



*Survey of Arisings and Use of Alternatives
to Primary Aggregates in England, 2005*

Other materials

Final Report



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Report from Capita Symonds Ltd, in association with WRc plc

February 2007

Department for Communities and Local Government : London

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CHAPTER 1

Summary

- 1.1 This document is the Final Report addressed to the Communities and Local Government, covering the “Other Materials”, being one component of a research project entitled ‘Survey of Arisings and Use of Alternatives to Primary Aggregates in England, 2005’. There is a separate report on the other component of the project covering Construction, Demolition and Excavation Waste (CDEW). This survey follows a previous similar one for England and Wales for 2001.
- 1.2 This component of the project was conducted by contacting relevant producers and processors and other bodies and organisations, to arrive at reasonable estimates about a number of widely differing materials. Data for 2005 was sought on arisings of a material, its current uses as aggregates or otherwise, and potential availability of material for further use. Views were also sought on trends in arisings and uses and on potential for the future.

Other Material	2005 Survey – England	2001 Survey – England & Wales
Ball Clay Waste	Yes	No
Colliery Spoil	Yes	Yes
China Clay Waste	Yes	Yes
Coastal Dredgings	No	No
Power Station PFA	Yes	Yes
Power Station Furnace Bottom Ash	Yes	Yes
Incinerator Bottom Ash – Waste to Energy Plant	Yes	Yes
Blast Furnace (Iron) Slag	Yes	Yes
Basic Oxygen Furnace (Steel) Slag	Yes	Yes
Electric Arc Furnace (Steel) Slag	Yes	Yes
Non-Ferrous Slags	Yes	No
Spent Foundry Sand	Yes	Yes
Slate Waste	Yes	Yes
Scrap Tyres	No	Yes
Spent Railway Track Ballast	Yes	Yes
Fired Ceramic Waste	Yes	Yes
Waste Glass	Yes	Yes
Recovered Asphalt Planings	Yes	No
Gypsum	Yes	No

- 1.3 This survey is to assist with minerals planning activities and so data are presented with this in mind. Thus it is not a detailed analysis of all aspects of each material, giving data and analysis of equal value to all stakeholders' viewpoints. Information is presented solely to give a scale to the current situation with these materials, in terms of arisings and use as aggregates or in other ways. This survey has not looked at the technicalities of the materials in terms of their properties or processing requirements or at the extent of their potential for particular use(s) as aggregates or otherwise.
- 1.4 Results for most materials are presented in separate Summary Sheets annexed to the Report:
- (i) ceramic (fired) waste;
 - (ii) china clay waste (including ball clay waste);
 - (iii) colliery spoil;
 - (iv) furnace bottom ash – power station;
 - (v) incinerator bottom ash – waste to energy plant;
 - (vi) foundry (spent) sand;
 - (vii) pulverised fuel ash (PFA);
 - (viii) slag – blast furnace (iron);
 - (ix) slag – basic oxygen furnace (steel);
 - (x) slag – electric arc furnace (steel);
 - (xi) slate waste;
 - (xii) spent railway track ballast; and
 - (xiii) waste (container) glass.
- 1.5 For some materials summary sheets were not appropriate and the findings are reported in the body of the report:
- (i) ball clay waste;
 - (ii) gypsum;
 - (iii) non-ferrous slags; and
 - (iv) recovered asphalt planings.
- 1.6 Comment is incidentally made on two other materials:
- (i) foundry slags; and
 - (ii) scrap tyres.

- 1.7 Opportunity was taken as part of the CDEW component of the project to seek information from operators of crushers and screens about their involvement in materials other than CDEW. This data is reported for information, but cannot be used in the estimation of the overall arisings and use of the various materials in this survey.
- 1.8 Most of the data included in the summary sheets have come through or been largely contributed by others. How these sources conducted their data gathering has not been investigated, but some knowledgeable consistency and acceptance of the data may be assumed. There will be variability in reliability between the data on arisings and use, the latter probably being rather less certain in general.
- 1.9 For the smallest arisings – ceramics, foundry (spent) sand and slate waste, the data are more fragmented and sketchy so the data should be more cautiously treated, though it is reasonable to assume that the relative order (or scale) of data is correct for these materials.
- 1.10 Data on the materials reported without a summary sheet are similarly widely variable as noted under each material, some giving a firm picture of the material but some with only very patchy and incomplete data.

Table 1.2: Summary of Arising and Use of Other Materials – England, 2005 million tonnes (mt)

Other Materials	Arisings	Not Relevant	Aggregate Use	Other Use	Potentially Available	Stockpiles
Ceramic (Fired) Waste 2004	0.05	nil	0.04	nil	0.01	nil
China Clay Waste	19.6	5.9	2.6	nil	11.1	c.150
Colliery Spoil	4.85	nil	1.0	nil	3.85	8
Furnace Bottom Ash: Power Station	1.0	nil	0.9	neg	nil	nil
Foundry (spent) Sand	0.35		>0.03		>0.2	–
Incinerator Bottom Ash: Waste to Energy Plant	0.725	nil	c. 0.4	nil	c. 0.3	–
Pulverised Fuel Ash	5.0	nil	0.9	1.8	2.3	–
Slag – Blast Furnace (Iron)	c. 2.0	nil	0.5	1.5	nil	–
Slag – Basic Oxygen Furnace (Steel)	0.5	nil	0.25	nil	0.25	–
Slag – Electric Arc Furnace (Steel)	0.26	nil	0.26	nil	nil	
Slate Waste	c. 0.5	–	0.15	0.08	–	>> 1.2
Spent Railway Track Ballast	1.4	0.2	1.2	nil	neg	–
Waste (Container) Glass	2.0	–	c. 0.1	50.9	0.95	–

- 1.11 These data are compared with those for England alone from the 2001 survey. This comparison, bearing in mind that the data are estimates of varying qualities and accommodating the error in the 2001 data for PFA use, shows no dramatic change in terms of overall aggregate use. Overall there may have been a decline in both the overall arisings of the materials and in the amount used for aggregates, though the proportion used as aggregates may have grown a little.
- 1.12 Details are in the summary sheets but other main points from the comparison are:
 - (i) PFA production overall has increased, but aggregate use has declined. Other uses have actually increased, though this is masked in the data by an over-estimate in the 2001 figure – the 2001 use figure is high as it included “grouting” and “other use” components not included in 2005 use figure; the comparable 2001 aggregate use figure should have been 1.00 million tonnes (mt);

- (ii) china clay waste and colliery spoil aggregate uses have risen despite the reduced production of the materials;
- (iii) power station FBA production has declined but it is still effectively all used as an aggregate; and
- (iv) use of waste container glass is the only case that has in percentage terms shown a considerable increase.

CHAPTER 2

Introduction

- 2.1 Capita Symonds Ltd, in association with WRc plc, were appointed by the Office of the Deputy Prime Minister (as was) to conduct a research project entitled ‘Survey of Arisings and Use of Alternatives to Primary Aggregates in England, 2005’. This project comprised two elements:
- (i) A study on Construction, Demolition and Excavation Wastes, and
 - (ii) A study on “Other Materials” that are used as alternative to primary aggregates.
- 2.2 This document is the Final Report addressed to the Communities and Local Government, covering the “Other Materials” element of the project. There is a separate report covering the Construction, Demolition and Excavation Waste (CDEW) element.
- 2.3 The project covers England only, and in this report any reference to regions, organisations, Local Authorities and other structures and entities should be interpreted as referring only to those in England. Wherever possible the data presented refer to the calendar year 2005. Where this is not the case the relevant period is identified.

AIMS AND OBJECTIVES

- 2.4 The full research specification is set out in Annex 3. Extracts from the specification that refer specifically to the aims and objectives of the Other Materials element are as follows:

Introduction

- 1.3 A variety of other materials are used as aggregates, including industrial by-products, mineral wastes and other recycled wastes. Information is also needed on arisings and use of these for 2005.

Aim

- 2.1 The aim of the work is to survey and report on arisings and use of alternatives to primary aggregates for 2005.

Objectives

- 3.2 The objectives, with respect to other alternatives to primary aggregates, are:
- to devise a method or methods for securing reasonably reliable information on arisings and use;
 - to collect and collate data; and
 - to prepare a commentary on the results that includes an assessment of reliability and a comparison with results of a survey undertaken for 2001.

3.3 The survey of other alternatives will rely on reasonable estimates.

PROJECT STEERING GROUP

- 2.5 The Communities and Local Government invited representatives of central and local government and of industry to sit on a steering group. The members of the steering group are listed in Annex 4.
- 2.6 The steering group met twice, in May and September 2006. At the first meeting they were briefed about the overall approach, and invited to comment. Prior to the second meeting the group was provided with a report presenting the emerging results and preliminary conclusions which were then discussed at the meeting. Later drafts of this report were circulated to the steering group by Communities and Local Government for comment.

MAIN ACTIONS AND MILESTONES

- 2.7 The main completed actions and project milestones were as follows:
- (i) start of project (February 2006);
 - (ii) review of previous contacts, review of other data sources, update of contacts and sources listing;
 - (iii) preparation of interim report for the first steering group meeting (in mid-May 2006) including proposed list of materials to be surveyed;
 - (iv) conduct of data gathering from contacts and data sources, collation of information, revision of summary sheet layout, preparation of summary sheets;
 - (v) submission of draft final report to Communities and Local Government for review at second steering group meeting (in mid-September 2006);
 - (vi) continuation of data chasing and gathering, preparation of final report, completion of summary sheets;
 - (vii) submission of final report (review draft) to Communities and Local Government on 7th November 2006; and
 - (viii) submission of final report to Communities and Local Government (on 5th December 2006).

CHAPTER 3

Other Materials Surveyed

- 3.1 This survey follows a survey conducted along similar lines in 2002 of relevant data for England and Wales for 2001.
- 3.2 The objectives of this survey were basically the same as before and consisted of the gathering of information on a variety of materials, other than CDEW, that are, or may be, used as alternatives to primary aggregates, in order to arrive at reasonable estimates of their arisings and uses. To this end we were required by the project brief:
- (i) to devise a method or methods for securing reasonably reliable information on arisings and use;
 - (ii) to collect and collate the data.
- 3.3 In addition this time, the project brief required us:
- (i) to prepare a commentary on the results that includes an assessment of reliability and a comparison with the results of a survey undertaken for 2001.
- 3.4 While not referred to specifically in the brief, the survey also addressed the issue of stockpiles of the materials potentially available for use as aggregates.
- 3.5 Following proposals made to and discussions at the first steering group meeting, the following materials were included in this survey (together with those involved in the previous similar surveys for comparison):

Table 3.1: Materials included in Survey

Other Material	2005 Survey – England	2001 Survey – England & Wales
Ball Clay Waste	Yes	No
Colliery Spoil	Yes	Yes
China Clay Waste	Yes	Yes
Coastal Dredgings	No	No
Power Station PFA	Yes	Yes
Power Station Furnace Bottom Ash	Yes	Yes
Incinerator Bottom Ash – Waste to Energy Plant	Yes	Yes
Blast Furnace (Iron) Slag	Yes	Yes
Basic Oxygen Furnace (Steel) Slag	Yes	Yes
Electric Arc Furnace (Steel) Slag	Yes	Yes
Non-Ferrous Slags	Yes	No
Spent Foundry Sand	Yes	Yes
Slate Waste	Yes	Yes
Scrap Tyres	No	Yes
Spent Railway Track Ballast	Yes	Yes
Fired Ceramic Waste	Yes	Yes
Waste Glass	Yes	Yes
Recovered Asphalt Planings	Yes	No
Gypsum	Yes	No

3.6 In explanation of the differences in the listing of materials surveys this time compared with 2001:

- (i) coastal dredgings (both capital and maintenance) were excluded as the last survey found that a very large proportion was not landed on shore or otherwise could not be considered as ‘available for general use’;
- (ii) scrap tyres were excluded as they are considered to be only peripherally relevant to aggregates use;
- (iii) recycled asphalt planings (RAP) were not included before as data were then being sought on this material by other means. They have been included this time, although we understand that previous data gathering attempts have not been particularly successful. This is a material that might be considered as falling under the CDEW categorisation, but since it does not necessarily require processing by crushing and/or screening, the majority of RAP re-used or recycled would probably not be picked up under the CDEW survey methodology;
- (iv) ball clay waste was not included before because of low overall quantities and low effective outputs, but is included this time, to check on the current situation and because the relevant producers will anyway be canvassed about china clay waste;

- (v) non-ferrous metal slags (e.g. aluminium slags) were not included last time, but have been included this time. They have similarities to ferrous slags and it was thought appropriate to check on the current situation; and
- (vi) gypsum (particularly 'waste' gypsum) has not been included before. The uses of gypsum are mostly within the construction industry though not really as aggregates. The major relevant producers will be canvassed anyway about combustion ashes, so it will be relatively easy to check on the gypsum situation at the same time. The scale of waste gypsum production has increased significantly since 2001 with the installation of flue gas desulphurisation at coal-fired power stations. It is, therefore, proposed to include it this time.

