

March 2010

Sub-Regional Apportionment of
Aggregates Provision in the West
Midlands Region 2005 – 2020
Final Report



Prepared for West Midlands
Regional Assembly
by Land Use Consultants

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**FINAL REPORT
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I. INTRODUCTION

- I.1. Following the recent publication of the national and regional guidelines for aggregates provision in England 2005-2020¹, and in accordance with Minerals Policy Statement I, the West Midlands Regional Assembly (the Regional Planning Body for the West Midlands) is required to apportion the West Midlands regional figure for primary aggregates provision contained in the guidelines to a sub-regional level, taking into account advice from the West Midlands Minerals Planning Authorities (MPAs) and the Regional Aggregates Working Party (WMRAWP).
- I.2. The current apportionment of primary aggregates within the West Midlands region is based on a superseded revision of the National and Regional guidelines for aggregates provision in England 2001-2016². The current apportionment methodology is based largely on historical shares and an assumption that provision would remain largely consistent during the period covered by the guidelines.
- I.3. The West Midlands Regional Assembly (WMRA) commissioned Land Use Consultants (LUC) in November 2009 to prepare alternative options for the apportionment of primary aggregates in the West Midlands for the period 2005-2020. Alternative options should take into consideration the location of the resource as well as planning and environmental designations and population / household growth projections.
- I.4. In a separate exercise, the WMRAWP developed a further set of options for apportionment of primary aggregates based on past sales or 'historical shares'.
- I.5. A project Steering Group was established and consisted of:
 - David Clarke: West Midlands Regional Assembly
 - Paul Wilcox: WMRA Policy Lead for Minerals
 - Chris Blakeley: West Midlands Regional Assembly

STRUCTURE OF REPORT

- I.6. This report sets out the proposed alternative sub-regional apportionment methodology and a quantification of the primary resources apportioned to each sub-region resulting from the methodology under a range of different scenarios (termed 'options').
- I.7. The remainder of the report is structured into the following chapters:

Chapter 2: Discusses the stages in the development of the sub-regional apportionment methodology, outlining the timeline and background to this study.

¹ National and Regional Guidelines for Aggregate Provision in England 2005-2020. Department for Communities and Local Government, June 2009.

² National and Regional Guidelines for Aggregate Provision in England 2001-2016. Department for Communities and Local Government, 2003.

Chapter 3: Outlines the factors proposed for inclusion within the methodology and their reasons for inclusion or exclusion.

Chapter 4: Sets out the revised factors and datasets for use in quantifying factors in the methodology.

Chapter 5: Details the process of developing options and the inclusion of weighting for factors.

Chapter 6: Sets out the results of the alternative apportionment options for both sand and gravel and crushed rock.

Chapter 7: Summarises the conclusions of the proposed apportionment methodology and implications for its use by WMRA and the sub-regions.

2. METHOD AND PROJECT TIMELINE

2.1. This chapter describes the stages in the development of the methodology for generating alternative options for a sub-regional apportionment of the total aggregate supply figure for the West Midlands Region (165mt of land-won sand and gravel and 82mt land-won crushed rock over the period 2005-2020). The methodology has been developed in association with the project Steering Group and representatives from WMRAWP.

2.2. The methodology has been developed in a number of stages described below:

Stage 1: Factors for consideration were discussed at a meeting held with the Steering Group and a group of MPAs on 13th November 2009.

Stage 2: Five draft options for apportionment were presented to the Steering Group and WMRAWP at a meeting held on 4th December 2009.

Stage 3: A revision of draft options followed, which incorporated suggestions and recommendations that had emerged from the 4th December meeting. These were written up in a draft report which was circulated by WMRA for a technical consultation with the WMRAWP.

Stage 4: Technical stakeholder consultation on the draft options was held 18th December 2009 to 22nd January 2010. The consultation provided members of the WMRAWP and MPAs with an opportunity to comment on the methodology and draft options.

Stage 5: Two new options for apportionment were introduced at the WMRAWP meeting held on 9 February 2010. These options drew on feedback from the technical consultation undertaken in Stage 4.

Stage 6: Further limited technical stakeholder consultation on the two new options was held with the WMRAWP from 17th February 2010 to 26th February 2010, including LUC attendance at a meeting of the Regional Minerals and Waste Officers Group (RMWOG) (23rd February 2010), and discussions at the WMRAWP meeting 3rd March 2010.

Stage 7: Final alternative options for apportionment are presented in this report taking into account feedback from the February 2010 consultation and 3rd March 2010 WMRAWP meeting.

2.3. It was acknowledged early on that the timescale for the study was tight and this was raised as an issue a number of times during consultation.

BACKGROUND

The current sub-regional apportionment and the target regional supply figure (Policy M2)

- 2.4. The current apportionment of the regional supply figure is based on past sales figures. While the basis for the apportionment is judged to be logical and reasonably robust, it is essentially derived from past rates of production, rather than an appraisal of future needs and the likely availability of materials, taking into account a more strategic analysis of environmental and other constraints.
- 2.5. The current apportionment is shown in **Tables 2.1 and 2.2.**

Table 2.1 Current apportionment for sand and gravel resources

Sub-regions	Current apportionment 2001-2016 (million tonnes per annum)	Percentage of regional total (%)
Herefordshire	0.283	2.80%
Shropshire	0.820	8.10%
Staffordshire	6.602	65.20%
Warwickshire	1.043	10.30%
West Midlands County	0.506	5.00%
Worcestershire	0.871	8.60%
West Midlands Region	10.125	100%
West Midlands 2001-2016	162 (mt)	

Source: West Midlands Regional Spatial Strategy Phase Two Revision – Draft, Preferred Option December 2007

Table 2.2 Current apportionment for crushed rock

Sub-regions	Current apportionment 2001-2005 (million tonnes per annum)	Current apportionment 2005-2016 (million tonnes per annum)	Percentage of regional total (%) 2005-2016
Herefordshire	0.424	0.424	7.30%
Shropshire	2.662	2.949	50.75%
Staffordshire	1.395	1.395	24.01%
Warwickshire	0.593	0.88	15.14%
West Midlands County	0.575	0	0%

Sub-regions	Current apportionment 2001-2005 (million tonnes per annum)	Current apportionment 2005-2016 (million tonnes per annum)	Percentage of regional total (%) 2005-2016
Worcestershire	0.163	0.163	2.81%
West Midlands Region	5.812	5.812	100%
West Midlands 2001-2016	93 (mt)		

Source: West Midlands Regional Spatial Strategy Phase Two Revision – Draft. Preferred Option December 2007

Sub-regions for the apportionment

- 2.6. The revised sub-regional apportionment will enable the regional supply figure for sand and gravel and crushed rock to be apportioned between all the sub-regions and will be applicable if overall national and regional guideline figures change in future following review. The sub-regions or planning units are:
- Herefordshire
 - Shropshire (includes Telford and Wrekin Council)
 - Staffordshire (includes Stoke-on-Trent)
 - Warwickshire
 - West Midlands County (includes Birmingham, Dudley, Wolverhampton, Coventry, Sandwell, Solihull and Walsall)
 - Worcestershire
- 2.7. It was agreed early on in the study that a separate apportionment for soft sand and sharp sand was not needed.

3. INITIAL FACTORS FOR CONSIDERATION

3.1. LUC proposed that the key considerations that might influence the supply and use of primary aggregates fall into one of three categories. The first reflects demand, with the intention being to establish a reliable measure of where building materials are likely to be required in large quantities in the future. Existing population and future housing fall into this category. The second category relates to supply, reflecting the location of unsterilised resources. The third category is termed constraints, and includes those considerations that may constrain the ability of a sub-region to provide for the supply of material. Generally it is assumed that these would be environmental (nature conservation and landscape designations) and heritage constraints. The categorisation is summarised in **Table 3.1**.

Table 3.1: Key considerations influencing the provision of primary aggregates

Demand	Supply	Constraint
Future development pressure Population / households Past use (Sales)	Unsterilised Resource Sustainable transport Existing contracts and patterns of supply	Environmental designations

3.2. The key considerations above were translated into a number of possible factors for inclusion in the apportionment methodology, which were presented to the Steering Group and MPAs at a meeting on 13th November 2009. The initial proposed set of factors is discussed below.

3.3. An apportionment methodology which reflected these considerations could also be designed to accommodate weighting, thereby making it possible to formulate and test different apportionment scenarios. The Steering Group and WMRAWP discussed these considerations with LUC at a number of meetings:

- 4th December 2009 (WMRAWP);
- 9th February 2010 (WMRAWP);
- 23rd February 2010 (RMWOG); and
- 3rd March 2010 (WMRAWP)

and through a series of iterations, established a final set of factors for inclusion in the apportionment methodology, thus not all of the factors below appear in the final

methodology (e.g. floodplains, Groundwater Protection Zones and Green Belt). The reasons for this are described under the heading for each factor.

- 3.4. A list of the attendees at the above meetings can be found in **Appendices 1** (13th November 2009 meeting), **2** (4th December 2009 meeting), **3** (9th February 2010 meeting), **4** (23rd February 2010 meeting) and **5** (3rd March 2010 meeting).
- 3.5. For each factor, a number of possible datasets were tested throughout the development of the apportionment options process. An initial set of data were used in order to develop the draft options for consultation. Following consultation, these datasets were refined as far as possible to address the key issues relating to data raised during consultation. Earlier options (A to E) presented in the draft report are therefore based on different datasets to the final options presented in this report (F and Refined option F) which are based on the more refined datasets. Detail on the datasets used for the draft options for apportionment (A to E) is provided in **Appendix 6**, and the final datasets used in the final apportionment options are detailed in **Section 4** of this report.

FUTURE DEVELOPMENT PRESSURE

What the factor is designed to measure

- 3.6. This factor is designed to measure future development pressure over a defined planning horizon. Future development pressure is simply another way of expressing construction demand. The planning system will guide development to certain strategic locations, leading to a demand for construction materials in those locations. Consequently, this factor is focussed on existing urban areas (in which it is intended that a significant amount of new housing and associated development will be accommodated), and proposed housing locations. As such, population and household projections and economic and employment forecasts have already been taken into account.

Key data and limitations

- 3.7. The housing proposals in the Regional Spatial Strategy have been subject to a number of reviews. It was proposed that the best available data to be used in the apportionment would be the table of Regional Housing Trajectory Indicative Average Annual Rates for 5 year periods presented in the Addendum to the Panel Report of the WM RSS Phase Two Revision. These proposals reflect the phasing policy and present the housing numbers in five year bands for each Local Authority. These figures represent the net housing requirements for the plan period (2006-2026).
- 3.8. Additionally, there are figures available for the number of demolitions planned per Local Authority over the plan period (2006-2026). The best available data for demolitions is the West Midlands Regional Spatial Strategy Phase Two Revision – Draft Preferred Option December 2007 (Table 2). It was agreed that these demolitions also represent a demand for aggregates and that the demolition figures should be added to the housing proposals figures.

- 3.9. In order to best match the apportionment time period, it was agreed that the planned housing and demolitions for the end of the Plan period (2021-2026) should be excluded from the apportionment calculations. The demolitions figures are presented as an annual average over the plan period with no additional information on phasing. For the purpose of the apportionment, it has been assumed that there will be no phasing over the period 2006-2021.

Issues to consider

- 3.10. The Steering Group agreed that this factor needed to be included in the methodology. It is anticipated that there will be revisions to these housing proposals made by the Secretary of State in the near future, but these figures will not be available within the timeframe of this study.
- 3.11. Consideration was also given to the distribution of demand for aggregates across the region needing to reflect the distribution of the resource across the MPAs. In particular, although demand in West Midlands County is high, not all of the Authorities within the MPA have aggregate resources, and in reality, this demand will need to be met by other MPAs.

POPULATION / HOUSING PROVISION

What the factor is designed to measure

- 3.12. This factor is designed as a measure of the existing distribution of the population in the Region. Such a measure is considered necessary because of the close correlation between concentrations of people and development activity. In simple terms, the greater the number of people, the greater the rate of development as people extend their houses, new schools are built and urban land is redeveloped. Therefore the methodology should take account of the demand for construction material arising from this activity. In effect, the factor reflects the latent demand that exists in urban areas.

Key data and limitations

- 3.13. The principal data source would be the Mid Year Population Estimates produced by the Office for National Statistics, with population disaggregated by mineral planning sub-region. Data was downloaded from the Office for National Statistics website.

Issues to consider

- 3.14. Similar to future development pressure, consideration was given to the distribution of demand across the region and the need to reflect the distribution of the resource across the MPAs.

PAST SALES

What the factor is designed to measure

- 3.15. This factor forms the basis of the existing apportionment. It provides a measure of sales over a preceding defined period. As such, it provides an accurate proxy of recent demand; however, it is necessarily backward looking and does not reflect where demand patterns may change in the future.
- 3.16. As a separate exercise, the WMRAWP developed a set of alternative apportionment options which were 'sales-based'. As such, no 'sales-led' alternative option was developed for the first round of consultation on alternative options, although sales was still included as a factor with a low weighting. Feedback from the consultation led to the development of a 'sales-led' alternative option (Options F and Refined Option F).

Key data and limitations

- 3.17. The principal data source is the Annual Report produced by the WMRAWP. The most recent publication is the 2007 Annual Report. Data for crushed rock sales were aggregated or not available for confidentiality reasons. These data were not available to WMRAWP so an alternative proxy for past sales data needed to be sought for crushed rock.

Issues to consider

- 3.18. It was felt that past sales were an important factor to reflect the supply of aggregates in the Region. WMRAWP members were consulted on regarding the time period to use for sales data – a three, five or ten year average. Whilst the initial draft options were based on three year sales data, February consultation responses indicated a preference for ten year sales data. In the absence of a full set of sales data for crushed rock, it was agreed that the current apportionment tonnages for crushed rock should be used as a proxy for supply as these are based on past sales data.

UNSTERILISED RESOURCE

What the factor is designed to measure

- 3.19. This factor is the distribution of unsterilised mineral resource (i.e. mineral resources not sterilised by urban areas and major transportation links). In order to approximate the amount of mineral resource available in each sub-region, the resource data should also exclude any worked out sites. The data are available as GIS layers and can therefore be quantified as an area in hectares. This is important in the context of the apportionment because extraction can only take place where the different resource types occur.

Key data and limitations

- 3.20. The British Geological Survey (BGS) data shows the distribution of minerals in the region in GIS. The best available data at the regional scale is the DiGMapGB-100 Mineral Resource dataset at 1:50 000. There is some evidence that there are gaps in the BGS data (e.g. incomplete coverage of the Shropshire 'fault line' and SW Herefordshire). Some MPAs have done further work with the BGS to map their resource more accurately, but there is not complete coverage for the Region.
- 3.21. This dataset does not exclude the areas sterilised by urban areas and major transport infrastructure), so needs to be further processed before being included in the methodology. There is no 'off the shelf' data on the depth of the resource or the quality of the resource.

Issues to consider

- 3.22. Some MPAs were concerned with the use of the DiGMapGB-100 Mineral Resource dataset given the gaps highlighted above. MPAs were unable to provide more detailed resource data for inclusion in this study.
- 3.23. It was agreed that the BGS GIS minerals data, with sterilised areas and worked out mineral sites removed, would be the data source for this factor as it ensured a consistent dataset across the sub-regions. Initially, the data was included as an area (hectares) in the methodology (for draft options A to E). Consultation highlighted dissatisfaction with using the area of the resource in the methodology and steps were taken to translate areas into approximate volumes. This process is described in detail in **Section 4**.
- 3.24. There was also discussion regarding the inclusion of resource that falls within internationally designated areas (Special Areas of Conservation, Special protection Areas, Ramsar sites and World Heritage sites). The Steering Group felt that the level of protection afforded to these sites by the planning system, meant that resource within these areas should be excluded from any calculations to estimate the volume of available resource.
- 3.25. At the 9th February WMRAWP meeting, a representation was made by Worcestershire to remove the Malvern Hills Conservators Landholdings from any hard rock resource calculations, as the Act of Parliament restriction placed on quarries in the Malvern Hills is considered to be as stringent as an international designation. Supporting evidence was supplied to WMRAWP and it was agreed that resource within these areas would be excluded.

Further considerations for factor 3 as highlighted by consultation

- 3.26. Two other issues raised during the technical consultation were considered when refining the resource data: viable transport and location of existing mineral sites.

Viable transportation and proximity to markets

- 3.27. Proximity of minerals to markets was raised as an issue during consultation. It was felt that the LUC methodology needed to better reflect the potential barriers with regards to transporting minerals around the Region. An economist for the Minerals Products Association was consulted and suggested that a distance of 38km could be used to reflect the distance within which it is economically viable to transport minerals by road.
- 3.28. A buffer of 38km was applied to the Major Urban Areas (MUAs) and Settlements of Significant Development beyond MUAs (defined in the West Midlands Regional Spatial Strategy) to approximate the viable transport distance, as these settlements are likely to generate most of the demand for aggregates. These buffers covered almost the entire Region and it was decided therefore that introducing this further constraint to the resource data would not have a significant effect on the resulting apportionment options. The 38km buffers are illustrated in **Appendix 7** overlaid onto the sand and gravel resource data. . At the 9th February WMRAWP meeting, it was acknowledged that the inclusion of past sales data (factor 2) already presents a proxy for viable transport distances, as the pattern of past sales reflects the historic proximity of resource to market.

Existing minerals allocations, preferred minerals areas and existing sites

- 3.29. A further suggestion was to restrict the estimated volume of available resource to the areas of resource within each MPA sub-region which are/have:
- Existing extraction permissions;
 - Allocated sites in development plans; and
 - Preferred areas or potential sites preferred by developers in emerging Minerals development plan documents.
- 3.30. It was not possible to obtain GIS data and location of all of these sites for the Region in the timescale of the project, and from the data that was obtained from the MPAs, it was decided that this would limit the resource data to too large an extent. The data that was provided by MPAs in GIS format is presented in **Appendix 7**.

SUSTAINABLE TRANSPORT

What the factor is designed to measure

- 3.31. This factor highlights the importance of transport in the use of primary aggregates, with a particular emphasis on what are termed sustainable modes (rail and water rather than road). Adequate transport links between the locations where minerals are worked, where they are processed, and where they are used are essential. Ideally these three things should occur in close proximity.

Key data and limitations

- 3.32. It was initially suggested that sustainable transport could be used as a factor by assessing the location of wharves, road and rail (including depots) provision in the Region in relation to the location of the resource. It was also proposed that proximity to the Primary Road Network be assessed.
- 3.33. Data on the locations of these sustainable transport links were not available across the region.

Issues to consider

- 3.34. The Steering Group agreed that sustainable transport should be omitted as a factor in the sub-regional apportionment. This is because it is misleading to assume that just because a mineral resource is near to a particular transport mode or transshipment point, it could easily be transported using that mode of transport. When seeking to divert aggregate transportation from road to rail or water (i.e. towards, in principle, more sustainable forms of transport), capacity of the network and ability to tranship aggregates become key considerations.

