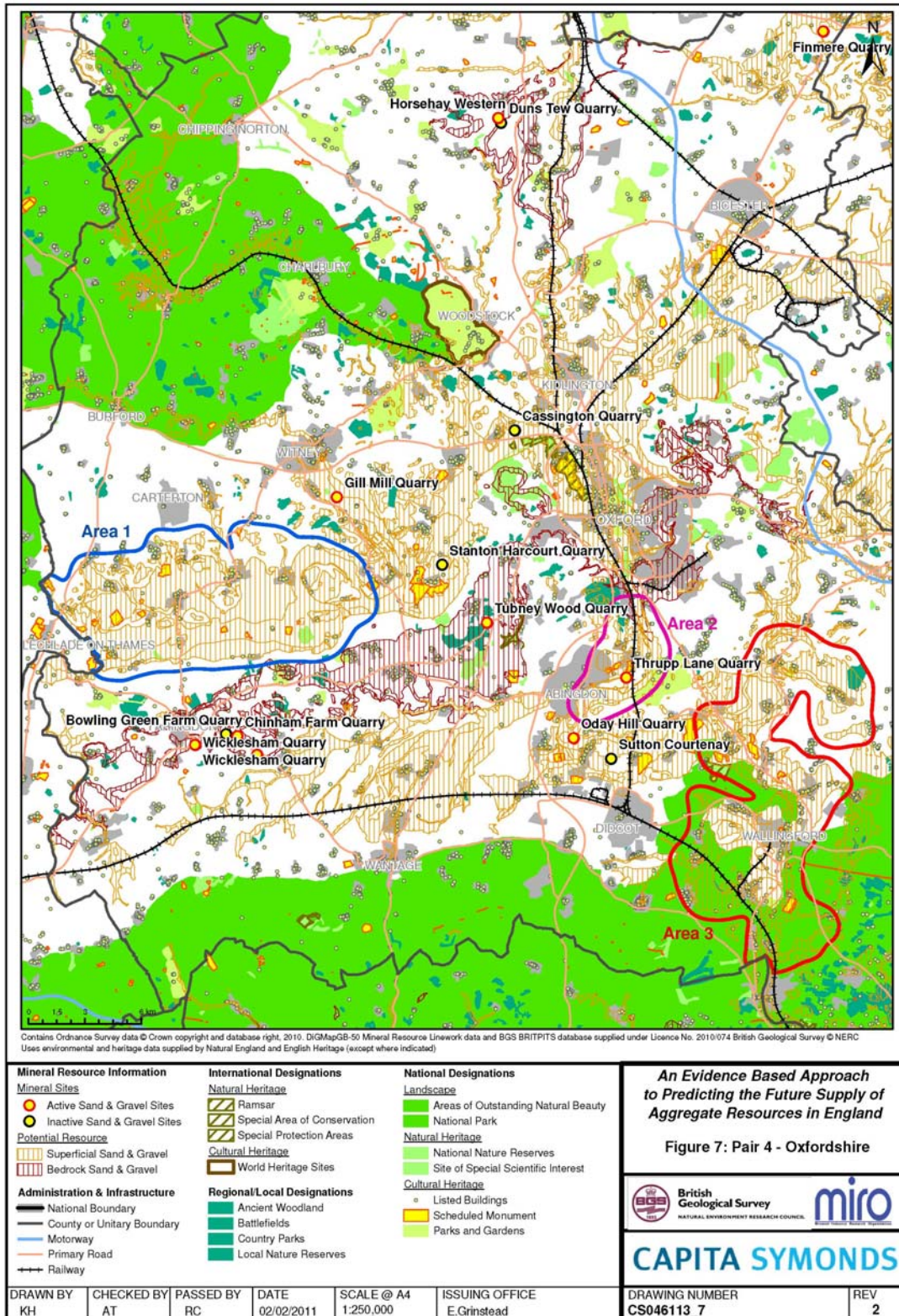
A SAC/SSSI/Ancient Woodland is included within the buffer applied to the resource but sits adjacent to the resource defined by the BGS. Area 3 also contains scheduled monuments and there is some potential, particularly around Warborough, for archaeological features to constrain future working<sup>39</sup>. In the north is the battlefield site of the Battle of Charlgrove. There are also two areas defined as parks and gardens. There are, however, resources in this area that are free from the mapped constraints.