CHAPTER 4

Survey Activities

METHOD

- 4.1 Given the wide diversity of the materials to be included – their only common denominator in this case being actual, or potential for, use as aggregates in the construction industry – and the generally small number of participants involved with any particular material, it was not appropriate to conduct surveying of the each material in a manner similar to that for the CDEW element of the project. The project brief envisaged that survey of the “Other Materials” would rely on reasonable estimates.
- 4.2 These materials were reviewed by contact with producers and processors and other bodies and organisations with interest in the materials. Whilst it had been thought that some face-to-face interviews about some materials would probably be appropriate, in the end these did not prove to be necessary. Overall, much more information about these materials is more generally available than for the last survey, due to the massive rise of the internet as an information medium and to the fact that more companies have an interest in publishing data about their activities for environmental reporting purposes. There has also been a rise in the general interest in recycling which has given a prominence to these materials.
- 4.3 Additionally since 2002, the Waste and Resources Action Programme (WRAP) has developed as a significant source of data on matters to do with waste recovery and has stimulated data gathering and research, as well as practical activity.
- 4.4 With these facts as background and taking the contacts made before as a starting point, data sources on each material have been researched and followed up afresh. This has been done by direct contact with relevant personnel, initially by telephone and then often by email follow-up, to provide the output from the 2001 survey as an example and starting point.
- 4.5 Opportunity was also taken to seek some information on some of these materials through the CDEW survey, which has produced some ‘grass roots’ information to augment that acquired from other sources. This has also provided contacts with significant involvement in one or two of the relevant materials from whom we sought views about trends and the marketplace.
- 4.6 In addition published data produced by others has been reviewed. This had often provided the starting point for contact with the personnel, to seek clarification of or, more usually, update the published data. In this respect data collated by WRAP has been a notable source.
- 4.7 It is also to be remembered that this survey is to assist with minerals planning activities and so data are presented with this in mind. Thus, it is not a detailed analysis of all aspects of each material, giving data and analysis of equal value to all stakeholders’ viewpoints.

- 4.8 Therefore information is presented solely to give a scale to the current situation with these materials in terms of arisings and use as aggregates or in other ways. This survey has not looked at the technicalities of the materials in terms of their properties or processing requirements, or at the extent of their potential for particular use(s) as aggregates or otherwise.

REPORTING THE RESULTS AT SUB-REGIONAL LEVEL

- 4.9 Estimates for the production of recycled aggregate from CDEW (and other measures to do with use and disposal), have been projected down to the sub-regional level, as set out in the following table:

Table 4.1: Sub-regions for data collection and reporting	
English Regions	Sub-Regions
North West	Cumbria Lancashire and Greater Manchester Cheshire and Merseyside
North East	Northumberland and Tyne & Wear Tees Valley and Durham
Yorkshire & the Humber	North Yorkshire (excluding south Teesside) West Yorkshire South Yorkshire East Riding, North Lincolnshire and North East Lincolnshire
West Midlands	Shropshire and Staffordshire Herefordshire and Worcestershire Metropolitan County of West Midlands, other than Coventry and Solihull Warwickshire, Coventry and Solihull
East Midlands	Derbyshire Nottinghamshire and Lincolnshire (excluding North Lincolnshire and North East Lincolnshire) Leicestershire and Rutland Northamptonshire
East of England	Cambridgeshire, Norfolk and Suffolk Bedfordshire and Hertfordshire Essex
London	West London East London
South East	Kent Surrey, East and West Sussex Hampshire and the Isle of Wight Berkshire, Buckinghamshire and Oxfordshire
South West	Gloucestershire (excluding South Gloucestershire) Wiltshire and Dorset Somerset and the four former Avon authorities Devon, Cornwall and the Isles of Scilly

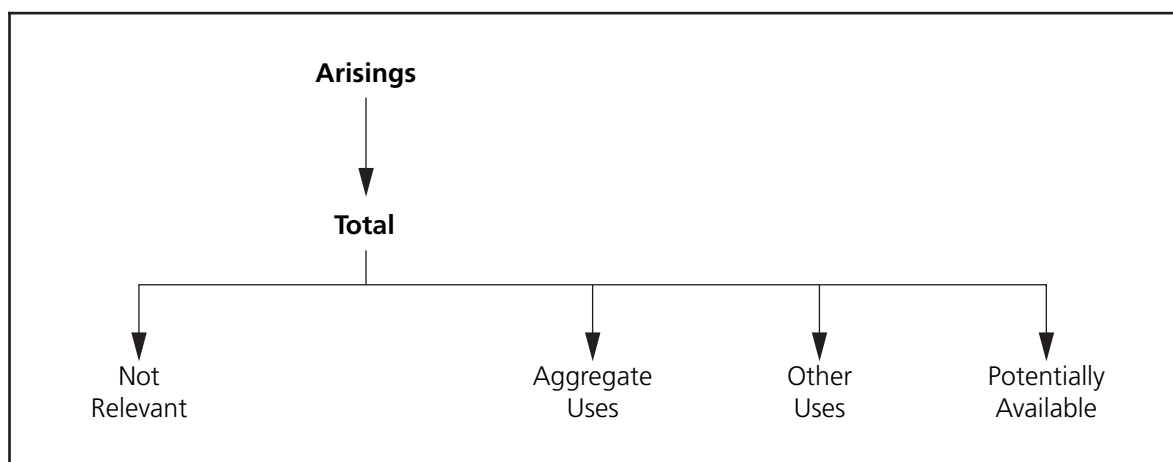
- 4.10 To maintain consistency, the arisings of the other materials have been geographically assigned using the same regional and sub-regional groupings where appropriate.
- (i) Most of the materials occur in geographically confined locations and arisings have been suitably assigned to the relevant sub-region;
 - (ii) power station ashes and Energy from Waste (EfW) bottom ash, which occur at specific locations, but more generally over the country, have been similarly assigned according to the quantity estimated to arise at each location corresponding to the relevant scale parameter of each facility;
 - (iii) track ballast formally arises where track maintenance or replacement occurs but is channelled to the market through specific locations (Local Distributions Centres). These have been assumed to be the practical sources of this material and so geographic assignment has been made on the basis of the location of these sites. Arisings from London Underground have been separately assigned to the London sub-regions; and
 - (iv) waste container glass has been geographically assigned according to population.
- 4.11 The **use** of these materials has not been estimated by region, as being impractical within the scope of this survey. With some materials, particular use may in fact be confined to a few locations; “general fill” type uses may be assumed to be relatively local to the source, but with other materials the use could be more distant. This means that where a portion of the arisings in a region are shown as used, the use could be anywhere and not (necessarily) in the region of arising. The use figures have been assigned to a region or sub-region mathematically, according to the proportions in the arisings data for the material.
- 4.12 **Potentially available** estimates have been similarly assigned.

CHAPTER 5

Results

SUMMARY SHEET REPORTS

- 5.1 The output from the survey is generally similar to that of the previous survey, that is;
- (i) a report on activity and overall findings and, principally,
 - (ii) a summary sheet about relevant materials that includes the salient data and commentary, including:
 - (a) the geographical source of the material;
 - (b) data on arisings and stockpiles;
 - (c) a commentary on arisings and stockpiles bearing in mind that many of these materials are locationally confined;
 - (d) information on uses, concentrating on aggregate uses but also referring to other uses or other disposals;
 - (e) other information that is forthcoming on trends and potential; and
 - (f) reference to the sources of the data.
 - (iii) commentary in the report about other materials surveyed but without a summary sheet.
- 5.2 In preparing these Summary Sheets, we have attempted to put the data into context.
- (i) For the arisings, we have split out from the overall total any fraction that is considered to be effectively not relevant for aggregate purposes, to give a more realistic understanding of the potential of the material stream. The remainder is then split between that which is used now as aggregate alternatives and that which is put to other uses, leaving a portion that is potentially available for use. It is likely that this last portion is currently put to disposal;



- (ii) what constitutes “aggregate use” for the purposes of the survey has been determined in a practical manner largely based on the premise that such use must displace a virgin aggregate. This is not an absolute definition since there are some aggregate uses that only involve recovered materials – some light weight aggregates, for example. Further, some materials have both aggregate and non-aggregate uses in construction;
- (iii) the figure given as “Potentially Available” is a straight mathematical calculation, and takes no account of the technicalities or practicalities of actually putting these materials to aggregate (or indeed other) use; and
- (iv) regarding stockpiles, we have attempted to distinguish between the existence of stockpiles of these materials, and the accessibility and potential use of those same stockpiles. In some cases, the stockpiles of materials have effectively been rendered inaccessible by planning requirements or conservation designations and are thus, at least for the foreseeable future, unavailable. This is an important issue in arriving at the right scale on potential resource, either by being reasonably sure that the total we found only refers to potentially available stockpiles or by separating out the unavailable element. We addressed the issue but in most cases did not find that good quality data on it exists and, besides, stockpiles are only relevant to a few of the materials.

- 5.3 While it has been relatively easy in most cases to identify the geographic spread of the sources of arisings and of the stockpiles to the sub-regional areas, only some anecdotal information about locations of relevant uses of some materials has emerged. It was not intended to pursue geographical information about the uses of the materials. In general too, it is to be remembered that aggregates are usually low value materials that cannot, therefore, be transported very far, unless in very large quantities or for specialist uses related to their characteristics.
- 5.4 The summary sheets are in Annex 1 to this report and are intended to be self-explanatory.
- 5.5 Regarding the summary sheet for **waste container glass**, the data at national level on arisings have been assigned to the various sub-regions in proportion to population, since amounts in the waste stream in the first instance is strongly related to population size. However, similarly assigning the use, as aggregates and as other uses, and the disposals to the regions mathematically is not considered useful or enlightening from an aggregate resource management viewpoint and could conflict with much more specific data

obtainable from waste collection authority activities. Given the social and technical aspects involved in recovering container glass from the waste stream and, therefore, the wide variation in what is actually happening in individual areas, data on use and availability have been left at the national level only, to avoid mis-interpretation of the regional data.

MATERIALS WITHOUT SUMMARY SHEETS

- 5.6 For some of the materials, where a summary sheet is not appropriate, the findings of the survey are discussed here.
- 5.7 **Gypsum** has been reviewed.
- (i) It has been noted that WRAP has produced a comprehensive report on plasterboard material flows and recovery, published in January 2006. This estimated that about 3Mt of gypsum waste and plasterboard waste arose in 2004 and that about 2Mt were re-used by the plasterboard industry with nearly all the remainder being landfilled. A small quantity was used in land spreading.
 - (ii) This, together with information from the power station sector, indicates that the dominant beneficial use of waste gypsum is into plasterboard manufacture, though there are technical and quality issues that will likely limit the quantity that can be re-used in this way. There is no use as an aggregate substitute and none is in prospect.
- 5.8 In the light of this, further data on gypsum have not been pursued in this survey.
- 5.9 **Ball clay waste** has been reviewed.
- (i) Clay production in 2005 was about 0.9Mt from two locations, the Bovey basin in Devon and the Wareham basin in Dorset.
 - (ii) Clay to waste production is in the ratio of 1:1.5 indicating a total waste production of about 1.5Mt. The large majority of this is retained for restoration, but, according to the Kaolin and Ball Clay Association, some 50,000 tonnes was recovered for aggregate use.
 - (iii) Given this relatively small contribution from ball clay production and its similarity to the aggregate output from china clay production, a separate summary sheet has not been produced and this figure is included in the china clay waste sheet.
- 5.10 **Non-ferrous slags:** The non-ferrous metal industry in the UK covers aluminium, copper, lead, magnesium, nickel, titanium and zinc. Primary production of aluminium and lead takes place in England. For the others there is processing and fashioning of products from the refined metal or from recovered metals.
- (i) For aluminium and lead, no potential for use of slags as construction aggregates has been identified.
 - (ii) Primary production of zinc in England has now ceased. A stockpile of up to 2Mt of slag is reported to exist near Bristol. Zinc slag has been trialled in asphalt and concrete road surfacing (reported in AggRegain database in WRAP's website), and this stockpile may be usable for this purpose.