CONTRACTS AND PATTERNS OF MOVEMENT

What the factor is designed to measure

- 3.35. This factor was included as a means of reality testing any conclusions reached with respect to transport. The factor would ensure that the methodology takes account of processing and transport capacity that is already committed through existing contractual arrangements.

Key data and limitations

- 3.36. It was anticipated that data relating to major planned developments (not including housing development) would be very difficult to obtain, both in terms of availability and commercial sensitivity.

Issues to consider

- 3.37. The Steering Group agreed that contracts and patterns of movement should be omitted as a factor as the apportionment period is too long to predict all major developments. There would also be significant difficulty in assembling the relevant information.

ENVIRONMENTAL CONSTRAINTS

What the factor is designed to measure

- 3.38. The presence of internationally and nationally important environmental features, some of which are represented by planning designations, will constrain mineral development in certain locations, and the methodology should reflect the degree of

constraint. For example, it would be contrary to policy and only acceptable in exceptional circumstances to build new processing facilities in an AONB, compared to less constrained locations.

Key data and limitations

- 3.39. The key data source for this factor would be planning / environmental / heritage designations in extant development plans (as well as other sources), and the land area covered. It should be noted that the inclusion of these international and national designations within the apportionment methodology seeks to address potential effects of mineral workings on the designated areas, but does not in itself satisfy the requirements of the SA. For this reason, a separate SA needs to be undertaken, to address the wider potential benefits and impacts on the natural environment.
- 3.40. If local designations (i.e. lower than national) are introduced to the apportionment methodology, there would be difficulties in obtaining comprehensive GIS data, and achieving consistency of interpretation across different planning authority areas. MPAs will need to appraise the potential heritage / ecological effects and opportunities of delivering the necessary sites to meet their sub-regional level apportionment through lower tier SAs of Minerals Development Documents.

Issues to consider

- 3.41. The Steering Group discussed a number of 'constraints' which could be included in this factor. Each of these is discussed in turn below and the justification for their inclusion or exclusion from the apportionment methodology is provided:

International nature and cultural heritage designations

- 3.42. As discussed under the resource factor above, international nature and cultural heritage designations were removed from the potential resource calculations to reflect their importance. The sites that have been removed from the estimates of unsterilised resource are:
- Nature Conservation Designations - Ramsar sites, Special Areas of Conservation, Special Protection Areas;
 - Heritage Assets – World Heritage Sites.
- 3.43. In addition to this, the resource within the Malvern Hills Conservators landholdings was excluded from the calculation of unsterilised resource.

National nature/ landscape and cultural heritage designations

- 3.44. It was agreed that the following represented real planning constraints on minerals extraction and should therefore be **included** in the methodology:
- Nature Conservation Designations - Sites of Special Scientific Interest and National Nature Reserves;

- Landscape Designations – Areas of Outstanding Natural Beauty and National Parks;
- Heritage Assets – Listed Buildings, Registered Parks and Gardens, Scheduled Ancient Monuments and Historic Battlefields.

Flood Risk Zones

- 3.45. This type of development (i.e. primary aggregate extraction) is considered ‘water compatible’ in PPS25 - the very nature of sand and gravel resource means that it is mainly going to be found in floodplains. Flood Risk Zones are therefore **excluded** from the methodology.

Green Belt

- 3.46. Mineral extraction is an acceptable use in the Green Belt (in PPG2) and it was therefore **excluded** from the methodology.

Conservation Areas

- 3.47. Data was unlikely to be consistently available across the region and these areas are most likely to be within urban areas, which are considered as ‘sterilised’ with respect to available minerals resource. Conservation Areas have therefore been **excluded** from the methodology.

Agricultural Land Grade I

- 3.48. The best quality agricultural land may be in areas where there is underlying aggregate. It is possible to restore land to Grade I standard following extraction and therefore such land has been **excluded** from the methodology.

Local nature conservation and landscape designations

- 3.49. Inclusion of local level designations was not considered appropriate at the regional level due to the strategic nature of the sub-regional apportionment. It would also be difficult to obtain GIS data for these designations. They were therefore **excluded** from the methodology.

Ancient Woodland

- 3.50. Based on PPS9, most ancient woodland should already have been designated under national SSSI designations. If there are areas that are not designated as SSSI, the assumption is that these will be local designations, and for the same reasons as other local designations, have been **excluded** from the methodology.

4. REVISED FACTORS AND DATASETS

4.1. For each factor used within the LUC methodology for developing sub-regional apportionment options, this section describes the source of data, how the data has been processed, and any limitations to the data. Any modifications that were made in order to refine the data during the project are described. The final factors used in the methodology are:

- Factor 1: Demand (with a ratio of 6:4 for 1a and 1b)
 - Factor 1a: Future (Housing provision)
 - Factor 1b: Current (Existing population)
- Factor 2: Past Sales
- Factor 3: Unsterilised resource outside of international designations (including the Malvern Hills Conservators landholdings)
- Factor 4: Constraints

FACTOR 1: DEMAND

4.2. Representatives of the Mineral Products Association advised that approximately 60% of demand for aggregates for construction is for development associated with meeting future housing/infrastructure targets/needs for the Region whilst the remaining 40% of demand is for existing redevelopment/refurbishment.

4.3. It was therefore agreed that Factor 1 would be made up of two factors – future and existing demand and these two factors (1a and 1b respectively) would be combined using a ratio of 6:4 to reflect this information.

Factor 1a: Future housing

4.4. The data used to quantify this factor are the Regional Housing Trajectory Indicative Average Annual Rates for 5 year periods presented in the Addendum to the Panel Report of the WM RSS Phase Two Revision for the period 2006-2021 with demolitions from West Midlands Regional Spatial Strategy Phase Two Revision – Draft Preferred Option December 2007 (Table 2) added. Data for this factor were supplied by WMRA and are shown in **Table 4.1**.

4.5. Data were presented by groups of Local Authorities and have been aggregated into the six sub-regions.

Table 4.1: Future housing and demolitions (2006-2021) by sub-region

Sub-region	Housing proposals 2006-2021	Demolitions 2006-2021	Total 2006-2021 (housing plus demolitions)	% of total
Herefordshire	12,050	375	12,425	3.90
Shropshire	37,100	420	37,520	11.77
Staffordshire	51,400	4,215	55,615	17.45
Warwickshire	29,075	1,515	30,590	9.60
West Midlands County	109,975	44,505	154,480	48.47
Worcestershire	27,075	1,005	28,080	8.81
West Midlands	266,675	52,035	318,710	100.00

Source: West Midlands RSS Phase 2 Revision Draft December 2007 and Addendum to the Panel Report of WM RSS Phase 2 Revision.

Factor 1b: Current (Existing population)

- 4.6. The data used to quantify the existing population were sourced from the Office for National Statistics. The most current data available are the 2008 mid-year estimates at district level. The data were presented by district or unitary authority, and so were assimilated into the six sub-regions for the purposes of the apportionment. The data for existing population are shown in **Table 4.2** below.

Table 4.2: Existing population 2008

Sub-region	2008 population	% of total
Herefordshire	179,300	3.31
Shropshire	454,900	8.41
Staffordshire	1,069,000	19.76
Warwickshire	530,700	9.81
West Midlands County	2,619,600	48.41
Worcestershire	557,600	10.30
West Midlands Region	5,411,100	100.00

Source: Office for National Statistics 2008 mid-year population estimates

Modifications to demand factor for sand and gravel

- 4.7. A reality check on sand and gravel resources in West Midlands County highlighted that the vast majority of this resource is coming from Solihull and Walsall only. In order to better reflect this in the apportionment method, the calculation for the resource factor was reduced to these two Authorities only (discussed in more detail under Factor 3 below). The demand factor also needed to be adjusted to reflect this.

- 4.8. It was agreed with the Steering Group that the resource factor for West Midlands County should only include the amount of resource which is found in Solihull and Walsall, and therefore the amount of demand should be reduced similarly for that sub-region. However, this demand for aggregates generated by construction of required housing etc. in West Midlands County still needs to be accounted for, and it was decided to redistribute the remaining demand evenly between the other sub-regions. This was straightforward for the existing population dataset as these figures are provided at Local Authority level and could be disaggregated easily. It was less straightforward for future housing and demolitions which are not provided at Local Authority level, but rather in groups of Local Authorities.
- 4.9. Future housing data for West Midlands County are presented in the Addendum to the Panel Report of the WM RSS Phase Two Revision for the period 2006-2021 disaggregated into:
- Birmingham and Solihull;
 - Coventry; and
 - Black Country.
- 4.10. In order to isolate housing figures for Solihull and Walsall and the rest of West Midlands County, some assumptions have had to be made. Table I in the Panel Report has indicative annual average figures split between Birmingham and Solihull showing a split between the two at 85% for Birmingham and 15% for Solihull. This percentage split has been used to divide the 2006-2021 future housing figures shown for the combined Birmingham and Solihull figure.
- 4.11. No figures are available which show the breakdown of future housing between the four authorities in Black Country. It was decided that in the absence of detailed data, an even split would be a fair division between the authorities. This reflects the existing population distribution in the Black Country which, at 2001, showed that Walsall had 23.5% of the total Black Country population³.
- 4.12. The data used for demolitions was available at Local Authority level and lent itself easily to being disaggregated. The redistributed housing and demolitions figures are illustrated in **Table 4.3**.

³ Office for National Statistics, 2001 census.

Table 4.3: Redistribution of future housing and demolitions for sand and gravel

Sub-region	Housing proposals 2006-2021	Demolitions 2006-2021	Total 2006-2021 (housing plus demolitions)	Redistributed total 2006-2021 (housing plus demolitions)	% of total
Herefordshire	12,050	375	12,425	38,203	11.99%
Shropshire	37,100	420	37,520	63,298	19.86%
Staffordshire	51,400	4,215	55,615	81,393	25.54%
Warwickshire	29,075	1,515	30,590	56,368	17.69%
West Midlands County	109,975	44,505	154,480	25,591	8.03%
<i>Solihull and Walsall</i>	<i>17349</i>	<i>8242</i>	<i>25,591</i>	<i>25,591</i>	<i>8.03%</i>
<i>Rest of West Midlands County</i>	<i>92626</i>	<i>36263</i>	<i>128,889</i>	<i>0</i>	<i>0.00%</i>
Worcestershire	27,075	1,005	28,080	53,858	16.90%
West Midlands	266,675	52,035	318,710	318,710	100.00%

- 4.13. The redistributed existing population figures are shown in **Table 4.4**. This table shows how the population for the 'Rest of West Midlands County' has been divided by five and added to the remaining sub-regions.

Table 4.4: Redistribution of existing population for sand and gravel

Sub-Region	2008 population	Redistributed 2008 population	% of total
Herefordshire	179,300	611,040	11.29%
Shropshire	454,900	886,640	16.39%
Staffordshire	1,069,000	1,500,740	27.73%
Warwickshire	530,700	962,440	17.79%
West Midlands County	2,619,600	460,900	8.52%
<i>Walsall and Solihull</i>	<i>460,900</i>	<i>460,900</i>	<i>8.52%</i>
<i>Rest of West Midlands County</i>	<i>2,158,700</i>	<i>0</i>	<i>0.00%</i>

Sub-Region	2008 population	Redistributed 2008 population	% of total
Worcestershire	557,600	989,340	18.28%
West Midlands Region	5,411,100	5,411,100	100.00

Modifications to demand factor for crushed rock

- 4.14. For crushed rock, it is known that the reserves in West Midlands County have been exhausted⁴. It was therefore necessary to account for this in the apportionment method by reducing the resource data to zero in West Midlands County. This is described in more detail under Factor 3. Consequently, we need to account for the demand for crushed rock aggregate generated in this sub-region despite the lack of crushed rock resource available. It was decided with the Steering Group that the West Midlands County demand should be redistributed to other sub-regions.
- 4.15. In a similar way to the current apportionment for crushed rock, the demand factor for West Midlands County has been redistributed evenly between Shropshire and Warwickshire. These two sub-regions are the only two that have a similar type of rock to West Midlands County⁵.
- 4.16. The future housing and demolitions figures for West Midlands County were redistributed evenly between Shropshire and Warwickshire to match the redistribution of the resource. This is illustrated in **Table 4.5**.

Table 4.5: Redistribution of future housing and demolitions for crushed rock

Sub-region	Housing proposals 2006-2021	Demolitions 2006-2021	Total 2006-2021 (housing plus demolitions)	Redistributed total 2006-2021 (housing plus demolitions)	% of total
Herefordshire	12,050	375	12,425	12,425	3.90%
Shropshire	37,100	420	37,520	114,760	36.01%
Staffordshire	51,400	4,215	55,615	55,615	17.45%
Warwickshire	29,075	1,515	30,590	107,830	33.83%

⁴ West Midlands Regional Aggregate Working Party Annual Report 2007

⁵ West Midland regional Aggregate Working Party Annual Report 2007.

Sub-region	Housing proposals 2006-2021	Demolitions 2006-2021	Total 2006-2021 (housing plus demolitions)	Redistributed total 2006-2021 (housing plus demolitions)	% of total
West Midlands County	109,975	44,505	154,480	0	0.00%
Worcestershire	27,075	1,005	28,080	28,080	8.81%
West Midlands	266,675	52,035	318,710	318,710	100.00%

- 4.17. **Table 4.6** shows the redistribution of the existing population figures by splitting the West Midlands County population evenly between Shropshire and Warwickshire.

Table 4.6: Redistribution of existing population for crushed rock

Sub-Region	2008 population	Redistributed 2008 population	% of total
Herefordshire	179,300	179,300	3.31%
Shropshire	454,900	1,764,700	32.61%
Staffordshire	1,069,000	1,069,000	19.76%
Warwickshire	530,700	1,840,500	34.01%
West Midlands County	2,619,600	0	0.00%
Worcestershire	557,600	557,600	10.30%
West Midlands Region	5,411,100	5,411,100	100.00%

FACTOR 2: PAST SALES

- 4.18. The source of data for past sales was the WMRAWP Annual Report 2007. The February technical consultation showed that there was a preference for the use of ten year past sales data (as opposed to the three year past sales data used in the LUC draft report). Data for crushed rock sales over a ten year period is not available for confidentiality reasons. It was therefore agreed that for crushed rock, the existing apportionment figures for each sub-region would be used as a proxy for past sales as this apportionment was based on past sales data. **Table 4.7** shows the data for sand and gravel over the full ten year period from 1998-2007.

Table 4.7: Past sales for sand and gravel

Sub-Region	Sales 1998 (mt)	Sales 1999 (mt)	Sales 2000 (mt)	Sales 2001 (mt)	Sales 2002 (mt)	Sales 2003 (mt)	Sales 2004 (mt)	Sales 2005 (mt)	Sales 2006 (mt)	Sales 2007 (mt)
Herefordshire	0.304	0.297	0.289	0.261	0.236	0.254	0.25	0.24	0.19	0.19
Shropshire	0.839	0.808	0.742	0.857	0.841	0.822	0.84	0.83	0.77	0.78
Staffordshire	6.491	6.589	6.442	6.411	6.196	6.264	6.1	5.8	6.8	6.44
Warwickshire	1.179	1.017	1.043	1.031	0.854	0.827	0.84	0.9	0.98	1.19
West Midlands County	0.445	0.474	0.481	0.536	0.512	0.499	0.52	0.58	0.55	0.61
Worcestershire	0.968	0.887	0.839	0.836	0.833	0.89	0.85	0.75	0.7	0.81
West Midlands	10.23	10.07	9.836	9.932	9.472	9.556	9.4	9.1	9.99	10.02

Source: WMRAWP Annual Reports

- 4.19. **Table 4.8** shows the ten year averages of past sales used in the apportionment methodology.

Table 4.8: Average past sales for sand and gravel

Sub-Region	Total sales 2003-2007 (mt)	Total sales 1998-2007 (mt)	10 year average (mt)	% of total (10 years)
Herefordshire	1.124	2.511	0.251	2.57%
Shropshire	4.042	8.129	0.813	8.33%
Staffordshire	31.404	63.533	6.353	65.09%
Warwickshire	4.737	9.861	0.986	10.10%
West Midlands County	2.759	5.207	0.521	5.33%
Worcestershire	4.000	8.363	0.836	8.57%
West Midlands	48.066	97.604	9.760	100.00%

Source: WMRAWP Annual Reports

- 4.20. **Table 4.9** shows the current apportionment for crushed rock which is the data used as a proxy for past sales in the absence of a full ten year set of past sales data.

Table 4.9: Current apportionment figures for crushed rock to be used as a proxy for past sales

Sub-regions	Current apportionment 2005-2016 (million tonnes per annum)	Percentage of regional total (%) 2005-2016
Herefordshire	0.424	7.30%
Shropshire	2.949	50.75%
Staffordshire	1.395	24.01%
Warwickshire	0.88	15.14%
West Midlands County	0	0%
Worcestershire	0.163	2.81%
West Midlands Region	5.812	100%

Source: West Midlands Regional Spatial Strategy Phase Two Revision – Draft. Preferred Option December 2007

FACTOR 3: UNSTERILISED RESOURCE

- 4.21. Data for this factor were the GIS layers for mineral resources as defined by the BGS into deposit types. The data is subject to the some limitations discussed below.
- 4.22. The British Geological Survey (BGS) data shows the distribution of minerals in the region in GIS. The best available data at the regional scale is the DiGMapGB-100 Mineral Resource dataset at 1:50 000. There is some evidence that there are gaps in the BGS data (e.g. incomplete coverage of the Shropshire 'fault line' and SW Herefordshire). Some MPAs have done further work with the BGS to map their resource more accurately, but there is not complete coverage for the Region.
- 4.23. The BGS data layers did not take account of resource that has been sterilised by urban development and associated infrastructure. They also did not take account of worked-out sites. It was therefore necessary to process the BGS data further to more accurately estimate the distribution of the resource within each sub-region.
- 4.24. In a recent BGS study⁶ undertaken for the former South East Regional Assembly (now South East England Partnership Board) a methodology for determining the extent of the sterilised resource was developed. This methodology has been drawn upon for this study. Factors that sterilise the resource are:

⁶ South East England Regional Assembly: South East Plan – Review of Mineral Supply and Demand. Economic Minerals Programme Commissioned Report CR/06/147. British Geological Society 2006.

