ANNEX 4a

Sustainability Appraisal for minerals strategy alternatives for the Oxfordshire Minerals and Waste Local Plan Part 1

Prepared by LUC

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Project Title: Sustainability Appraisal of alternatives to the Oxfordshire Minerals and Waste Local Plan Part 1: Core Strategy

Client: Oxfordshire County Council

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Prepared by LUC in association with Sub Consultants

January 2017

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1 Introduction

1.1 Oxfordshire County Council (the Council) is currently in the process of preparing Part 1 of their new Minerals and Waste Local Plan, the Core Strategy. This was submitted to the Secretary of State for independent examination in December 2015. Following his Interim Report (October 2016) the Inspector required the Council to consider reasonable alternatives with regards to certain policies.

1.2 This appendix provides information on the alternatives that are being considered during the post-Examination process to undertake the further Strategic Environmental Assessment / Sustainability Appraisal (referred to hereafter as 'SA') required and finalise the Main Modifications that Oxfordshire County Council will be proposing to publish for consultation.

1.3 This appendix presents the SA assessment results of those policies with reasonable alternative options. This work will inform the Council's selection and rejection of these options.

2 Methodology

2.1 The methodology used to undertake the assessment of reasonable alternatives (options) will be consistent with the approach undertaken for the Submission Core Strategy. This is summarised below.

2.2 In order to be able to easily compare the effects of each option against each of the SA objectives, assessments have been combined into a single table rather than having separate tables for each option. Using this helps ensure that all alternatives will be assessed at the same level of detail and allows easier comparison.

2.3 Each policy option was assessed against each of the 12 SA objectives, and a judgement was made with regards to the likely effect that the option would have on that objective. These judgements were recorded as a colour coded symbol, as shown in **Table 2.1** below. **Table 2.2** to **Table 2.5** explain the terminology and symbology used with regards to the assessment of duration, reversibility, scale and permanence of effects, as presented in **Chapter 3**.

Table 2.1 Key to symbols and colour coding used in the SA of the Core Strategy

Significance Assessment	Description
++	The option is likely to have a significant positive effect
+	The option is likely to have a positive effect which is not significant
0	No predicted effects / no clear link
?	Uncertain or insufficient information on which to determine effect
-	The option is likely to have a negative effect which is not significant
- -	The option is likely to have a significant negative effect
+/-	The option is likely to have some positive and some negative effects (mixed effect)

Table 2.2 Duration of effects identified

Duration	Approximate timing of effect
Short Term	0-5 years
Medium Term	5 years to end of Plan period in 2031
Long Term	After life of plan (post 2031)

Table 2.3 Reversibility of effects identified

Symbol	Meaning	Comment
R	Reversible effect	Environmental effect that can be reversed, for example an incident of water pollution can be cleaned up over time.
I	Irreversible	Environmental effect that cannot be reversed such as the loss of a historic feature or the loss of agricultural soil due to

Symbol	Meaning	Comment
	effect	permanent development.

Table 2.4 Scale of effects identified

Symbol	Meaning	Comment
L	Local	Within Oxfordshire Local Authority areas
R	Regional	Oxfordshire and surrounding counties
N	National	UK or a wider global impact

Table 2.5 Permanence of effects identified

Symbol	Meaning	Comment
P	Permanent	Effect even after mineral and waste activities have ceased
T	Temporary	Effect during mineral and waste activities

2.4 **Table 2.6** below summarises the SA objectives against which the options are assessed. The full SA framework is detailed in **Appendix A**: SA Framework. The table also includes a 'reference term', which is a short title for each SA Objective to be used in the assessment tables in **Chapter 3**.

Table 2.6 SA Objectives

SA Objective		Reference Term
1	To protect, maintain, and enhance Oxfordshire's biodiversity and geological diversity including natural habitats, flora and fauna and protected species	Biodiversity & geodiversity
2a	To protect and enhance landscape character and local distinctiveness	Landscape
2b	To conserve and enhance the historic environment, heritage assets and their settings	Historic environment
3	To maintain and improve ground and surface water quality	Water quality
4	To improve and maintain air quality to levels which do not damage natural systems	Air quality
5	To reduce greenhouse gas emissions to reduce the cause of climate change	Greenhouse gas emissions
6	To reduce the risk of flooding	Flood risk
7	To minimise the impact of transportation of aggregates and waste products on the local and strategic road network	Transport effects
8	To minimise negative impacts of waste management facilities and mineral extraction on people and local communities	Population and health
9	To protect, improve and where necessary restore land and soil quality	Soils
10	To contribute towards moving up the waste hierarchy in Oxfordshire	Waste hierarchy
11	To enable Oxfordshire to be self-sufficient in its waste management and to provide for its local need for aggregates as set	Self-sufficiency

SA Objective		Reference Term
	out in the LAA	
12	To support Oxfordshire's economic growth and reduce disparities across the County	Economic growth

3 Assessment results

3.1 This chapter details the results of the assessment of reasonable alternatives for the sharp sand and gravel element of the minerals spatial strategy. At this stage of plan-making additional reasonable alternatives have only been identified against Policy M3, Principal locations for working aggregate minerals.

3.2 Firstly, there is the option of whether or not to include the Bampton/Clanfield area as a Strategic Resource Area (SRA) for sharp sand and gravel. This has resulted in Options 1 and 2 below. The second set of options relates to the distribution of sharp sand and gravel provision and is discussed in more detail later in this chapter.

Locations for minerals working (SRAs) for sharp sand and gravel

Option 1 – Submission version

3.3 This option involves retaining the sharp sand and gravel strategic resource areas (SRAs) as presented in the Submission Core Strategy (policy M3). These are as follows:

- The Thames, Lower Windrush and Lower Evenlode Valleys area from Standlake to Yarnton (SRA 6);
- The Thames and Lower Thame Valleys area from Oxford to Cholsey (SRA 5);
- The Thames Valley area from Caversham to Shiplake (SRA 4).

Option 2 – include Bampton/Clanfield

3.4 This option would retain all of the SRAs for sharp sand and gravel as per Option 1, plus an additional SRA in the Bampton/Clanfield area. As there is no mapped area for a Bampton/Clanfield SRA, for the purposes of this assessment the Mineral Safeguarding Area associated with Bampton/Clanfield has been used a proxy for a potential SRA.

3.5 The weighted average area that would need to be worked to provide a million tonnes of mineral resources is less for Bampton/Clanfield than for all other SRAs[1]. As such, it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel as other SRAs. Nevertheless, the weighted average area that would need to be worked varies within, as well as between, SRAs, and would therefore depend on the exact location of mineral workings.

3.6 The weighted average journey length from nominated sharp sand and gravel sites within Bampton/Clanfield to main markets is greater than for all other SRAs, ranging from an additional 8.6 million tonne miles (to Banbury and Bicester) to an additional 17.7 million tonne miles (to Didcot)[2]. As a result, the weighted average journey length from nominated sand and gravel sites within Option 2 is greater than Option 1, ranging from an additional 2.7 million tonne miles (to Banbury and Bicester) to an additional 5.6 million tonne miles (to Didcot). Option 2 is likely to lead to greater distances between source and market, therefore requiring more extensive lorry journeys, although this depends on the exact locations of minerals workings.

[1] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[2] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

Table 3.1 Assessment of reasonable alternatives to Policy M3: locations for minerals working (SRAs) for sharp sand and gravel

SA Objective		Assessment of effect						
		Duration			Reversibility	Scale	Permanence	Evidence and Reference
		Short term	Medium term	Long term				
1	Biodiversity & geodiversity	+/-	+/-	+/-	I	L	P	**Option 1: Submission version** Some of the Strategic Resource Areas (SRAs) contain areas designated as SSSIs and in addition there are SACs and SSSIs that are in close proximity to SRAs. However criteria within policies M4, M10 and Core Policy C7 will ensure that these designated sites are not adversely affected by mineral extraction. In particular Policy M4 includes requirements to protect the integrity of the Oxford Meadows SAC. The Habitats Regulations Assessment screening report has concluded a finding of no likely significant effect on these sites. There are also Conservation Target Areas associated with SRAs. The main aim within CTAs is to restore biodiversity at a landscape-scale through maintenance, restoration and creation of BAP priority habitats. When working ceases in these areas there is potential for restoration schemes to contribute positively to the planned restoration and habitat creation at a large-scale, which would have significant beneficial cumulative effects for biodiversity. However, these benefits would not be felt until the very long-term as it is likely to take years before the restoration plans are implemented. During the period of active working adverse effects are more likely.

		+/-	+/-	+/-	I	L	P	**Option 2: include Bampton/Clanfield** Some of the SRAs include areas designated as SSSIs or are within SSSI Impact Risk Zones for minerals workings. However, criteria within policies M4, M10 and C7 will ensure that these sites are not adversely affected by mineral extraction. In particular, Policy M4 includes requirements to protect the integrity of the Oxford Meadows SAC. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs in this option would be less than for Option 1[3]. As such, it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel as Option 1, which could help minimise biodiversity impacts, although this remains uncertain as this depends on the exact location of workings. There are also Conservation Target Areas associated with SRAs. The main aim within CTAs is to restore biodiversity at a landscape-scale through maintenance, restoration and creation of BAP priority habitats. When working ceases in these areas there is potential for restoration schemes to contribute positively to the planned restoration and habitat creation at a large-scale, which would have significant beneficial cumulative effects for biodiversity. However, these benefits would not be felt until the very long-term as it is likely to take years before the restoration plans are implemented. During the period of active working adverse effects are more likely.
		Summary for topic						Both Options 1 and 2 identify SRAs that contain nationally designated wildlife sites, although other policies include criteria to safeguard these. Option 2 is less likely to lead to minerals workings near sensitive receptors, as the weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs in this option would be less than for Option 1[4], although this remains uncertain as this depends on the exact location of workings.. This difference is not considered to be of a magnitude to alter the scores in the 'Duration' column. Both options have potential to enhance biodiversity in the long term through restoration projects.

[3] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[4] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

2a	Landscape	-/?	-/?	-/?	I	L	P	**Option 1: Submission version** SRAs 4 and 5 are in close proximity to the North Wessex Downs AONB and/or the Chilterns AONB. Mineral working in these areas could give rise to adverse effects on the setting of the AONBs in the short to medium term. Working in all the SRAs has the potential for negative effects on local landscape character, however criteria within policies M4, and Core Policy C8 will ensure that any adverse effects are minimised. In the longer term, restoration may return the landscape to its previous condition. However, this is likely to be in the very long-term, as it is likely to take years before the restoration plans are implemented. During the period of active working adverse effects are more likely.
		-/?	-/?	-/?	I	L	P	**Option 2: include Bampton/Clanfield** SRAs 4 and 5 are in close proximity to the North Wessex Downs AONB and the Chilterns AONB. A small part of the Bampton/Clanfield area is adjacent to the Cotswolds AONB. Mineral working in these areas could give rise to adverse effects on the setting of the AONBs in the short to medium term, although this depends on the specific locations of minerals workings. As there are currently no workings in the Bampton/Clanfield area, this option may open up a new area of the county to risk of landscape impacts from minerals extraction. Workings in all the SRAs has the potential for negative effects on local landscape character, however criteria within policies M4, and Core Policy C8 will ensure that any adverse effects are minimised. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs in this option would be less than for Option 1[5]. As such, it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel as Option 1, which could help minimise landscape impacts, although this remains uncertain as this depends on the exact location of workings.. In the longer term, restoration may return the landscape to its previous condition. However, this is likely to be in the very long-term, as it is likely to take years before the restoration plans are implemented. During the period of active working adverse effects are more likely.