- (iii) The zinc galvanising industry produces some slag-type wastes, but these are fully recovered within the industry.
- (iv) As for the other metals, no arisings of potentially suitable slags have been identified in England.
- (v) Other than the existing stock of zinc slag, the non-ferrous metals industry does not appear to be a potential source of materials of interest to the aggregates industry.

5.11 **Recovered asphalt planings** are generally seen as a very useful construction material. They are used in two main ways:

- (i) As a component of new asphalt, and this is achieved in two ways:
 - (a) ex-situ recycling, where the planings are removed to a fixed coating plant and incorporated into new asphalt as appropriate. This is the main way of recycling into asphalt and it may involve hot mix asphalt or to a lesser extent a cold foam-mix process; and
 - (b) in-situ recycling, where the planings are processed by mobile plant where they arise and are effectively re-laid immediately. It appears this is still a small-scale activity in comparison with the ex-situ mode.
- (ii) As a granular fill material, also used in unbound layers in road or other surfacing construction including in temporary or minor roads or tracks.

5.12 Contacts were made with the Quarry Products Association (QPA), several large asphalt producers, the Association of Planing Contractors and several planing contractors, to gauge the scale of the industry and to see if any estimate of the use of the arising and use of planings can be developed.

5.13 Data for 2004 from the European Asphalt Pavement Association (EAPA) estimated hot mixed asphalt production of 27Mt for the UK with this split nearly 50:50 between surface course materials and base course materials. This production rate has remained at around this level since 1999. EAPA also estimated for 2004 that less than 10% of UK production of new asphalt contained RAP.

5.14 The QPA estimated that the UK production of asphalt in UK in 2005 was 27Mt with 21Mt of this in England.

5.15 The Association of Planing Contractors estimated that between 7Mt and 10Mt of planings currently arise in the UK per annum.

5.16 Contacts were attempted with a number of larger planing contractors in England to enquire about their production. This was only partially successful in terms of acquiring data, and it also showed that this source of data is not straightforward because:

- (i) many contractors both operate machinery and hire it out with varying emphases between these two modes;

- (ii) work may be undertaken on a planing only basis with the arisings received by others, or on an inclusive basis involving planing and removal of the arisings and these in turn may be retained or passed on to others;
 - (iii) output cannot be ascertained by machine capacity and operational hours since a machine's operational width and depth of planing can vary; and
 - (iv) the variety of procurement contractual forms also contributes to the difficulty. e.g. project contracts, term contracts, frameworks, etc.
- 5.17 Possibly more usefully, these contacts suggested a consensus estimate of around 8Mt per annum of planings arisings in UK, and one suggestion was that England may represent about 70% of this total, about 5Mt to 6Mt per annum.
- 5.18 Seven large asphalt producers were asked about their production level for 2005 and if they had information on how much of that had contained RAP, thereby giving some insight into the ex-situ use of RAP in asphalt. Other than from one major producer, data were not readily forthcoming on RAP content, and so this line of enquiry did not prove fruitful.
- 5.19 There is no estimate of how much RAP may be being disposed of as waste at landfills.
- 5.20 The great majority of RAP is thought to be used as granular fill material in various ways, assuming that the in-situ re-use of RAP into asphalt is relatively a small activity.
- 5.21 However, some data did arise from the CDEW survey responses and these are reported below. These give some indication of the possible division of the arisings into some main uses, about which the planing contractors are unlikely to have much direct knowledge.
- 5.22 As to the potential, it is apparent that it is, in technical and regulatory terms, relatively easy to incorporate up to 10%, by weight, of RAP into new asphalt. It is thought likely that this is only in base course materials and based on data in paragraph 5.13, a theoretical annual demand for RAP at this level would be about 1million tonnes.
- 5.23 Asphalt specifications in fact allow for higher percentages of RAP in both surface and base materials, but it appears that the production technicalities and quality control issues of doing this are much less straightforward. There is some concern about customer acceptance as well. But, theoretically, it appears that the asphalt production could absorb a large proportion of the RAP arisings.
- 5.24 Gathering data on RAP arisings thus looks to be a complex activity, perhaps with more in common with the development of estimates on the arisings of CDEW. For pursuing more accurate data on RAP arisings and use, it becomes necessary to consider how accurate the data needs to be and how much this accuracy is worth.
- 5.25 **Scrap tyres** were not included in the survey. However, it has been noted that comprehensive data on scrap tyre arisings and use is available (for 2004) from WRAP. This shows that a small proportion of these tyres have been used in landfill engineering, which could be construed as an aggregate use. But, whether this use will increase or decline is unclear in the face of other routes for the recovery of tyres which may be more fruitful and, indeed, necessary.

5.26 **Foundry slag** is also a material not originally included in the survey, but while researching spent foundry sand, it became apparent that there is also a slag material that arises from foundries. Attempts have been made to evaluate the arisings of this waste stream and whether it is recovered as aggregate use, but no data were forthcoming in the event. It is thought unlikely that any worthwhile quantities of suitable materials would arise from this source.

OTHER COMMENTS

5.27 **Pulverised fuel ash (PFA)** may be described as a success story in generating and establishing a market for it as a worthwhile construction material which has been accepted as such for decades. But it is now experiencing difficulties because of its designation as a waste, thus bringing it under waste management regulation. There is evidence that this is limiting the use of PFA in some cases and the power industry is active in seeking clarification of this issue where the use of PFA in construction is concerned. This issue is being addressed by the Environment Agency and WRAP with the aim of producing a recovery protocol for this material. A solution is expected early in 2007.

5.28 **Waste container glass** as a whole consists of a number of component streams including container glass, flat glass, tableware, fibreglass, special glasses, automotive windows, etc. Container glass is by far the largest component and aggregate use has arisen as an “alternative” use for this stream. Other waste glasses are predominantly clear and there are higher value uses available for them. Container glass has a significant coloured constituent and mixed-colour glass can be used as an aggregate. Additionally – and unlike the other waste glasses and indeed the other materials in this survey – it is a packaging material and so falls within the Packaging Recovery Note (PRN) system, which augments the finances of the recovery and processing of waste container glass. It is understood that the value of glass PRNs remained fairly steady during 2004 and 2005, but 2006 has seen a reduction in value which is having a direct and deleterious effect upon the enthusiasm of the industry to continue with this activity.

5.29 Information on **stockpiles** has been sought, but little is available.

- (i) The definition of what is a stockpile for this purpose is not precise, purposely so that any data that comes to light may be considered.
- (ii) There are difficulties with some materials as to whether a stockpile is or maybe “available” for recovery at some time. Materials may be required for restoration and/or landscaping. Others are retained for production operational purposes.
- (iii) It is also apparent that the materials for which there may be notable stockpiles are also materials which have large arisings. For such stockpiles to become of interest would mean that these arisings are being used and there is still further demand for the material. This is not anywhere near the case at present nor is it foreseeable.
- (iv) For other materials there are not any significant stockpiles thought to exist other than what may be described as operational or buffer stockpiles.

- (v) In most cases where stockpiles do or may exist, quantifying them with any degree of accuracy would be time-consuming and so, while the general issue may be kept under consideration, pursuing the data is not thought to be worthwhile until and unless a definite need for it arises.

DATA FROM THE CDEW SURVEY

5.30 As part of the CDEW survey, a survey of crushing and screening activity was undertaken, and the opportunity was taken to ask about involvement with materials other than CDEW, specifically:

- (i) used asphalt including planings;
- (ii) spent railway track ballast;
- (iii) waste glass; and
- (iv) other aggregate materials, e.g. ash, slags, foundry sand etc.

5.31 In that survey, 318 responses have been returned with useful information (a return rate of 25%) and, of these, a number included the information that the respondent was involved with materials other than CDEW. Taking this information at face value and interpreting some data as seems appropriate, the following levels of activity were revealed:

- (i) recovered asphalt planings – 72 responses; total 1.3Mt (average of about 18,000t per response):
 - (a) 0.3Mt going to unspecified uses (23%) – it is thought that this is likely to be for non-asphalt uses;
 - (b) 0.5Mt to general fill (38%);
 - (c) 0.46Mt to asphalt (35%); and
 - (d) 45,000t (3%) to other uses.
- (ii) Glass – 13 responses; total 145,000 tonnes (t) (average of about 11,000t per response):
 - (a) this total represented about 75% of the estimated UK production of aggregates from waste glass, and about 75% of this total was accounted for by a small number of these respondents;
 - (b) 115,000t (79%) to asphalt;
 - (c) 27,000t (19%) to other uses; and
 - (d) 2,500t (2%) as fill.
- (iii) Track Ballast – 10 responses; total 0.712Mt (average of about 71,000t per response):

- (a) this total represents about half of the spent track ballast arisings with, again, the large proportion of it handled by a few respondents;
- (b) 0.325Mt (45%) going to general fill;
- (c) 80,000t (11%) to roadstone;
- (d) 12,000t (2%) to clean graded aggregate;
- (e) 0.195Mt (27%) to unspecified uses;
- (f) 98,000t (14%) described as “sold”; and
- (g) 2,000t as drainage medium.

5.32 These data cannot be meaningfully grossed up to an England-wide estimate, but they do represent an indication of the split of uses of the materials where they pass through processing organisations.

OVERALL SUMMARY FIGURES

5.33 Figures in the following table have been extracted from the **summary sheets**.

Other Materials	Arisings	Not Relevant	Aggregate Use	Other Use	Potentially Available	Stockpiles
Ceramic (Fired) Waste 2004	0.05	nil	0.04	nil	0.01	nil
China Clay Waste	19.6	5.9	2.6	nil	11.1	c.150
Colliery Spoil	4.85	nil	1.0	nil	3.85	8
Furnace Bottom Ash: Power Station	1.0	nil	0.9	neg	nil	nil
Foundry (spent) Sand	0.35	–	>0.03	–	>0.2	–
Incinerator Bottom Ash: Waste to Energy Plant	0.725	nil	c. 0.4	nil	c. 0.3	–
Pulverised Fuel Ash	5.0	nil	0.9	1.8	2.3	–
Slag – Blast Furnace (Iron)	c. 2.0	nil	0.5	1.5	nil	–
Slag – Basic Oxygen Furnace (Steel)	0.5	nil	0.25	nil	0.25	–
Slag – Electric Arc Furnace (Steel)	0.26	nil	0.26	nil	nil	–
Slate Waste	c. 0.5	–	0.15	0.08	–	>> 1.2
Spent Railway Track Ballast	1.4	0.2	1.2	nil	neg	–
Waste (Container) Glass	2.0	–	c. 0.1	50.9	0.95	–

DATA RELIABILITY

5.34 Most of the data included in the **summary sheets** has come through or been largely contributed by a relevant organisation, be it an operator or an industry representative body or other relevant source. How these sources conducted their data gathering has not been investigated, but some knowledgeable consistency and acceptance of the data may be assumed. There will be variability in reliability between the data on arisings and use, the latter probably being rather less certain in general.

- 5.35 For the smallest arisings – ceramics, foundry (spent) sand and slate waste the data are more fragmented and sketchy so the data should be more cautiously treated, though it is reasonable to assume that the relative order (or scale) of data is correct for these materials.
- 5.36 Data on the materials reported without a summary sheet are similarly widely variable as noted under each material above, some giving a firm picture of the material but some with only very patchy and incomplete data.

CHAPTER 6

Comparison with 2001

6.1 Comparison of the headline figures from the survey for 2001 and this survey are shown in the following table:

Table 6.1: Comparison of Arisings and Aggregate Use; England, 2005 and 2001 million tonnes (mt)					
Other Material	2005 Survey (England)		2001 Survey (England)		Comment
	Total Arisings Mt	Aggregate Use	Total Arisings Mt	Aggregate Use Mt	
Ceramic (Fired) Waste	0.05	0.04	0.1	0.09 – 0.1	Note 3
China Clay Waste	19.6	2.6	22.6	2.28	Note 1
Colliery Spoil	4.85	1.0	7.26	0.78	
Furnace Bottom Ash: Power Station	1.0	0.9	0.89	0.88	
Foundry (Spent) Sand	0.35	> 0.03	0.88	0.18	
Incinerator Bottom Ash: Waste to Energy Plant	0.725	c. 0.4	0.62	0.38	
Pulverised Fuel Ash	5.0	0.9	4.41	1.5	Note 2
Slag - Blast Furnace (Iron)	c. 2.0	0.5	2.01	0.6 – 0.8	
Slag - Basic Oxygen Furnace (Steel)	0.5	0.25	0.67	0.66	
Slag - Electric Arc Furnace (Steel)	0.26	0.26	0.28	0.28	
Slate Waste	c. 0.5	0.15	2.33	0.26	Note 4
Spent Railway Track Ballast	1.4	1.2	1.25	1.19	
Waste (Container) Glass	2.0	c. 0.15	2.08	0.08	
TOTALS	38.3	8.4	45.4	9.3	
		22%		20%	

NOTES:

1. = 2005 use figure includes Ball Clay waste (c. 2%)
2. = 2001 use figure high, should have been 1.00Mt.
3. = 2005 survey shows data for 2004.
4. = 2001 arisings figure is now suspected to be too high, in view of the 2005 figure, though this is in turn a low confidence estimate, and is considered to be more appropriate in scale. No great change in the English industry has occurred in the intervening years.