- The road network – based on the Primary Road Network with a 5m buffer of the line features in GIS to approximate the footprint on the ground;
 - Railways – based on railway data supplied by WMRA with a 5m buffer of the line features in GIS to approximate the footprint on the ground;
 - Urban areas – based on the 2001 Census Urban Areas dataset; and
 - Worked-out sites – see next paragraph.
- 4.25. No comprehensive GIS layer of worked-out aggregate sites was available for the Region. Each of the MPAs was asked to provide this data for their MPA in GIS format and these were collated by Staffordshire County Council and passed on to Land Use Consultants to use in GIS.
- 4.26. Data for historic/worked-out sites were only available for some of the MPAs. The list below summarises the data collection exercise:
- Shropshire: Historical sites available as GIS layer and have been removed from the resource layer;
 - Staffordshire: Historical sites available as GIS layer and have been removed from the resource layer;
 - Worcestershire: No GIS data on historical sites available;
 - Herefordshire: No GIS data on historical sites available;
 - Warwickshire: Data on some worked-out sites provided as GIS layer. No data available for historic sites;
 - Walsall: Historical sites available as GIS layer and have been removed from the resource layer; and
 - Solihull: Historical sites available as GIS layer and have been removed from the resource layer.

Modifications to the data for the resource factor

- 4.27. There is no ‘off the shelf’ BGS dataset that gives further information on thickness and quality of the mineral resource. Previous iterations of this methodology relied solely on the surface area of the resource on the ground as mapped by the BGS. Consultation responses from the WMRAWP highlighted that this was an inadequate measure of the resource in the region given that there are such large variations in deposit thickness across the region.
- 4.28. In response to the requests via consultation that a finer grain of detail was needed in order to have confidence in using the BGS minerals data as a factor in this method, three minerals planning officers (one a geologist) from the region analysed the

deposit types in the region and using local knowledge, approximated a mean working thickness for each deposit type in each sub-region. The results of their analyses are presented in **Table 4.10**. For hard rock, the minerals planning officers recommended excluding any deposits of Building Stone and Silica Sand.

Table 4.10: Mean working thickness (m) of deposits by sub-region

Sub-Region	Sand and gravel		Hard rock		
	Superficial (thickness m)	Bedrock (thickness m)	Igneous (thickness m)	Limestone (thickness m)	Sandstone (thickness m)
Herefordshire	6	24	60	25	-
Shropshire	6	24	60	50	60
Staffordshire	6	24	-	100	-
Warwickshire	6	24	60	16	60
West Midlands County	6	24	60	25	60
Worcestershire	6	24	60	27	-

4.29. Using GIS, and taking each deposit type in turn, these thicknesses were applied to the areas of each deposit in order to convert the area (ha) to a volume (mt). In order to do this, an average bulk density for sand and gravel and hard rock also needed to be used in the calculation. Based on the BGS study in the South East⁷, these bulk density figures were approximated at:

- 1675kg/m³ for sand and gravel – this is an average of the figures for soft sand (1600kg/m³) and sharp sand (1750kg/m³); and
- 2600kg/m³ for hard rock.

4.30. Furthermore, it was decided following the technical consultation that all international nature conservation and heritage designations would be removed from the calculations for ‘unsterilised resource’ to reflect the level of protection that international designations are afforded by the Planning system. The area of these designations was removed from the area of resource prior to converting the area to a tonnage. These designations included:

- Special Areas of Conservation;
- Special Protection Areas;
- Ramsar sites; and

⁷ South East England Regional Assembly: South East Plan – Review of Mineral Supply and Demand. Economic Minerals Programme Commissioned Report CR/06/147. British Geological Society 2006.

- World Heritage Sites.
- 4.31. In addition, at the WMRAWP meeting of 9th February 2010, a representation was made by Worcestershire to remove the Malvern Hills Conservators Landholdings from any hard rock resource calculations, as the restriction placed on quarries in the Malvern Hills is considered to be as stringent as an international designation. These landholdings are found on the border of Worcestershire and Herefordshire and are protected by the The Malvern Hills Act 1924 and the 1953 decision of the Minister of Housing and Local Government which defined the physical and time limits of the existing quarries still in existence and secured their permanent closure.
- 4.32. The removal of the hard rock resource that falls within the area covered by this Act was agreed by the WMRAWP and these areas have been excluded from the hard rock calculations.
- 4.33. For sand and gravel, as discussed under Factor 1, in order to better reflect reality, resource calculations for West Midlands County were based on the resource found in Solihull and Walsall only.
- 4.34. **Tables 4.11 and 4.12** show the breakdown of unsterilised resource area by sub-region for sand and gravel and crushed rock and **Figures 1 and 2** show the mapped resource. **Figure 3** shows the international designations and the Malvern Hills Conservators landholdings.

Table 4.11: Area (ha) and volume (mt) of unsterilised sand and gravel outside of international designations by sub-region

Sub-region	Area of unsterilised sand and gravel (ha)	Volume of unsterilised sand and gravel (mt)	% of total
Herefordshire	24,036.99	2,415.72	7.48%
Shropshire	79,855.64	10,783.65	33.38%
Staffordshire	52,817.96	11,326.64	35.06%
Warwickshire	36,797.88	3,698.19	11.45%
West Midlands County (Solihull and Walsall only)	5,491.80	862.40	2.67%
Worcestershire	25,036.34	3,222.57	9.97%
West Midlands	224,036.60	32,309.16	100.00%

Source: BGS and MPAs (for worked-out/historic sites)

Table 4.12: Area (ha) and volume (mt) of unsterilised crushed rock outside of international designations and Malvern Hills Conservators landholdings by sub-region

Sub-region	Area of unsterilised crushed rock (ha)	Volume of unsterilised crushed rock (mt)	% of total volume	% of total volume (when West Mids County is excluded)
Herefordshire	4,596.33	3,132.77	6.11%	6.12%
Shropshire	21,011.25	31,397.80	61.27%	61.33%
Staffordshire	5,798.34	15,075.60	29.42%	29.45%
Warwickshire	1,919.17	1,163.78	2.27%	2.27%
<i>West Midlands County*</i>	<i>65.12</i>	<i>48.94</i>	<i>0.10%</i>	<i>0.00%</i>
Worcestershire	508.98	427.58	0.83%	0.84%
Total	33,899.19	51,246.48	100.00%	100.00%

Source: BGS and MPAs (for worked-out/historic sites)

* Although the BGS data shows 65.12ha of unsterilised crushed rock in West Midlands County, the reserves are known to be exhausted and this will be set to zero for the apportionment. See para 4.35

- 4.35. Despite the BGS data showing that there is some crushed rock resource in West Midlands County, the reserves have been exhausted and the last quarry in the area has ceased production⁸. For this reason, the area used in the apportionment methodology for crushed rock will be set to zero so that West Midlands County receives no apportionment for crushed rock.

FACTOR 4: CONSTRAINTS

- 4.36. Data for this factor were the area (ha) of unsterilised resource outside of international and national designations, converted to a volume using the mean working thickness and bulk density figures discussed under Factor 3. All of these data are available as GIS layers from Natural England and English Heritage, and are shown in **Figure 4**.
- 4.37. The four international designations considered for this factor are listed below:
- Special Areas of Conservation;
 - Special Protection Areas;
 - Ramsar sites; and
 - World Heritage Sites.
- 4.38. In addition to the international designations, as discussed under Factor 3, the Malvern Hills Conservators Landholdings were also excluded.

⁸ West Midlands Regional Aggregate Working Party Annual Report 2007.

4.39. The eight national designations considered for this factor are listed below:

- Sites of Special Scientific Interest;
- Areas of Outstanding Natural Beauty;
- National Nature Reserves;
- National Parks;
- Scheduled Ancient Monuments;
- Registered Parks and Gardens;
- Registered Battlefields; and
- Listed Buildings.

4.40. All of the layers are available as polygons (i.e. they have an area or footprint) except for the Listed Building data, which are available as both points (i.e. with no associated footprint/area) and polygons. In order to exclude the area covered by Listed Buildings where data were only available as a centre point, a notional 10m buffer was applied to each point in order to give each Listed Building a footprint. These constraint layers were aggregated in GIS and removed from the resource calculations.

4.41. **Tables 4.13 and 4.14** show the areas of resource outside of international and national designations that were used in this calculation. **Figures 5 and 6** show the spatial relationship between each of the deposit types and these designations.

Table 4.13: Areas (ha) and volume (mt) of unsterilised sand and gravel outside of constraints

Sub-region	Area of unsterilised sand and gravel outside of international and national designations (ha)	Volume of unsterilised sand and gravel outside of international and national designations (mt)	% of total
Herefordshire	22,116.26	2,222.68	7.64%
Shropshire	74,202.16	10,176.63	34.97%
Staffordshire	47,397.64	9,312.55	32.00%
Warwickshire	34,742.94	3,491.67	12.00%
West Midlands County (Solihull and Walsall only)	5,408.48	850.98	2.92%
Worcestershire	23,437.05	3,047.46	10.47%
West Midlands	207,304.53	29,101.97	100.00%

Table 4.14: Areas (ha) and volume (mt) of unsterilised crushed rock outside of constraints

Sub-region	Area of unsterilised crushed rock outside of international and national designations (ha)	Volume of unsterilised crushed rock outside of international and national designations (mt)	% of total volume	% of total volume (when West Midlands County is excluded)
Herefordshire	3,032.33	2,042.49	10.32%	10.34%
Shropshire	8,725.95	12,909.77	65.20%	65.34%
Staffordshire	1,537.39	3,997.16	20.19%	20.23%
Warwickshire	738.22	626.14	3.16%	3.17%
<i>West Midlands County*</i>	<i>52.18</i>	<i>40.51</i>	<i>0.00</i>	<i>0.00</i>
Worcestershire	197.46	183.11	0.92%	0.93%
West Midlands	14,283.52	19,799.19	100.00%	100.00%






Source: BGS, MPAs, Natural England and English Heritage

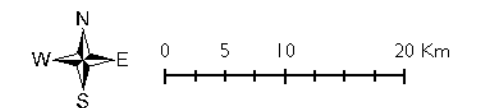
* Although the BGS data shows 52.18ha of unsterilised crushed rock outside of designations in West Midlands County, the reserves are known to be exhausted and this will be set to zero for the apportionment. See para 2.35

West Midlands Sub-Regional Apportionment

Figure 1: Unsterilised sand and gravel resource outside of International Designations (Factor 3)

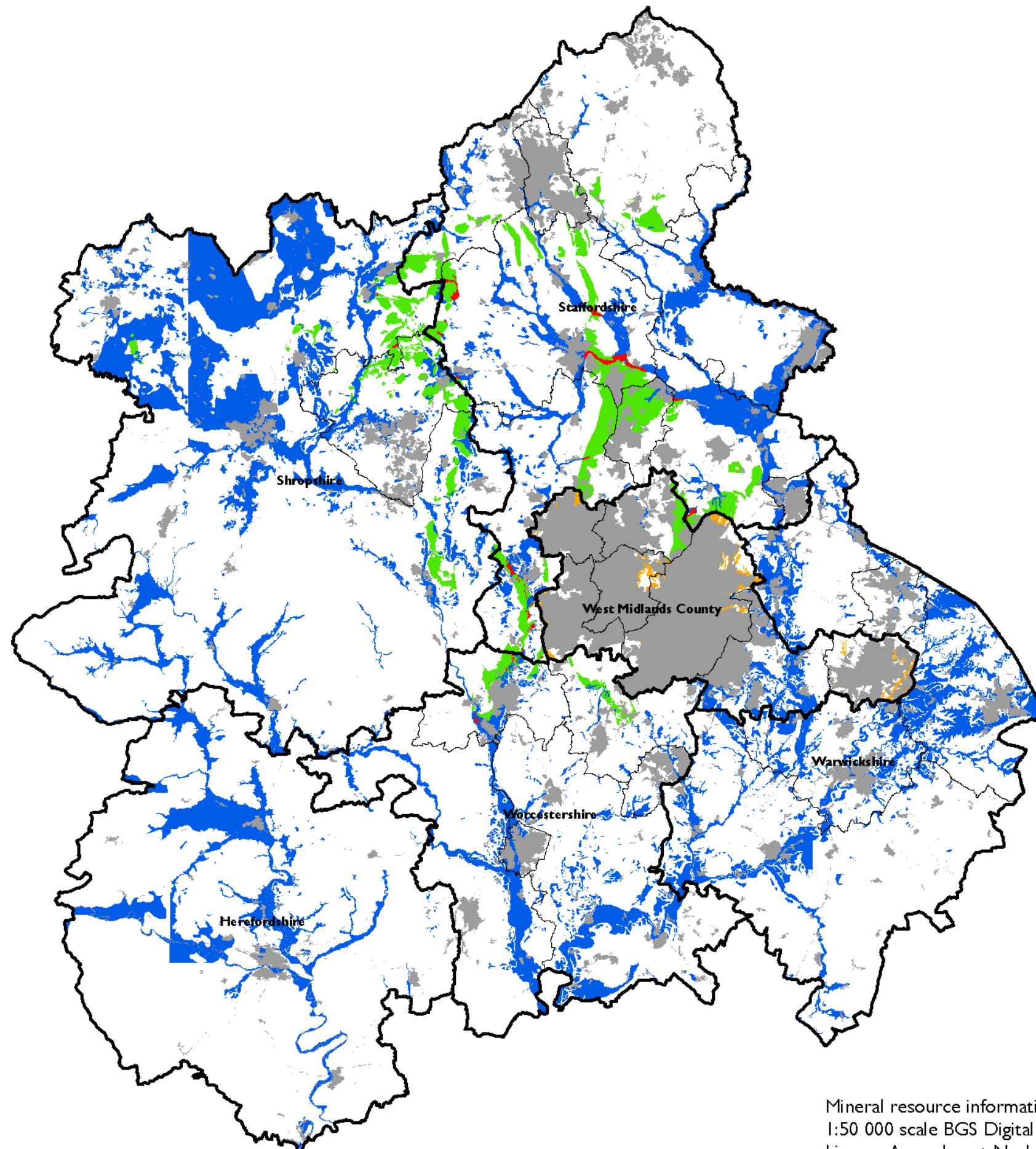
Key

-  Sub-Regions
-  Local Authority boundaries
- Sterilising factors including:
 -  Urban areas
 -  Transport infrastructure
 -  Worked-out/historic sand and gravel sites
 -  International designations
- Deposit
 -  Bedrock sand and gravel (24m thickness)
 -  Superficial sand and gravel (6m thickness)
 -  Bedrock and superficial sand and gravel (24m+6m thickness)
 -  Resource excluded from West Midlands County



Source: WMRA, BGS, Ordnance Survey, MPAs, Natural England, English Heritage

Date: 10/03/2010
Revision:



Mineral resource information derived from 1:50 000 scale BGS Digital Data under Licence Amendment No.1 2009/043 British Geological Survey©NERC

West Midlands Sub-Regional Apportionment

Figure 2: Unsterilised hard rock resource outside of International Designations and Malvern Hills Conservators landholdings (Factor 3)


Key


 Sub-Regions


 Local Authority boundaries


Sterilising factors including:
 Urban areas
 Transport infrastructure
 Worked-out/historic crushed rock sites
 International designations
 Malvern Hills Conservators landholdings

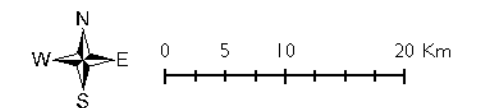
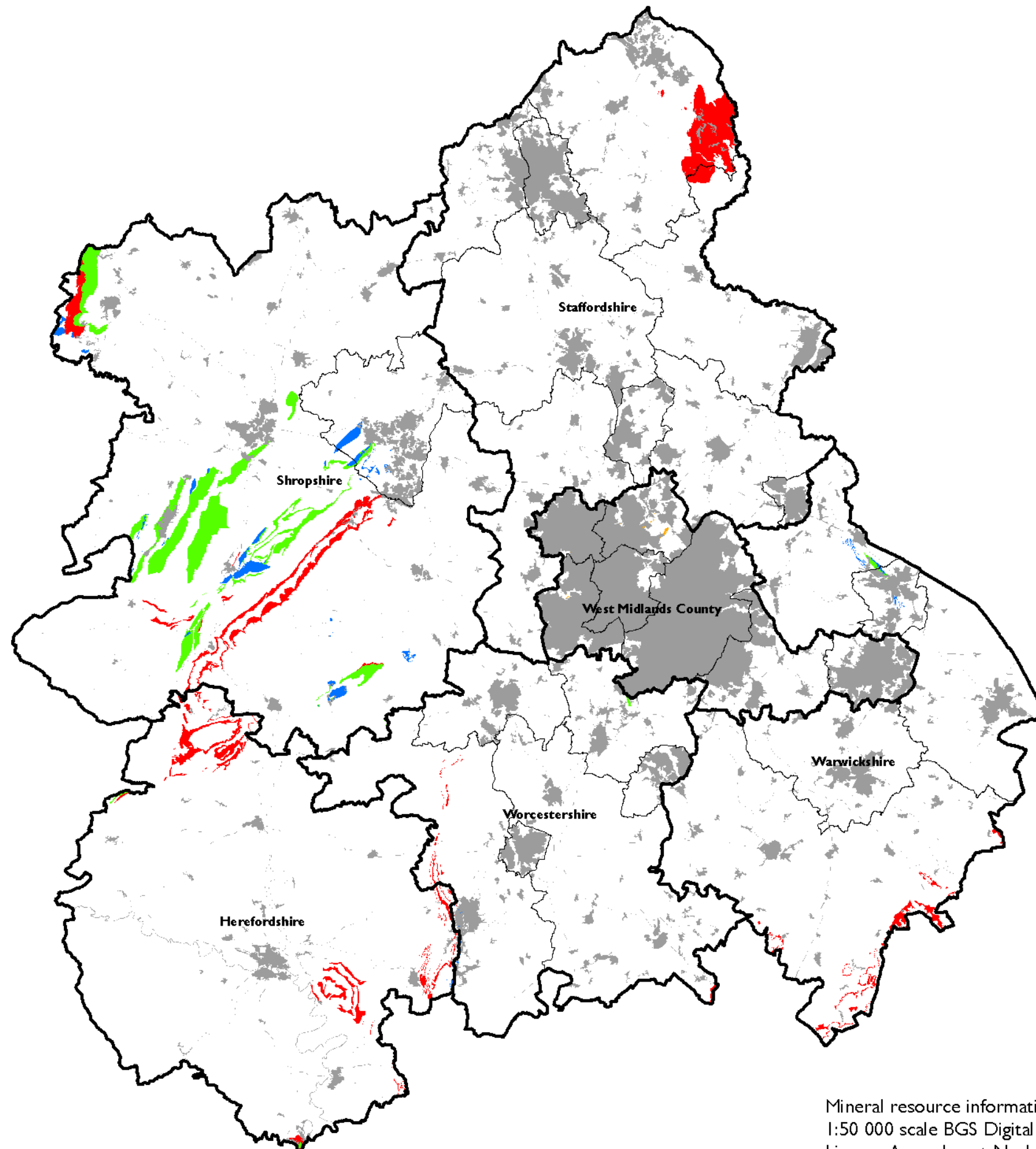
Deposit