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<sup>37</sup> Safeguarding of Aerodromes, CAA 2003

<sup>38</sup> Land-won aggregates: Spatial Strategy Options Presentation to Stakeholders, 2010

<sup>39</sup> Oxfordshire Mineral and Waste Development Framework, Presentation to stakeholders, February – March 2010



**Figure 59.** Relationship between geological resources and environmental constraints in Oxfordshire (case study pair 4).

## Summary for sand and gravel extraction in Oxfordshire

Focusing on the three strategic resource areas in Oxfordshire that have been outlined by the BGS, there appear to be prospects for future working of river terrace and/or sub-alluvial sands and gravels in areas that are free of major designations and existing built development. The most extensive prospects for relatively unconstrained future working would appear to be in Strategic Area 1, but none of the resources in any of the areas has yet been formally identified as preferred areas for future working<sup>40</sup>. As noted above for Surrey, however, neither the BGS maps nor the identification of preferred areas necessarily mean that the resources are either commercially exploitable or free of environmental concerns. Subject to this uncertainty, and to the detailed resource exploration work that would need to be carried out in order to prove viable reserves, the Oxfordshire resources would appear to offer greater prospects for future sand and gravel extraction than those in Surrey, which are generally more affected by proximity to existing development. Whilst that, in itself, is not a designated constraint, it might well have a strong influence on the outcome of planning decisions. In some cases the areas involved fall within the Green Belt (not shown on the maps), although that, again, should not preclude mineral development, which is recognised as being a temporary land use.

## CASE STUDY PAIR 5: SAND AND GRAVEL IN STAFFORDSHIRE AND SHROPSHIRE

The traditional (historic market share) basis for sub-regional apportionment of sand and gravel provision within the West Midlands region has been challenged by Staffordshire County Council, on the basis that it does not reflect the most sustainable balance for aggregates supply in the region. The council has argued that to apply an apportionment based on past sales trends would not be *‘effective in delivering environmental safeguards and reducing cumulative impacts from sand & gravel mineral operations in Staffordshire’*<sup>41</sup>. Other counties in the region have stated, however, that they could not deliver the shortfall that a reduction in Staffordshire’s contribution would create.

This case study examines the extent to which one of the region’s other main suppliers – Shropshire – might be able to increase its share of future sand & gravel provision, in terms of both resource availability and broad environmental implications. The comparison focuses primarily on particular areas of sand & gravel resources within Shropshire which have been investigated in the past by the former Institute of Geological Sciences (now the BGS), although additional resource areas (e.g. to the South of Shrewsbury, investigated by Liverpool University) also exist within the county

### Sand and gravel production within Staffordshire

Figure 60 shows the extent of the bedrock and superficial sand & gravel resources within Staffordshire, as mapped by the BGS, together with the currently active and inactive quarries and the distribution of the main environmental<sup>42</sup> and cultural heritage constraints. The key issues relating to resource availability and constraints are outlined below for each resource type.

#### BEDROCK SAND AND GRAVEL

Conglomerates (weakly cemented sand and gravel deposits) within the Triassic Sherwood Sandstone Group form an important resource of coarse and fine aggregate for the manufacture of

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<sup>40</sup> Nominations have come forward and a shortlist of preferred site options will be published within the Core Strategy Preferred Options document

<sup>41</sup> West Midlands Sub-Regional Apportionment of Aggregates, Technical Consultation with West Midlands Regional Aggregates Working Party – Staffordshire response.

<sup>42</sup> Excluding LGSs

concrete, as well as for building and asphaltting sand. Within Staffordshire, these deposits occur in three main areas: in the north of the County (to the south-east, south and south-west of Stoke-on-Trent), in the area within and around Cannock Chase, and in the south east of the County, to the south of Lichfield.

The quarries in the north Staffordshire outcrop (the active Freehay and Croxden quarries and the currently inactive Trentham Quarry), together with the wider areas of unworked resource in this area, are generally unconstrained by major environmental and cultural heritage designations. Small areas of ancient woodland and occasional listed buildings are present in some parts of the resource, whilst some other areas are either sterilised by existing urban development or constrained by proximity to it. There are, nevertheless, significant areas which appear to be relatively unconstrained.