6.2 This comparison, bearing in mind that the data are estimates of varying qualities and accommodating the error in the 2001 data for PFA use, shows no dramatic change in terms of overall aggregate use. Details are in the summary sheets, but the main points are:

- (i) many of the materials show a decline in arisings, similarly with aggregate use, though some materials do buck this trend. Overall the aggregate use has probably remained similar to 2001, though overall arisings have apparently declined;

- (ii) PFA production overall has increased, but aggregate use has declined. Other uses have actually increased, though this is masked in the data by an over-estimate in the 2001 figure – the 2001 use figure is high as it included “grouting” and “other use” components not included in 2005 use figure; the comparable 2001 aggregate use figure should have been 1.00Mt;
- (iii) china clay waste and colliery spoil aggregate uses have risen despite the reduced production of the materials;
- (iv) power station FBA production has declined, but it is still effectively all used as an aggregate;
- (v) the slate waste arisings have apparently declined, but the 2001 arisings figure is now suspected to be too high, in view of the 2005 figure, though this is in turn’s a low confidence estimate but is considered to be of more appropriate in scale. No great change in the English industry has occurred in the intervening years;
- (vi) use of waste container glass is the only case that has in percentage terms shown a considerable increase; and
- (vii) the foundry (spent) sand reduction is probably indicative of continuing increases in efficiencies of use of this material as well as a continuing decline in the overall industry.

ANNEX 1

Material Summary Sheets

Ceramic (fired) Waste

China Clay Waste (including Ball Clay Waste)

Colliery Spoil

Furnace Bottom Ash – Power Station

Incinerator Bottom Ash – Waste to Energy Plant

Foundry (spent) Sand

Pulverised Fuel Ash

Slag – Blast Furnace (Iron)

Slag – Basic Oxygen Furnace (Steel)

Slag – Electric Arc Furnace (Steel)

Slate Waste

Spent Railway Track Ballast

Waste (Container) Glass

MATERIAL: CERAMIC (FIRED) WASTE				
Relevant material and location	Fired waste from the ceramics industry, concentrated in the West Midlands and the East of England			
Overall Arisings = c. 0.05Mt (2004)				Stockpiles
Not Relevant nil	Aggregate Use c. 0.04Mt	Other Use nil	Potentially Available c. 0.01Mt	Possibly Usable nil
<p>Explanatory Comments</p> <p>Latest information is for 2004.</p> <p>Industry divided generally into two components – building products (brick, pipes, tiles) and whiteware (sanitary ware, table ware, ornamental, tiles).</p> <p>Building product waste (of all types) amounted to about 135,000t and of this “only a little” is product waste. For this exercise this is assumed to be 20% = 27,000t.</p> <p>Whiteware industry is now is all now around Stoke on Trent; fired waste amounted to 23,000t.</p>				
<p>Arisings</p> <p>The very great majority of fired waste in all cases is re-used back into the production processes. Hence, in relation to the materials usage in the industry, the output of fired product as waste is tiny (under 0.5% by weight).</p>				
<p>Stockpiles</p> <p>No readily usable stockpiles exist. There are landfills around Stoke that contain such waste and at least one that is predominantly waste from the ceramics industry. It is unlikely that this could be considered as recoverable in any practical sense. Current planning policies may preclude this option.</p>				
<p>Use</p> <p>Whiteware waste, other than sanitary components, is used in decorative tile manufacture. Fired waste from sanitary ware production (c. 10,000t) is disposed of as waste as it is difficult to process because of its hardness.</p> <p>Brick waste is mainly used as bulk fill material.</p> <p>At least one recycler is crushing and grading sanitary ware waste, with use as decorative material and as a lightweight aggregate for loose lay purposes.</p>				
<p>Trends in Aggregate use</p> <p>Trend in production of this waste is down, though re-definition of some materials as wastes has increased the percentage produced slightly. Aggregate use is correspondingly on a downward trend.</p>				
<p>Future Potential</p> <p>Waste reduction pressures will bear down on available material. The only stream not routinely used is the sanitary ware waste; its use would depend upon processing capability; use in concrete may be inhibited because of the glaze.</p>				
<p>Data Sources and assumptions</p> <p>CERAM Research, Brick Development Association, Jack Moody Ltd.</p>				

Geographic Breakdown of Arisings – Ceramic (Fired) Wastes:

NOTE: Where a portion of the arisings in a region is shown as used, the use could be anywhere and not (necessarily) in the region of arising.

	Total Arisings (Mt)	Not Relevant (Mt)	Aggregate Use (Mt)	Other Use (Mt)	Potentially Available (Mt)	Stockpiles (Mt)
North West	0.00	-	0.00	0.00	0.00	-
North East	0.00	-	0.00	0.00	0.00	-
Yorkshire & Humber	0.00	-	0.00	0.00	0.00	-
West Midlands	0.02	-	0.01	0.00	0.01	-
East Midlands	0.00	-	0.00	0.00	0.00	-
East England	0.03	-	0.03	0.00	0.00	-
London	0.00	-	0.00	0.00	0.00	-
South East	0.00	-	0.00	0.00	0.00	-
South West	0.00	-	0.00	0.00	0.00	-
Total England	0.05		0.04	Nil	0.01	

MATERIAL: CHINA CLAY WASTE				
Relevant material and location	Sand and rock from china clay quarries in South West England – 85% arising in Cornwall, north of St Austell, and – 15% in Devon, north of Plympton. Similar materials arising from ball clay quarries in Devon and Dorset			
Overall Arisings = 19.6Mt				Stockpiles
Not Relevant 5.9Mt (c.30%)	Aggregate Use 2.6Mt	Other Use nil	Potentially Available 11.1Mt	Possibly Usable c.150Mt
Explanatory Comments Approximately 9 tonnes of waste is produced in extracting each tonne of marketable china clay, being 4 tonnes of sand, 2.5 tonnes of rock referred to as stent, 1.5 tonnes of overburden and 1 tonne of fine residues. These last two components have no re-use as aggregates. NB: The figures above INCLUDE the component (about 2% of arisings) of similar material arising from ball clay production in Devon and Dorset.				
Arisings About 2.2Mt of china clay was produced in 2005, similar to 2004, but a general decline in production continues, with a corresponding decline in waste production. All aggregate usage comes from waste from current workings.				
Stockpiles These are located in association with the working or worked areas. Total stockpile quantities of up to 600Mt have been suggested, but much of this is not available. Recent work on potentially usable stockpile indicates a broad estimate figure of 150Mt. Actual amount of recoverable material would depend upon the age, nature and construction of the source.				
Use Predominantly in the south-west which has a finite requirement for such aggregates. The stent and sand can be screened and graded to produce aggregates for concrete and/or blockmaking. Bulk fill uses are also appropriate.				
Trends in Aggregate use Aggregate use has been steady at its current level.				
Future Potential Increase in shipping cost and reduction in grant aid have delayed investment in Par Docks for exporting aggregates. The Aggregates Levy has not had the impact hoped for and further significant use of relevant waste will depend upon export from the region which means overcoming the cost and logistics issues.				
Data Sources and assumptions Numeric and narrative data and from the Kaolin and Ball Clay Association.				

Geographic Breakdown of Arisings – China Clay Waste

NOTE: Where a portion of the arisings in a region is shown as used, the use could be anywhere and not (necessarily) in the region of arising.

	Total Arisings (Mt)	Not Relevant (Mt)	Aggregate Use (Mt)	Other Use (Mt)	Potentially Available (Mt)	Stockpiles (Mt)
North West	0.00	0.00	0.00	0.00	0.00	0.00
North East	0.00	0.00	0.00	0.00	0.00	0.00
Yorkshire & Humber	0.00	0.00	0.00	0.00	0.00	0.00
West Midlands	0.00	0.00	0.00	0.00	0.00	0.00
East Midlands	0.00	0.00	0.00	0.00	0.00	0.00
East England	0.00	0.00	0.00	0.00	0.00	0.00
London	0.00	0.00	0.00	0.00	0.00	0.00
South East	0.00	0.00	0.00	0.00	0.00	0.00
South West	19.6	5.9	2.6	0.00	11.1	c. 150
Gloucestershire (excl S Glos)	0.00	0.00	0.00	0.00-	0.00	0.00
Wiltshire & Dorset	0.00	0.00	0.00	0.00	0.00	0.00
Somerset & former Avon	0.00	0.00	0.00	0.00	0.00	0.00
Devon, Cornwall & Isle of Scilly	19.6	5.9	2.6	0.00	11.1	150
Total England	19.6	5.9	2.6	0.00	11.1	c. 150

MATERIAL: COLLIERY SPOIL				
Relevant material and location	Spoil arising from deep coal mining in Yorkshire, West Midlands, East Midlands			
Overall Arisings = 4.85Mt				Stockpiles
Not Relevant Nil	Aggregate Use 1.00Mt	Other Use –	Potentially Available 3.85Mt	Possibly Usable 8Mt
Explanatory Comments Figures relate to arisings from deep mining only. Open-cast mines are generally required to keep overburden for restoration purposes.				
Arisings Arisings are determined by geology as well as scale of activity and are not consistently proportional to production between mines. There are now 6 large-scale mines and 4 other small-scale operations each producing a few thousand tonnes of coal per year. Deep mine coal production in UK for 2005 was 9Mt (with 1mt from open cast mines). 90% of this was consumed by electricity generation.				
Stockpiles Stockpile that are readily usable are located at active mines and amount to about 10Mt of which 8Mt may be relevant. Much of this is earmarked for mine restoration activities. Substantial long-term stockpiles exist and this situation is not changing. An estimate of some 2,000Mt in England has been suggested, but substantial work would be needed to determine the reality of this figure. It is not foreseen that any use for this material will arise that would warrant recovery of this material in any significant way. Planning policies are also likely to inhibit such use.				
Use Most is used as bulk fill including at the collieries themselves. Substantial quantities have been used recently in major road works in Yorkshire. Other uses include brickmaking, lightweight aggregate, as a cement stabilised material.				
Trends in Aggregate use Deep mine coal production continues to decline. This trend has continue for a long time. There are now though economic pressures that may reduce, if not reverse, the rate of decline. It is understood that preparations for re-opening Hatfield mine (near Doncaster) are in hand.				
Future Potential Significant use as aggregate is likely to depend upon relevant construction occurring close to the sources. Of the other uses, brickmaking may have potential for using more minestone. None of the other areas of research have yet produced a "breakthrough" use opportunity.				
Data Sources and assumptions Coal Authority, UK Coal Ltd, CERAM Research.				

Geographic Breakdown of Arisings – Colliery Spoil

NOTE: Overall figures have been assigned to the regions in proportion to the coal production at each mine.
Where a portion of the arisings in a region is shown as used, the use could be anywhere and not (necessarily) in the region of arising.