 Igneous (60m thickness across all sub-regions)

 Limestone-including crushed rock (varies from 16m in Warks to 100m thick in Staffs)

 Sandstone-excluding building stone (60m thickness across all sub-regions)

 Resource excluded from West Midlands County



Source: WMRA, BGS, Ordnance Survey, MPAs, Natural England, English Heritage, Malvern Hills Conservators
 Date: 10/03/2010
 Revision:










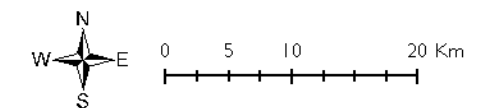
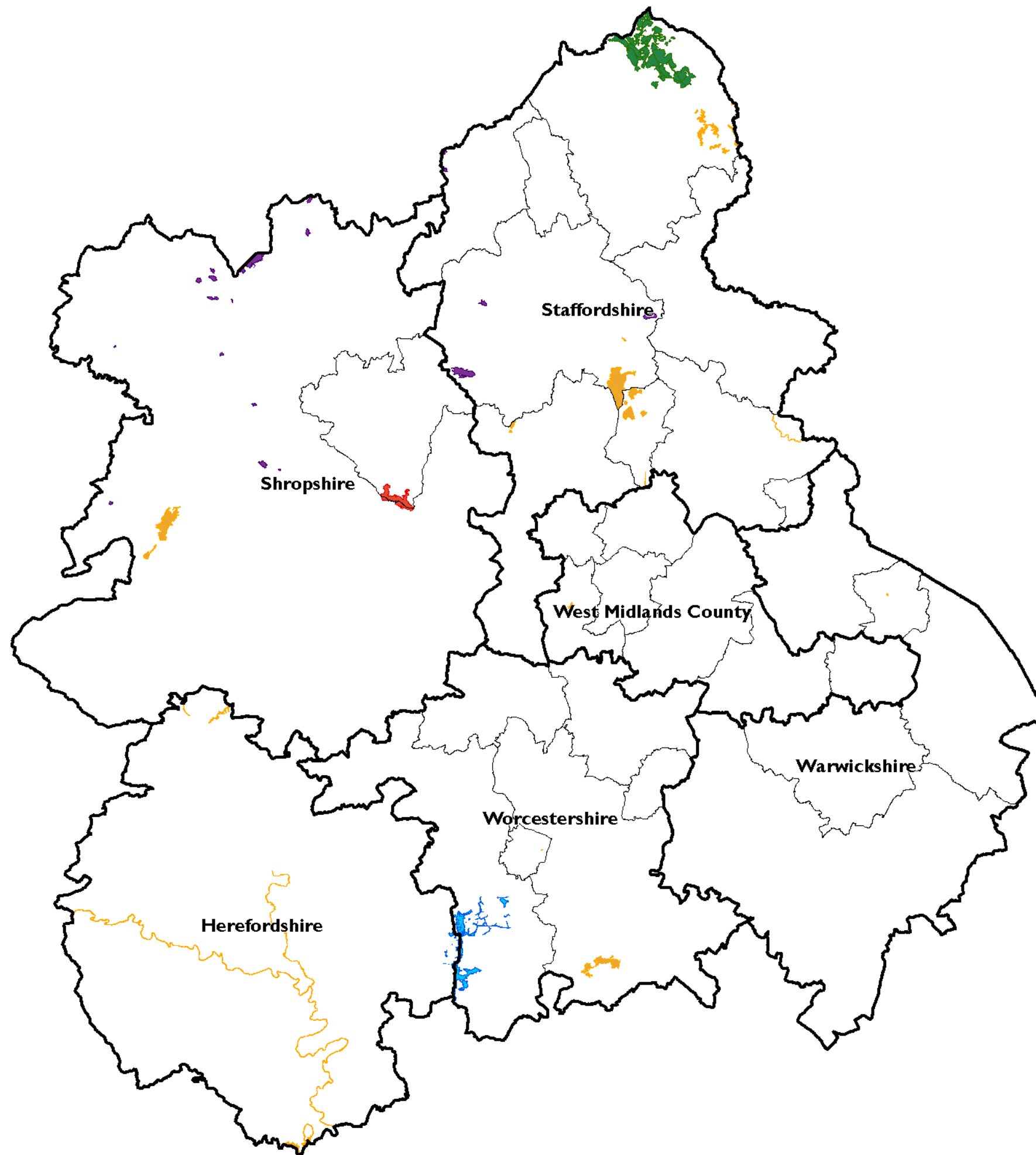
Mineral resource information derived from 1:50 000 scale BGS Digital Data under Licence Amendment No.1 2009/043 British Geological Survey©NERC

West Midlands Sub-Regional Apportionment

Figure 3: International designations and Malvern Hills Conservators landholdings (Factor 3)

Key

-  Sub Regions
-  Local Authority boundaries
-  Ramsar sites
-  Special Protection Areas
-  Special Areas of Conservation
-  World Heritage Sites
-  Malvern Hills Conservators landholdings (for Crushed Rock only)



Source: English Heritage, Natural England, Malvern Hills Conservators

Date: 10/03/2010

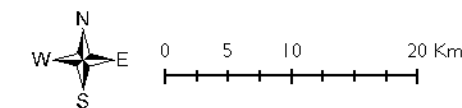
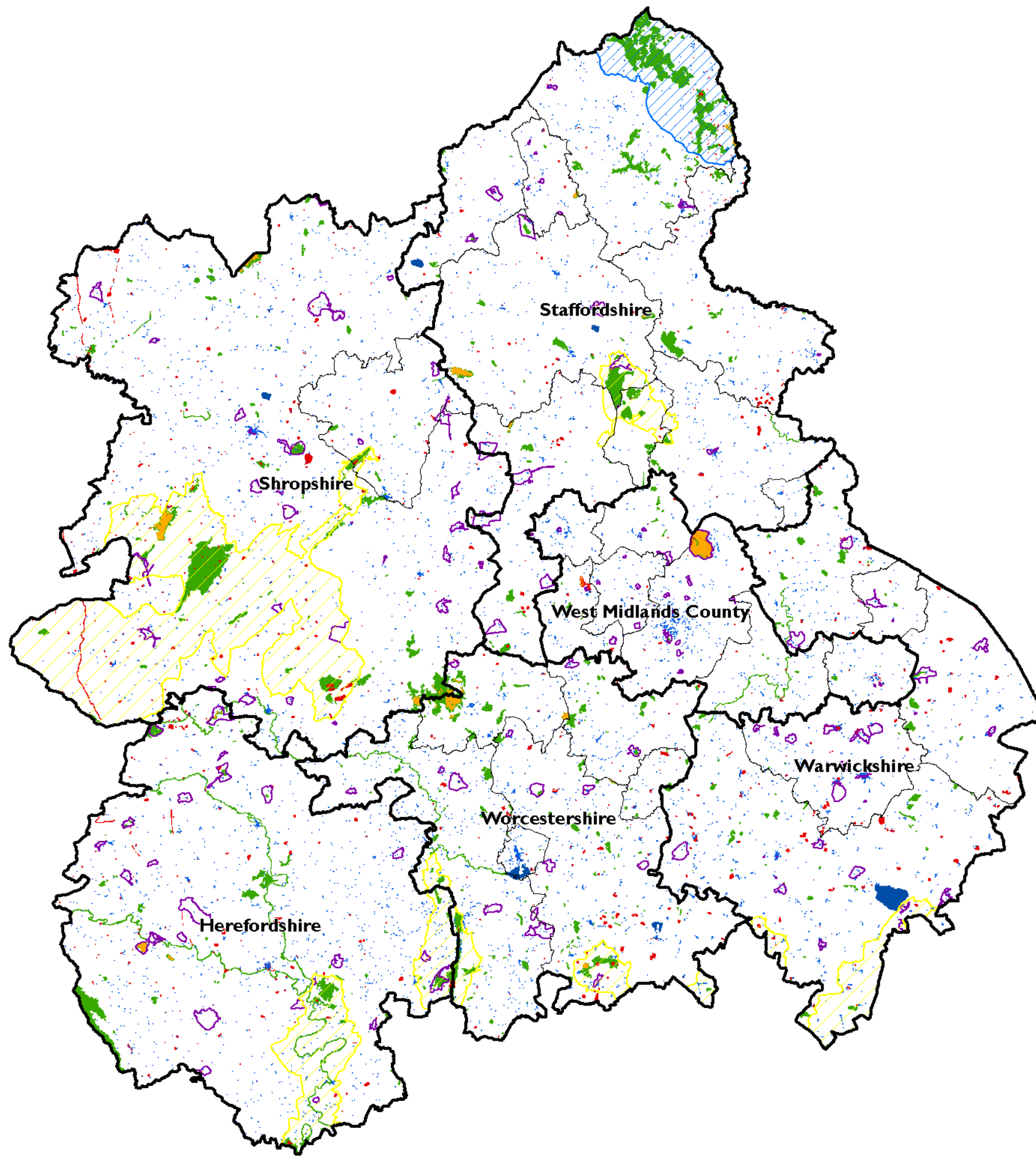
Revision:



West Midlands Sub-Regional Apportionment
Figure 4: National designations (Factor 4)

Key

-  Sub Regions
-  Local Authority boundaries
-  Areas of Outstanding Natural Beauty
-  Historic Parks and Gardens
-  National Parks
-  Listed Buildings (converted to a footprint)
-  Battlefields
-  National Nature Reserves
-  Scheduled Monuments
-  Sites of Special Scientific Interest



Source: English Heritage and Natural England









Date: 10/03/2010
 Revision:

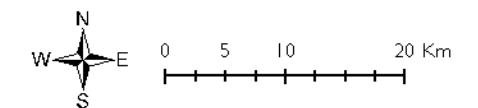
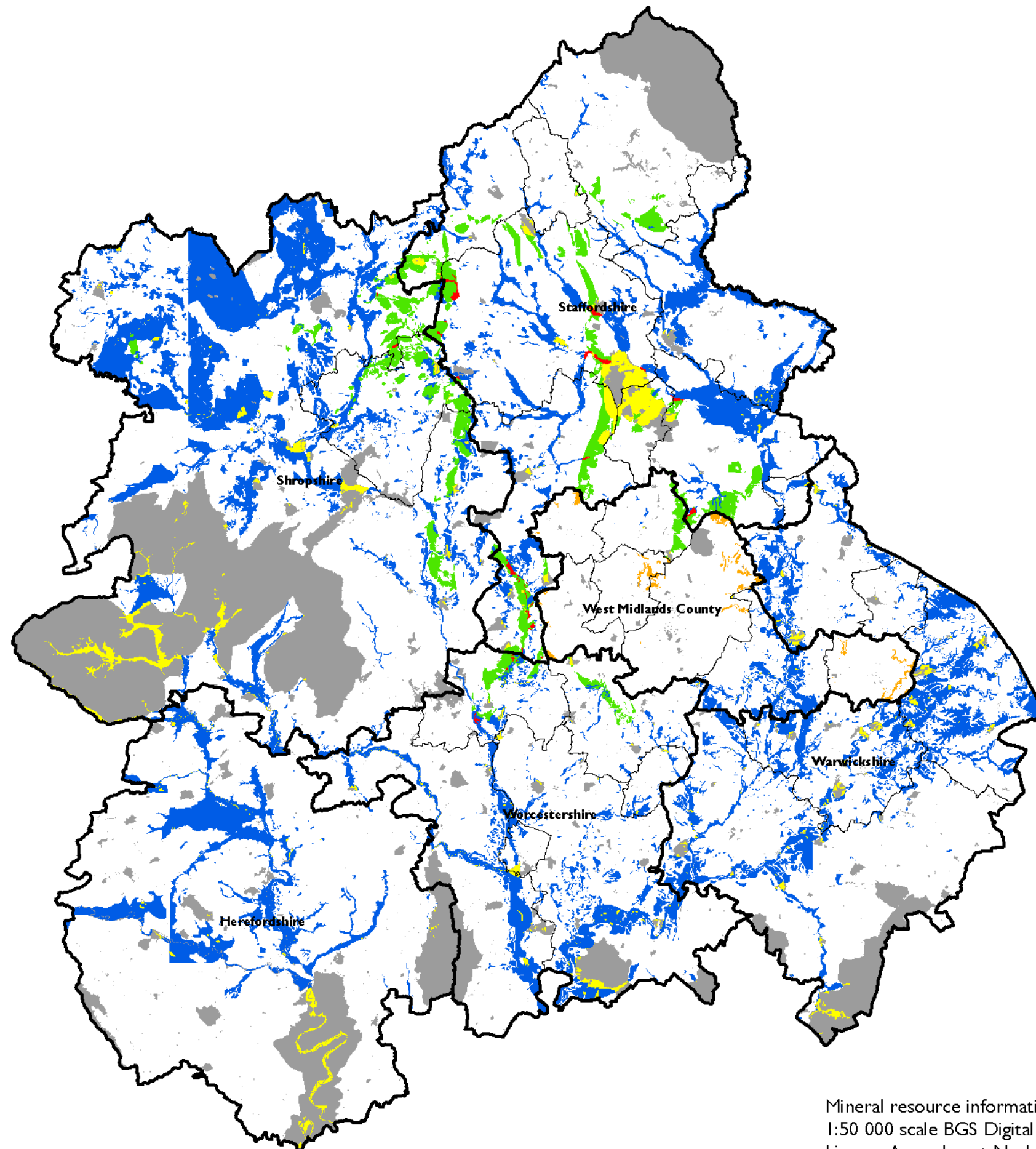


West Midlands Sub-Regional Apportionment

Figure 5: Unsterilised sand and gravel resource outside of constraints (Factor 4)

Key

-  Sub-Regions
 -  Local Authority boundaries
 -  International and national designations
- Deposit
-  Bedrock sand and gravel (24m thickness)
 -  Superficial sand and gravel (6m thickness)
 -  Bedrock and superficial sand and gravel (24m+6m thickness)
 -  Resource excluded from West Midlands County
 -  Sand and gravel resource excluded due to national designations



Source: WMRA, BGS, Ordnance Survey, MPAs, Natural England, English Heritage

Date: 10/03/2010
Revision:



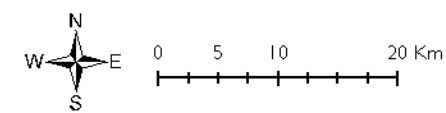
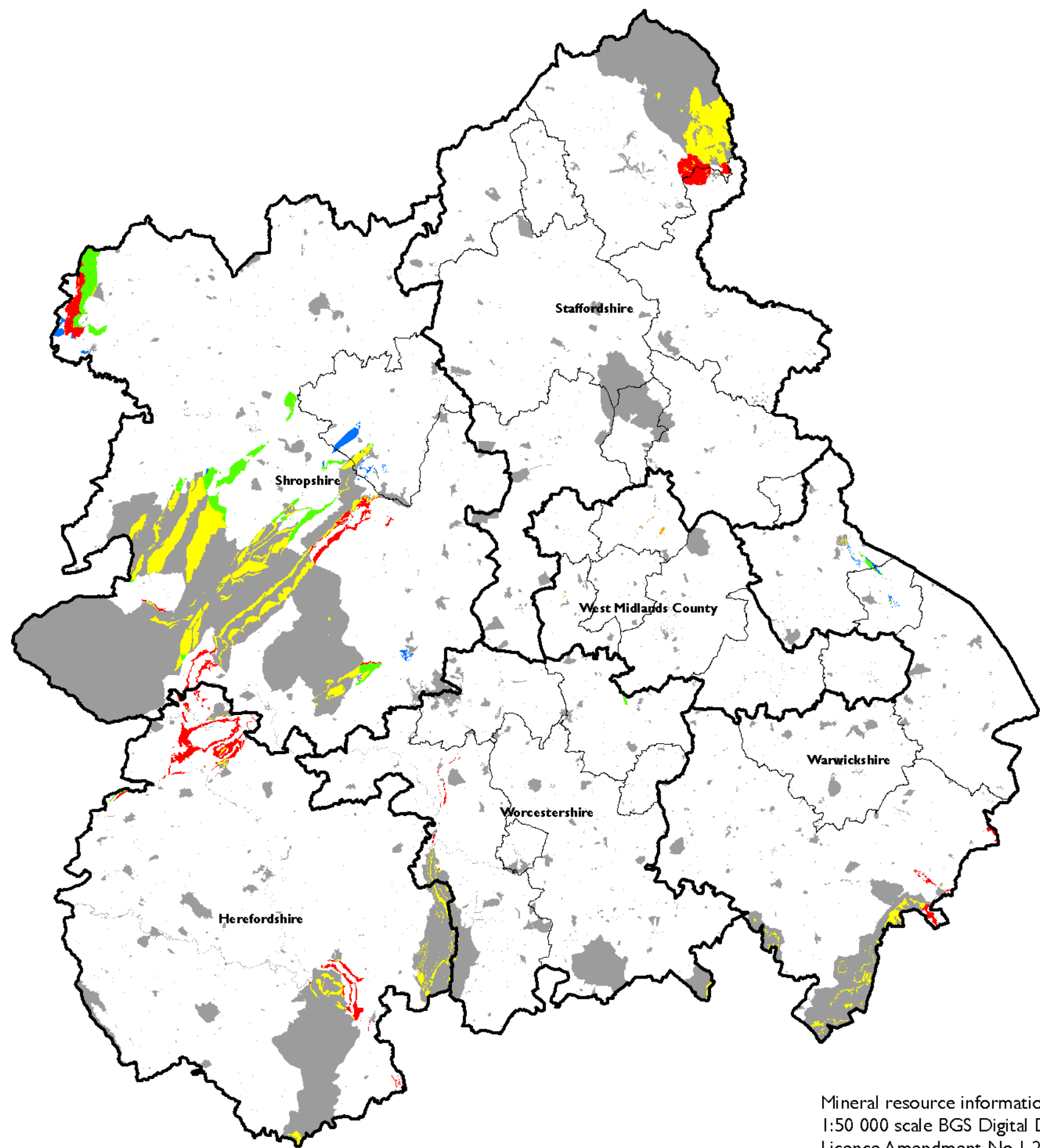
Mineral resource information derived from 1:50 000 scale BGS Digital Data under Licence Amendment No.1 2009/043 British Geological Survey©NERC

West Midlands Sub-Regional Apportionment

Figure 6: Unsterilised rock resource outside of constraints (Factor 4)

Key

-  Sub-Regions
 -  Local Authority boundaries
 -  International and national designations
- Deposit
-  Igneous (60m thickness across all sub-regions)
 -  Limestone-including crushed rock (varies from 16m in Warks to 100m thick in Staffs)
 -  Sandstone-excluding building stone (60m thickness across all sub-regions)
 -  Rock resource excluded due to national designations
 -  Resource excluded from West Midlands County



Source: WMRA, BGS, Ordnance Survey, MPAs, Natural England, English Heritage

Date: 10/03/2010
Revision:



Mineral resource information derived from 1:50 000 scale BGS Digital Data under Licence Amendment No.1 2009/043 British Geological Survey©NERC

5. DEVELOPMENT OF OPTIONS

- 5.1. For the purposes of discussion at the December Steering Group/WMRAWP meeting, LUC presented a number of potential options for generating the sub-regional apportionment figures. There was a clear rationale for generating each of the options, which was to demonstrate to the meeting participants the principle of weighting, and the influence that each factor has on the overall apportionment to individual sub-regions. Each of the options included all of the factors discussed in Chapter 4.
- 5.2. This initial set of 'extreme' options was consulted on between December 2009 and January 2010. Each of these options was 'led' by a particular factor, by applying the highest weighting to that factor:
- **Option A: Supply-led** weighted 70% on the supply (i.e. the location of the unsterilised resource), and 10% for each of the other factors (with a 6:4 ratio for future : current demand);
 - **Option B: Growth-led** weighted 70% on demand (with a 6:4 ratio for future: current demand), and 10% for each of the other factors;
 - **Option C: Environment-led** weighted 70% on constraints (i.e. the area of sterilised resource outside of environmental, landscape and heritage constraints), and 10% for each of the other factors (with a 6:4 ratio for future : current demand);
 - **Option D: Equal weighting** weighted 25% for all the factors (with a 6:4 ratio for future : current demand); plus an additional option:
 - **Option E: Demand and resource** weighted 40% on demand (with a 6:4 ratio for future: current demand), 40% on supply (the location of the unsterilised resource) and 10% each for past sales and constraints.
- 5.3. The technical consultation showed that none of these options presented a preferred option, and due to the 'extreme' weighting, few represented viable options in practical terms. These options did however serve a purpose which was to demonstrate the principle of weighting used in the LUC methodology, and the effect that each factor has on the resulting sub-regional apportionment. The details of the sub-regional apportionment resulting under options A to E can be found in **Appendix 6**.
- 5.4. Feedback from the technical consultation showed a strong opinion to test the LUC method on a sales-led option. Using this feedback, two new, sales-led options were developed for the WMRAWP meeting on 9th February. These options were subject to a further limited consultation with the WMRAWP from 17th February to 26th February.