The Triassic resources at Cannock Chase and to the west of Cannock are largely covered by the AONB designation. Parts of this area are also affected by a variety of other designations including SAC, SSSI, Ancient Woodland, Country Park, Parks and Gardens, LNR, Scheduled Monument and, at the peripheries, listed buildings. Within the AONB are three active quarries, Rugeley, Pottal Pool and Huntington quarries. One additional inactive quarry within the same resource, at Saredon, is unaffected by any of these designations.

In the south east Staffordshire area the active quarries are Hints, the Weeford complex and Cranebrook. This latter is a small quarry, located in an area where no resources are identified on the BGS mapping. All three of these sites appear to be free of major environmental and cultural heritage designations, though they are bordered in some places by ancient woodland. Further apparently unconstrained resources are mapped to the south west of the Weeford sites, towards (and beyond) the county boundary.

#### SUPERFICIAL SAND AND GRAVEL

Quaternary river valley gravels (comprising sub-alluvial and river terrace deposits) are worked in the Trent and Tame valleys at Alrewas, Barton, Manor Park (inactive) and Newbold quarries, and in the Dove Valley at Uttoxeter Quarry. In these areas, the main potential constraints are existing urban development and major infrastructure (roads and railways), together with scheduled monuments and sporadic listed buildings. Beyond these features, there appear to be substantial areas of relatively unconstrained resources, although the Trent Valley in general is known to have considerable archaeological potential and Staffordshire County Council has noted that the cumulative impacts of mineral extraction on local communities here may also be significant. Although the unworked resources within the Trent Valley are not protected by any formal landscape designations, the valley has undergone large-scale landscape change as a result of previous and ongoing mineral extraction and restoration. Locally, landscapes contribute to quality of life and may be valued by local communities.