[5] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

		Summary for topic						Options 1 and 2 both have potential to negatively impact protected landscapes, particularly AONBs. Option 2 has the potential to impact the setting of the Cotswolds AONB (in addition to the North Wessex Downs and Chilterns AONBs) due to the location of the Bampton/Clanfield area, although only workings in the western part of the area are at risk of affecting the setting of the AONB. Option 2 is less likely to lead to minerals workings near sensitive receptors, as the weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs in this option would be less than for Option 1[6], although this remains uncertain as this depends on the exact location of workings. This difference is not considered to be of a magnitude to alter the scores in the 'Duration' column.
2b	Historic environment	**-/?**	**-/?**	**-/?**	**I**	**L**	**P**	**Option 1: Submission version** The SRAs contain or are in close proximity to a range of heritage assets, including Scheduled Ancient Monuments, Registered Parks & Gardens and Listed Buildings. English Heritage, now Historic England, have highlighted that there are also significant archaeological constraints, particularly in parts of the Lower Windrush Valley, part of the Thames, Lower Windrush and Evenlode Valleys strategic resource area (SRA 6)[7,8] and parts of the Thames and Lower Thame Valleys strategic resource area[9] (SRA5). Minerals extraction in these areas could result in adverse effects to the heritage assets, however SRAs are intended as broad locations where extraction would be appropriate and there are numerous site options that are not in proximity to such heritage assets. Criteria within policies M4, and Core Policy C9 will ensure that any adverse effects are minimised.

[6] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[7] English Heritage (2012) Letter to Lois Partridge at Oxfordshire County Council, dated 17 January 2012
[8] Mullin, Booth, Hardy, Scott, Hayden, Hind and Spandl (2011) The Oxfordshire Aggregates and Archaeology Assessment
[9] Oxfordshire County Council (2015) Oxfordshire Minerals and Waste Local Plan Part 1 – Core Strategy, Proposed Submission Document: *paragraph 4.35*

		-/?	-/?	-/?	I	L	P	**Option 2: include Bampton/Clanfield** Some of the SRAs contain heritage assets, such as Scheduled Ancient Monuments, Registered Parks & Gardens and Listed Buildings, and/or are in close proximity to these. English Heritage, now Historic England, have highlighted that there are also significant archaeological constraints, particularly in parts of the Lower Windrush Valley, part of the Thames, Lower Windrush and Evenlode Valleys strategic resource area (SRA 6)[10,11] and parts of the Thames and Lower Thame Valleys strategic resource area[12] (SRA5). Minerals extraction in these areas could result in adverse effects to the heritage assets, however SRAs are intended as broad locations where extraction would be appropriate and there are numerous site options that are not in proximity to such heritage assets. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs in this option would be less than for Option 1[13]. As such, it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel as Option 1, which could help minimise impacts on the historic environment, although this remains uncertain as this depends on the exact location of workings. Criteria within policies M4, and Core Policy C9 will ensure that any adverse effects are minimised.
		Summary for topic						Options 1 and 2 may both lead to minerals working in proximity to heritage assets, however there are numerous potential site options within SRAs that are not in proximity to such heritage assets. Option 2 is less likely to lead to minerals workings near sensitive receptors, as the weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs in this option would be less than for Option 1[14], although this remains uncertain as this depends on the exact location of workings.. This difference is not considered to be of a magnitude to alter the scores in the 'Duration' column. Criteria within policies M4, and Core Policy C9 will ensure that any adverse effects are minimised.

[10] English Heritage (2012) Letter to Lois Partridge at Oxfordshire County Council, dated 17 January 2012
[11] Mullin, Booth, Hardy, Scott, Hayden, Hind and Spandl (2011) The Oxfordshire Aggregates and Archaeology Assessment
[12] Oxfordshire County Council (2015) Oxfordshire Minerals and Waste Local Plan Part 1 – Core Strategy, Proposed Submission Document: *paragraph 4.35*
[13] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[14] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

3	Water quality	**-/?**	**-/?**	**-/?**	**I**	**L**	**P**	**Option 1: Submission version** There is potential for adverse effects on surface and ground water in the SRAs as a result of mineral workings. Effects may include the modification of surface flows to watercourses or existing ponds, and alteration of groundwater seepages, flushes or spring flows. There is potential for cumulative negative effects on ground water flow as a result of concentration of mineral workings within one area. Policy M4 includes requirements to protect the integrity of the Oxford Meadows SAC as 'it must be demonstrated that there will be no change in water levels' at these sites.
		-/?	**-/?**	**-/?**	**I**	**L**	**P**	**Option 2: include Bampton/Clanfield** There is potential for adverse effects on surface and ground water in the SRAs as a result of mineral workings. Effects may include the modification of surface flows to watercourses or existing ponds, and alteration of groundwater seepages, flushes or spring flows. There is potential for cumulative negative effects on ground water flow as a result of concentration of mineral workings within one area. Working in the Bampton/Clanfield area would open up a new part of the county to risks to water quality. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs in this option would be less than for Option 1[15]. As such, it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel as Option 1, which could help minimise water quality impacts, although this remains uncertain as this depends on the exact location of workings. Policy M4 includes requirements to protect the integrity of the Oxford Meadows SAC as 'it must be demonstrated that there will be no change in water levels' at these sites.
		Summary for topic						Both Options 1 and 2 may lead to modification of surface water flows and groundwater seepages. Option 2 is less likely to lead to minerals workings near sensitive receptors, as the weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs in this option would be less than for Option 1[16], although this remains uncertain as this depends on the exact location of workings. This difference is not considered to be of a magnitude to alter the scores in the 'Duration' column. Policy M4 is expected to ensure that water levels at Oxford Meadows SAC are not subject to change as a result of mineral workings.

[15] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[16] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

4	Air quality	-	-	-	R	L	P	**Option 1: Submission version** The SRAs identified in this option include all areas in the County where sharp sand and gravel minerals are currently worked, except the relatively small workings at Finmere and Faringdon. There is potential for air pollution associated with HGV movements over the lifetime of the working permissions and into the restoration period. This includes the possibility of increased traffic within the City of Oxford Air Quality Management Area (AQMA), although these effects would result regardless of the location of minerals extraction. Policy C5 should help to mitigate any local adverse effects.
		-	-	-	R	L	P	**Option 2: include Bampton/Clanfield** There is potential for air pollution associated with HGV movements over the lifetime of the working permissions and into the restoration period. Notable increases in air pollution are more likely to arise from this option as HGVs are likely to have to travel further to transport aggregates to market. The weighted average journey length from nominated sharp sand and gravel sites within the SRAs to main markets is generally greater for Option 2,ranging from an additional 2.7 million tonne miles (to Banbury and Bicester) to an additional 5.6 million tonne miles (to Didcot)[17], although this depends on the exact location of mineral workings. Option 2 is likely to lead to greater distances between source and market, therefore requiring more extensive lorry journeys and increased associated impacts on air quality. Policy C5 should help to mitigate any adverse effects.
		Summary for topic						Option 1 is expected to perform better than Option 2, as the weighted average distance to market is likely to be greater for Option 2, ranging from an additional 2.7 million tonne miles (to Banbury and Bicester) to an additional 5.6 million tonne miles (to Didcot)[18], due to the inclusion of the Bampton/Clanfield area, although this depends on the exact location of mineral workings.
5	Greenhouse gas emissions	+	+	+	R	N	P	**Option 1: Submission version** Greenhouse gas emissions associated with extraction, processing and HGV movements would result wherever minerals are extracted. The distribution of SRAs across the County in relation to locations of demand will help to reduce the transportation distances for minerals and so minor positive effects are predicted for this objective.

[17] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[18] *Ibid*

		-	-	-	R	N	P	**Option 2: include Bampton/Clanfield** Greenhouse gas emissions associated with extraction, processing and HGV movements would result wherever minerals are extracted. Minerals extraction in the Bampton/Clanfield area is likely to lead to greater greenhouse gas emissions. The weighted average journey length from nominated sharp sand and gravel sites within the SRAs to main markets is generally longer for Option 2,ranging from an additional 2.7 million tonne miles (to Banbury and Bicester) to an additional 5.6 million tonne miles (to Didcot)[19], although this depends on the exact location of mineral workings therefore requiring more extensive lorry journeys and associated increases in greenhouse gas emissions.
		Summary for topic						Greenhouse gas emissions associated with extraction, processing and HGV movements would result regardless of the location of minerals extraction. However, the weighted average distance to market is likely to be greater for Option 2, ranging from an additional 2.7 million tonne miles (to Banbury and Bicester) to an additional 5.6 million tonne miles (to Didcot)[20], due to the inclusion of the Bampton/Clanfield area, although this depends on the exact location of mineral workings. Option 1 is likely to minimise greenhouse gas emissions as the distribution of SRAs across the County in relation to locations of demand will help to reduce the transportation distances for minerals.
6	Flood risk	**0**	**0**	**+**	**I**	**L**	**P**	**Option 1: Submission version** Some parts of the SRAs for sharp sand and gravel lie within high flood risk zones (e.g. SRAs 4, 5 and 6 along the Thames Valley). Paragraph 100 of the NPPF requires that development should be avoided in areas of high flood risk where possible and requires the sequential and (where appropriate), the exception tests to be applied. The requirement to apply these tests is explicitly included in common core Policy C3: Flooding. Sand and gravel extraction is considered to be water compatible development but the sequential test is still applied to the assessment of these areas as flooding may cause damage, disruption and loss of earnings to this type of development. For example, supporting infrastructure would be at risk from flooding and should be located away from the high risk areas. Extraction of minerals in these areas could offer opportunities to increase flood storage capacity through restoration, thereby reducing the risk of flooding in these areas in the long term (i.e. after the operational phase of a site has ended).