	Total Arisings (Mt)	Not Relevant (Mt)	Aggregate Use (Mt)	Other Use (Mt)	Potentially Available (Mt)	Stockpiles (Mt)
North West	0.00	0.00	0.00	0.00	0.00	0.00
North East	0.00	0.00	0.00	0.00	0.00	0.00
Yorkshire & Humber	1.97	0.00	0.41	0.00	1.56	3.25
North Yorkshire	1.07	0.00	0.22	0.00	0.85	1.77
South Yorkshire	0.9	0.00	0.19	0.00	0.71	1.48
West Yorkshire	0.00	0.00	0.00	0.00	0.00	0.00
East Riding, N&NE Lincolnshire	0.00	0.00	0.00	0.00	0.00	0.00
West Midlands	1.13	0.00	0.23	0.00	0.90	1.86
Shropshire & Staffordshire	0.00	0.00	0.00	0.00	0.00	0.00
Herefordshire & Worcestershire	0.00	0.00	0.00	0.00	0.00	0.00
West Midlands excl Coventry .. & Solihull						
Warwickshire, Coventry & Solihull	1.13	0.00	0.23	0.00	0.90	1.86
East Midlands	1.75	0.00	0.36	0.00	1.40	2.89
Derbyshire	0.01	0.00	0.00	0.00	0.01	0.02
Notts & Lincs (excl N&NE Lincs)	1.74	0.00	0.36	0.00	0.39	2.87
Leicestershire & Rutland	0.00	0.00	0.00	0.00	0.00	0.00
Northamptonshire	0.00	0.00	0.00	0.00	0.00	0.00
East England	0.00	0.00	0.00	0.00	0.00	0.00
London	0.00	0.00	0.00	0.00	0.00	0.00
South East	0.00	0.00	0.00	0.00	0.00	0.00
South West	0.00	0.00	0.00	0.00	0.00	0.00
Total England	4.85	0	1.0	0	3.85	8.0

MATERIAL: FURNACE BOTTOM ASH – POWER STATIONS				
Relevant material and location	Bottom ash from furnaces in coal-fired power stations, situated across the regions except London and the South West			
Overall Arisings = 1.0				Stockpiles
Not Relevant Nil	Aggregate Use 0.9	Other Use negligible	Potentially Available nil	Possibly Usable nil
Explanatory Comments GB Data from UK Quality Ash Association (UKQAA), assumes that 81.25% of FBA produced in England based on installed generating capacity of the power stations.				
Arisings Coal-fired power stations in England in North-West, Yorkshire and Humberside, West Midlands, East Midlands, South-East.				
Stockpiles No stockpiles exist other than as short-term production stock.				
Use In 2005: 95% used into concrete block making and 5% taken into production stock.				
Trends in Aggregate use Aggregate use is in line with the scale of coal fired power generation and is not related to demand for the ash.				
Future Potential Increases in coal fired energy production in 2005 are set to continue. Demand outstrips supply. Increased supply of IBA may provide an alternative. New coal-fired power stations may be developed but this is a medium-term prospect.				
Data Sources and assumptions Coal Authority, UK Quality Ash Association.				

Geographic Breakdown of Arisings: Furnace Bottom Ash – Power Stations

NOTE: Overall total for each column heading has been assigned to the regions in proportion to the installed generating capacity at each power station.
Where a portion of the arisings in a region is shown as used, the use could be anywhere and not (necessarily) in the region of arising.

	Total Arisings (Mt)	Not Relevant (Mt)	Aggregate Use (Mt)	Other Use (Mt)	Potentially Available (Mt)	Stockpiles (Mt)
North West	0.08	0.00	0.08	0.00	0.00	0.00
Cumbria	0.00	0.00	0.00	0.00	0.00	0.00
Lancashire & G Manchester	0.00	0.00	0.00	0.00	0.00	0.00
Cheshire & Merseyside	0.08	0.00	0.08	0.00	0.00	0.00
North East	0.03	0.00	0.02	0.00	0.00	0.00
Northumberland, Tyne & Wear	0.02	0.00	0.01	0.00	0.00	0.01
Tees Valley & Durham	0.01	0.00	0.01	0.00	0.00	0.01
Yorkshire & Humber	0.33	0.00	0.29	0.00	0.00	0.00
North Yorkshire	0.24	0.00	0.22	0.00	0.00	0.00
South Yorkshire	0.00	0.00	0.00	0.00	0.00	0.00
West Yorkshire	0.09	0.00	0.07	0.00	0.00	0.00
East Riding, N&NE Lincolnshire	0.00	0.00	0.00	0.00	0.00	0.00
West Midlands	0.08	0.00	0.08	0.00	0.00	0.00
Shropshire & Staffordshire	0.08	0.00	0.08	0.00	0.00	0.00
Herefordshire & Worcestershire	0.00	0.00	0.00	0.00	0.00	0.00
West Midlands excl Coventry & Solihull	0.00	0.00	0.00	0.00	0.00	0.00
Warwickshire, Coventry & Solihull	0.00	0.00	0.00	0.00	0.00	0.00
East Midlands	0.26	0.00	0.23	0.00	0.00	0.00
Derbyshire	0.00	0.00	0.00	0.00	0.00	0.00
Notts & Lincs (excl N&NE Lincs)	0.26	0.00	0.23	0.00	0.00	0.00
Leicestershire & Rutland	0.00	0.00	0.00	0.00	0.00	0.00
Northamptonshire	0.00	0.00	0.00	0.00	0.00	0.00
East England	0.04	0.00	0.04	0.00	0.00	0.00
Cambs, Norfolk & Suffolk	0.00	0.00	0.00	0.00	0.00	0.00
Bedfordshire & Hertfordshire	0.00	0.00	0.00	0.00	0.00	0.00
Essex	0.04	0.00	0.04	0.00	0.00	0.00
London	0.00	0.00	0.00	0.00-	0.00	0.00
South East	0.17	0.00	0.15	0.00	0.00	0.00
Kent	0.08	0.00	0.07	0.00	0.00	0.00
Surrey, E&W Sussex	0.00	0.00	0.00	0.00	0.00	0.00
Hampshire and IoW	0.00	0.00	0.00	0.00	0.00	0.00
Berks, Bucks & Oxon	0.09	0.00	0.08	0.00	0.00	0.00
South West	0.00	0.00	0.00	0.00	0.00	0.00
Total England	1.0	0.00	0.9	0.00	0.00	0.00

MATERIAL: FOUNDRY (SPENT) SAND				
Relevant material and location	Spent foundry sand from castings industry, mostly in London, Midlands, North West and North East			
Overall Arisings = 1.0				Stockpiles
Not Relevant –	Aggregate Use >0.03	Other Use –	Potentially Available >0.2	Possibly Usable no data
<p>Explanatory Comments</p> <p>The arisings figure is an estimate of the total input of new silica sand into the casting industry and is has been assumed that an equal quantity leaves the industry. A survey was conducted by the Cast Metal Federation (CMF) of their members and data from a self-selecting sample of responding foundries indicated that this is a reasonable assumption.</p> <p>Data from this sample also indicated that, of the sand disposed of, about half went to landfill and about half to other uses, principally block making. It is not known if this is representative of the industry as a whole; earlier estimates of this disposal ratio was in the region of 90% to landfill and 10% to other uses.</p>				
<p>Arisings</p> <p>The castings industry is now predominantly in the South-East, the Midlands, the North-East and the North-West. It has not been possible to regionalise the arisings.</p>				
<p>Stockpiles</p> <p>Some probably small, scattered (as the industry) landfills are thought to exist which contain foundry sand and so might be considered as possible stockpiles. No data have been identified which quantify this.</p>				
<p>Use</p> <p>Blockmaking, asphalt.</p> <p>The data from the CMF survey sample could indicate that quite large quantities are going out to aggregate-type uses, but the known wide diversity between foundries does not support that this indication is representative of the industry as a whole.</p> <p>Data on aggregate use as above shows the quantity actually reported in the CMF survey.</p> <p>No other use was identified in the CMF survey, but some is being used in cement production though this has not been quantified.</p> <p>Above half of the arisings is thought to be potentially available.</p>				
<p>Trends in Aggregate use</p> <p>The industry as a whole continues to decline. The trend to more and longer recycling of sand within the industry continues. Increased disposal costs are causing more attention to be paid to alternative outlets for the spent sand, instead of landfill.</p>				
<p>Future Potential</p> <p>Arisings are likely to continue to decline, but the proportion used as opposed to landfilled could well rise.</p> <p>One definite barrier to greater use has been noted: many foundries produce only small quantities of spent sand. Current user industries are large and use input materials in bulk and so are not geared to taking them in relatively small quantities. More use could arise if a pooling of spent sand could economically be organised or if users can be found that are smaller in scale.</p>				
<p>Data Sources and assumptions</p> <p>Cast Metal Federation, WRAP. Assumptions are identified in relevant sections above.</p>				

Geographic Breakdown of Arisings – Spent Foundry Sand

NOTE: Where a portion of the arisings in a region is shown as used, the use could be anywhere and not (necessarily) in the region of arising.

	Total Arisings (Mt)	Not Relevant (Mt)	Aggregate Use (Mt)	Other Use (Mt)	Potentially Available (Mt)	Stockpiles (Mt)
North West	-	-	-	-	-	
North East	-	-	-	-	-	
Yorkshire & Humber	-	-	-	-	-	
West Midlands	-	-	-	-	-	
East Midlands	-	-	-	-	-	
East England	-	-	-	-	-	
London	-	-	-	-	-	
South East	-	-	-	-	-	
South West	-	-	-	-	-	
Total England	0.40	0.00	> 0.03	0.00	> 0.20	no data

MATERIAL: INCINERATOR BOTTOM ASH – WASTE TO ENERGY PLANTS				
Relevant material and location	Incinerator bottom ash is the material discharged into the burning grate of Municipal Solid Waste (MSW) incinerators. Incinerators now in almost all regions of England			
Overall Arisings = c. 0.725 Mt				Stockpiles
Not Relevant nil	Aggregate Use c. 0.4Mt	Other Use nil	Potentially Available c. 0.3Mt	Possibly Usable no data
Explanatory Comments Often referred to as IBA = Incinerator Bottom Ash.				
Arisings Capacity for incineration of municipal waste in 2005 stood at 3Mt, with seven new plants totalling 0.9Mt capacity coming on line since 2001.				
Stockpiles Only short-term working stockpiles exist.				
Use The raw IBA is processed to remove metals and the small percentage of material that is unusable. The remaining material is screened into varying size fractions to make Incinerator Bottom Ash Aggregate (IBAA). The main uses of IBAA are in concrete block making and in road construction including: unbound fill materials, asphalt, foamed asphalt, cement bound materials, lightweight blocks, foamed concrete and pavement concrete. Other uses are in landfill engineering and brownfield remediation. The Highways Agency recognises the use of IBAA as an aggregate in bound and unbound layers in road construction where it meets aggregate requirements. Potentially available portion currently goes for disposal.				
Trends in Aggregate use Aggregate use has risen by about 10% since 2001, which is less than the increase in production capacity.				
Future Potential The Government's review of Waste Strategy 2000 suggested that waste-to-energy treatment is predicted to rise to about 25% of municipal solid waste by 2020. This is likely to result in significant increases in the amount of IBA. Use as aggregate has the potential to increase in absolute and percentage terms. More use in concrete blocks is in prospect with declining arisings of the slags currently used in such blocks.				
Data Sources and assumptions Environmental Services Association, WRAP, Ballast Phoenix Ltd.				

Geographic Breakdown of Arisings – Incinerator Bottom Ash – Waste to Energy Plants

NOTE: Overall figures have been assigned to the regions in proportion to the waste treatment capacity at each facility. Where a portion of the arisings in a region is shown as used, the use could be anywhere and not (necessarily) in the region of arising.