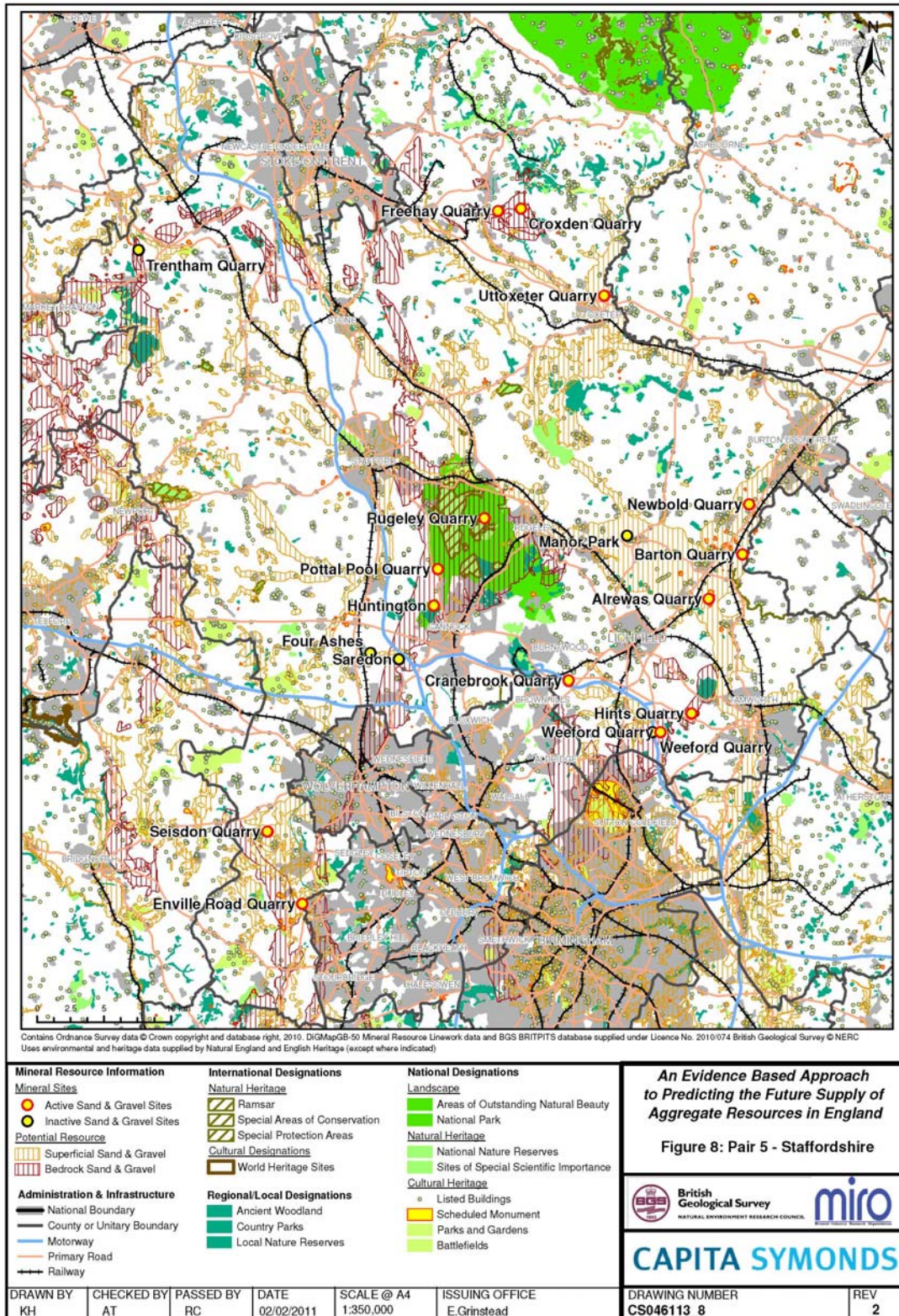


Figure 60. Relationship between geological resources and environmental constraints in Staffordshire (case study pair 5).

Older Quaternary (glacio-fluvial) sand and gravel is worked at the Seisdon, Enville Road and (until recently) Four Ashes quarries. These resources are frequently overlain by or interbedded with glacial till deposits, making their exploitation relatively difficult and small scale, but they are important in providing local supplies and (incidentally) in revealing features of geodiversity interest, relating in particular to Quaternary history<sup>43</sup>. The area of resource to the east of Seisdon is free from major environmental constraints, although the resource to the west is sterilised by existing urban development. The Enville Road works appear to be constrained to a limited deposit that becomes sterilised by development in the east. Designations found elsewhere within this resource area include a scheduled monument and listed buildings (generally within urban areas) and a SSSI designation which is also a Country Park covers a small area of the resource some 3.5 km west of Enville Road.

Additional resources of glacial sand and gravel which appear to be largely free of major environmental designations, formal landscape designations, and built development, occur to the south of Uttoxeter.

### Summary

Although much of Staffordshire's bedrock sand and gravel resources are constrained by AONB and other major designations, there are also areas where the resources are free of such designations. These areas would seem to offer scope for future resource development in line with MPS1 objectives. In the case of superficial sand and gravel resources there appears to be similar or greater scope for exploiting unworked resources without impinging on major designations.

### Sand and gravel production within Shropshire

Figure 61 shows the extent of the bedrock and superficial sand and gravel resources within Shropshire, as mapped by the BGS, together with the currently active and inactive quarries and the distribution of the main environmental and cultural heritage constraints. Large areas within the county of Shropshire contain sand and gravel mineral resources. As in neighbouring Staffordshire, these include both bedrock and superficial deposits. The latter are very extensive, particularly (but not only) to the north of Shrewsbury, and include both glacio-fluvial and postglacial river terrace/ alluvial deposits. Despite this abundance of resources, there are currently only seven active and three inactive sand & gravel quarries within the County, all of which exploit glacio-fluvial sands and gravels.

Historically, Shropshire has supplied around 8% of the West Midlands regional sand & gravel apportionment. The reasons for this seemingly limited utilisation of a large scale resource are partly related to the distance of the resource from key market areas such as Birmingham and Wolverhampton (compared with the resources in Staffordshire) and partly to the nature of the mineral itself. The resources are largely associated with deposition by meltwater from former ice-sheets which crossed the Irish Sea, from icecaps as far away as Cumbria and Scotland. These glacio-fluvial deposits are dominated by relatively fine grained sediments – with a high proportion of sand and a relatively low proportion of gravel. This makes them less economically viable than deposits (such as the Triassic pebble beds worked in Staffordshire) which generally have a much higher proportion of gravel. The Shropshire glacio-fluvial deposits are also sometimes associated with glacial till, which occurs both as overburden and interburden within some (but not all) of the deposits, making them more difficult to work compared with the well-sorted fluvial sediments of the Trent Valley. As a consequence, at least some of the Shropshire deposits are likely to require more labour-intensive working to separate out layers of unsuitable

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<sup>43</sup> The Four Ashes pit is recognised as the type locality for the last main glaciation of the UK – known as the Devensian period.

material; more intensive washing and screening to reduce unwanted fines, and may deliver a less economically advantageous balance of sand and gravel than can be obtained in Staffordshire.