[19] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[20] *Ibid*

		0	**0**	**+**	**I**	**L**	**P**	**Option 2: include Bampton/Clanfield** Some parts of the SRAs for sharp sand and gravel lie within Flood Zones 2 and 3, which are at medium to high risk of flooding (e.g. SRAs 4, 5 and 6 along the Thames Valley and the Bampton/Clanfield area experiences flooding from the Thames and its tributaries). Development should be avoided in the floodplain where possible and requires the sequential and (where appropriate), the exception tests to be applied. The requirement to apply these tests is explicitly included in common core Policy C3: Flooding. Sand and gravel extraction is considered to be compatible development but the sequential test is still applied to the assessment of these areas as flooding may cause damage, disruption and loss of earnings to this type of development. For example, supporting infrastructure would be at risk from flooding and should be located away from the high risk areas. Extraction of minerals in these areas could offer opportunities to increase flood storage capacity through restoration, thereby reducing the risk of flooding in these areas in the long term (i.e. after the operational phase of a site has ended).
		Summary for topic						Options 1 and 2 both have potential to lead to sharp sand and gravel extraction in areas of medium to high flood risk. This is water compatible development and may lead to increased flood storage capacity in the long term. This could take place as part of the restoration of the site, after the operational phase has ended, thus positive effects are only expected in the long term.
7	Transport effects	**-**	**-**	**-**	**R**	**L**	**P**	**Option 1: Submission version** Continued and concentrated working in the existing areas is likely to result in cumulative effects in terms of congestion, road maintenance and safety. However, mitigation measures at the planning application stage can help reduce such effects where new planning permissions are sought. Core Policies C5 and C10 require proposals to demonstrate that they will not have unacceptable effects on traffic and that they will maintain and/or improve road safety and the efficiency of the road network, which are expected to help mitigate any effects. It is an objective of the Core Strategy to minimise the transport impact of mineral development by minimising the distance that minerals need to be transported by road, from quarry to market, which would help to minimise negative effects in Oxfordshire and the wider area. Any impact is likely to be greatest in the northern part of the County, particularly in West Oxfordshire District Council area, where sharp sand and gravel resources and production are most concentrated. This may contribute to an increase in traffic on the A40. Local effects should be addressed through the application of the core policies, particularly Policies C5 and C10, in the allocation of sites and at the planning application stage.

		-	-	-	R	L	P	**Option 2: include Bampton/Clanfield** Continued and concentrated working in the existing areas is likely to result in cumulative effects in terms of congestion, road maintenance and safety. Local effects should be addressed through the allocation of sites and at the planning application stage. Core Policies C5 and C10 require proposals to demonstrate that they will not have unacceptable effects on traffic and that they will maintain and/or improve road safety and the efficiency of the road network, which are expected to help mitigate any effects. The weighted average journey length from nominated sharp sand and gravel sites within the SRAs to main markets is generally longer for Option 2, ranging from an additional 2.7 million tonne miles (to Banbury and Bicester) to an additional 5.6 million tonne miles (to Didcot)[21], therefore requiring more extensive lorry journeys, although this depends on the exact location of mineral workings.
		Summary for topic						Options 1 and 2 are both likely to have negative implications for transport, as continued and concentrated working in the existing areas is likely to result in cumulative effects in terms of congestion, road maintenance and safety. The impacts of Option 2 are expected to be greater as this option is likely to lead to an increase in length of lorry journeys to market, ranging from an additional 2.7 million tonne miles (to Banbury and Bicester) to an additional 5.6 million tonne miles (to Didcot)[22], due to the inclusion of the Bampton/Clanfield area, although this depends on the exact location of mineral workings. The SA 'score' against short, medium and long term effects is the same for both options as, although Option 2 is expected to have greater effects, this is not expected to be sufficient to lead to a significant negative effect on transport.

[21] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[22] *Ibid*

8	Population and health	**-/?**	**-/?**	**+/?**	**I**	**L**	**P**	**<u>Option 1: Submission version</u>** The SRAs are associated with the existing sharp sand and gravel working areas (except Finmere and Faringdon) and therefore the great majority of those communities that are currently adversely affected by sharp sand and gravel mineral workings are expected to continue to experience adverse effects for the plan period and longer term. Increased workings in these areas, or extending existing workings, could lead to intensified and longer-term effects on these communities. Once sites are fully worked out and restored, these adverse effects should be reduced, and over time there may be positive permanent effects as a result of restoration initiatives. The degree and nature of effects will be dependent on mitigation measures put in place through new planning permissions, proximity to sensitive receptors and the duration of working. Core policies, particularly Policy C5, are expected to help mitigate any adverse effects. There may also be future extraction in those parts of the SRAs where local communities are not currently affected by minerals operations. There is potential for negative adverse effects on local communities near to any new minerals workings as a result of dust, noise, disruption, adverse visual effects and traffic congestion. Alternatively, distributing such effects over a greater number of communities could reduce the intensity and timescale of negative effects on communities already experiencing impacts from minerals workings. The extent of these adverse effects will depend on the mitigation measures put in place, proximity of workings to sensitive receptors and the duration of working. Negative effects should be addressed through the application of the core policies (particularly Policy C5), in the allocation of sites and at the planning application stage.

		-/?	-/?	+/?	I	L	P	**Option 2: include Bampton/Clanfield** The SRAs (except Bampton/Clanfield) are associated with the existing sharp sand and gravel working areas (except Finmere and Faringdon) and therefore the great majority of those communities that are currently adversely affected by sharp sand and gravel mineral workings are expected to continue to experience adverse effects for the plan period and longer term. Increased workings in these areas, or extending existing workings, could lead to intensified and longer-term effects on these communities. Once sites are fully worked out and restored, these adverse effects should be reduced, and over time there may be positive permanent effects as a result of restoration initiatives. The degree and nature of effects will be dependent on mitigation measures put in place through new planning permissions, proximity to sensitive receptors and the duration of working. Core policies, particularly Policy C5, are expected to help mitigate these effects. This option is more likely to lead to future extraction in those parts of the SRAs where local communities are not currently affected by minerals operations, particularly at Bampton/Clanfield as there are currently no workings in this area. There is potential for negative adverse effects on local communities near to any new minerals workings as a result of dust, noise, disruption, adverse visual effects and traffic congestion. The extent of these adverse effects will depend on the mitigation measures put in place, proximity of workings to sensitive receptors and the duration of working – all of which will be addressed at the site specific level. Effects should be addressed through the application of the core policies (particularly Policy C5), in the allocation of sites and at the planning application stage.
		Summary for topic						Options 1 and 2 are both expected to have negative effects in the short term. Communities that currently experience adverse effects due to minerals workings may continue to do so and additional communities may also be affected. Additional communities are more likely to be affected as a result of Option 2, as there are currently no minerals workings in the Bampton/Clanfield area, although this may help reduce the intensity and timescale of effects on communities currently experiencing adverse effects from minerals workings. The SA 'score' against short, medium and long term effects is the same for both options, as any differences are not expected to be sufficient to lead to a significant negative effect on population and health. Restoration of sites may have positive implications for local communities in the long term.

9	Soils	-	-	-/?	I	L	P	**Option 1: Submission version** Minerals extraction is likely to lead to loss of best and most versatile agricultural land, as there is a large area of Grade 2 agricultural land within SRA 6 and there are extensive areas of Grade 2 and Grade 3a agricultural land along the Thames valley and its tributaries, where most of the sand and gravel resource is located[23] (i.e. SRAs 4 and 5). This would be lost to minerals extraction. Agricultural land may be replaced through restoration in the long term. However, the Core Strategy notes that, because of a general shortage of inert waste material for infilling, sand and gravel workings in river valleys (i.e. all SRAs for sand and gravel) are often restored to wetlands. The Core Strategy states that when suitable material is available, consideration should be given to filling below original levels to improve flood storage capacity[24]. Given these factors, it is considered that agricultural land is likely to be permanently lost at these sites.
		-	-	-/?	I	L	P	**Option 2: include Bampton/Clanfield** Minerals extraction is likely to lead to loss of best and most versatile agricultural land, as there is a large area of Grade 2 agricultural land within SRA 6 and Bampton/Clanfield, and there are extensive areas of Grade 2 and Grade 3a agricultural land along the Thames valley and its tributaries, where most of the sand and gravel resource is located[25] (i.e. SRAs 4 and 5). This would be lost to minerals extraction. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs in this option would be less than for Option 1[26]. As such, it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel as Option 1, which could help minimise impacts on soils, although this remains uncertain as this depends on the exact location of workings. Agricultural land may be replaced through restoration in the long term. However, the Core Strategy notes that, because of a general shortage of inert waste material for infilling, sand and gravel workings in river valleys (i.e. all SRAs for sand and gravel) are often restored to wetlands. The Core Strategy states that when suitable material is available, consideration should be given to filling below original levels to improve flood storage capacity[27]. Given these factors, it is considered that agricultural land is likely to be permanently lost at these sites.

[23] Oxfordshire County Council (2016) Topic Paper: Restoration of Mineral Workings
[24] Oxfordshire County Council (2015) Oxfordshire Minerals and Waste Local Plan Part 1 – Core Strategy, Proposed Submission Document: *paragraph 4.81*
[25] Oxfordshire County Council (2016) Topic Paper: Restoration of Mineral Workings
[26] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[27] Oxfordshire County Council (2015) Oxfordshire Minerals and Waste Local Plan Part 1 – Core Strategy, Proposed Submission Document: *paragraph 4.81*

		Summary for topic						Options 1 and 2 are likely to lead to the loss of best and most versatile agricultural land, Grade 2 agricultural land is present in all sharp sand and gravel SRAs. Option 2 is less likely to lead to minerals workings near sensitive receptors, as the weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs in this option would be less than for Option 1[28], although this remains uncertain as this depends on the exact location of workings. This difference is not considered to be of a magnitude to alter the scores in the 'Duration' column. While SRAs constitute broad areas where minerals extraction may be appropriate, of which the entire area will not be worked, the areas of Grade 2 agricultural land are extensive and therefore it is likely that some workings will coincide with this.
10	Waste hierarchy	**0**	**0**	**0**				**Option 1: Submission version** No predicted effects.
		0	**0**	**0**				**Option 2: include Bampton/Clanfield** No predicted effects.
		Summary for topic						Both Options 1 and 2 are not expected to have any effects with regards to this objective.
11	Self-sufficiency	**+**	**++**	**++**	**R**	**L**	**P**	**Option 1: Submission version** This option makes provision to enable the supply of aggregate minerals from land-won sources within Oxfordshire to meet the requirement identified in the most recent Local Aggregate Assessment (LAA). The choice of potential extraction sites will be less without the inclusion of Bampton/Clanfield as an SRA, but it is understood that there will still be a wide choice of potential extraction sites and that this will not prevent provision of aggregate at levels identified in the LAA.
		+	**++**	**++**	**R**	**L**	**P**	**Option 2: include Bampton/Clanfield** This option makes provision to enable the supply of aggregate minerals from land-won sources within Oxfordshire to meet the requirement identified in the most recent Local Aggregate Assessment.
		Summary for topic						Options 1 and 2 are likely to have similar effects with regards to self-sufficiency, as both will contribute to supply of minerals within Oxfordshire and enable the requirement identified in the most recent Local Aggregates Assessment (LAA) to be met.