	Total Arisings (Mt)	Not Relevant (Mt)	Aggregate Use (Mt)	Other Use (Mt)	Potentially Available (Mt)	Stockpiles (Mt)
North West	0.02	0.00	0.01	0.00	0.01	-
Cumbria	0.00	0.00	0.00	0.00	0.00	-
Lancashire & G Manchester	0.02	0.00	0.01	0.00	0.01	-
Cheshire & Merseyside	0.00	0.00	0.00	0.00	0.00	-
North East	0.05	0.00	0.02	0.00	0.02	-
Northumberland, Tyne & Wear	0.00	0.00	0.00	0.00	0.00	-
Tees Valley & Durham	0.05	0.00	0.02	0.00	0.02	-
Yorkshire & Humber	0.08	0.00	0.04	0.00	0.03	-
North Yorkshire	0.00	0.00	0.00	0.00	0.00	-
South Yorkshire	0.04	0.00	0.02	0.00	0.02	-
West Yorkshire	0.03	0.00	0.01	0.00	0.01	-
East Riding, N&NE Lincolnshire	0.01	0.00	0.01	0.00	0.00	-
West Midlands	0.18	0.00	0.10	0.00	0.08	-
Shropshire & Staffordshire	0.03	0.00	0.02	-	0.02	-
Herefordshire & Worcestershire	0.00	0.00	0.00	-	0.00	-
West Midlands excl Coventry & Solihull	0.15	0.00	0.08	-	0.06	-
Warwickshire, Coventry & Solihull	0.00	0.00	0.00	-	0.00	-
East Midlands	0.03	0.00	0.02	0.00	0.01	-
Derbyshire	0.00	0.00	0.00	0.00	0.00	-
Notts & Lincs (excl N&NE Lincs)	0.03	0.00	0.02	0.00	0.01	-
Leicestershire & Rutland	0.00	0.00	0.00	0.00	0.00	-
Northamptonshire	0.00	0.00	0.00	0.00	0.00	-
East England	0.00	0.00	0.00	0.00	0.00	-
London	0.17	0.00	0.10	0.00	0.07	-
West London	0.00	0.00	0.00	0.00	0.00	-
East London	0.17	0.00	0.10	0.00	0.07	-
South East	0.19	0.00	0.11	0.00	0.08	-
Kent	0.09	0.00	0.05	0.00	0.04	-
Surrey, E&W Sussex	0.00	0.00	0.00	0.00	0.00	-
Hampshire and IoW	0.08	0.00	0.05	0.00	0.03	-
Berks, Bucks & Oxon	0.02	0.00	0.01	0.00	0.01	-
South West	0.00	0.00	0.00	0.00	0.00	-
Total England	0.72	0.00	c. 0.40	0.00	c. 0.30	

MATERIAL: PULVERISED FUEL ASH				
Relevant material and location	Ash from coal-fired power stations, mostly in the midlands and the north			
Overall Arisings = 5.0 Mt				Stockpiles
Not Relevant nil	Aggregate Use 0.9Mt	Other Use 1.8Mt	Potentially Available 2.3Mt	Possibly Usable no data
<p>Explanatory Comments</p> <p>GB Data from UKQAA, assumes that 81.25% of PFA produced in England is based on installed generating capacity of the power stations.</p> <p>"Aggregate use" has been assumed to apply to use in concrete blockmaking.</p> <p>"Other Use" assumed to apply to fill and ground remediation, grouting, cement replacement or additives, and other uses.</p> <p>The "Potentially Available" portion currently goes for disposal.</p>				
<p>Arisings</p> <p>Coal-fired power stations in England in North-West, Yorkshire and Humberside, West Midlands, East Midlands, South-East.</p>				
<p>Stockpiles</p> <p>Notable stockpiles exist at power stations, which may be re-usable though classification of this as waste will be an issue.</p>				
<p>Use</p> <p>It is generally doubtful that PFA is much used in actual primary aggregate replacement uses. It is though widely used and well-established for construction purposes.</p> <p>Dominant use is in concrete block making; some is used to make lightweight aggregate (about 90,000t in 2005). Other major uses are as a cement additive or cement replacement and as a fill or in ground remediation. A major use is currently arising in filling of underground caverns which has increased the Other Uses component. This will continue into 2006.</p> <p>Overall use of PFA is estimated by UKQAA as follows:</p> <p>Aggregate uses:- Blocks and precast concrete = 0.9Mt.</p> <p>Other uses:- Cementitious = 1.2Mt; Fill and ground remediation = 0.5Mt; Miscellaneous = 0.1Mt.</p> <p>There are no data on the split between fill use and ground remediation use, but it is thought that fill use is the major element.</p> <p>The potentially available component is currently landfilled.</p>				
<p>Trends in Aggregate use</p> <p>Use is showing a general upward trend, but some of the uses other than in concrete block making are finding difficulties with Waste Management Regulation necessitating approvals processes which are inhibiting some clients and contractors.</p>				
<p>Future Potential</p> <p>With recent large increases in energy prices, coal fired energy production is rising, thus production of PFA is expected to show a rise in 2006.</p> <p>Pressure to use more cement substitution will also rise. Hence use of PFA overall may well rise but this may not be in the aggregate re-use sector.</p> <p>Clarification of the material's status in relation to Waste Management Regulation – especially that portion of production which goes straight into construction purposes – will assist use of the material.</p> <p>Given the scale of annual production, use of stockpiled PFA would require a very large (and unforeseeable) increase in market demand.</p> <p>Production of lightweight aggregate has now ceased so this outlet is lost to the aggregate re-use sector.</p>				
<p>Data Sources and assumptions</p> <p>Data from Coal Authority, UK Quality Ash Association.</p>				

Geographic Breakdown of Arisings: Pulverised Fuel Ash

NOTE: Overall total for each column heading has been assigned to the regions in proportion to the installed generating capacity at each power station.
Where a portion of the arisings in a region is shown as used, the use could be anywhere and not (necessarily) in the region of arising.

	Total Arisings (Mt)	Not Relevant (Mt)	Aggregate Use (Mt)	Other Use (Mt)	Potentially Available (Mt)	Stockpiles (Mt)
North West	0.42	0.00	0.08	0.15	0.20	-
Cumbria	0.00	0.00	0.00	0.00	0.00	-
Lancashire & G Manchester	0.00	0.00	0.00	0.00	0.00	-
Cheshire & Merseyside	0.42	0.00	0.08	0.15	0.20	-
North East	0.11	0.00	0.02	0.04	0.06	-
Northumberland, Tyne & Wear	0.9	0.00	0.01	0.03	0.04	-
Tees Valley & Durham	0.02	0.00	0.01	0.01	0.02	-
Yorkshire & Humber	1.68	0.00	0.29	0.61	0.77	-
North Yorkshire	1.26	0.00	0.22	0.45	0.58	-
South Yorkshire	0.00	0.00	0.00	0.00	0.00	-
West Yorkshire	0.42	0.00	0.07	0.16	0.19	-
East Riding, N&NE Lincolnshire	0.00	0.00	0.00	0.00	0.00	-
West Midlands	0.42	0.00	0.08	0.16	0.20	-
Shropshire & Staffordshire	0.42	0.00	0.08	0.16	0.20	-
Herefordshire & Worcestershire	0.00	0.00	0.00	0.00	0.00	-
West Midlands excl Coventry & Solihull	0.00	0.00	0.00	0.00	0.00	-
Warwickshire, Coventry & Solihull	0.00	0.00	0.00	0.00	0.00	-
East Midlands	1.29	0.00	0.23	0.46	0.59	-
Derbyshire	0.00	0.00	0.00	0.00	0.00	-
Notts & Lincs (excl N&NE Lincs)	1.29	0.00	0.23	0.46	0.59	-
Leicestershire & Rutland	0.00	0.00	0.00	0.00	0.00	-
Northamptonshire	0.00	0.00	0.00	0.00	0.00	-
East England	0.23	0.00	0.04	0.08	0.10	-
Cambs, Norfolk & Suffolk	0.00	0.00	0.00	0.00	0.00	-
Bedfordshire & Hertfordshire	0.00	0.00	0.00	0.00	0.00	-
Essex	0.23	0.00	0.04	0.08	0.10	-
London	0.00	0.00	0.00	0.00	0.00	-
South East	0.84	0.00	0.15	0.30	0.38	-
Kent	0.42	0.00	0.07	0.15	0.20	-
Surrey, E&W Sussex	0.00	0.00	0.00	0.00	0.00	-
Hampshire and IoW	0.00	0.00	0.00	0.00	0.00	-
Berks, Bucks & Oxon	0.42	0.00	0.08	0.15	0.18	-
South West	0.00	0.00	0.00		0.00	-
Total England	5.0	0.00	0.90	1.8	2.3	

MATERIAL: SLAG – BLAST FURNACE (Iron)				
Relevant material and location	Slag from blast furnaces (which process iron), in North East and Yorkshire and Humberside			
Overall Arisings = c. 2 Mt				Stockpiles
Not Relevant nil	Aggregate Use 0.5Mt	Other Use 1.5Mt	Potentially Available nil	Possibly Usable no data
Explanatory Comments Blast furnace slag maybe either air-cooled or water-cooled (quenched) at the point of production.				
Arisings Corus operate the only two sites in England, at Teeside and Scunthorpe, both currently producing around 1Mt of slag per annum. At present, about 75% of the slag is quenched and this is then processed to produce ground granulated blast furnace slag (GGBS), which is used by the concrete industry as a cement amendment or replacement. The remainder is air-cooled and is used as an aggregate. The split between the two uses is dictated by production choices, economics and demand, but it appears that quenching the output is the preferred option.				
Stockpiles There are slag stockpiles associated with the production centres, but no data has been discovered on their scale or usability.				
Use Effectively, the whole output of this slag is used as GGBS or as an aggregate for construction purposes which includes use in asphalt or concrete, or as sub-base and capping materials. There is a continuing demand for the material for these purposes.				
Trends in Aggregate use Total blast furnace iron production in UK has been steady over the past three years at c.10.2 Mt (approx two-thirds of this in England). Significant increase in this is unlikely because of capacity limitations. Decline is possible due to changes in demand or the cost of steel imports.				
Future Potential Feed into aggregate use depends upon the relative merits of producing air-cooled or quenched slag and the market competition from the demand for GGBS.				
Data Sources and assumptions Tarmac (who deal with all Corus's air-cooled slag); the Iron and Steel Statistics Bureau.				

Geographic Breakdown of Arisings: Slag – Blast Furnace (Iron)

NOTE: Where a portion of the arisings in a region is shown as used, the use could be anywhere and not (necessarily) in the region of arising.

	Total Arisings (Mt)	Not Relevant (Mt)	Aggregate Use (Mt)	Other Use (Mt)	Potentially Available (Mt)	Stockpiles (Mt)
North West	0.00	0.00	0.00	0.00	0.00	-
North East	1.00	0.00	0.25	0.75	0.00	-
Northumberland, Tyne & Wear	0.00	0.00	0.00	0.00	0.00	
Tees Valley & Durham	1.00	0.00	0.25	0.75	0.00	
Yorkshire & Humber	1.0	0.00	0.25	0.75	0.00	-
North Yorkshire	0.00	0.00	0.00	0.00	0.00	-
South Yorkshire	0.00	0.00	0.00	0.00	0.00	-
West Yorkshire	0.00	0.00	0.00	0.00	0.00	-
East Riding, N&NE Lincolnshire	1.00	0.00	0.25	0.75	0.00	-
West Midlands	0.00	0.00	0.00	0.00	0.00	-
East Midlands	0.00	0.00	0.00	0.00	0.00	-
East England	0.00	0.00	0.00	0.00	0.00	-
London	0.00	0.00	0.00	0.00	0.00	-
South East	0.00	0.00	0.00	0.00	0.00	-
South West	0.00	0.00	0.00	0.00	0.00	-
Total England	2.0	0.00	0.50	1.5	0.00	

MATERIAL: SLAG – BASIC OXYGEN FURNACE (Steel)				
Relevant material and location	Slag from steel-making plants using basic oxygen furnaces. Two sites, in Yorkshire and Humberside			
Overall Arisings = 0.5 Mt				Stockpiles
Not Relevant nil	Aggregate Use 0.25Mt	Other Use nil	Potentially Available 0.25Mt	Possibly Usable no data
Explanatory Comments The "Potentially Available" figure refers to the arisings that were taken into stock by the processor in 2005. Stockpiles buffer production and demand fluctuations.				
Arisings UK production of BOF steel was about 10.5Mt in 2005, about two-thirds of this was in England. Production is at Corus's facilities at Teeside and Scunthorpe.				
Stockpiles The material is stockpiled to "weather" as part of its preparation for use and is therefore within the processing chain. Currently some 2Mt in total are in such stockpiles at the two production sites. No information has been found on the existence or scale of other long-term stockpiles.				
Use Effectively, on average, all the arisings are used in road construction, in asphalt or in sub-base. Very small quantities go for non-aggregate uses elsewhere. There is continuing demand for this material for road construction purposes. For 2005, half of production was used and half went into stockpile. This is expected to be absorbed into use in the near future.				
Trends in Aggregate use As there appear to be no significant competing uses, aggregate use will depend upon steel production.				
Future Potential Since effectively all is readily used, and demand is expected to continue, there is little necessity to find alternative uses.				
Data Sources and assumptions International Iron and Steel Institute, Tarmac (who process all Corus's BOF slag).				

Geographic Breakdown of Arisings: Slag – Basic Oxygen (Steel)

NOTE: Where a portion of the arisings in a region is shown as used, the use could be anywhere and not (necessarily) in the region of arising.