REVISED OPTIONS FOR APPRAISAL

- 5.5. Following technical consultation, it was decided to only proceed with the two sales-led options. These two options are:
- **Option F: Past sales-led** weighted 70% on past sales, and 10% for each of the other factors (with a 6:4 ratio for future : current demand); and
 - **Refined Option F: Past sales led but with phasing** weighted 100% on past sales in the early years of the apportionment period (2011-2012), 90% weighting to past sales 2013-2015 decreasing to 70% in 2016-2020, so still the highest weighting to past sales, and distributing equal weighting to the remaining factors.
- 5.6. For the purposes of the February consultation, sand and gravel options were developed using past sales data for a five year and a ten year period. The results of the consultation demonstrated a preference for the ten year sales data.
- 5.7. **Table 5.1** illustrates the weightings to be used for Option F and the final percentages to be used once the ratios have been applied for Factor I.

Table 5.1: Weighting for Option F

Factor		Option F: Past sales-led (weighting per factor)	Option F: Past sales-led (weighting per factor once Factor 1a:1b ratios have been applied)
1: Demand	a: future housing/infrastructure	10%	6%
	1b: current refurbishment and redevelopment)		4%
2: Past sales		70%	70%
3: The resource		10%	10%
4: Constraints		10%	10%

- 5.8. **Table 5.2** shows the weightings to be applied at each phase for refined option F. **Table 5.3** shows the weightings to be applied during each of the time periods for refined option F once the ratios for factor I have been applied.

Table 5.2: Weighting for Refined Option F

Factor	2005-2010	2011-2012	2013-2015	2016-2020
1: Demand (split 60/40 between 1a: future housing/infrastructure and 1b: current refurbishment and redevelopment)	Current apportionment	0%	3.3%	10%
2: Past sales		100%	90%	70%
3: The resource		0%	3.3%	10%
4: Constraints		0%	3.3%	10%

Table 5.3: Weighting for Refined Option F with Factor 1a:1b ratios applied

Factor	2005-2010	2011-2012	2013-2015	2016-2020
1: Demand (split 60/40 between 1a: future housing/infrastructure and 1b: current refurbishment and redevelopment)	Current apportionment	0%	2%	6%
1.3%			4%	
2: Past sales		100%	90%	70%
3: The resource		0%	3.3%	10%
4: Constraints		0%	3.3%	10%

- 5.9. Data for Factors 1 to 4 were entered into the Microsoft Excel based database, and using multi-criteria analysis, the weightings of each factor could be adjusted to reflect the options that were developed. Extracts from the database are shown in **Appendix 8**.
- 5.10. The results of applying these options to the sub-regional apportionment are discussed and illustrated in the next chapter.

6. FINDINGS

- 6.1. The resulting sub-regional apportionments for the two additional past sales options introduced at the end of **Chapter 5** of this report are shown below. For both sand and gravel and crushed rock, a summary graph and tables illustrate the outcomes of applying the apportionment methodology to each of the two new options.
- 6.2. The sub-regional apportionment has been expressed as a percentage of the regional total that each sub-region will need to provide for each resource type. Percentages have been used so that if the overall regional supply figures change (e.g. in the future or if a higher rate of recycled aggregate provision was to be agreed for the region), the methodology is flexible enough to accommodate these changes. These percentages have then been translated into volumes (million tonnes) of aggregate to be supplied based on the regional guideline supply figure. The current apportionment is also included in the tables and charts for comparison.

SAND AND GRAVEL

- 6.3. **Table 6.1** shows the results of the revised sub-regional apportionment options for land-won sand and gravel. A comparison has been made between the two new options and the current apportionment. **Table 6.2** shows the percentages translated into million tonnes (mt) based on achieving an overall Regional total of 165mt.

Table 6.1: Summary of sand and gravel sub-regional apportionment options with ten year sales data (percentages)

Sub-region	Option F: Past sales-led	Refined Option F: Phased sales (averaged over 2005-2020)	Current apportionment
Herefordshire	4.48%	3.38%	2.80%
Shropshire	14.51%	10.59%	8.10%
Staffordshire	54.91%	61.27%	65.20%
Warwickshire	11.19%	10.59%	10.30%
West Midlands County	5.12%	5.13%	5.00%
Worcestershire	9.79%	9.04%	8.60%
West Midlands	100.00%	100.00%	100.00%

Table 6.2: Summary of sand and gravel sub-regional apportionment options with ten year sales data (million tonnes)

Sub-region	Option F: Past sales-led	Refined Option F: Phased sales	Current apportionment
Herefordshire	7.40	5.57	4.61
Shropshire	23.95	17.47	13.36
Staffordshire	90.60	101.10	107.59
Warwickshire	18.46	17.47	17.00
West Midlands County	8.45	8.46	8.25
Worcestershire	16.15	14.92	14.19
West Midlands	165.0	165.0	165.0

- 6.4. In order to generate a summary figure for Refined Option F, the contribution for each of the time periods was calculated in the same way as described above. This breakdown is illustrated as percentages in **Table 6.3**. **Table 6.4** shows the contributions in millions tonnes that will need to be made by each sub-region for each phase of the apportionment period.

Table 6.3: Refined option F for sand and gravel broken down by phase (expressed as a percentage)

Sub-region	2005-2010	2011-2012	2013-2015	2016-2020
Herefordshire	2.80%	2.57%	3.21%	4.48%
Shropshire	8.10%	8.33%	10.39%	14.51%
Staffordshire	65.20%	65.09%	61.70%	54.91%
Warwickshire	10.30%	10.10%	10.46%	11.19%
West Midlands County	5.00%	5.34%	5.26%	5.12%
Worcestershire	8.60%	8.57%	8.97%	9.79%
West Midlands	100.00%	100.00%	100.00%	100.00%

- 6.5. A total contribution in million tonnes for each phase can be calculated based on a total regional production of 165mt over the full 16 year time period. It is assumed that for years 2005 – 2010 (6 years in total), production has been in line with the current apportionment (producing 10.13mt per annum) – equating to a total of 60.75mt over the 6 year period. For the remainder of the time period 2011-2020 (10 years in total), 104.25mt still needs to be produced by the region (to meet the total 165mt regional figure), giving an average contribution of 10.43mt per annum. Based on producing 10.43mt per year for years 2011-2020, **Table 6.4** shows the contributions that will need to be made by each sub-region for each phase of the apportionment period.

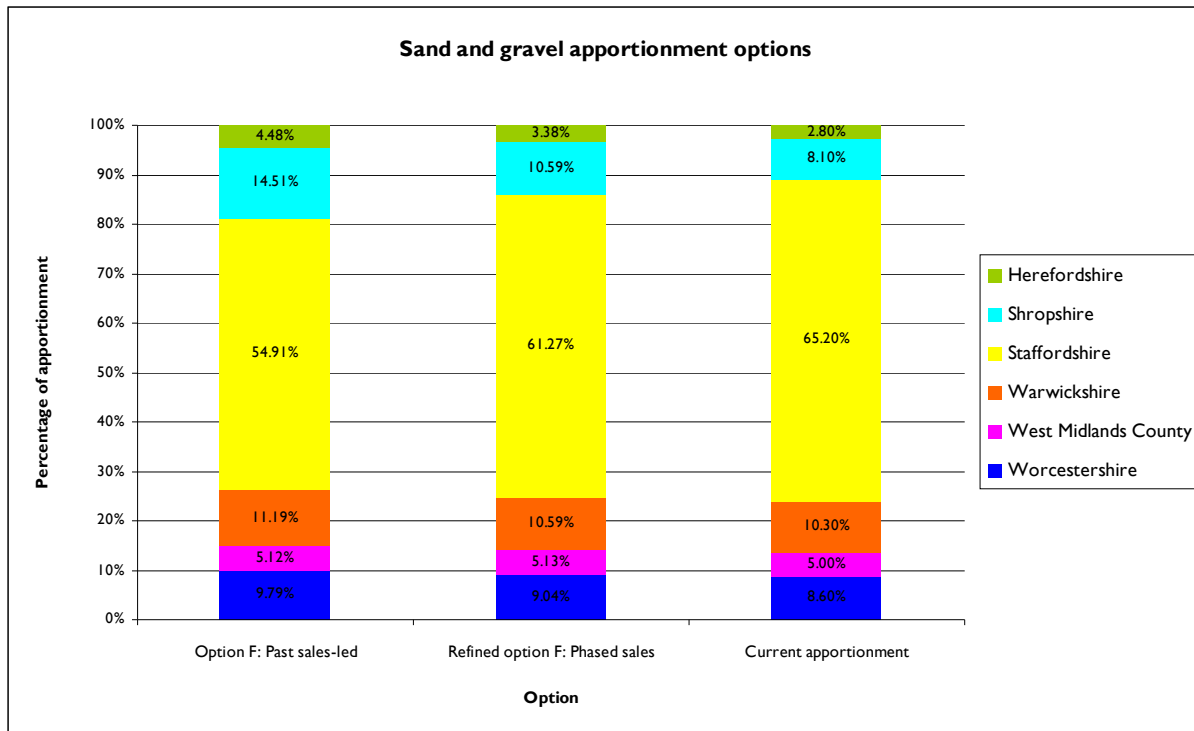
Table 6.4: Refined option F for sand and gravel broken down by phase and expressed as a volume (mt)

Sub-region	Annual contribution for 2005-2010 (total for 6 year period in brackets)	Annual contribution for 2011-2012 (total for 2 year period in brackets)	Annual contribution for 2013-2015 (total for 3 year period in brackets)	Annual contribution for 2016-2020 (total for 5 year period in brackets)	Total contribution for 2005-2020	Overall percentage (averaged over 2005-2020)%
Herefordshire	0.28 (1.70)	0.27 (0.54)	0.33 (1.00)	0.47 (2.34)	5.57	3.38%
Shropshire	0.82 (4.92)	0.87 (1.74)	1.08 (3.25)	1.51 (7.56)	17.47	10.59%
Staffordshire	6.60 (39.61)	6.79 (13.57)	6.43 (19.30)	5.72 (28.62)	101.10	61.27%
Warwickshire	1.04 (6.26)	1.05 (2.11)	1.09 (3.27)	1.17 (5.83)	17.47	10.59%
West Midlands County	0.51 (3.04)	0.56 (1.11)	0.55 (1.65)	0.53 (2.67)	8.46	5.13%
Worcestershire	0.87 (5.23)	0.89 (1.79)	0.94 (2.81)	1.02 (5.10)	14.92	9.04%
West Midlands	10.13 (60.75)	10.43 (20.85)	10.43 (31.28)	10.43 (52.13)	165.00	100.00%

Note: Totals may not add up due to rounding

6.6. **Figure 7** illustrates Options F and Refined F expressed as a percentage, alongside the current apportionment.

Figure 7: Illustrative comparison of revised sand and gravel sub-regional apportionment options



- 6.7. Under the current apportionment, Staffordshire is required to provide over 65% of the regional sand and gravel total. Under options F and Refined option F, there is a reduction in Staffordshire's apportionment. The result of this decrease for Staffordshire is an increase in the apportionment for all other sub-regions under all the options.
- 6.8. The increases are less dramatic than those generated under options A to E, and the increase in West Midlands County has been tempered by the exclusion of resource outside of Solihull and Walsall and the consequent redistribution of demand.

CRUSHED ROCK

- 6.9. **Table 6.5** shows the results of the sub-regional apportionment options for crushed rock expressed as a percentage of the Regional total. A comparison has been made between the options and the current apportionment. **Table 6.6** shows the percentages translated into million tonnes (mt) based on achieving an overall Regional total of 82mt
- 6.10. As per paragraph 4.35, no apportionment has been given to West Midlands County on account of the reserves having been exhausted⁹ - despite the BGS resource data showing that there is a very small amount of resource in this sub-region.

Table 6.5: Summary of crushed rock sub-regional apportionment options F and Refined F (percentages)

Sub-region	Option F: Past sales-led	Refined Option F: Phased sales (averaged over 2005-2020)	Current apportionment
Herefordshire	7.12%	7.24%	7.30%
Shropshire	51.66%	51.06%	50.75%
Staffordshire	23.61%	23.87%	24.01%
Warwickshire	14.54%	14.93%	15.14%
West Midlands County	0.00%	0.00%	0.00%
Worcestershire	3.08%	2.90%	2.81%
West Midlands	100.00%	100.00%	100.00%

Table 6.6: Summary of crushed rock sub-regional apportionment options F and Refined F (million tonnes)

Sub-region	Option F: Past sales-led	Refined Option F: Phased sales	Current apportionment
Herefordshire	5.84	5.93	5.98

⁹ West Midlands Regional Aggregate Working Party Annual Report 2007.

Sub-region	Option F: Past sales-led	Refined Option F: Phased sales	Current apportionment
Shropshire	42.36	41.87	41.61
Staffordshire	19.36	19.57	19.69
Warwickshire	11.92	12.25	12.42
West Midlands County	0.00	0.00	0.00
Worcestershire	2.53	2.38	2.30
West Midlands	82.00	82.00	82.00

6.11. In order to generate a summary figure for refined option F, the contribution for each of the time periods was calculated. This breakdown is illustrated in **Table 6.7**.

Table 6.7: Refined option F for crushed rock broken down by phase (expressed as a percentage)

Sub-region	2005-2010	2011-2012	2013-2015	2016-2020
Herefordshire	7.30%	7.30%	7.24%	7.12%
Shropshire	50.75%	50.75%	51.05%	51.66%
Staffordshire	24.01%	24.01%	23.87%	23.61%
Warwickshire	15.14%	15.14%	14.94%	14.54%
West Midlands County	0.00%	0.00%	0.00%	0.00%
Worcestershire	2.81%	2.81%	2.90%	3.08%
West Midlands	100.00%	100.00%	100.00%	100.00%

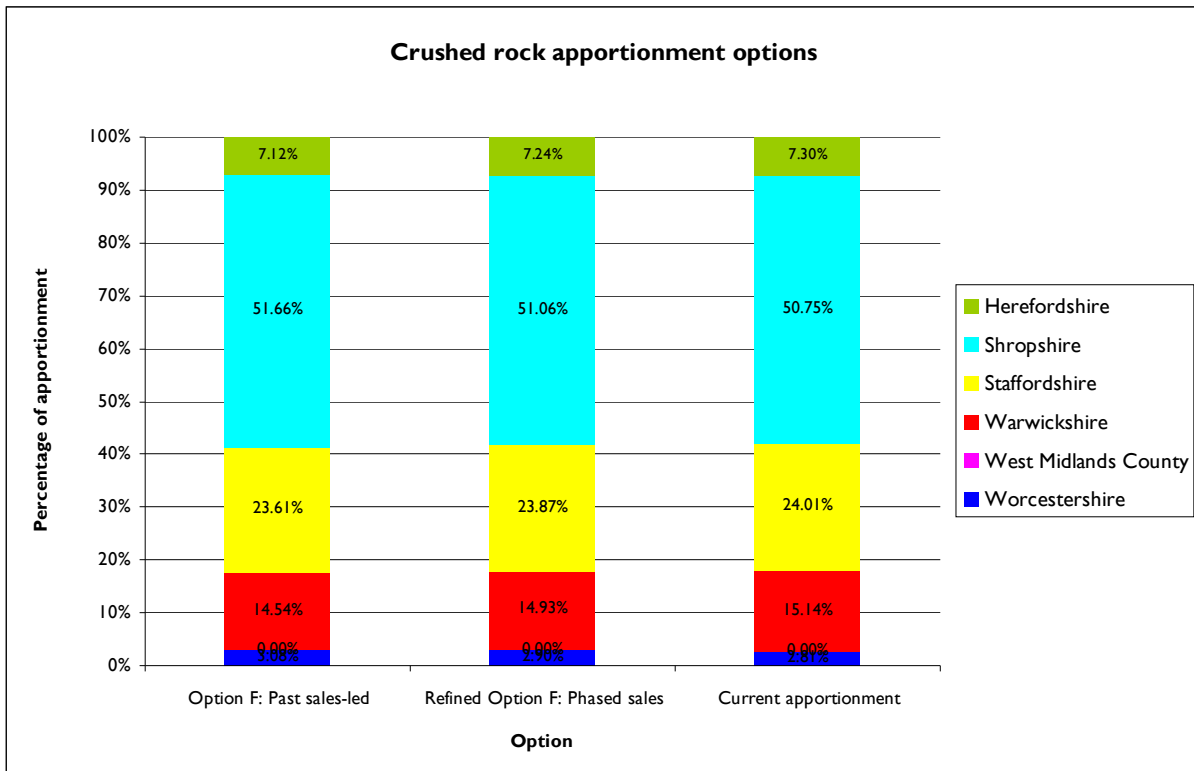
6.12. A total contribution in million tonnes for each phase can be calculated based on a total regional production of 82mt over the full 16 year time period. It is assumed that for years 2005 – 2010 (6 years in total), production has been in line with the current apportionment (producing 5.81mt per annum) – equating to a total of 34,87mt over the 6 year period. For the remainder of the time period 2011-2020 (10 years in total), 47.13mt still needs to be produced by the region (to meet the total 82mt regional figure), giving an average contribution of 4.713mt per annum. Based on producing 4.713mt per year for years 2011-2020, **Table 6.8** shows the contributions that will need to be made by each sub-region for each phase of the apportionment period.