[28] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

12	Economic growth	+	+	+	R	L	P	**Option 1: Submission version** The SRAs for sharp sand and gravel extraction are well located in terms of proximity to the markets and provide potential for investment and job creation which supports the local economy and has a long term positive effect on this SA objective.
		+/?	+/?	+/?	R	L	P	**Option 2: include Bampton/Clanfield** The SRAs for sharp sand and gravel extraction are well located in terms of proximity to the markets, with the exception of the Bampton/Clanfield area. This may make the Bampton/Clanfield area less attractive for potential investment, although there are a number of nominated mineral extraction sites within this area. The economic implications of the increased distance to market from Bampton/Clanfield remain uncertain. Any expanded and new minerals extraction provides potential for job creation which supports the local economy and has a long term positive effect on this SA objective.
		Summary for topic						Options 1 and 2 are both likely to contribute to the local economy in terms of investment and employment. The economic implications of the increased distance to market from Bampton/Clanfield remain uncertain.

Recommendation of preferred option	The negative effects of Option 2 (as compared with Option 1) relate to the inclusion of the Bampton/Clanfield area as an SRA. The weighted average distance from minerals workings to market is greater for Option 2, than for Option 1. As such, Option 2 would lead to increased emissions of air pollution and greenhouse gases associated with HGV transportation (SA Objectives 4 and 5), although this depends on the exact location of mineral workings. Option 2 would also be likely to lead to greater effects on transport, including increased congestion, or congestion over a wider area, and increased requirements for road maintenance (SA Objective 7). For this objective, the SA 'score' against short, medium and long term effects is the same for both options as, although Option 2 is expected to have slightly greater effects, it is not expected to lead to a significant negative effect on transport. Greater weighted average distance to market may result in lower economic benefits from Option 2, as it may appear a less attractive option for investment and bring smaller financial benefits, although distances depend on the exact location of mineral workings (SA objective 12). With regards to SA Objectives 1, 2a, 2b, 3 and 9, Option 2 performs slightly better. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs in this option would be less than for Option 1[29]. As such, it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel as Option 1, which could help minimise impacts, although this remains uncertain as this depends on the exact location of workings. Both options perform similarly with regards to SA Objectives 6 and 10, as these are not affected by size of the area to be worked or distance to market. While Option 1 would result in a more limited range of SRAs, which would restrict the choice of potential site allocations, it is considered to be a more sustainable option overall due to having a smaller average distance between source and market, leading to associated decreases in air pollution and greenhouse gas emissions.

[29] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

Distribution of minerals provision

3.7 This set of alternatives relates to the relative distribution of additional provision for sharp sand and gravel between northern Oxfordshire (West Oxfordshire and Cherwell Districts) and southern Oxfordshire (Vale of the White Horse and South Oxfordshire Districts). Oxford City is split 50:50 between northern and southern Oxfordshire. The reasonable alternatives are presented as Options 1 to 4 below.

3.8 The total requirement for sharp sand and gravel in the plan period is 18.27 mt. The current permitted reserves available for working during the plan period total 11.85 mt. Taking into account sales in 2014 and 2015 of 1.41 mt, this leaves a remaining requirement of approximately 5 mt to be provided within the plan period[30]. It is for this shortfall that the Core Strategy needs to make provision and therefore the options presented below relate to this figure.

3.9 Currently, approximately 45% of sharp sand and gravel production capacity in Oxfordshire is in southern Oxfordshire of the county and 55% is in northern Oxfordshire. Approximately 35%of permitted reserves of sharp sand and gravel in Oxfordshire are in southern Oxfordshire of the county and 65% of permitted reserves of sharp sand and gravel are in northern Oxfordshire[31]. Option 2 would continue this distribution.

3.10 The Evidence Base for Spatial Strategy Alternatives for Delivery Requirement for Sharp Sand and Gravel[32] indicates that there is almost a 50:50 split between northern and southern Oxfordshire in terms of growth in population, housing, employment and provision of land for economic development. These figures indicate a nearly equal split in demand for aggregate materials between northern Oxfordshire and southern Oxfordshire. As minerals provision is currently higher in northern Oxfordshire, allocating 75% additional minerals provision over the plan period to southern Oxfordshire and the remaining 25% to northern Oxfordshire (i.e. Option 3) would result in an overall 50:50 split of production capacity between northern and southern Oxfordshire over than plan period.

3.11 Options 1 and 4, to allocate 100% of the additional sharp sand and gravel requirement to northern Oxfordshire and 100% to southern Oxfordshire respectively, were proposed in representations on the Proposed Submission Core Strategy.

3.12 It has been assumed that areas to be worked will be within the sand and gravel SRAs in each area. Note that for the purposes of this assessment, northern Oxfordshire is assumed to include the SRA presented in Policy M3 of the Submission Core Strategy (i.e. including SRA6 and excluding Bampton/Clanfield).

3.13 The weighted average area required to produce a million tonnes of sand and gravel resources at nominated sites in northern Oxfordshire is 19.96 ha, which is less than that for nominated sites in southern Oxfordshire, which would require a weighted average area of 22.51ha to extract a million tonnes[33]. As such, it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel in northern Oxfordshire. Effects will also depend on the exact location of minerals workings, as mineral thickness, and consequently the area required to extract a million tonnes of mineral resources, varies within SRAs.

3.14 The weighted average journey length from nominated sharp sand and gravel sites to main markets varies both within and between nominated sites in northern and southern Oxfordshire. The greatest weighted average journey lengths are between nominated sites in northern Oxfordshire and Didcot, in southern Oxfordshire, (an additional 10.4 million tonne miles) and between nominated sites in southern Oxfordshire and Banbury and Bicester, in northern Oxfordshire, (an additional 8.2 million tonne miles). Limiting additional minerals extraction to either northern or southern Oxfordshire alone (Options 1 and 4 respectively) is expected to result

[30] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[31] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[32] Oxfordshire County Council (2016) Evidence Base for Spatial Strategy Alternatives for Delivery Requirement for Sharp Sand and Gravel
[33] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

either in minerals being transported long distances to markets in the southern parts of the county (for Option 1) or the northern parts of the county (Option 2), or an increased likelihood that sharp sand and gravel users near the southern or northern borders of Oxfordshire may choose to source minerals from outside the county.

Option 1 – 0% Southern 100% Northern

3.15 Additional requirement: 0% southern Oxon, 100% northern Oxon (as proposed in representations).

Option 2 – 35% Southern, 65% Northern

3.16 Additional Requirement: 35% southern Oxon, 65% northern Oxon (current situation).

Option 3 – 75% Southern, 25% Northern

3.17 Additional Requirement: 75% southern Oxon, 25% northern Oxon (split required to achieve an approximate 50:50 split of production capacity to reflect the estimated 50:50 split in future demand between the northern and southern parts of the County). The percentage in the south is greater than that in the west as the existing permitted reserves are greater in the west (including a permission at Gill Mill which will continue right through the plan period and beyond).

Option 4 – 100% Southern, 0% Northern

3.18 Additional requirement: 100% southern Oxon, 0% northern Oxon (as proposed in representations).

Table 3.2 Assessment of reasonable alternatives to Policy M3: distribution of minerals provision

SA Objective		Assessment of effect						
		Duration			Reversibility	Scale	Permanence	Evidence and Reference
		Short term	Medium term	Long term				
1	Biodiversity & geodiversity	+/-	+/-	+/-	I	L	P	**Option 1: 0% Southern, 100% Northern** The sharp sand and gravel SRA in northern Oxfordshire (SRA 6) includes areas designated as SSSIs and that are within SSSI Impact Risk Zones for minerals workings. Criteria within policies M4, M10 and C7 are expected to ensure that these sites are not adversely affected by mineral extraction. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs would be less in northern Oxfordshire, than southern[34]. As such, it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than all other options, which could help minimise biodiversity and geodiversity impacts, although this remains uncertain as this depends on the exact location of workings. There are also Conservation Target Areas associated with the SRA. When working ceases in these areas there is potential for restoration schemes to contribute positively to the planned restoration and habitat creation at a large-scale, which would have significant beneficial cumulative effects for biodiversity. However, these benefits would not be felt until the very long-term as it is likely to take some years before the restoration plans are completed. During the period of active working adverse effects are more likely.

[34] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

		+/-	+/-	+/-	I	L	P	**Option 2: 35% Southern, 65% Northern** SRA6 in northern Oxfordshire includes areas designated as SSSIs and, along with SRA5 in southern Oxfordshire, includes areas within SSSI Impact Risk Zones for minerals workings. Criteria within policies M4, M10 and C7 are expected to ensure that these sites are not adversely affected by mineral extraction. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs would be less in northern Oxfordshire, than southern[35]. As such, it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than Options 3 and 4, which could help minimise biodiversity and geodiversity impacts, although this remains uncertain as this depends on the exact location of workings. There are also Conservation Target Areas associated with SRAs. When working ceases in these areas there is potential for restoration schemes to contribute positively to the planned restoration and habitat creation at a large-scale, which would have significant beneficial cumulative effects for biodiversity. However, these benefits would not be felt until the very long-term as it is likely to take some years before the restoration plans are completed. During the period of active working adverse effects are more likely.

[35] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

		+/-	+/-	+/-	I	L	P	**Option 3: 75% Southern, 25% Northern** SRA6 in northern Oxfordshire includes areas designated as SSSIs and, along with SRA5 in southern Oxfordshire, includes areas within SSSI Impact Risk Zones for minerals workings. Criteria within policies M4, M10 and C7 are expected to ensure that these sites are not adversely affected by mineral extraction. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs would be greater in southern Oxfordshire, than northern[36]. As such, it is likely that a larger area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than Options 1 and 2, which could increase the scale and likelihood of biodiversity and geodiversity impacts, although this remains uncertain as this depends on the exact location of workings. There are also Conservation Target Areas associated with SRAs. When working ceases in these areas there is potential for restoration schemes to contribute positively to the planned restoration and habitat creation at a large-scale, which would have significant beneficial cumulative effects for biodiversity. However, these benefits would not be felt until the very long-term as it is likely to take years before the restoration plans are completed. During the period of active working adverse effects are more likely.