	Total Arisings (Mt)	Not Relevant (Mt)	Aggregate Use (Mt)	Other Use (Mt)	Potentially Available (Mt)	Stockpiles (Mt)
North West	0.00	0.00	0.00	0.00	0.00	-
North East	0.25	0.00	0.12	0.00	0.13	-
Northumberland, Tyne & Wear	0.00	0.00	0.00	0.00	0.00	-
Tees Valley & Durham	0.25	0.00	0.12	0.12	0.13	-
Yorkshire & Humber	0.25	0.00	0.13	0.00	0.12	-
North Yorkshire	0.00	0.00	0.00	0.00	0.00	-
South Yorkshire	0.00	0.00	0.00	0.00	0.00	-
West Yorkshire	0.00	0.00	0.00	0.00	0.00	-
East Riding, N&NE Lincolnshire	0.25	0.00	0.13	0.00	0.12	-
West Midlands	0.00	0.00	0.00	0.00	0.00	-
East Midlands	0.00	0.00	0.00	0.00	0.00	-
East England	0.00	0.00	0.00	0.00	0.00	-
London	0.00	0.00	0.00	0.00	0.00	-
South East	0.00	0.00	0.00	0.00	0.00	-
South West	0.00	0.00	0.00	0.00	0.00	-
Total England	0.50	0.00	0.25	0.00	0.25	

MATERIAL: SLAG – ELECTRIC ARC FURNACE (Steel)				
Relevant material and location	Slag from electric arc furnace steel plants in South East, Yorkshire and Humberside and the South East			
Overall Arisings = 0.26				Stockpiles
Not Relevant nil	Aggregate Use 0.26	Other Use nil	Potentially Available nil	Possibly Usable nil
Explanatory Comments Approximately, slag production is about 10% by weight of steel production.				
Arisings UK production of EAF steel in 2005 was about 2.7Mt, all of it in England.				
Stockpiles Short-term stockpiles of slag occur at the points of production and use. These are for production chain purposes. Longer-term stockpiles are thought not to exist, but no data have been found.				
Use EAF slag is effectively all used as a high quality aggregate material in road surfacings.				
Trends in Aggregate use Only three sites are operational in 2005. Effectively all usable material is used and demand remains high.				
Future Potential Production capacity increase expected in South East so overall declining trend may flatten out.				
Data Sources and assumptions Heckett Multiserv (Steelphalt) Ltd., International Iron and Steel Institute, Thamesteel Services Ltd.				

Geographic Breakdown of Arisings: Slag – Electric Arc Furnace (Steel)

NOTE: Where a portion of the arisings in a region is shown as used, the use could be anywhere and not (necessarily) in the region of arising.

	Total Arisings (Mt)	Not Relevant (Mt)	Aggregate Use (Mt)	Other Use (Mt)	Potentially Available (Mt)	Stockpiles (Mt)
North West	0.00	0.00	0.00	0.00	0.00	–
North East	0.00	0.00	0.00	0.00	0.00	–
Yorkshire & Humber	0.22	0.00	0.22	0.00	0.00	–
North Yorkshire	0.00	0.00	0.00	0.00	0.00	–
South Yorkshire	0.22	0.00	0.22	0.00	0.00	–
West Yorkshire	0.00	0.00	0.00	0.00	0.00	–
East Riding, N&NE Lincolnshire	0.00	0.00	0.00	0.00	0.00	–
West Midlands	0.00	0.00	0.00	0.00	0.00	–
East Midlands	0.00	0.00	0.00	0.00	0.00	–
East England	0.00	0.00	0.00	0.00	0.00	–
London	0.00	0.00	0.00	0.00	0.00	–
South East	0.04	0.00	0.04	0.00	0.00	–
Kent	0.04	0.00	0.04	0.00	0.00	–
Surrey, E&W Sussex	0.00	0.00	0.00	0.00	0.00	–
Hampshire and IoW	0.00	0.00	0.00	0.00	0.00	–
Berks, Bucks & Oxon	0.00	0.00	0.00	0.00	0.00	–
South West	0.00	0.00	0.00	0.00	0.00	–
Total England	0.26	0.00	0.26	0.00	0.00	nil

MATERIAL: SLATE WASTE				
Relevant material and location	Waste rock from slate quarrying activities in North West and South West			
Overall Arisings = c. 0.5 Mt				Stockpiles
Not Relevant –	Aggregate Use 0.15	Other Use 0.08	Potentially Available –	Possibly Usable >>1.2 Mt
<p>Explanatory Comments</p> <p>Arisings are estimated from principal product quantities (5% product from each tonne extracted) and from some more direct information. The overall figure, therefore, is to be treated with particular caution.</p> <p>The Aggregate use figure includes material withdrawn from stockpiles.</p>				
<p>Arisings</p> <p>Arisings do form potentially useful aggregate materials, but much is retained for restoration and quarry operational reasons. Thus the extent of overall potential availability is not readily identifiable.</p>				
<p>Stockpiles</p> <p>Stockpiles do exist in both locations, but extent to which they may be recoverable for use is unclear. Some material is in restoration and some is used as backfill to support previous excavations.</p>				
<p>Use</p> <p>Unspecified aggregate uses occur and some fines are used in block manufacture in Cumbria. Non-aggregate uses are mainly as walling, horticultural features, paving and mulch.</p> <p>There appears to be very little aggregate use in the South-West.</p>				
<p>Trends in Aggregate use</p> <p>Use remains low. Can only be economic locally, and, in the South West, there is particular competition from china clay waste.</p>				
<p>Future Potential</p> <p>Potential for more use remains unrealised. The waste does require some processing to produce usable products and the economics of this are marginal. Competition and limited market in the South West may inhibit expansion. Planning constraints for site restoration and on other operational activities may also limit expansion of product output from the waste stream.</p>				
<p>Data Sources and assumptions</p> <p>Burlington Slate Ltd.; Kirkstone Quarries Ltd.; Delabole Slate Company; Cornwall County Council; Stone Federation of Great Britain, Cumbria County Council; Lake District National Park.</p>				

Geographic Breakdown of Arisings: Slate Waste

NOTE: Where a portion of the arisings in a region is shown as used, the use could be anywhere and not (necessarily) in the region of arising.

	Total Arisings (Mt)	Not Relevant (Mt)	Aggregate Use (Mt)	Other Use (Mt)	Potentially Available (Mt)	Stockpiles (Mt)
North West	0.20	0.00	0.15	0.08	0.00	> 1.0
Cumbria	0.20	0.00	0.15	0.08	0.00	> 1.0
Lancashire & G Manchester	0.00	0.00	0.00	0.00	0.00	-
Cheshire & Merseyside	0.00	0.00	0.00	0.00	0.00	-
South West	0.30	0.00	0.00	0.00	0.00	0.20
Gloucestershire (excl S Glos)	0.00	0.00	0.00	0.00	0.00	-
Wiltshire & Dorset	0.00	0.00	0.00	0.00	0.00	-
Somerset & former Avon	0.00	0.00	0.00	0.00	0.00	-
Devon, Cornwall & Scillies	0.30	0.00	0.00	0.00	0.00	0.20
Total England	c. 0.50	0.00	0.15	0.08	0.00	>> 1.2

MATERIAL: SPENT RAILWAY TRACK BALLAST				
Relevant material and location	Spent track ballast arising from track renewals nationwide			
Overall Arisings = 1.4 Mt				Stockpiles
Not Relevant 0.2 Mt	Aggregate Use 1.2 Mt	Other Use nil	Potentially Available negligible	Possibly Usable negligible
<p>Explanatory Comments</p> <p>Railtrack arisings in GB were 1.5Mt. 85% assumed to arise in England. 10% sent for disposal.</p> <p>London Underground arisings 93,500t of which 48% sent for disposal.</p> <p>In addition (not included in the figures above), there were c. 200,000t of fines arising from High Output Ballast Cleaning (HOBC) machines, which are used to effect in-situ amelioration of track ballast.</p> <p>The "Not Relevant" figure is that portion of arisings that are sent for disposal as unusable. In addition there is some 50,000t of contaminated ballast (from both Network Rail and LU) that is disposed of separately.</p>				
<p>Arisings</p> <p>This material is taken from Network Rail by aggregates suppliers/contractors for processing and recycling. Network Rail monitors the recycling performance.</p> <p>The material is channelled from the various worksites through 11 Local Distribution Centres (LDC) around England.</p> <p>In general, Network Rail arisings are nationwide but are in practice through the relevant LDC. The arisings at any LDC would depend upon the programme and distribution of track renewal activity.</p> <p>Arisings also from London Underground.</p>				
<p>Stockpiles</p> <p>Working stockpile only exist at the LDCs and with the processors. No measure of these has been sought.</p> <p>No long-term stockpiles (other than what may have been landfilled) are known.</p>				
<p>Use</p> <p>All aggregate use is via the external processors. Network Rail does not specifically re-use its own arisings.</p> <p>For Network Rail monitoring purposes, reprocessed ballast is classified as:</p> <p>Category C which is reused "as is", as a 60mm down fill material;</p> <p>Category B which is part-processed by crushing and screening for sub-base and like uses;</p> <p>Category A which is fully processed, single-size aggregates used in asphalt and some concrete applications.</p> <p>HOBC arisings are used in fill mixtures.</p>				
<p>Trends in Aggregate use</p> <p>Network Rail is looking at the issue of re-using spent ballast back into trackwork and to pursue in-situ recycling operations.</p> <p>LU is seeking to increase their recycling proportion by introduction of risk protocol.</p> <p>Arisings will depend upon the track renewals programme. Use of the material is in competition with like materials from CDEW which may need less processing/cleaning. Use in concrete faces some concerns over contraries content.</p>				
<p>Future Potential</p> <p>Use is high now. Further percentage increase would involve more effort on the presently rejected elements, where cost/benefit and competition considerations are not now favourable.</p>				
<p>Data Sources and assumptions</p> <p>Network Rail; London Underground.</p>				

Geographic Breakdown of Arisings – Spent Track Ballast

NOTE: Overall figures have been assigned to the regions assuming that the material effectively arises at Local Distribution Depots (LDC). Arisings have been assigned equally amongst all LDCs and regional data has been calculated according to the location of the LDCs. Use data have been similarly calculated.

Where a portion of the arisings in a region is shown as used, the use could be anywhere and not (necessarily) in the region of arising.

	Total Arisings (Mt)	Not Relevant (Mt)	Aggregate Use (Mt)	Other Use (Mt)	Potentially Available (Mt)	Stockpiles (Mt)
North West	0.38	0.05	0.33	0.00	-	-
Cumbria	0.13	0.02	0.11	0.00	-	-
Lancashire & G Manchester	0.13	0.02	0.11	0.00	-	-
Cheshire & Merseyside	0.12	0.01	0.11	0.00	-	-
North East	0.00	0.00	0.00	0.00	-	-
Yorkshire & Humber	0.13	0.02	0.11	0.00	-	-
North Yorkshire	0.00	0.00	0.00	0.00	-	-
South Yorkshire	0.13	0.02	0.11	0.00	-	-
West Yorkshire	0.00	0.00	0.00	0.00	-	-
East Riding, N&NE Lincolnshire	0.00	0.00	0.00	0.00	-	-
West Midlands	0.13	0.02	0.11	0.00	-	-
Shropshire & Staffordshire	0.00	0.00	0.00	0.00	-	-
Herefordshire & Worcestershire	0.00	0.00	0.00	0.00	-	-
West Midlands excl Coventry & Solihull	0.13	0.02	0.11	0.00	-	-
Warwickshire, Coventry & Solihull	0.00	0.00	0.00	0.00	-	-
East Midlands	0.13	0.02	0.11	0.00	-	-
Derbyshire	0.13	0.02	0.11	0.00	-	-
Notts & Lincs (excl N&NE Lincs)	0.00	0.00	0.00	0.00	-	-
Leicestershire & Rutland	0.00	0.00	0.00	0.00	-	-
Northamptonshire	0.00	0.00	0.00	0.00	-	-
East England	0.25	0.04	0.22	0.00	-	-
Cambs, Norfolk & Suffolk	0.00	0.00	0.00	0.00	-	-
Bedfordshire & Hertfordshire	0.25	0.04	0.22	0.00	-	-
Essex	0.00	0.00	0.00	0.00	-	-
London	0.00	0.00	0.00	0.00	-	-
South East	0.38	0.05	0.33	0.00	-	-
Kent	0.00	0.00	0.00	0.00	-	-
Surrey, E&W Sussex	0.00	0.00	0.00	0.00	-	-
Hampshire and IoW	0.25	0.03	0.22	0.00	-	-
Berks, Bucks & Oxon	0.13	0.02	0.11	0.00	-	-
South West	0.00	0.00	0.00	0.00	-	-
Total England	1.4	0.2	1.2	0	Negligible	Negligible