The Shropshire Core Strategy<sup>44</sup>, which outlines both the geological resources of the region and those resources that are included within MSAs, also identifies that sites capable of helping to deliver the sub-regional target for sand and gravel will be allocated within mapped 'broad locations'. 'Potential future' sand and gravel workings are identified within the Minerals Technical Background paper<sup>45</sup>. Prior to this, in early 2010, Shropshire Council had launched a 'call for sites' to inform the preparation of the Site Allocations DPD intended to help deliver the Core Strategy. During the resulting meetings with representatives of minerals companies operating in Shropshire, it was explained by industry that the relatively high proportion of sand and the variable quality of the resource, together with greater transport distances and costs, means that the industry has little interest in significantly expanding sand and gravel production in this area. These views are reflected in the limited number, size and nature of the sites brought forward by industry for consideration.

Large areas within the north of the county were previously included within the programme of sand and gravel resource assessments carried out by the IMAU of the former Institute of Geological Sciences (now the BGS). While it is acknowledged that other areas within Shropshire are known to contain additional resources, and that some of these have been identified as broad areas and sites of potential future working, the following details focus on the area of IMAU investigations, simply as an example of the potential environmental and cultural heritage implications of additional future quarrying in Shropshire.

Just two quarries are shown within the IMAU area of superficial (glacio-fluvial) resources; Wood Lane (active) and Sleaf Airfield (inactive). The permission at Sleaf Airfield is relatively recent and has been implemented but quarrying has not yet begun.

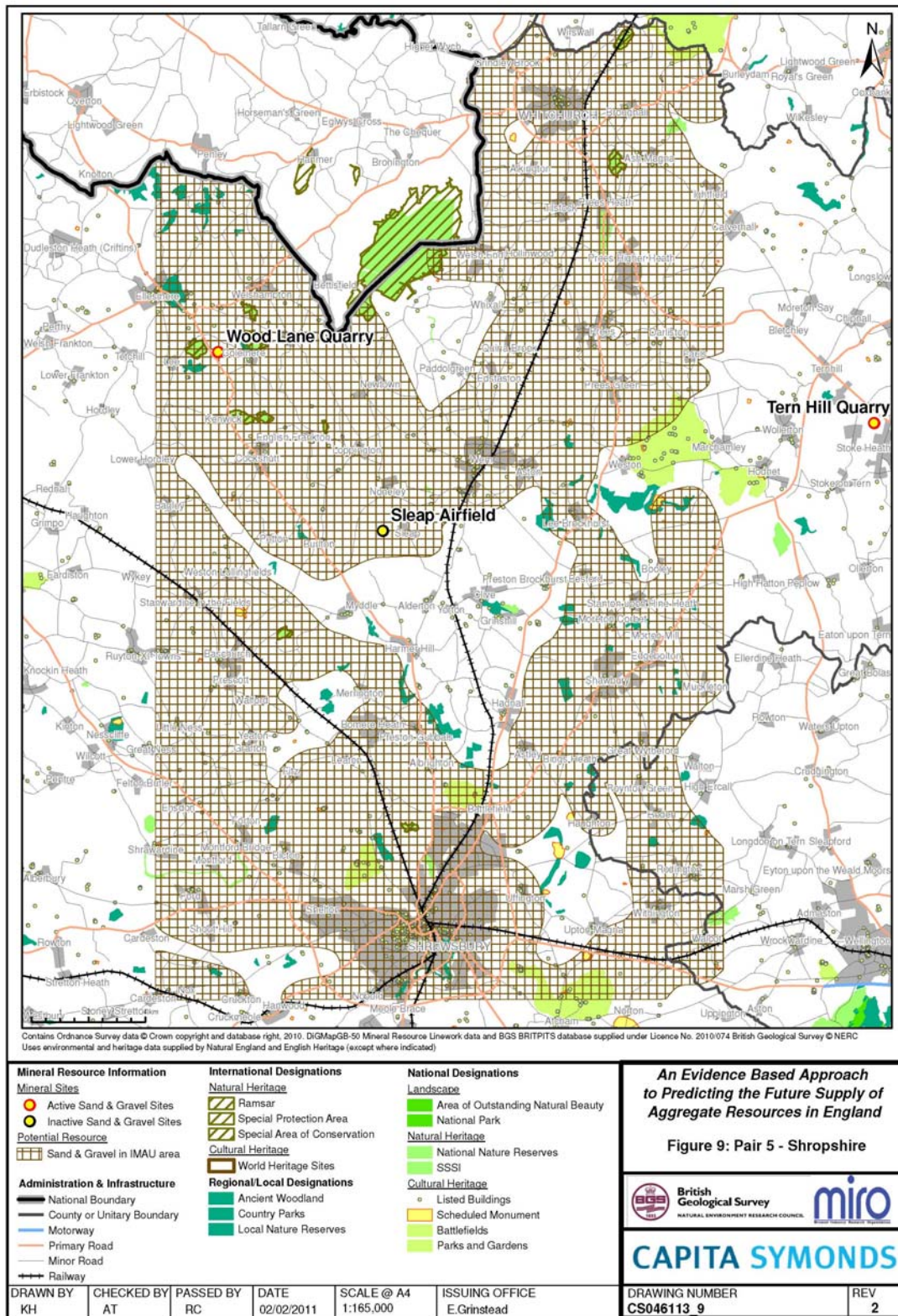
In the IMAU-assessed resource area, the overall footprint subject to environmental designations is small. As an indication of this, there are 19 SSSIs, each covering less than 0.5 km<sup>2</sup>, within the total resource outcrop of approximately 470 km<sup>2</sup>. Of these SSSIs, 11 are Ramsar sites and 3 are also SACs. The Meres and Mosses Ramsar sites are generally groundwater-supported habitats, linked to 'perched' and/or main aquifer units within the superficial sand and gravel bodies. As such, they may represent constraints to future workings if they fall within the hydrogeological zone of influence of any proposed quarrying activities (whether through deliberate dewatering and/or relating to the drawdown induced by other water losses, including evaporation from open water bodies created by quarrying).