[36] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

		+/-	+/-	+/-	I	L	P	**Option 4: 100% Southern, 0% Northern** SRA5 in southern Oxfordshire includes areas within SSSI Impact Risk Zones for minerals workings. Criteria within policies M4, M10 and C7 are expected to ensure that these sites are not adversely affected by mineral extraction. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs would be greater in southern Oxfordshire, than northern[37]. As such, it is likely that a larger area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than all other options, which could increase the scale and likelihood of biodiversity and geodiversity impacts, although this remains uncertain as this depends on the exact location of workings. There are also Conservation Target Areas associated with SRAs. When working ceases in these areas there is potential for restoration schemes to contribute positively to the planned restoration and habitat creation at a large-scale, which would have significant beneficial cumulative effects for biodiversity. However, these benefits would not be felt until the very long-term as it is likely to take years before the restoration plans are completed. During the period of active working adverse effects are more likely.
		Summary for topic						All options perform similarly with regards to biodiversity and geodiversity. Effects on biodiversity and geodiversity are likely to be site-specific. Potential negative impacts on sites designated for biodiversity interests are likely to be minimised by Criteria within policies M4, M10 and C7. Option 1 performs slightly better than the other options, as it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than southern Oxfordshire[38], although this depends on the exact location of minerals workings. All options may lead to positive effects, such as net biodiversity gain, through restoration of sites.

[37] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[38] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

2a	Landscape	-/?	-/?	-/?	I	L	P	**Option 1: 0% Southern, 100% Northern** Effects of minerals workings in SRA6 would depend on the size and location of the workings. Workings in SRA6 in northern Oxfordshire could lead to negative effects on local landscape character, however criteria within policy M4, along with Core Policy C8 will ensure that any adverse effects are minimised. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs would be less in northern Oxfordshire, than southern[39]. As such, it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than all other options, which could help minimise landscape impacts, although this remains uncertain as this depends on the exact location of workings. In the longer term, restoration may return the landscape to its previous condition. However, this is likely to be in the very long-term, as it is likely to take some years before the restoration plans are completed. During the period of active working adverse effects are more likely.
		-/?	-/?	-/?	I	L	P	**Option 2: 35% Southern, 65% Northern** SRAs 4 and 5 in southern Oxfordshire are in close proximity to the North Wessex Downs and the Chilterns AONBs. The nature and extent of negative effects from workings would depend on the size and location of the workings. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs would be less in northern Oxfordshire, than southern[40]. As such, it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than Options 3 and 4, which could help minimise landscape impacts, although this remains uncertain as this depends on the exact location of workings. Working in either of these SRAs has the potential for negative effects on local landscape character, however criteria within policy M4, along with Core Policy C8 will ensure that any adverse effects are minimised. In the longer term, restoration may return the landscape to its previous condition. However, this is likely to be in the very long-term, as it is likely to take some years before the restoration plans are completed. During the period of active working adverse effects are more likely.

[39] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[40] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

		-/?	-/?	-/?	I	L	P	**Option 3: 75% Southern, 25% Northern** SRAs 4 and 5 in southern Oxfordshire are in close proximity to AONBs. The nature and extent of negative effects from workings would depend on size and location of the workings. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs would be greater in southern Oxfordshire, than northern[41]. As such, it is likely that a larger area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than Options 1 and 2, which could increase the scale and likelihood of landscape impacts, although this remains uncertain as this depends on the exact location of workings. Working in all the SRAs has the potential for negative effects on local landscape character, however criteria within policy M4, along with Core Policy C8 will ensure that any adverse effects are minimised. In the longer term, restoration may return the landscape to its previous condition. However, this is likely to be in the very long-term, as it is likely to take some years before the restoration plans are completed. During the period of active working adverse effects are more likely.
		-	-	-/?	I	L	P	**Option 4: 100% Southern, 0% Northern** SRAs 4 and 5 in southern Oxfordshire are in close proximity to the North Wessex Downs and Chilterns AONBs. In particular, workings at SRA 5 are likely to affect the settings of both AONBs and workings at SRA4 could affect the setting of the Chilterns AONB. The nature and extent of negative effects from workings would depend on size and location of the workings. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs would be greater in southern Oxfordshire, than northern[42]. As such, it is likely that a larger area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than all other options, which could increase the scale and likelihood of landscape impacts, although this remains uncertain as this depends on the exact location of workings. Working in all the SRAs has the potential for negative effects on local landscape character, however criteria within policy M4, along with Core Policy C8 will ensure that any adverse effects are minimised. In the longer term, restoration may return the landscape to its previous condition. However, this is likely to be in the very long-term, as it is likely to take some years before the restoration plans are completed. During the period of active working adverse effects are more likely.

[41] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[42] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

		Summary for topic					Options 2, 3 and 4 have potential to negatively affect AONBs, as SRAs 4 and 5 in southern Oxfordshire are in close proximity to the North Wessex Downs and Chilterns AONBs. Option 4 is most likely to result in negative effects in this regard, as minerals workings are more likely to be concentrated near an AONB under these options, although this is not likely to be of such a magnitude to change the scoring in the 'Duration' column. All options have potential to negatively impact local landscape character, however criteria within policy M4, along with Core Policy C8 will ensure that any adverse effects are minimised. Option 1 performs slightly better than the other options, as it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than southern Oxfordshire[43], although this depends on the exact location of workings.
2b	Historic environment	**-/?**	**-/?**	**-/?**	**I**	**L**	**P**	**Option 1: 0% Southern, 100% Northern** The SRA in northern Oxfordshire (SRA 6) contains heritage assets, such as Scheduled Ancient Monuments, conservation areas and Listed Buildings, and a small part of the SRA is in close proximity to the World Heritage Site and registered park and gardens at Blenheim Palace. English Heritage, now Historic England, have highlighted that there are also significant archaeological constraints, particularly in parts of the Lower Windrush Valley, part of the Thames, Lower Windrush and Evenlode Valleys strategic resource area (SRA 6)[44,45]. The Core Strategy states that the Council will work with English Heritage to ensure that important archaeology is given appropriate protection, but as SRA6 is the only sand and gravel SRA in northern Oxfordshire, there is a strong possibility that this option would lead to minerals workings in or near the Lower Windrush Valley. This could lead to damage or loss of archaeological features in this area, although the location and extent of such effects is dependent on the site and size of minerals workings. Criteria within policy M4, along with Core Policy C9, are likely to ensure that any adverse effects are minimised and any residual effects are not significant. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs would be less in northern Oxfordshire, than southern[46]. As such, it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than all other options, which could help minimise impacts on the historic environment, although this remains uncertain as this depends on the exact location of workings.

[43] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[44] English Heritage (2012) Letter to Lois Partridge at Oxfordshire County Council, dated 17 January 2012
[45] Mullin, Booth, Hardy, Scott, Hayden, Hind and Spandl (2011) The Oxfordshire Aggregates and Archaeology Assessment
[46] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

		-/?	-/?	-/?	I	L	P	**Option 2: 35% Southern, 65% Northern** SRA6, in northern Oxfordshire, and SRAs 4 and 5, in southern Oxfordshire, contain heritage assets, such as Scheduled Ancient Monuments, Registered Parks & Gardens, conservation areas and Listed Buildings, and/or are in close proximity to these. There are also significant archaeological constraints in parts of the Lower Windrush Valley part of the Thames, Lower Windrush and Evenlode Valleys strategic resource area (SRA 6)[47,48] and parts of the Thames and Lower Thame Valleys strategic resource area[49] (SRA5). The Core Strategy states that the Council will work with English Heritage to ensure that important archaeology is given appropriate protection. In addition, this option would lead to a greater choice of sites for minerals workings than Options 1 and 4, as all SRAs (4, 5 and 6) would be considered for sharp sand and gravel workings. This greater choice could help to avoid minerals workings in sensitive areas in both northern and southern Oxfordshire. The location and extent of negative effects on heritage assets is dependent on the site and size of minerals workings, however criteria within policy M4 and Core Policy C9 will ensure that any adverse effects are minimised. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs would be less in northern Oxfordshire, than southern[50]. As such, it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than Options 3 and 4, which could help minimise impacts on the historic environment, although this remains uncertain as this depends on the exact location of workings.

[47] English Heritage (2012) Letter to Lois Partridge at Oxfordshire County Council, dated 17 January 2012

[48] Mullin, Booth, Hardy, Scott, Hayden, Hind and Spandl (2011) The Oxfordshire Aggregates and Archaeology Assessment

[49] Oxfordshire County Council (2015) Oxfordshire Minerals and Waste Local Plan Part 1 – Core Strategy, Proposed Submission Document: *paragraph 4.35*

[50] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

		-/?	-/?	-/?	I	L	P	**Option 3: 75% Southern, 25% Northern** SRA6, in northern Oxfordshire, and SRAs 4 and 5, in southern Oxfordshire, contain heritage assets, such as Scheduled Ancient Monuments, Registered Parks & Gardens, conservation areas and Listed Buildings, and/or are in close proximity to these. There are also significant archaeological constraints in parts of the Lower Windrush Valley, part of the Thames, Lower Windrush and Evenlode Valleys strategic resource area (SRA 6)[51,52] and parts of the Thames and Lower Thame Valleys strategic resource area[53] (SRA5). The Core Strategy states that the Council will work with English Heritage to ensure that important archaeology is given appropriate protection. In addition, this option would lead to a greater choice of sites for minerals workings than Options 1 and 4, as all SRAs (4, 5 and 6) would be considered for sharp sand and gravel workings. This greater choice could help to avoid minerals workings in sensitive areas in both northern and southern Oxfordshire. The location and extent of negative effects on heritage assets is dependent on the site and size of minerals workings; however criteria within policy M4 and Core Policy C9 will ensure that any adverse effects are minimised. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs would be greater in southern Oxfordshire, than northern[54]. As such, it is likely that a larger area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than Options 1 and 2, which could increase the scale and likelihood of impacts on the historic environment, although this remains uncertain as this depends on the exact location of workings.

[51] English Heritage (2012) Letter to Lois Partridge at Oxfordshire County Council, dated 17 January 2012

[52] Mullin, Booth, Hardy, Scott, Hayden, Hind and Spandl (2011) The Oxfordshire Aggregates and Archaeology Assessment

[53] Oxfordshire County Council (2015) Oxfordshire Minerals and Waste Local Plan Part 1 – Core Strategy, Proposed Submission Document: *paragraph 4.35*

[54] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

		-/?	-/?	-/?	I	L	P

Option 4: 100% Southern, 0% Northern

SRAs 4 and 5 contain heritage assets, such as Scheduled Ancient Monuments, Registered Parks & Gardens, conservation areas and Listed Buildings, and/or are in close proximity to these.

There are also significant archaeological constraints in parts of the Thames and Lower Thame Valleys strategic resource area[55] (SRA5). The Core Strategy states that the Council will work with English Heritage to ensure that important archaeology is given appropriate protection.

The location and extent of negative effects on heritage assets is dependent on the site and size of minerals workings; however criteria within policy M4 and Core Policy C9 will ensure that any adverse effects are minimised.

The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs would be greater in southern Oxfordshire, than northern[56]. As such, it is likely that a larger area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than all other options, which could increase the scale and likelihood of impacts on the historic environment, although this remains uncertain as this depends on the exact location of workings.