Table 6.8: Refined option F for crushed rock broken down by phase and expressed as a volume (mt)

Sub-region	Annual contribution for 2005-2010 (total for 6 year period in brackets)	Annual contribution for 2011-2012 (total for 2 year period in brackets)	Annual contribution for 2013-2015 (total for 3 year period in brackets)	Annual contribution for 2016-2020 (total for 5 year period in brackets)	Total contribution for 2005-2020	Overall percentage (averaged over 2005-2020)%
Herefordshire	0.42 (2.54)	0.34 (0.69)	0.34 (1.02)	0.34 (1.68)	5.93	7.24%
Shropshire	2.95 (17.69)	2.39 (4.78)	2.41 (7.22)	2.43 (12.17)	41.87	51.06%
Staffordshire	1.40 (8.37)	1.13 (2.26)	1.13 (3.38)	1.11 (5.56)	19.57	23.87%
Warwickshire	0.88 (5.28)	0.71 (1.43)	0.70 (2.11)	0.69 (3.43)	12.25	14.93%
West Midlands County	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0.00	0.00%
Worcestershire	0.16 (0.98)	0.13 (0.26)	0.14 (0.41)	0.15 (0.73)	2.38	2.90%
West Midlands	5.81 (34.87)	4.71 (9.43)	4.71 (14.14)	4.71 (23.57)	82.00	100.00%

6.13. **Figure 8** illustrates these Options F and Refined F for crushed rock expressed as a percentage alongside the current apportionment.

Figure 8: Illustrative comparison of crushed rock sub-regional apportionment options



- 6.14. Under the current apportionment for crushed rock, Shropshire has the highest apportionment at just over 50%. Under both options F and refined option F, Shropshire continues to have the highest apportionment with a slight increase on the current apportionment. Both options result in an increase for Worcestershire, although this is very small due to the removal of the Malvern Hill resource. Reductions for Herefordshire, Staffordshire and Warwickshire are very small.

7. CONCLUSIONS

- 7.1. The development of this alternative sub-regional apportionment methodology for the West Midlands Region has been guided by the input from the Steering Group and members of WMRAWP, and provides a transparent means for identifying the contribution that each sub-region should make towards the regional supply figures for sand and gravel, and crushed rock. A range of options based on different weightings scenarios for the factors to be included in the sub-regional apportionment, have been formulated in consultation with the Steering Group and members of WMRAWP to reflect a range of different priorities within the region relevant to supply of land-won primary aggregates, and to illustrate how sub-regions would be affected in terms of their sub-regional apportionment under each option.
- 7.2. The methodology developed for the sub-regional apportionment is very flexible, and datasets and the factors used can be revised as needed, especially if new data become available. Specific data for each sub-region can be revised if necessary and the weightings for each factor can be adjusted. By expressing the final sub-regional apportionment figures as percentages for each sub-region, the actual tonnages for each sub-region can also be adjusted if the regional supply figure were to be altered in the future.

Land Use Consultants

29 March 2010

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APPENDIX I

List of attendees at 13 November 2009 inception meeting with MPAs

LIST OF MEETING ATTENDEES 13 NOVEMBER 2009

Jon Grantham, Diana Manson, Taran Livingston - Land Use Consultants
Steve Owen – URSUS Consulting
David Clarke - WMRA
Paul Wilcox - Staffordshire County Council
Chris Blakeley - WMRA
Dawn Harris- Walsall Metropolitan Borough Council
Mohammed Salim- Sandwell Metropolitan Borough Council
Matt Griffin – Staffordshire County Council
Tony Lyons – Warwickshire County Council
Malcolm Bell - Shropshire Council

APPENDIX 2

List of attendees at 4 December 2009 WMRAWP meeting

LIST OF MEETING ATTENDEES 4 DECEMBER 2009

Paul Wilcox - WMRAWP Chairman/ Staffordshire County Council
Jasbir Kaur - Technical Secretary/ Warwickshire County Council
Matt Griffin - Staffordshire County Council
Malcolm Bell - Shropshire Council
Chris Blakeley - West Midland Regional Assembly
Nick Dean - Worcestershire County Council
Malcolm Bell - Shropshire Council
Mick Daynes - MPA / Hanson UK
Tony Lyons - Warwickshire County Council
Ray Colbourne - GOWM
Mohammed Salim - Sandwell MBC
Malcolm Lawer - MPA /Tarmac
Tim Deal - MPA/ Lafarge
Colin d'Oyley - MPA/ Ennstone UK
Anthony Rowley - Cemex
Debby Klein - Herefordshire Council
Adrian Cooper - Shropshire Council
Ken Hobden - MPA
Dave Clarke - West Midlands Regional Assembly
Dawn Harris - Walsall MBC
Stephen Owen - URSUS Consulting Ltd
Jon Grantham - LUC
Taran Livingston - LUC

Apologies:

Rob Haig – Coventry CC
Jim Davies – Environment Agency
Craig Rowbottom – Wolverhampton CC
Brian Davies - Stoke CC
Andy Ambrose – Consultant
Brian Dore - Birmingham City Council

APPENDIX 3

List of attendees at 9 February 2010 WMRAWP meeting

LIST OF MEETING ATTENDEES 9 FEBRUARY 2010

Paul Wilcox	WMRAWP Chairman/ Staffordshire County Council
Jasbir Kaur	Technical Secretary/ Warwickshire County Council
Tony Lyons	Warwickshire County Council
Ray Colborne	GOWM
Nick Dean	Worcestershire County Council
Debby Klein	Herefordshire Council
Jim Davies	Environment Agency
Colin D'Oyley	MPA/ Ennstone Johnston UK
Chris Blakeley	West Midlands Regional Assembly
Dave Coxill	Telford & Wrekin Council
Malcolm Bell	Shropshire Council
Adrian Cooper	Shropshire Council
Dawn Harris	Walsall Metropolitan Council
Brian Dore	Birmingham City Council
Matthew Griffin	Staffordshire County Council
Mick Daynes	MPA/ Hanson
Malcolm Lawer	MPA/ Tarmac
Nick Atkins	MPA/ Tarmac
Stephen Owen	URSUS Consulting Ltd
Taran Livingston	LUC
David Clarke	West Midlands Regional Assembly
Joshua Singh	Post Graduate Student – Warwickshire County Council

Apologies
Rob Haigh - Coventry CC
Craig Rowbottom – Wolverhampton CC
Maurice Barlow – Solihull Council
Jon Grantham – LUC

APPENDIX 4

List of attendees at 23 February 2010 RMWOG meeting

LIST OF MEETING ATTENDEES 23 FEBRUARY 2010

Jon Grantham, Taran Livingston - Land Use Consultants

David Clarke - WMRA

Paul Wilcox - Staffordshire County Council

Matt Griffin – Staffordshire County Council

Adrian Cooper - Shropshire Council

Malcolm Bell - Shropshire Council

Dave Coxill – Telford and Wrekin Council

Nick Dean - Worcestershire County Council

David Piper – Dudley Council

APPENDIX 5

List of attendees at 3 March 2010 WMRAWP meeting

LIST OF MEETING ATTENDEES 3 MARCH 2010

Paul Wilcox -WMRAWP Chairman/ Staffordshire County Council
David Clarke - WMRA
John Pattinson - WMRA – Head of Regional Planning
Jasbir Kaur - Technical Secretary/ Warwickshire County Council
Adam James - Warwickshire County Council
Matthew Griffin - Staffordshire County Council
Adrian Cooper - Shropshire Council
Dave Coxill - Telford & Wrekin Council
Ray Colborne - GOWM
Malcolm Bell - Shropshire Council
Ken Hobden - MPA
Shaun Denny - MPA/Cemex
Malcolm Lawer - MPA/Tarmac
Mick Daynes - MPA/Hanson
Brian Dore - Birmingham City Council
Dawn Harris - Walsall Metropolitan Council
Ross - MPA/Lafarge
Jim Davies - Environment Agency
Debby Klein - Herefordshire Council
Colin D'Oyley - MPA/ Ennstone Johnston UK
Chris Blakeley - West Midlands Regional Assembly
Stephen Owen - URSUS Consulting Ltd
Taran Livingston - LUC
Nick Dean -Worcestershire County Council

Apologies – David Wigfield (SMBC)

APPENDIX 6

Detailed information on Options A to E

DETAILED INFORMATION ON APPORTIONMENT OPTIONS A TO E (PRESENTED IN DRAFT REPORT)

FACTORS AND DATASETS USED

As a result of the consultation with the Steering Group, and WMRAWP representatives (meeting held on 4th December 2009), a revised list of factors to be used in the sub-regional apportionment methodology was established. For each factor, this section describes the source of data, how the data has been processed, and any limitations. The revised factors are:

- Factor 1: Demand (with a ratio of 6:4 for 1a and 1b)
 - Factor 1a: Future (Housing provision)
 - Factor 1b: Current (Existing population)
- Factor 2: Past Sales
- Factor 3: Unsterilised resource
- Factor 4: Constraints

FACTOR 1: DEMAND

Representatives of the Mineral Products Association advised that approximately 60% of demand for aggregates for construction is for development associated with meeting future housing/infrastructure targets/needs for the Region whilst the remaining 40% of demand is for existing redevelopment/refurbishment.

It was therefore agreed that Factor 1 would be made up of two factors – future and existing demand and these two factors (1a and 1b respectively) would be combined using a ratio of 6:4 to reflect this information.

Factor 1a: Future housing

The data used to quantify this factor are the Regional Housing Trajectory Indicative Average Annual Rates for 5 year periods presented in the Addendum to the Panel Report of the WM RSS Phase Two Revision for the period 2006-2021 with demolitions from West Midlands Regional Spatial Strategy Phase Two Revision – Draft Preferred Option December 2007 (Table 2) added. Data for this factor were supplied by WMRA and are shown in **Table A.1**.

Data were presented by Local Authority and have been aggregated into the six sub-regions.

Table A.1: Future housing and demolitions (2006-2021) by sub-region

Sub-region	Housing proposals 2006-2021	Demolitions 2006-2021	Total 2006-2021 (housing plus demolitions)	% of total
Herefordshire	12,050	375	12,425	3.90
Shropshire	37,100	420	37,520	11.77
Staffordshire	51,400	4,215	55,615	17.45
Warwickshire	29,075	1,515	30,590	9.60
West Midlands County	109,975	44,505	154,480	48.47
Worcestershire	27,075	1,005	28,080	8.81
West Midlands	266,675	52,035	318,710	100.00

Source: West Midlands RSS Phase 2 Revision Draft December 2007 and Addendum to the Panel Report of WM RSS Phase 2 Revision.

Factor 1b: Current (Existing population)

The data used to quantify the existing population were sourced from the Office for National Statistics. The most current data available are the 2008 mid-year estimates at district level. The data were presented by district or unitary authority, and so were assimilated into the six sub-regions for the purposes of the apportionment. The data for existing population are shown in **Table A.2**.

Table A.2: Existing population 2008

Sub-region	2008 population	% of total
Herefordshire	179,300	3.31
Shropshire	454,900	8.41
Staffordshire	1,069,000	19.76
Warwickshire	530,700	9.81
West Midlands County	2,619,600	48.41
Worcestershire	557,600	10.30
West Midlands Region	5,411,100	100.00

Source: Office for National Statistics 2008 mid-year population estimates

FACTOR 2: PAST SALES

The source of data for past sales was the WMRAWP Annual Report 2007. It was agreed that a three year average of annual sales would be used as the data for sand and gravel. Data for crushed rock sales over a three year period is not available for confidentiality reasons. It was therefore agreed that for crushed rock, the existing apportionment would be used as a proxy for past sales as this apportionment was based on past sales. **Tables A.3 and A.4** below show the data for sand and gravel and crushed rock.

Table A.3: Past sales for sand and gravel

Sub-Region	Sales 2005 (mt)	Sales 2006 (mt)	Sales 2007 (mt)	3 year average (mt)	% of total
Herefordshire	0.24	0.19 (est.)	0.19	0.21	2.13
Shropshire	0.83	0.77	0.78	0.79	8.18
Staffordshire	5.8	6.8	6.44	6.35	65.41
Warwickshire	0.9	0.98	1.19	1.02	10.55
West Midlands County	0.58	0.55	0.61	0.58	5.98
Worcestershire	0.75	0.7	0.81	0.75	7.76
West Midlands	9.1	9.99	10.02	9.70	100.00

Source: WMRAWP Annual Report 2007

Table A.4: Current apportionment figures for crushed rock to be used as a proxy for past sales

Sub-regions	Current apportionment 2005-2016 (million tonnes per annum)	Percentage of regional total (%) 2005-2016
Herefordshire	0.424	7.30%
Shropshire	2.949	50.75%
Staffordshire	1.395	24.01%
Warwickshire	0.88	15.14%
West Midlands County	0	0%
Worcestershire	0.163	2.81%
West Midlands Region	5.812	100%

Source: West Midlands Regional Spatial Strategy Phase Two Revision – Draft. Preferred Option December 2007

FACTOR 3: UNSTERILISED RESOURCE

Data for this factor were the GIS layers for mineral resources as defined by the BGS collated in GIS into a single layer for sand and gravel and a single layer for crushed rock.

These layers did not take account of resource that has been sterilised by urban development and associated infrastructure. It also did not take account of worked-

out sites. It was therefore necessary to process the data further to more accurately estimate the distribution of the resource within each sub-region.

In a recent BGS study¹⁰ undertaken for the former South East Regional Assembly (now South East England Partnership Board) a methodology for determining the extent of the sterilised resource was developed. This methodology has been drawn upon for this study. Factors that sterilise the resource are:

- The road network – based on the Primary Road Network with a 5m buffer of the line features in GIS to approximate the footprint on the ground;
- Railways – based on railway data supplied by WMRA with a 5m buffer of the line features in GIS to approximate the footprint on the ground;
- Urban areas – based on the 2001 Census Urban Areas dataset; and
- Worked-out sites – see next paragraph.

No comprehensive GIS layer of worked-out sites was available for the Region. Each of the MPAs was asked to provide this data for their MPA in GIS format and these were collated by Staffordshire County Council and passed on to Land Use Consultants to use in GIS.

Data for historic/worked-out sites were only available for some of the MPAs. The list below summarises the data collection exercise:

- Shropshire: Historical sites available as GIS layer and have been removed from the resource layer;
- Staffordshire: Historical sites available as GIS layer and have been removed from the resource layer;
- Worcestershire: No GIS data on historical sites available;
- Herefordshire: No GIS data on historical sites available;
- Warwickshire: Data on some worked-out sites provided as GIS layer. Not data available for historic sites;
- Walsall: Historical sites available as GIS layer and have been removed from the resource layer; and
- Solihull: Historical sites available as GIS layer and have been removed from the resource layer.

Table A.5 and A.6 show the breakdown of unsterilised resource area by sub-region for sand and gravel and crushed.

¹⁰ South East England Regional Assembly: South East Plan – Review of Mineral Supply and Demand. Economic Minerals Programme Commissioned Report CR/06/147. British Geological Society 2006.

Table A.5: Area (ha) of unsterilised sand and gravel by sub-region

Sub-region	Area of unsterilised sand and gravel (ha)	% of total
Herefordshire	24,653.77	10.79
Shropshire	80,134.19	35.06
Staffordshire	54,194.83	23.71
Warwickshire	36,797.88	16.10
West Midlands County	7,751.05	3.39
Worcestershire	25,036.40	10.95
West Midlands	228,568.13	100.00

Source: BGS and MPAs (for worked-out/historic sites)

Table A.6: Area (ha) of unsterilised crushed rock by sub-region

Sub-region	Area of unsterilised crushed rock (ha)	% of total
Herefordshire	4,806.46	13.30
Shropshire	21,713.22	60.07
Staffordshire	6,697.91	18.53
Warwickshire	1,919.17	5.31
<i>West Midlands County*</i>	<i>65.12</i>	<i>0.18</i>
Worcestershire	947.40	2.62
West Midlands	36,149.27	100.00

Source: BGS and MPAs (for worked-out/historic sites)

* Although the BGS data shows 65.12ha of unsterilised crushed rock in West Midlands County, the reserves are known to be exhausted and this will be set to zero for the apportionment. See para 2.58

Despite the BGS data showing that there is some crushed rock resource in West Midlands County, the reserves have been exhausted and the last quarry in the area has ceased production¹¹. For this reason, the area used in the apportionment methodology for crushed rock will be set to zero so that West Midlands County receives no apportionment for crushed rock.

Unfortunately the thickness of the resource is not known, so it is not possible to translate the hectares mapped by the BGS into a volume (million tonnes).

FACTOR 4: CONSTRAINTS

Data for this factor were the area (ha) of unsterilised resource outside of international and national designations. All of this data are available as GIS layers from Natural England and English Heritage.

The four international designations considered for this factor are listed below:

¹¹ West Midlands Regional Aggregate Working Party Annual Report 2007.

- Special Areas of Conservation;
- Special Protection Areas;
- Ramsar sites; and
- World Heritage Sites

The eight national designations considered for this factor are listed below:

- Sites of Special Scientific Interest;
- Areas of Outstanding Natural Beauty;
- National Nature Reserves;
- National Parks;
- Scheduled Ancient Monuments;
- Registered Parks and Gardens;
- Registered Battlefields; and
- Listed Buildings.

All of the layers are available as polygons (i.e. they have an area or footprint) except for the Listed Building data, which are available as both points (i.e. with no associated footprint/area) and polygons. When considering Listed Buildings, both the point and polygon layers need to be taken into account. The polygon Listed Buildings layer was converted to centre points and appended to the point dataset to create one layer for Listed Buildings.

In order to accommodate the polygon constraints layers and the Listed Buildings points into this factor, a two stage approach had to be developed.

The first stage was to assimilate all the polygon layers into a single data layer, and calculate the area of mineral resource (for each resource type) outside of these international and national designations. This value, calculated in GIS, was then normalised to achieve a number between 0 and 1. In order to include Listed Buildings (which were now collated as a point layer) within the single 'constraints factor', the density of heritage features per hectare of mineral resource was calculated. This value was then translated into a value for the inverse density per hectare of resource, and normalised¹².