There are no landscape designations (National Parks or AONBs) within the IMAU-assessed resource areas. Urban areas, other than the main centres of Shrewsbury, Whitchurch and Wem, are limited and listed buildings are sparse within the intervening rural areas. Outside of the urban areas, there are two Parks and Gardens in the south, near Shrewsbury, and two others that just clip the resource area in the north-east and at the eastern edge of the resource outcrop, respectively. Other than these features there appear to be no local landscape designations. Few areas of Ancient Woodland are present and all of these are less than a quarter of a square kilometre in size. The area has one LNR, one battlefield and two Country Parks (one of which is also a Ramsar and SSSI).

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<sup>44</sup> Final Plan Publication, February 2010 - The Examination in Public of the Core Strategy has taken place and the Inspector is considering his report.

<sup>45</sup> July, 2010 - forming part of the evidence base of the CS submission.



**Figure 61.** Relationship between geological resources and environmental constraints in Shropshire (case study pair 5).



## Summary

By comparison with Staffordshire, Shropshire appears to have much greater availability (in terms of surface area) of unworked resources that are free of both major environmental constraints and local landscape designations. The IMAU-assessed resource area as a whole is largely free of such constraints: although a number of SSSIs, SACs and Ramsar sites are present, these affect only a minor proportion of the available resource. However, the resources in Shropshire are in many cases more complex, geologically, and more distant from the main regional areas of demand (in Birmingham and Wolverhampton). Industry preference will always be for deposits which are relatively simple (and therefore inexpensive) to develop, and which are closest to the markets. In this case (and often more generally), this economic preference is aligned with the Proximity Principle and with the more general concepts of energy and resource efficiency.

Even if Staffordshire's apportionment were to be reduced, and Shropshire's increased, industry may be reluctant to bring forward new proposals within Shropshire unless and until the actual supply from Staffordshire became sufficiently restricted to increase the level of demand in Shropshire. This would certainly be the case for the north Shropshire resources considered here. Greater interest might be seen in resources to the east of Telford, which are closer to Staffordshire and to the main markets.

Whilst this might eventually achieve a shift in the pattern of supply, it would also increase the delivered cost of construction aggregates and the environmental impacts of transportation, particularly carbon emissions. These effects would need to be balanced against any reductions in site-specific environmental impacts that might be achieved by reduced levels of extraction in Staffordshire.

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