Summary for topic

All options have potential to negatively affect heritage assets, but the nature of effects depends on the location and size of mineral workings. Option 1 may be most likely to have negative effects on the historic environment, as a significant part of this SRA consists of the Lower Windrush Valley, part of the Thames, Lower Windrush and Evenlode Valleys strategic resource area (SRA 6), (parts of which are a sensitive archaeological area) and it is the only SRA for sharp sand and gravel in northern Oxfordshire. SRA5, in southern Oxfordshire, includes parts of the Thames and Lower Thame Valleys, parts of which are also sensitive archaeological areas. Options 2 and 3 may be least likely to have negative effects, as they offer a wider range of site options, which may allow allocation of sites that avoid sensitive areas. Option 1 performs slightly better than the other options, as it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than southern Oxfordshire[57], although this depends on the exact location of workings. These differences are not considered to be of such a magnitude to change the scoring in the 'Duration' column.

[55] Oxfordshire County Council (2015) Oxfordshire Minerals and Waste Local Plan Part 1 – Core Strategy, Proposed Submission Document: *paragraph 4.35*
[56] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[57] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

3	Water quality	-/?	-/?	-/?	I	L	P	**Option 1: 0% Southern, 100% Northern** There is potential for adverse effects on surface and ground water in the SRA in northern Oxfordshire as a result of mineral workings. Effects may include the modification of surface flows to watercourses or existing ponds, and alteration of groundwater seepages, flushes or spring flows. There is potential for cumulative negative effects on ground water flow as a result of concentration of mineral workings within SRA6. Policy C4 may help mitigate any adverse effects, as it states that proposals would need to demonstrate there will be no unacceptable risk to quantity and quality of water resources. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs would be less in northern Oxfordshire, than southern[58]. As such, it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than all other options, which could help minimise impacts on water quality, although this remains uncertain as this depends on the exact location of workings. Policy M4 includes requirements to protect the integrity of the Oxford Meadows SAC as 'it must be demonstrated that there will be no change in water levels at these sites.
		-/?	-/?	-/?	I	L	P	**Option 2: 35% Southern, 65% Northern** There is potential for adverse effects on surface and ground water in the SRAs in northern and southern Oxfordshire as a result of mineral workings. Effects may include the modification of surface flows to watercourses or existing ponds, and alteration of groundwater seepages, flushes or spring flows. Policy C4 may help mitigate any adverse effects, as it states that proposals would need to demonstrate there will be no unacceptable risk to quantity and quality of water resources. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs would be less in northern Oxfordshire, than southern[59]. As such, it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than Options 3 and 4, which could help minimise impacts on water quality, although this remains uncertain as this depends on the exact location of workings. Policy M4 includes requirements to protect the integrity of the Oxford Meadows SAC as 'it must be demonstrated that there will be no change in water levels at these sites'.

[58] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[59] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

		-/?	-/?	-/?	I	L	P	**Option 3: 75% Southern, 25% Northern** There is potential for adverse effects on surface and ground water in the SRAs in northern and southern Oxfordshire as a result of mineral workings. Effects may include the modification of surface flows to watercourses or existing ponds, and alteration of groundwater seepages, flushes or spring flows. Policy C4 may help mitigate any adverse effects, as it states that proposals would need to demonstrate there will be no unacceptable risk to quantity and quality of water resources. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs would be greater in southern Oxfordshire, than northern[60]. As such, it is likely that a larger area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than Options 1 and 2, which could increase the scale and likelihood of water quality impacts, although this remains uncertain as this depends on the exact location of workings. Policy M4 includes requirements to protect the integrity of the Oxford Meadows SAC as 'it must be demonstrated that there will be no change in water levels at these sites'.
		-/?	-/?	-/?	I	L	P	**Option 4: 100% Southern, 0% Northern** There is potential for adverse effects on surface and ground water in the SRAs in southern Oxfordshire as a result of mineral workings. Effects may include the modification of surface flows to watercourses or existing ponds, and alteration of groundwater seepages, flushes or spring flows. There is potential for cumulative negative effects on ground water flow as a result of concentration of mineral workings within southern Oxfordshire (SRA4 & SRA5). Policy C4 may help mitigate any adverse effects, as it states that proposals would need to demonstrate there will be no unacceptable risk to quantity and quality of water resources. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs would be greater in southern Oxfordshire, than northern[61]. As such, it is likely that a larger area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than all other options, which could increase the scale and likelihood of water quality impacts, although this remains uncertain as this depends on the exact location of workings. Policy M4 includes requirements to protect the integrity of the Oxford Meadows SAC as 'it must be demonstrated that there will be no change in water levels at these sites'.

[60] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[61] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

		Summary for topic					All options have potential to alter surface water flows and groundwater seepages, although Policy C4 is expected to help minimise this. Option 1 performs slightly better than the other options, as it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than southern Oxfordshire[62], although this depends on the exact location of workings. Options 1 and 4 may have cumulative negative effects on ground water flow as a result of concentration of mineral workings within one part of Oxfordshire, although this is not likely to be of such a magnitude to change the scoring in the 'Duration' column.
4	Air quality	**-**	**-**	**-**	**R**	**L**	**P**	**Option 1: 0% Southern, 100% Northern** There is potential for air pollution associated with HGV movements in the identified area for working in northern Oxfordshire over the lifetime of the working permissions and into the restoration period. This option is likely to lead to increased air pollution as HGVs would have to travel further to transport sharp sand and gravel to market areas in the south of Oxfordshire[63]. For example, the weighted average distance from nominated sites in northern Oxfordshire to Didcot in southern Oxfordshire is 23.8 million tonne miles, whereas from nominated sites in northern Oxfordshire to Oxford is only 9.1 million tonne miles, although distances depend on the exact location of mineral workings. Policy C5 should help to mitigate any local adverse effects.
		-	**-**	**-**	**R**	**L**	**P**	**Option 2: 35% Southern, 65% Northern** There is potential for air pollution associated with HGV movements in the identified areas for working in northern and southern Oxfordshire over the lifetime of the working permissions and into the restoration period. This option may contribute to emissions from transport by retaining the pattern of greater extraction in the west, despite the fact there is a 50:50 split in demand for sand and gravel between the northern and southern areas of Oxfordshire. Policy C5 should help to mitigate any local adverse effects.
		+/?	**+/?**	**+/?**	**R**	**L**	**P**	**Option 3: 75% Southern, 25% Northern** This option would lead to sharp sand and gravel provision in closer proximity to main markets, which would reduce the length and time of journeys made by HGVs[64]. This is expected to minimise emissions of air pollutants associated with HGV movements and could improve local air quality.

[62] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[63] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[64] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

		-	-	-	R	L	P	**Option 4: 100% Southern, 0% Northern** There is potential for air pollution associated with HGV movements in the identified areas for working in southern Oxfordshire over the lifetime of the working permissions and into the restoration period. This option may lead to increased air pollution as HGVs would have to travel further to transport aggregates to market areas in the north of Oxfordshire[65]. For example, the weighted average distance from nominated sites in southern Oxfordshire to Banbury, in northern Oxfordshire, is 38.7 million tonne miles, whereas from nominated sites in southern Oxfordshire to Abingdon, in southern Oxfordshire, is only 9 million tonne miles, although distances depend on the exact location of mineral workings. Policy C5 should help to mitigate any local adverse effects.
		Summary for topic						All options may contribute to traffic within the City of Oxford AQMA. Options 1, 2 and 4 are likely to result in increased HGV movements and associated emissions. Options 1 and 4 are both likely to increase the weighted average journey for sharp sand and gravel from aggregate source to market[66], although this depends on the exact location of mineral workings, whereas Option 2 is unlikely to change this and Option 3 is likely to decrease this. As such, Option 3 is expected minimise effects on air quality, whereas Options 1 and 4 may lead to decreases in air quality.
5	Greenhouse gas emissions	-	-	-	R	N	P	**Option 1: 0% Southern, 100% Northern** Greenhouse gas emissions associated with extraction, processing and HGV movements would result regardless of the location of minerals extraction. This option may lead to increased greenhouse gas emissions as HGVs would have to travel further to transport sharp sand and gravel to market areas in the south of Oxfordshire[67]. For example, the weighted average distance from nominated sites in northern Oxfordshire to Didcot, in southern Oxfordshire, is 23.8 million tonne miles, whereas from nominated sites in northern Oxfordshire to Oxford is only 9.1 million tonne miles, although distances depend on the exact location of mineral workings.

[65] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[66] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[67] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

		-	-	-	R	N	P	**Option 2: 35% Southern, 65% Northern** Greenhouse gas emissions associated with extraction, processing and HGV movements would result regardless of the location of minerals extraction. Nevertheless, this option may contribute to emissions from transport by retaining the pattern of greater extraction in the west, despite the fact there is a 50:50 split in demand for sand and gravel between the northern and southern areas of Oxfordshire.
		+/?	+/?	+/?	R	N	P	**Option 3: 75% Southern, 25% Northern** Greenhouse gas emissions associated with extraction, processing and HGV movements would result regardless of the location of minerals extraction. This option would lead to aggregate provision in closer proximity to main markets, which would reduce the length and time of journeys made by HGVs[68], leading to minimisation of emissions associated with vehicular transport.
		-	-	-	R	N	P	**Option 4: 100% Southern, 0% Northern** Greenhouse gas emissions associated with extraction, processing and HGV movements would result regardless of the location of minerals extraction. This option may lead to increased greenhouse gas emissions as HGVs would have to travel further to transport sharp sand and gravel to market areas in the north of Oxfordshire. For example, the weighted average distance from nominated sites in southern Oxfordshire to Banbury, in northern Oxfordshire, is 38.7 million tonne miles, whereas from nominated sites in southern Oxfordshire to Abingdon, in southern Oxfordshire, is only 9 million tonne miles, although distances depend on the exact location of mineral workings.
		Summary for topic						Options 1 and 4 are both likely to increase the weighted average journey from aggregate source to market, although this depends on the exact location of mineral workings, whereas Option 2 is unlikely to change this and Option 3 is likely to decrease this[69]. As such, Option 3 is expected to minimise greenhouse gas emissions, whereas Options 1 and 4 may maximise these.