¹² The inverse is used in order to positively weight the potential constraint to the use of the mineral resource represented by a Listed Building. In effect, a high inverse density will mean that there is a low Listed Building density per hectare of mineral resource within a sub-region, and that sub-region should therefore receive more of the apportionment. If the inverse density is not used, a sub-region with a low density of Listed Buildings per hectare of mineral resource would have a low normalised value compared to other sub-regions with higher densities of Listed Buildings per hectare of mineral resource. Thus, even though the low density of Listed Buildings represents a higher amount of potentially unconstrained mineral resource in that sub-region, when

The second stage was to combine these two normalised values using a ratio of 11:1 (11 other international and national constraints: 1 Listed Building designation) to achieve one normalised value for national constraints to feed into the apportionment methodology. The 11:1 ratio reflects the fact that Listed Buildings is 1 of 12 constraint features that need to be accounted for in this factor. This two stage approach is seen as the best way to incorporate these two different data types into one factor. This approach was used in the apportionment of primary aggregates in the South East Region, and was agreed with English Heritage for that study.

Tables A.7 and A.8 show the areas of resource outside of international and national designations that were used in this calculation. **Tables A.9 and A.10** show the calculation of the density and inverse density of Listed Buildings per sub-region.

Table A.7: Areas (ha) of unsterilised sand and gravel outside of constraints

Sub-region	Area of unsterilised sand and gravel outside of international and national designations (ha)	% of total
Herefordshire	22,127.95	10.56
Shropshire	74,235.63	35.41
Staffordshire	47,414.90	22.62
Warwickshire	34,762.71	16.58
West Midlands County	7,642.62	3.65
Worcestershire	23,457.55	11.19
West Midlands	209,641.37	100.00

Table A.8: Areas (ha) of unsterilised crushed rock outside of constraints

Sub-region	Area of unsterilised crushed rock outside of international and national designations (ha)	% of total
Herefordshire	3,034.61	20.40
Shropshire	8,915.46	59.92
Staffordshire	1,940.27	13.04
Warwickshire	738.37	4.96
<i>West Midlands County*</i>	<i>52.18</i>	<i>0.35</i>
Worcestershire	197.63	1.33
West Midlands	14,878.51	100.00

Source: BGS, MPAs, Natural England and English Heritage

* Although the BGS data shows 52.18ha of unsterilised crushed rock outside of designations in West Midlands County, the reserves are known to be exhausted and this will be set to zero for the apportionment. See para 2.58

weighting is applied to this criterion, that sub-region would receive a lower sub-regional apportionment, which would not reflect its level of potentially unconstrained (by Listed Buildings) mineral resource.

Table A.9: Density of Listed Buildings per hectare of unsterilised sand and gravel

Sub-region	Area of unsterilised sand and gravel (ha)	Number of Listed Buildings on resource	Density of Listed Buildings (Listed Buildings per hectare)	Inverse density (1 - Listed Building density)
Herefordshire	24,653.77	430	0.017	0.983
Shropshire	80,134.19	1417	0.018	0.982
Staffordshire	54,194.83	651	0.012	0.988
Warwickshire	36,797.88	764	0.021	0.979
West Midlands County	7,751.05	121	0.016	0.984
Worcestershire	25,036.40	776	0.031	0.969
West Midlands	228,568.13	4159	0.018	0.982

Source: BGS, MPAs and English Heritage

Table A.10: Density of Listed Buildings per hectare of unsterilised crushed rock

Sub-region	Area of unsterilised crushed rock (ha)	Number of Listed Buildings on resource	Density of Listed Buildings (Listed Buildings per hectare)	Inverse density (1 - Listed Building density)
Herefordshire	4,806.46	136	0.028	0.972
Shropshire	21,713.22	259	0.012	0.988
Staffordshire	6,697.91	148	0.022	0.978
Warwickshire	1,919.17	31	0.016	0.984
<i>West Midlands County*</i>	<i>65.12</i>	<i>1</i>	<i>0.015</i>	<i>0.985</i>
Worcestershire	947.40	24	0.025	0.975
West Midlands	36,149.27	599	0.017	0.983

Source: BGS, MPAs and English Heritage

* Although the BGS data shows 65.12ha of unsterilised crushed rock in West Midlands County, the reserves are known to be exhausted and this will be set to zero for the apportionment. See para 2.58

DEVELOPMENT OF OPTIONS A TO E

For the purposes of discussion at the December Steering Group/WMRAWP meeting, LUC presented a number of potential options for generating the sub-regional apportionment figures. There was a clear rationale for generating each of the options, which was to demonstrate to the meeting participants the principle of weighting, and the effect that each factor has on the overall apportionment. Each of the options included all of the factors. The initial options are listed below:

- **Supply-led** - Giving the highest weighting to the location of the resource, and distributing equal weighting to the remaining factors;

- **Growth -led** - Giving the highest weighting to demand, and distributing equal weighting to the remaining factors;
- **Environment-led** - Giving the highest weighting to the amount of resource outside of environmental constraints, and distributing equal weighting to the remaining factors;
- **Equal weighting** - where all factors are given equal weighting.

No sales-led option was presented as sales/ historical shares is the basis of the options being generated by WMRAWP.

Despite being based on data that was subsequently revised, these options formed the basis of a very useful discussion at the Steering Group / WMRAWP meeting about developing realistic options which could be appraised. The outcome of the discussion was the inclusion of a further option and firming up of the initial proposed options which are presented in the next section.

OPTIONS FOR DRAFT REPORT (A TO E)

With the involvement of the Steering Group and WMRAWP members the following options were developed:

- **Option A: Supply-led** weighted 70% on the supply (i.e. the location of the unsterilised resource), and 10% for each of the other factors (with a 6:4 ratio for future : current demand);
- **Option B: Growth-led** weighted 70% on demand (with a 6:4 ratio for future: current demand), and 10% for each of the other factors;
- **Option C: Environment-led** weighted 70% on constraints (i.e. the area of sterilised resource outside of environmental, landscape and heritage constraints), and 10% for each of the other factors (with a 6:4 ratio for future : current demand);
- **Option D: Equal weighting** weighted 25% for all the factors (with a 6:4 ratio for future : current demand); plus an additional option:
- **Option E: Demand and resource** weighted 40% on demand (with a 6:4 ratio for future: current demand), 40% on supply (the location of the unsterilised resource) and 10% each for past sales and constraints.

The weightings presented in these options are 'extreme' in order to show the differences between the options. The method allows for the weightings to be adjusted by adjusting the value of the percentages (e.g. the highest weighting could be set to 50% instead of 70%) to make the options less 'extreme'.

Table A.11 illustrates these options and **Table A.12** shows the final percentages to be used once the ratios have been applied for Factor 1.

Table A.11: Weighting for five alternative options (to the current apportionment)

Factor	Option A: Supply-led	Option B: Growth-led	Option C: Environment-led	Option D: Equal weighting	Option E: Demand and resource
1: Demand (split 60/40 between 1a: future housing/infrastructure and 1b: current refurbishment and redevelopment)	10%	70%	10%	25%	40%
2: Past sales	10%	10%	10%	25%	10%
3: The resource	70%	10%	10%	25%	40%
4: Constraints	10%	10%	70%	25%	10%

Table A.12: Final weighting for five alternative options once the ratios have been applied

Factor		Option A: Supply-led	Option B: Growth-led	Option C: Environment-led	Option D: Equal weighting	Option E: Demand and resource
1: Demand	a: future housing/infrastructure	6%	42%	6%	15%	24%
	1b: current refurbishment and redevelopment)	4%	28%	4%	10%	16%
2: Past sales		10%	10%	10%	25%	10%
3: The resource		70%	10%	10%	25%	40%
4: Constraints		10%	10%	70%	25%	10%

Factors 1 to 4 were fed into the Microsoft Excel based database, and using multi-criteria analysis, the weightings of each factor could be adjusted to reflect the options that were developed.

The results of applying these options to the sub-regional apportionment are discussed and illustrated in the **Findings**.

Figure A1: Illustrative comparison of sand and gravel sub-regional apportionment options

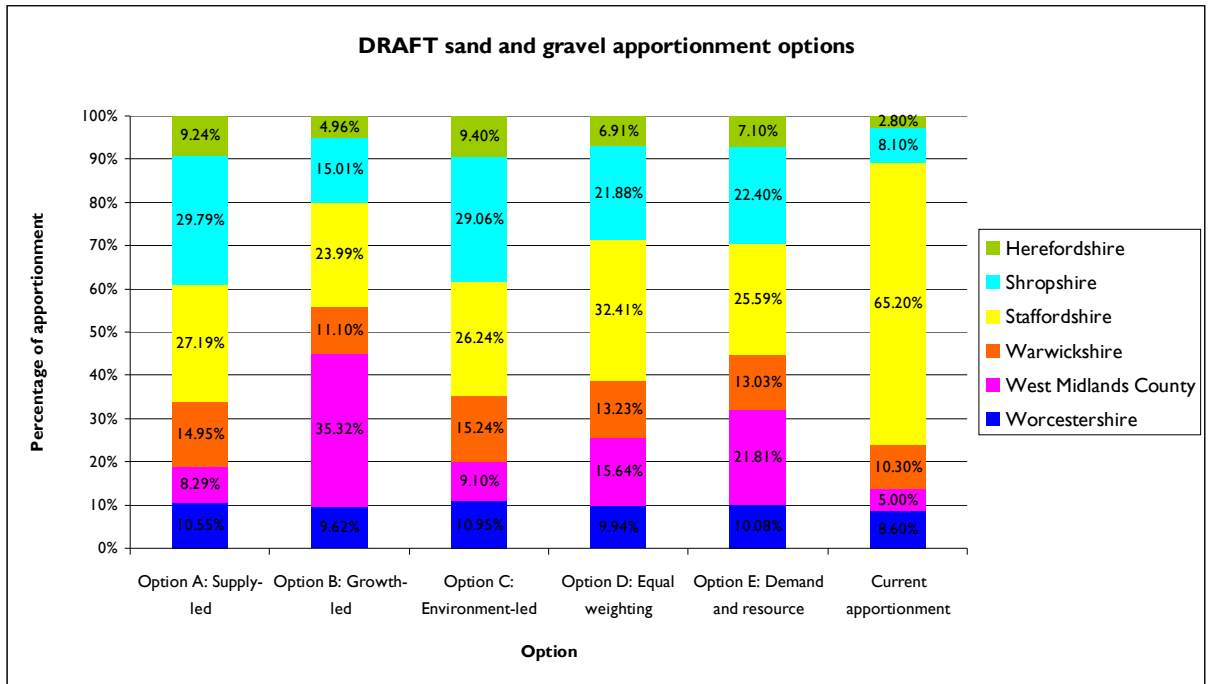


Table A.14: Summary of sand and gravel sub-regional apportionment options (million tonnes)

Sub-region	Option A: Supply-led	Option B: Growth-led	Option C: Environment-led	Option D: Equal weighting	Option E: Demand and resource	Current apportionment
Herefordshire	15.24	8.19	15.52	11.40	11.71	4.61
Shropshire	49.15	24.76	47.95	36.10	36.95	13.36
Staffordshire	44.86	39.58	43.30	53.47	42.22	107.59
Warwickshire	24.67	18.32	25.15	21.83	21.49	17.00
West Midlands County	13.68	58.28	15.01	25.80	35.98	8.25
Worcestershire	17.40	15.87	18.07	16.40	16.64	14.19
West Midlands	165.00	165.00	165.00	165.00	165.00	165.00

Under the current apportionment, Staffordshire are required to provide over 65% of the regional sand and gravel total. Under all of the options A to E there is a reduction in Staffordshire’s apportionment. The result of this decrease for Staffordshire is an increase in the apportionment for all other sub-regions under all the options.

It is acknowledged that some options may result in a significant increase in the amount of aggregates that a sub-region is expected to supply which may be

unrealistic, but as previously, the weighting presented here are 'extreme' and can be modified if deemed unsuitable. An example of this is Option B, which is growth-led and therefore there is a dramatic increase in the amount apportioned to West Midlands County compared to the other options and the current apportionment. No check has been undertaken to establish whether there is sufficient sand and gravel resource to meet the implied volume for a particular sub-region from the apportionment options. Views on issues such as these from consultees would be very useful in informing the evolution and selection of options.

Crushed Rock

Table A.15 and **Figure A2** show the results of the sub-regional apportionment options for crushed rock expressed as a percentage of the Regional total. A comparison has been made between the options and the current apportionment. **Table A.16** shows the percentages translated into million tonnes (mt) based on achieving an overall Regional total of 82 mt.

No apportionment has been given to West Midlands County on account of the reserves having been exhausted¹³ - despite the BGS resource data showing that there is a very small amount of resource (approximately 65ha).

Table A.15: Summary of crushed rock sub-regional apportionment options (percentages)

Sub-region	Option A: Supply-led	Option B: Growth-led	Option C: Environment-led	Option D: Equal weighting	Option E: Demand and resource	Current apportionment
Herefordshire	12.81%	9.08%	17.06%	12.04%	10.94%	7.30%
Shropshire	54.90%	30.93%	52.88%	46.99%	42.92%	50.75%
Staffordshire	20.32%	30.57%	17.38%	22.97%	25.45%	24.01%
Warwickshire	7.74%	15.82%	8.29%	11.37%	11.78%	15.14%
Worcestershire	4.23%	13.61%	4.38%	6.64%	8.92%	2.81%
West Midlands	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

¹³ West Midlands Regional Aggregate Working Party Annual Report 2007.

Figure A2: Illustrative comparison of crushed rock sub-regional apportionment options

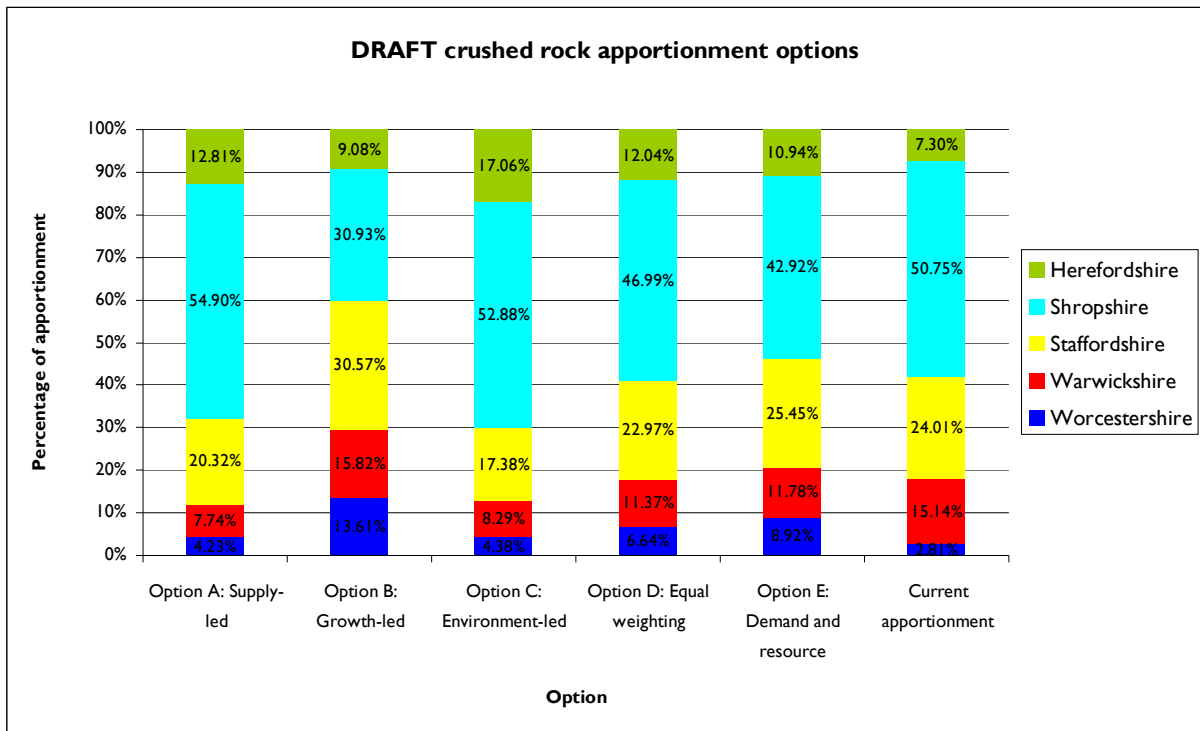


Table A.16: Summary of crushed rock sub-regional apportionment options (million tonnes)

Sub-region	Option A: Supply-led	Option B: Growth-led	Option C: Environment-led	Option D: Equal weighting	Option E: Demand and resource	Current apportionment
Herefordshire	10.50	7.45	13.99	9.87	8.97	5.98
Shropshire	45.02	25.36	43.36	38.53	35.19	41.61
Staffordshire	16.67	25.07	14.25	18.83	20.87	19.69
Warwickshire	6.35	12.97	6.80	9.32	9.66	12.42
Worcestershire	3.47	11.16	3.60	5.44	7.31	2.30
West Midlands	82.00	82.00	82.00	82.00	82.00	82.00

Under the current apportionment, Shropshire has the highest apportionment at just over 50%. Under all options A to E, Shropshire continues to have the highest apportionment. All options result in an increase for Herefordshire and all options with the exception of Option B result in a reduction in Warwickshire’s apportionment.