MATERIAL: WASTE (Container) GLASS				
Relevant material and location	Post-consumer <i>container glass</i>, the largest component of the overall waste glass stream. The relevant waste actually arises throughout England, but significant quantities of derived aggregate materials arise with a few producers.			
Overall Arisings = 2.0 Mt				Stockpiles
Not Relevant negligible	Aggregate Use c. 0.15 Mt	Other Use c. 0.9 Mt	Potentially Available 0.95 Mt	Possibly Usable nil
<p>Explanatory Comments</p> <p>Arisings of waste container glass in UK estimated at 2.4 Mt. Uses were:</p> <ul style="list-style-type: none"> back into new containers:- 742,000t export:- 243,000t nto fibreglass:- 90,000t aggregate:- 185,000t. <p>Arisings in England estimated to be 2Mt (in proportion to population).</p> <p>The 0.95Mt Potentially Available currently is not being recovered and goes for disposal.</p> <p>Practical factors would limit the proportion of this that could actually be recovered.</p>				
<p>Arisings</p> <p>Effectively nationwide, according to population and collection systems in place.</p>				
<p>Stockpiles</p> <p>Stockpiles only exist within the re-use processing chain. Much glass theoretically recoverable from municipal waste landfills but this activity unlikely to become a reality.</p>				
<p>Use</p> <p>Aggregates derived from mixed-colour container glass waste feedstock. Washed and graded product used as bedding materials. Crushed and graded product used in asphalt.</p> <p>Competing uses for this feedstock are back into the container industry, export, fibreglass industry, small but viable use as filter medium.</p> <p>Other components of the overall glass waste stream are theoretically available in addition, but competing higher values uses exist for these materials.</p>				
<p>Trends in Aggregate use</p> <p>Has been growing steadily since 2001 but still at a low level. Further growth affected by value of Packaging Recovery Notes that container glass waste processing attracts.</p>				
<p>Future Potential</p> <p>Much effort is being made to find uses for waste glass. Avenues such as in brick making, filtration media, grit blasting and uses for milled glass, are being researched and tested. These will compete with aggregate uses.</p> <p>Further capability in the container glass industry to use mixed-colour glass waste is likely which will also bring further competition.</p> <p>Fibreglass industry can now use mixed-colour container glass waste and this use has grown six-fold since 2001.</p> <p>Potential for increased aggregate production and use depends upon generating demand for the product, keeping the economics stable and recovering more glass from the overall (municipal) waste stream.</p>				
<p>Data Sources and assumptions</p> <p>WRAP; Valpak; British Glass Manufacturers' Confederation; Day Aggregates Ltd; CEMEX.</p>				

Geographic Breakdown of Arisings – Waste (container) Glass						
NOTE: Overall figure have been distributed in proportion to population. Rounding errors are apparent in this table. Data on use and availability have been left at the national level only, to avoid mis-interpretation of the regional data. (See Report para 5.5.)						
	Total Arisings (Mt)	Not Relevant (Mt)	Aggregate Use (Mt)	Other Use (Mt)	Potentially Available (Mt)	Stockpiles (Mt)
North West	0.27	0.00	–	–	–	0.00
Cumbria	0.02	–	–	–	–	–
Lancashire & G Manchester	0.16	–	–	–	–	–
Cheshire & Merseyside	0.10	–	–	–	–	–
North East	0.10	0.00	–	–	–	0.00
Northumberland, Tyne & Wear	0.06	–	–	–	–	–
Tees Valley & Durham	0.05	–	–	–	–	–
Yorkshire & Humber	0.20	0.00	–	–	–	0.00
North Yorkshire	0.03	–	–	–	–	–
South Yorkshire	0.08	–	–	–	–	–
West Yorkshire	0.05	–	–	–	–	–
East Riding, N&NE Lincolnshire	0.03	–	–	–	–	–
West Midlands	0.21	0.00	–	–	–	0.00
Shropshire & Staffordshire	0.06	–	–	–	–	–
Herefordshire & Worcestershire	0.03	–	–	–	–	–
West Midlands excl Coventry & Solihull	0.08	–	–	–	–	–
Warwickshire, Coventry & Solihull	0.04	–	–	–	–	–
East Midlands	0.17	0.00	–	–	–	0.00
Derbyshire	0.04	–	–	–	–	–
Notts & Lincs (excl N&NE Lincs)	0.07	–	–	–	–	–
Leicestershire & Rutland	0.04	–	–	–	–	–
Northamptonshire	0.03	–	–	–	–	–
East England	0.22	0.00	–	–	–	0.00
Cambs, Norfolk & Suffolk	0.09	–	–	–	–	–
Bedfordshire & Hertfordshire	0.06	–	–	–	–	–
Essex	0.07	–	–	–	–	–
London	0.30	0.00	–	–	–	0.00
West London	0.15	–	–	–	–	–
East London	0.14	–	–	–	–	–
South East	0.33	0.00	–	–	–	0.00
Kent	0.06	–	–	–	–	–
Surrey, E&W Sussex	0.10	–	–	–	–	–
Hampshire and IoW	0.07	–	–	–	–	–
Berks, Bucks & Oxon	0.09	–	–	–	–	–
South West	0.20	0.00	–	–	–	0.00
Gloucestershire (excl S Glos)	0.02	–	–	–	–	–
Wiltshire & Dorset	0.05	–	–	–	–	–
Somerset & former Avon	0.06	–	–	–	–	–
Devon, Cornwall & Scillies	0.06	–	–	–	–	–
Total England	2.0	0.00	0.15	0.90	0.95	0.00

ANNEX 2

Regional Data Summary

Table with extract data connecting material with region (and sub-region).

MATERIAL	Ceramic (fired) Waste			China Clay Waste			Colliery Spoil			Furnace Bottom Ash: Power Stations			Incinerator Bottom Ash: Waste to Energy Plants		
	Total Arisings (Mt)	Aggregate Use (Mt)	Potentially Available (Mt)	Total Arisings (Mt)	Aggregate Use (Mt)	Potentially Available (Mt)	Total Arisings (Mt)	Aggregate Use (Mt)	Potentially Available (Mt)	Total Arisings (Mt)	Aggregate Use (Mt)	Potentially Available (Mt)	Total Arisings (Mt)	Aggregate Use (Mt)	Potentially Available (Mt)
<p>NOTES: Where a portion of the arisings in a region are shown as used, the use could be anywhere and not (necessarily) in the region of arising.</p> <p>Overall total for each column heading has been assigned to the regions in proportion to the waste treatment capacity at each facility.</p> <p>Overall figures have been assigned to the regions in proportion to the coal production at each mine.</p> <p>Overall total for each column heading has been assigned to the regions in proportion to the installed generating capacity at each power station.</p>															
North West															
Cumbria															
Lancashire & G Manchester															
Cheshire & Merseyside															
North East															
Northumberland, Tyne & Wear															
Tees Valley & Durham															
Yorkshire & Humber															
North Yorkshire															
South Yorkshire															
West Yorkshire															
East Riding, N&NE Lincolnshire															
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East Midlands															
Derbyshire															
Notts & Lincs (excl N&NE Lincs)															
Leicestershire & Rutland															
Northamptonshire															
East England															
Cambs, Norfolk & Suffolk															
Bedfordshire & Hertfordshire															
Essex															
London															
West London															
East London															
South East															
Kent															
Surrey, E&W Sussex															
Hampshire and IoW															
Berks, Bucks & Oxon															
South West															
Gloucestershire (excl S Glos)															
Wiltshire & Dorset															
Somerset & former Avon															
Devon, Cornwall & Scillies															
Total England	0.05	0.04	0.01	19.6	2.6	11.1	4.85	1.0	3.85	1.00	0.90	0.00	0.72	c. 0.40	c. 0.30

ANNEX 3

Research Specification

The following research specification covers the full project, which comprises two elements. Those parts of the specification which **specifically relate wholly or in part to this report on other materials have been emphasised through the use of bold text**. When the specification was issued, it was issued by the Office of the Deputy Prime Minister (ODPM) (as was).

SURVEY OF ARISING AND USE OF ALTERNATIVES TO PRIMARY AGGREGATES IN ENGLAND, 2005

Introduction

- 1.1 It is Government policy to encourage the use of alternative materials instead of quarrying and dredging for primary aggregates. Construction, demolition and excavation wastes (CDEW) are the main alternatives and, therefore, Communities and Local Government requires up-to-date information on arisings and use of these as aggregate. Previous surveys of CDEW were undertaken for 1999, 2001 and 2003. A survey for 2005 is now required.
- 1.2 The surveys have been improved progressively and, while still subject to statistical uncertainties, are now reasonably reliable at the national level and useful, but less reliable, at the regional level. There is strong pressure to improve regional data for use in Regional Spatial Strategies, and to secure sound information by Mineral Planning Authority area as an input into the preparation of local development documents.
- 1.3 **A variety of other alternatives are used as aggregates including industrial by products, mineral wastes and other recycled wastes. Information is also needed on arisings and use of these for 2005.**

Aim

- 2.1 The aim of the work is to survey and report on arisings and use of alternatives to primary aggregates for 2005.

Objectives

- 3.1 The objectives of the work in respect of CDEW are:
 - to review the method and results of the previous national survey and to identify improvements, if any;
 - to review data collected by industry (the Quarry Products Association, British Aggregates Association and National Federation of Demolition Contractors) so that, if possible, use can be made of these to avoid duplication and reduce the burden of the survey on respondents;

- to design an appropriate survey method that takes account, as far as is practicable, of consistency with past surveys while improving reliability at regional / local level especially by devising means of improving response rates;
- to undertake the survey;
- to analyse, collate and validate the results;
- to prepare a commentary on the results that includes an assessment of reliability and a comparison with results of previous surveys; and
- to identify lessons for future surveys.

3.2 **The objectives, with respect to other alternatives to primary aggregates, are:**

- **to devise a method or methods for securing reasonably reliable information on arisings and use;**
- **to collect and collate data; and**
- **to prepare a commentary on the results that includes an assessment of reliability and a comparison with results of a survey undertaken for 2001.**

3.3 It is expected that most of the effort in this work will be allocated to the CDEW survey. **The survey of other alternatives will rely on reasonable estimates.**

Deliverables

4.1 **The required deliverables are:**

- a) an interim report setting out the proposed approaches to the surveys for discussion by a steering group;**
- b) a digital database containing information on participating organisations and results of the CDEW survey;
- c) a draft final report of the CDEW survey for amendment following discussion with the steering group;
- d) a draft final report of the survey of other alternatives for amendment following discussion with the steering group;**
- e) 20 copies of the two final reports in the versions agreed for publication; and**
- f) publication-ready digital copy of the final reports suitable for placing on a website and also for reproduction as paper copy.**

Management

5.1 Day to day management of the work will be undertaken by the contract managers for Communities and Local Government and for the contractor only. However, the Communities and Local Government contract manager will be advised by a steering group consisting of representatives drawn from about eight key interested organisations.

Quality Plan

- 6.1 The proposal should include a quality plan setting out quality assurance procedures for all activities and outputs. The plan will indicate who has responsibility for each element of the work and who has overall management control and who has editorial control of the final reports.

Criteria for Tender Evaluation

- 7.1 Tenderers are asked to identify an appropriate programme to deliver the outputs described in section 4, within the objectives stated in section 3, above.
- 7.2 Tender evaluation will be based on performance against the following:
- a) understanding of the policies and practical issues, and knowledge of related studies;
 - b) how well the research objectives are addressed;
 - c) the quality of ideas that are presented;
 - d) the relevance of skills and the experienced of the proposed research team;
 - e) the robustness and suitability of the proposed approach in meeting the requirements of the specification;
 - f) the adequacy of the proposed project management, programme of work, and quality assurance procedures;
 - g) evidence of the track record of the tenderer in delivering high quality, succinct reports and other outputs to schedule;
 - h) the extent to which the tender meets the requirements of ODPM; and
 - j) overall value for money.

Duration and Timetable

- 8.1 Communities and Local Government expects the length of the contract to be about 12 months. The work should be completed by the end of February 2007. The proposed timetable of work should make due allowance for consideration of drafts by, and meetings of, the steering group at appropriate points during the work programme. The contractor will be responsible for preparing and distributing papers for, and preparing a note of the proceedings at, each meeting.

ANNEX 4

Members of the Project Steering Group

ACKNOWLEDGEMENT

The members of the Project Steering Group, and their alternates where relevant, are listed below. Their advice, guidance and contributions are gratefully acknowledged. Information and comments put forward by members of the steering group were taken into account in the preparation for, and analysis of, the surveys. However, the findings and commentary are those of the study team, as is the responsibility for any errors or omissions.

Communities and Local Government:

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William Mackenzie (Contract Manager), Planning: Resources and Environment Policy Division
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This report sets the results of the survey of arisings and use of secondary materials as alternatives to primary aggregates in England 2005.

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