[68] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[69] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

6	Flood risk	**0**	**0**	**+**	**I**	**L**	**P**	**Option 1: 0% Southern, 100% Northern** Some parts of the SRA for sharp sand and gravel in northern Oxfordshire (SRA6) lie within Flood Zones 2 and 3, which are at medium to high risk of flooding. Development should be avoided in the floodplain (Flood Zone 3) where possible and requires the sequential and (where appropriate), the exception tests to be applied. The requirement to apply these tests is explicitly included in Core Policy C3: Flooding. Sand and gravel extraction is considered to be water compatible development but the sequential test is still applied to the assessment of these areas as flooding may cause damage, disruption and loss of earnings to this type of development. For example, supporting infrastructure would be at risk from flooding and should be located away from the high risk areas. Extraction of minerals in these areas could offer opportunities to increase flood storage capacity in the longer term, through restoration, thereby reducing the risk of flooding in these areas.
		0	**0**	**+**	**I**	**L**	**P**	**Option 2: 35% Southern, 65% Northern** Some parts of the SRAs for sharp sand and gravel in both northern and southern Oxfordshire lie within Flood Zones 2 and 3, which are at medium to high risk of flooding (i.e. SRAs 4, 5 and 6 along the Thames Valley). Development should be avoided in the floodplain where possible and requires the sequential and (where appropriate), the exception tests to be applied. The requirement to apply these tests is explicitly included in core Policy C3: Flooding. Sand and gravel extraction is considered to be water compatible development but the sequential test is still applied to the assessment of these areas as flooding may cause damage, disruption and loss of earnings to this type of development. For example, supporting infrastructure would be at risk from flooding and should be located away from the high risk areas. Extraction of minerals in these areas could offer opportunities to increase flood storage capacity in the longer term through restoration, thereby reducing the risk of flooding in these areas.

		0	**0**	**+**	**I**	**L**	**P**	**Option 3: 75% Southern, 25% Northern** Some parts of the SRAs for sharp sand and gravel in both northern and southern Oxfordshire lie within Flood Zones 2 and 3, which are at medium to high risk of flooding (i.e. SRAs 4, 5 and 6 along the Thames Valley). Development should be avoided in the floodplain where possible and requires the sequential and (where appropriate), the exception tests to be applied. The requirement to apply these tests is explicitly included in core Policy C3: Flooding. Sand and gravel extraction is considered to be water compatible development but the sequential test is still applied to the assessment of these areas as flooding may cause damage, disruption and loss of earnings to this type of development. For example, supporting infrastructure would be at risk from flooding and should be located away from the high risk areas. Extraction of minerals in these areas could offer opportunities to increase flood storage capacity in the longer term through restoration, thereby reducing the risk of flooding in these areas.
		0	**0**	**+**	**I**	**L**	**P**	**Option 4: 100% Southern, 0% Northern** Some parts of the SRAs for sharp sand and gravel in southern Oxfordshire (SRA5 and SRA4) lie within Flood Zones 2 and 3, which are at medium to high risk of flooding. Development should be avoided in the floodplain (Flood Zone 3) where possible and requires the sequential and (where appropriate), the exception tests to be applied. The requirement to apply these tests is explicitly included in Core Policy C3: Flooding. Sand and gravel extraction is considered to be water compatible development but the sequential test is still applied to the assessment of these areas as flooding may cause damage, disruption and loss of earnings to this type of development. For example, supporting infrastructure would be at risk from flooding and should be located away from the high risk areas. Extraction of minerals in these areas could offer opportunities to increase flood storage capacity in the longer term through restoration, thereby reducing the risk of flooding in these areas.
		Summary for topic						All options include SRAs with areas in Flood Zones 2 and 3, which are at medium to high risk of flooding. Sharp sand and gravel extraction is considered a water compatible development and mineral workings have potential to increase flood storage in the longer term, primarily through use as flood storage after restoration.

7	Transport effects	-	-	-	R	L	P	**Option 1: 0% Southern, 100% Northern** Increased working in any one particular area (i.e. SRA6) has potential for negative cumulative effects on the road network and communities near the area, particularly in terms of congestion, road maintenance and safety. Careful consideration should be given to access and road capacities when considering sites for further working. Local effects should be addressed through the application of the core policies in the allocation of sites and at the planning application stage. Concentrating development in northern Oxfordshire is likely to increase the average distance that aggregates must be transported to market[70] (due to the need to transport aggregates to southern Oxfordshire). For example, the weighted average distance from nominated sites in northern Oxfordshire to Didcot is 23.8 million tonne miles, whereas from nominated sites in northern Oxfordshire to Oxford is only 9.1 million tonne miles, although distances depend on the exact location of mineral workings. This could lead to increases in congestion over a wider part of the road network.
		-	-	-	R	L	P	**Option 2: 35% Southern, 65% Northern** Continued and concentrated working in the existing sand and gravel SRAs is likely to result in cumulative effects in terms of congestion, road maintenance and safety. Local effects should be addressed through the application of the core policies in the allocation of sites and at the planning application stage.
		+	+	+	R	L	P	**Option 3: 75% Southern, 25% Northern** Continued working in the existing sand and gravel SRAs is likely to result in cumulative effects in terms of congestion, road maintenance and safety. Local effects should be addressed through the application of the core policies in the allocation of sites and at the planning application stage. This policy recognises that future demand for sharp sand and gravel resources is likely to be split 50:50 between northern and southern Oxfordshire (see **paragraph 3.10** of this appendix). Allocating 75% of the additional requirement of sharp sand and gravel to southern Oxfordshire and the remaining 25% to northern Oxfordshire would result in an equal split of overall sharp sand and gravel provision between northern and southern Oxfordshire. In matching distribution of sharp sand and gravel workings with the distribution of demand, this option is likely to minimise the distance HGVs need to travel to market. This is likely to minimise any impacts on traffic, including congestion and road maintenance and could bring these below current levels.

[70] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

		-	-	-	R	L	P	**Option 4: 100% Southern, 0% Northern** Increased working in any one part of the county (i.e. in SRA4 & SRA5) has potential for negative cumulative effects on the road network and communities near the area, particularly in terms of congestion, road maintenance and safety. Careful consideration should be given to access and road capacities when considering sites for further working. Local effects should be addressed through the application of the core policies in the allocation of sites and at the planning application stage. Concentrating development in southern Oxfordshire is likely to increase the average distance that sharp sand and gravel is transported to market (due to the need to transport aggregates to the north of Oxfordshire). For example, the weighted average distance from nominated sites in southern Oxfordshire to Banbury is 38.7 million tonne miles, whereas from nominated sites in southern Oxfordshire to Abingdon is only 9 million tonne miles, although distances depend on the exact location of mineral workings. This could lead to increases in congestion over a wider part of the road network.
		Summary for topic						Option 3 performs best, as aligning locations of minerals supply and areas of demand will minimise the distance HGVs travel between source and market. Options 1 and 4 are likely to have the greatest negative effect on transport, as both these options will require HGVs to travel further to serve markets in the southern and northern parts of the county respectively. The SA 'score' against short, medium and long term effects is the same for Option 1, 2 and 4 as, although Options 1 and 4 are expected to have slightly greater effects, these are not expected to lead to a significant negative effects on transport.
8	Population and health	-	-	+/ ?	I	L	P	**Option 1: 0% Southern, 100% Northern** Whilst the SRA is associated with the existing sharp sand and gravel working areas (except Finmere and Faringdon), minerals workings are likely to expand and become more concentrated if sites in northern Oxfordshire are required to fulfil the entire sharp sand and gravel requirement. This may intensify existing adverse effects and also increase the likelihood that communities that are not currently affected by minerals operations may start to be affected by these. Potential negative adverse effects on local communities could arise as a result of dust, noise, disruption, adverse visual effects and traffic congestion. The extent of these adverse effects will depend on the mitigation measures put in place, proximity of workings to sensitive receptors and the duration of working – all of which will be addressed at the site specific level. Local effects should be addressed through the application of the core policies in the allocation of sites and at the planning application stage. Once sites are fully worked out and restored, these adverse effects should be reduced, and over time there may be positive permanent effects as a result of restoration initiatives.

		-/?	-/?	+/?	I	L	P	**Option 2: 35% Southern, 65% Northern** The SRAs are associated with the existing sharp sand and gravel working areas (except Finmere and Faringdon) and therefore those communities that are currently adversely affected by mineral workings are expected to continue to experience adverse effects for the plan period and longer term. Once sites are fully worked out and restored, these adverse effects should be reduced, and over time there may be positive permanent effects as a result of restoration initiatives. The degree and nature of effects will be dependent on mitigation measures put in place through new planning permissions, proximity to sensitive receptors and the duration of working. There may also be future extraction in areas where local communities are not currently affected by minerals operations. There is potential for negative adverse effects on local communities near to any new minerals as a result of dust, noise, disruption, adverse visual effects and traffic congestion. The extent of these adverse effects will depend on the mitigation measures put in place, proximity of workings to sensitive receptors and the duration of working – all of which will be addressed at the site specific level. Local effects should be addressed through the application of the core policies in the allocation of sites and at the planning application stage.
		-/?	-/?	+/?	I	L	P	**Option 3: 75% Southern, 25% Northern** The SRAs are associated with the existing sharp sand and gravel working areas (except Finmere and Faringdon) and therefore those communities that are currently adversely affected by mineral workings are expected to continue to experience adverse effects for the plan period and longer term. Once sites are fully worked out and restored, these adverse effects should be reduced, and over time there may be positive permanent effects as a result of restoration initiatives. The degree and nature of effects will be dependent on mitigation measures put in place through new planning permissions, proximity to sensitive receptors and the duration of working. There may also be future extraction in areas where local communities are not currently affected by minerals operations. There is potential for negative adverse effects on local communities near to any new minerals as a result of dust, noise, disruption, adverse visual effects and traffic congestion. The extent of these adverse effects will depend on the mitigation measures put in place, proximity of workings to sensitive receptors and the duration of working – all of which will be addressed at the site specific level. Local effects should be addressed through the application of the core policies in the allocation of sites and at the planning application stage.

		-	-	+/ ?	I	L	P	**Option 4: 100% Southern, 0% Northern** Whilst the SRAs are associated with the existing sharp sand and gravel working areas (except Finmere and Faringdon), minerals workings are likely to expand and become more concentrated if sites in southern Oxfordshire are required to fulfil the entire sharp sand and gravel requirement. This may intensify existing adverse effects and also increase the likelihood that communities that are not currently affected by minerals operations may start to be affected by these. Potential negative adverse effects on local communities could arise as a result of dust, noise, disruption, adverse visual effects and traffic congestion. The extent of these adverse effects will depend on the mitigation measures put in place, proximity of workings to sensitive receptors and the duration of working – all of which will be addressed at the site specific level. Local effects should be addressed through the application of the core policies in the allocation of sites and at the planning application stage. Once sites are fully worked out and restored, these adverse effects should be reduced, and over time there may be positive permanent effects as a result of restoration initiatives.
		Summary for topic						All options perform similarly with regards to population and health. Options 2 and 3 may have a lesser impact, as negative effects are expected to be distributed over a larger area. Options 1 and 4 are more likely to increase the proportion of minerals workings in their respective SRAs, which could lead to greater effects on local communities.