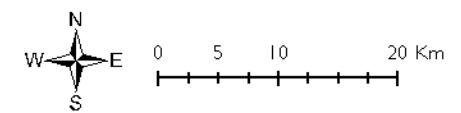
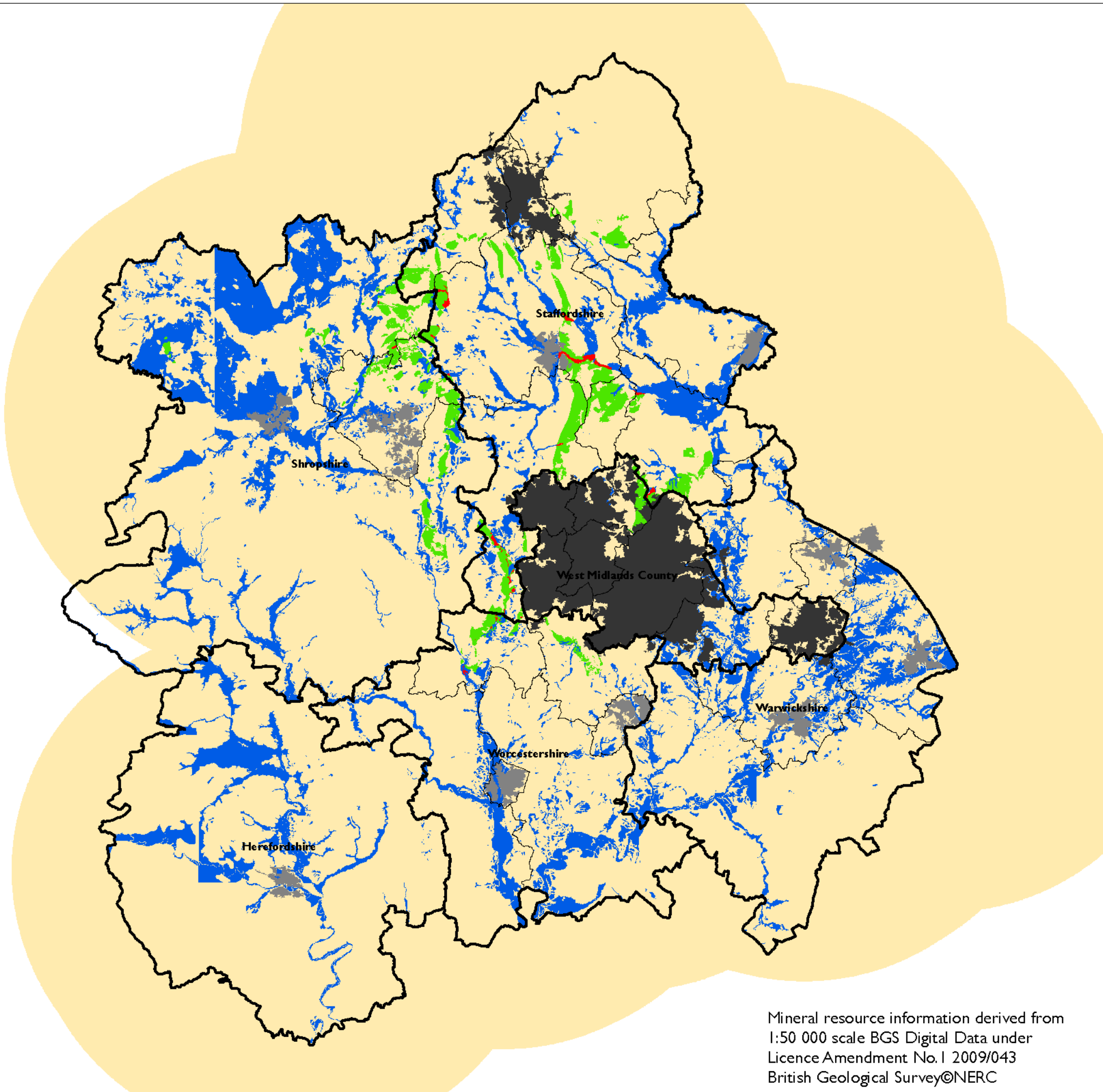
APPENDIX 7

Maps of viable transport and data from MPAs

West Midlands Sub-Regional Apportionment
Appendix Map I: Major Urban Areas and Settlements of Significant Development with a 38km buffer

Key

-  Sub-Regions
 -  Local Authority boundaries
 -  38km buffer around MUAs and SSDs
 -  Major Urban Areas
 -  Settlements of Significant Development
- Deposit
-  Bedrock sand and gravel (24m thickness)
 -  Superficial sand and gravel (6m thickness)
 -  Bedrock and superficial sand and gravel (24m+6m thickness)



Source: WMRA, BGS, ONS







Date: 10/03/2010
 Revision:



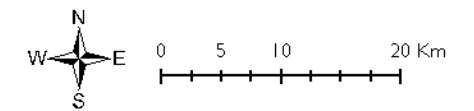
Mineral resource information derived from
 1:50 000 scale BGS Digital Data under
 Licence Amendment No.1 2009/043
 British Geological Survey©NERC

West Midlands Sub-Regional Apportionment
Appendix Map 2: MPA data collection exercise

Key

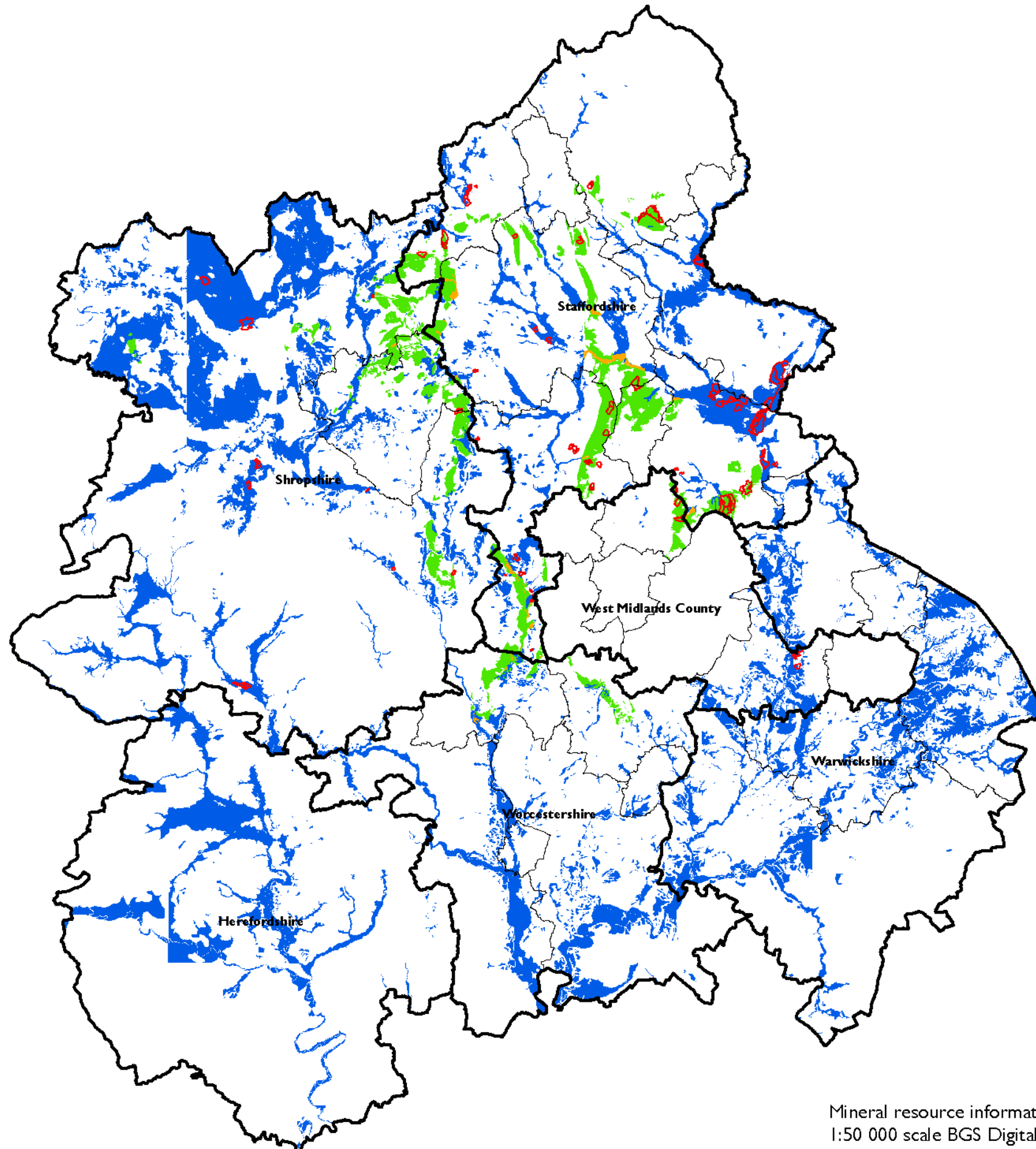
-  Sub-Regions
-  Local Authority boundaries
-  Existing permissions, areas of search, allocations
- Deposit**
-  Bedrock sand and gravel (24m thickness)
-  Superficial sand and gravel (6m thickness)
-  Bedrock and superficial sand and gravel (24m+6m thickness)

Please note:
 Data collection was not completed as the option to use this data was not pursued. Results are summarised below:
 Herefordshire: Sites need to be digitised so are not illustrated on this map.
 Shropshire: No data available on preferred areas/potential sites as study is not complete.
 Warwickshire: No data received.
 Worcestershire: Revised BGS data sent in hardcopy format.
 Staffordshire, Solihull and Walsall: Data shown on map.



Source: WMRA, BGS, Ordnance Survey, MPAs

Date: 10/03/2010
 Revision:



Mineral resource information derived from 1:50 000 scale BGS Digital Data under Licence Amendment No.1 2009/043 British Geological Survey©NERC

APPENDIX 8

Database used to generate options F and Refined F

Sand and Gravel Option F database

Sub Region	Factor 1: Demand				Factor 2: Past sales		Factor 3: Unsterilised resource outside of International Designations		Factor 4: Unsterilised resource outside of International and National Designations	
	Factor 1a Housing provision	Normalised factor 1a	Factor 1b Existing population	Normalised factor 1b	Factor 2 Past sales (10 year average)	Normalised factor 2	Factor 3 Volume (mt) of resource outside international designations	Normalised factor 3	Factor 4 Volume (mt) of resource outside of International and National Designations	Normalised factor 4
Herefordshire	38,203	0.12	611,040	0.11	0.25	0.03	2,415.72	0.07	2,222.68	0.08
Shropshire	63,298	0.20	886,640	0.16	0.81	0.08	10,783.65	0.33	10,176.63	0.35
Staffordshire	81,393	0.26	1,500,740	0.28	6.35	0.65	11,326.64	0.35	9,312.55	0.32
Warwickshire	56,368	0.18	962,440	0.18	0.99	0.10	3,698.19	0.11	3,491.67	0.12
West Midlands County	25,591	0.08	460,900	0.09	0.52	0.05	862.40	0.03	850.98	0.03
Worcestershire	53,858	0.17	989,340	0.18	0.84	0.09	3,222.57	0.10	3,047.46	0.10
TOTAL	318,710	1.00	5,411,100	1.00	9.76	1.00	32,309.16	1.00	29,101.97	1.00

	Factor	Weighting
Option F: Past sales-led	Factor 1a: Future housing	6%
	Factor 1b: Existing population	4%
	Factor 2: Past sales	70%
	Factor 3: Unsterilised resource	10%
	Factor 4: Unsterilised resource outside of International and National Designations	10%
	SUM	100%
Sub region	Apportionment %	Apportionment (mt)
Herefordshire	4.48%	7.4
Shropshire	14.51%	23.9
Staffordshire	54.91%	90.6
Warwickshire	11.19%	18.5
West Midlands County	5.12%	8.4
Worcestershire	9.79%	16.1
TOTAL	100.00%	165.0

Sand and Gravel Refined Option F database

Sub Region	Factor 1: Demand				Factor 2: Past sales		Factor 3: Unsterilised resource outside of International Designations		Factor 4: Unsterilised resource outside of International and National Designations	
	Factor 1a Housing provision	Normalised factor 1a	Factor 1b Existing population	Normalised factor 1b	Factor 2 Past sales (10 year average)	Normalised factor 2	Factor 3 Volume (mt) of resource outside international designations	Normalised factor 3	Factor 4 Volume (mt) of resource outside of International and National Designations	Normalised factor 4
Herefordshire	38,203	0.12	611,040	0.11	0.25	0.03	2,415.72	0.07	2,222.68	0.08
Shropshire	63,298	0.20	886,640	0.16	0.81	0.08	10,783.65	0.33	10,176.63	0.35
Staffordshire	81,393	0.26	1,500,740	0.28	6.35	0.65	11,326.64	0.35	9,312.55	0.32
Warwickshire	56,368	0.18	962,440	0.18	0.99	0.10	3,698.19	0.11	3,491.67	0.12
West Midlands County	25,591	0.08	460,900	0.09	0.52	0.05	862.40	0.03	850.98	0.03
Worcestershire	53,858	0.17	989,340	0.18	0.84	0.09	3,222.57	0.10	3,047.46	0.10
TOTAL	318,710	1.00	5,411,100	1.00	9.76	1.00	32,309.16	1.00	29,101.97	1.00

	Factor	Weighting
Refined Option F: 2011-2012 (100% sales)	Factor 1a: Future housing	0%
	Factor 1b: Existing population	0%
	Factor 2: Past sales	100%
	Factor 3: Unsterilised resource	0%
	Factor 4: Unsterilised resource outside of International and National Designations	0%
	SUM	100%
Sub region	Apportionment %	Annual provision (mt)
Herefordshire	2.57%	0.27
Shropshire	8.33%	0.87
Staffordshire	65.09%	6.79
Warwickshire	10.10%	1.05
West Midlands County	5.34%	0.56
Worcestershire	8.57%	0.89
TOTAL	100.00%	10.43

	Factor	Weighting
Refined Option F: 2013-2015 (90% sales)	Factor 1a: Future housing	2.0%
	Factor 1b: Existing population	1.3%
	Factor 2: Past sales	90.0%
	Factor 3: Unsterilised resource	3.3%
	Factor 4: Unsterilised resource outside of International and National Designations	3.3%
	SUM	100%
Sub region	Apportionment %	Annual provision (mt)
Herefordshire	3.21%	0.33
Shropshire	10.39%	1.08
Staffordshire	61.70%	6.43
Warwickshire	10.46%	1.09
West Midlands County	5.26%	0.55
Worcestershire	8.97%	0.94
TOTAL	100.00%	10.43

	Factor	Weighting
Refined Option F: 2016-2020 (70% sales)	Factor 1a: Future housing	6%
	Factor 1b: Existing population	4%
	Factor 2: Past sales	70%
	Factor 3: Unsterilised resource	10%
	Factor 4: Unsterilised resource outside of International and National Designations	10%
	SUM	100%
Sub region	Apportionment %	Annual provision (mt)
Herefordshire	4.48%	0.47
Shropshire	14.51%	1.51
Staffordshire	54.91%	5.72
Warwickshire	11.19%	1.17
West Midlands County	5.12%	0.53
Worcestershire	9.79%	1.02
TOTAL	100.00%	10.43

Crushed Rock Option F database

Sub Region	Factor 1: Demand				Factor 2: Past sales		Factor 3: Unsterilised resource outside of International Designations		Factor 4: Unsterilised resource outside of International and National Designations	
	Factor 1a Housing provision	Normalised factor 1a	Factor 1b Existing population	Normalised factor 1b	Factor 2 Past sales	Normalised factor 2	Factor 3 Volume (mt) of resource outside international designations	Normalised factor 3	Factor 4 Volume (mt) of resource outside of International and National Designations	Normalised factor 4
Herefordshire	12,425	0.04	179,300	0.03	0.42	0.07	3,132.77	0.06	2,042.49	0.10
Shropshire	114,760	0.36	1,764,700	0.33	2.95	0.51	31,397.80	0.61	12,909.77	0.65
Staffordshire	55,615	0.17	1,069,000	0.20	1.40	0.24	15,075.60	0.29	3,997.16	0.20
Warwickshire	107,830	0.34	1,840,500	0.34	0.88	0.15	1,163.78	0.02	626.14	0.03
West Midlands County	0	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worcestershire	28,080	0.09	557,600	0.10	0.16	0.03	427.58	0.01	183.11	0.01
TOTAL	318,710	1.00	5,411,100	1.00	5.81	1.00	51,197.54	1.00	19,758.67	1.00

	Factor	Weighting
Option F: Sales-led	Factor 1a: Future housing	6%
	Factor 1b: Existing population	4%
	Factor 2: Past sales	70%
	Factor 3: Unsterilised resource	10%
	Factor 4: Unsterilised resource outside of International and National Designations	10%
	SUM	100%
Sub region	Apportionment %	Apportionment (mt)
Herefordshire	7.12%	5.8
Shropshire	51.66%	42.4
Staffordshire	23.61%	19.4
Warwickshire	14.54%	11.9
West Midlands County	0.00%	0.0
Worcestershire	3.08%	2.5
TOTAL	100.00%	82.0

Crushed Rock Refined Option F database

Sub Region	Factor 1: Demand				Factor 2: Past sales		Factor 3: Unsterilised resource outside of International Designations		Factor 4: Unsterilised resource outside of International and National Designations	
	Factor 1a Housing provision	Normalised factor 1a	Factor 1b Existing population	Normalised factor 1b	Factor 2 Past sales	Normalised factor 2	Factor 3 Volume (mt) of resource outside international designations	Normalised factor 3	Factor 4 Volume (mt) of resource outside of International and National Designations	Normalised factor 4
Herefordshire	12,425	0.04	179,300	0.03	0.42	0.07	3132.77	0.06	2042.49	0.10
Shropshire	114,760	0.36	1,764,700	0.33	2.95	0.51	31397.80	0.61	12909.77	0.65
Staffordshire	55,615	0.17	1,069,000	0.20	1.40	0.24	15075.60	0.29	3997.16	0.20
Warwickshire	107,830	0.34	1,840,500	0.34	0.88	0.15	1163.78	0.02	626.14	0.03
West Midlands County	0	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worcestershire	28,080	0.09	557,600	0.10	0.16	0.03	427.58	0.01	183.11	0.01
TOTAL	318,710	1.00	5,411,100	1.00	5.81	1.00	51,197.54	1.00	19,758.67	1.00

	Factor	Weighting
Refined Option F: 2011-2012 (100% sales)	Factor 1a: Future housing	0%
	Factor 1b: Existing population	0%
	Factor 2: Past sales	100%
	Factor 3: Unsterilised resource	0%
	Factor 4: Unsterilised resource outside of International and National Designations	0%
	SUM	100%
	Apportionment %	Apportionment (mt)
Herefordshire	7.30%	0.3
Shropshire	50.75%	2.4
Staffordshire	24.01%	1.1
Warwickshire	15.14%	0.7
West Midlands County	0.00%	0.0
Worcestershire	2.81%	0.1
TOTAL	100.00%	4.7

	Factor	Weighting
Refined Option F: 2013-2015 (90% sales)	Factor 1a: Future housing	2.0%
	Factor 1b: Existing population	1.3%
	Factor 2: Past sales	90.0%
	Factor 3: Unsterilised resource	3.3%
	Factor 4: Unsterilised resource outside of International and National Designations	3.3%
	SUM	100%
	Apportionment %	Apportionment (mt)
Herefordshire	7.24%	0.3
Shropshire	51.05%	2.4
Staffordshire	23.87%	1.1
Warwickshire	14.94%	0.7
West Midlands County	0.00%	0.0
Worcestershire	2.90%	0.1
TOTAL	100.00%	4.7

	Factor	Weighting
Refined Option F: 2016-2020 (70% sales)	Factor 1a: Future housing	6%
	Factor 1b: Existing population	4%
	Factor 2: Past sales	70%
	Factor 3: Unsterilised resource	10%
	Factor 4: Unsterilised resource outside of International and National Designations	10%
	SUM	100%
	Apportionment %	Apportionment (mt)
Herefordshire	7.12%	0.3
Shropshire	51.66%	2.4
Staffordshire	23.61%	1.1
Warwickshire	14.54%	0.7
West Midlands County	0.00%	0.0
Worcestershire	3.08%	0.1
TOTAL	100.00%	4.7