9	Soils	-/?	-/?	-/?	I	L	P	**Option 1: 0% Southern, 100% Northern** Minerals extraction is likely to lead to loss of best and most versatile agricultural land, as there is a large area of Grade 2 agricultural land within SRA 6, which could be lost to minerals extraction. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs would be less in northern Oxfordshire, than southern[71]. As such, it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than all other options, which could help minimise impacts on soils, although this remains uncertain as this depends on the exact location of workings. Agricultural land may be replaced through restoration in the long term. However, the Core Strategy notes that, because of a general shortage of inter waste material for infilling, sand and gravel workings in river valleys (i.e. all SRAs for sand and gravel) are often restored to wetlands. The Core Strategy states that when suitable material is available, consideration should be given to filling below original levels to improve flood storage capacity[72]. Given these factors, it is considered that agricultural land is likely to be permanently lost at these sites.
		-/?	-/?	-/?	I	L	P	**Option 2: 35% Southern, 65% Northern** Minerals extraction is likely to lead to loss of best and most versatile agricultural land, as there are areas of Grade 2 agricultural land within all SRAs, which could be lost to minerals extraction. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs would be less in northern Oxfordshire, than southern[73]. As such, it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than Options 3 and 4, which could help minimise impacts on soils, although this remains uncertain as this depends on the exact location of workings. Agricultural land may be replaced through restoration in the long term. However, the Core Strategy notes that, because of a general shortage of inter waste material for infilling, sand and gravel workings in river valleys (i.e. all SRAs for sand and gravel) are often restored to wetlands. The Core Strategy states that when suitable material is available, consideration should be given to filling below original levels to improve flood storage capacity[74]. Given these factors, it is considered that agricultural land is likely to be permanently lost at these sites.

[71] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[72] Oxfordshire County Council (2015) Oxfordshire Minerals and Waste Local Plan Part 1 – Core Strategy, Proposed Submission Document: *paragraph 4.81*
[73] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[74] Oxfordshire County Council (2015) Oxfordshire Minerals and Waste Local Plan Part 1 – Core Strategy, Proposed Submission Document: *paragraph 4.81*

		-/?	-/?	-/?	I	L	P	**Option 3: 75% Southern, 25% Northern** Minerals extraction is likely to lead to loss of best and most versatile agricultural land, as there are areas of Grade 2 agricultural land within all SRAs, which could be lost to minerals extraction. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs would be greater in southern Oxfordshire, than northern[75]. As such, it is likely that a larger area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than Options 1 and 2, which could increase the scale and likelihood of soil impacts, although this remains uncertain as this depends on the exact location of workings. Agricultural land may be replaced through restoration in the long term. However, the Core Strategy notes that, because of a general shortage of inter waste material for infilling, sand and gravel workings in river valleys (i.e. all SRAs for sand and gravel) are often restored to wetlands. The Core Strategy states that when suitable material is available, consideration should be given to filling below original levels to improve flood storage capacity[76]. Given these factors, it is considered that agricultural land is likely to be permanently lost at these sites.

[75] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

[76] Oxfordshire County Council (2015) Oxfordshire Minerals and Waste Local Plan Part 1 – Core Strategy, Proposed Submission Document: *paragraph 4.81*

		-/?	-/?	-/?	I	L	P	**Option 4: 100% Southern, 0% Northern** Minerals extraction is likely to lead to loss of best and most versatile agricultural land, as there are areas of Grade 2 agricultural land within both SRAs 4 and 5, which could be lost to minerals extraction. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs would be greater in southern Oxfordshire, than northern[77]. As such, it is likely that a larger area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than all other options, which could increase the scale and likelihood of soil impacts, although this remains uncertain as this depends on the exact location of workings. Agricultural land may be replaced through restoration in the long term. However, the Core Strategy notes that, because of a general shortage of inter waste material for infilling, sand and gravel workings in river valleys (i.e. all SRAs for sand and gravel) are often restored to wetlands. The Core Strategy states that when suitable material is available, consideration should be given to filling below original levels to improve flood storage capacity[78]. Given these factors, it is considered that agricultural land is likely to be permanently lost at these sites.
		Summary for topic						All options perform similarly with regards to soils, as all have potential to lead to loss of best and most versatile agricultural land. Option 1 performs slightly better than the other options, as SRAs in northern Oxfordshire, as it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel than southern Oxfordshire[79], although this depends on the exact location of workings.
10	Waste hierarchy	**0**	**0**	**0**				**Option 1: 0% Southern, 100% Northern** No effect predicted.
		0	**0**	**0**				**Option 2: 35% Southern, 65% Northern** No effect predicted.
		0	**0**	**0**				**Option 3: 75% Southern, 25% Northern** No effect predicted.

[77] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[78] Oxfordshire County Council (2015) Oxfordshire Minerals and Waste Local Plan Part 1 – Core Strategy, Proposed Submission Document: *paragraph 4.81*
[79] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

		0	**0**	**0**				**Option 4: 100% Southern, 0% Northern** No effect predicted.
		Summary for topic						It is not anticipated that any of the options will have impacts on the waste hierarchy.
11	Self-sufficiency	**-/?**	**-/?**	**-/?**	**R**	**L**	**P**	**Option 1: 0% Southern, 100% Northern** The SRA in northern Oxfordshire is a considerable distance from certain market areas in southern Oxfordshire, for example the weighted average distance from all site nominations in northern Oxfordshire to Didcot, in southern Oxfordshire, is 23.8 million tonne miles, but only 9.1 to Oxford[80], although distances depend on the exact location of mineral workings. This may encourage sharp sand and gravel users in the south part of southern Oxfordshire to source minerals from outside the county.
		?	**?**	**?**				**Option 2: 35% Southern, 65% Northern** The SRAs for sharp sand and gravel extraction in both northern and southern Oxfordshire are relatively well located in terms of proximity to the markets. However, this distribution would continue the existing pattern of greater levels of minerals provision in northern Oxfordshire. Future demand for sharp sand and gravel resources is likely to be split 50:50 between northern and southern Oxfordshire (see **paragraph 3.10** of this appendix). The SRA in northern Oxfordshire is a considerable distance from certain market areas in southern Oxfordshire. For example the weighted average distance from all site nominations in northern Oxfordshire to Didcot, in southern Oxfordshire, is 23.8 million tonne miles[81], although distances depend on the exact location of mineral workings. This option may encourage sharp sand and gravel users in the south part of southern Oxfordshire to source minerals from outside the county.

[80] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[81] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

		+	+	+	R	L	P	**Option 3: 75% Southern, 25% Northern** This policy recognises that future demand for sharp sand and gravel resources is likely to be split 50:50 between northern and southern Oxfordshire (see **paragraph 3.10** of this appendix). Allocating 75% of the additional requirement of sharp sand and gravel to southern Oxfordshire and the remaining 25% to northern Oxfordshire would result in an equal split of overall sharp sand and gravel provision between northern and southern Oxfordshire. This option may help to maximise self-sufficiency by making provision for sharp sand and gravel workings close to locations of demand for this mineral.
		-/?	-/?	-/?	R	L	P	**Option 4: 100% Southern, 0% Northern** The SRAs in southern Oxfordshire are a considerable distance from certain market areas, for example the sand and gravel deposits in the Thames Valley – Caversham to Shiplake SRA (SRA4) are over 55 million tonne miles from the Banbury market. This may encourage sharp sand and gravel users in the north of Oxfordshire to source minerals from outside the county. The implications of the increased distance to market remain uncertain.
		Summary for topic						It is understood that all options will be able to provide for the sharp sand and gravel supply levels identified in the LAA. Option 3 is most likely to promote self-sufficiency, as it will enable working of sharp sand and gravel close to markets in Oxfordshire for this resource. Options 1 and 4 are identified as potentially having negative effects on self-sufficiency, as greater distances from workings to markets may make imports of aggregates from outside Oxfordshire more attractive than sourcing from within the county. This may also be true for Option 2, although this is uncertain as some sharp sand and gravel provision will be retained in both northern and southern Oxfordshire.
12	Economic growth	+/-/?	+/-/?	+/-/?	R	L	P	**Option 1: 0% Southern, 100% Northern** Any expanded and new minerals extraction provides potential for job creation which supports the local economy and has a long term positive effect on this SA objective. The SRA in northern Oxfordshire is a considerable distance from market areas in southern Oxfordshire, for example the weighted average distance from all site nominations in northern Oxfordshire to Didcot in southern Oxfordshire is 23.8 million tonne miles, but only 9.1 to Oxford [82], although distances depend on the exact location of mineral workings. This may make this area less attractive for investment in the aggregate industry or it may encourage sharp sand and gravel users in the south part of southern Oxfordshire to source minerals from outside the county.

[82] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

		+/?	+/?	+/?				**Option 2: 35% Southern, 65% Northern** The SRAs for sharp sand and gravel extraction in both northern and southern Oxfordshire are relatively well located in terms of proximity to the markets and provide potential for investment. Any expanded and new minerals extraction provides potential for job creation which supports the local economy and has a long term positive effect on this SA objective. However, this distribution would continue the existing pattern of greater levels of minerals provision in northern Oxfordshire, whereas future demand for sharp sand and gravel resources is likely to be split 50:50 between northern and southern Oxfordshire (see **paragraph 3.10** of this appendix). This could lead to sharp sand and gravel users in the south part of southern Oxfordshire to source minerals from outside the county
		+	+	+	R	L	P	**Option 3: 75% Southern, 25% Northern** The SRAs for sharp sand and gravel extraction in both northern and southern Oxfordshire are well located in terms of proximity to the markets and provide potential for investment. Any expanded and new minerals extraction provides potential for job creation which supports the local economy and has a long term positive effect on this SA objective.
		+/-/?	+/-/?	+/-/?	R	L	P	**Option 4: 100% Southern, 0% Northern** Any expanded and new minerals extraction provides potential for job creation which supports the local economy and has a long term positive effect on this SA objective. The SRAs in southern Oxfordshire are a considerable distance from certain market areas, for example the sand and gravel deposits near Shiplake (SRA4) are a distance from the Banbury market. This may make these areas less attractive for investment in the aggregate industry or it may encourage sharp sand and gravel users in the north part of northern Oxfordshire to source minerals from outside the county. The economic implications of the increased distance to market remain uncertain.
		Summary for topic						All options will lead to new and/or expanded minerals extraction, which provides potential for job creation and supports the local economy. With regards to economic growth, Options 1 and 4 present potential negative effects as some SRAs would be a considerable distance from the relevant market, which may encourage sourcing of minerals from outside the county. This may also be true for Option 2, although this is uncertain as some sharp sand and gravel provision will be retained in both northern and southern Oxfordshire.

Recommendation of preferred option	All options perform similarly with regards to SA Objectives 1, 6, 9 and 10. This is largely due to the fact that these options relate to broad areas that include a range of features for which minerals workings may have a positive or a negative effect (or mixed effects). Uncertainty generally arises from the fact that the Core Strategy does not identify specific sites for mineral aggregate workings, only broad areas (SRAs) within which sites will subsequently be allocated. Options 1 and 4 are generally expected to have more negative effects, due to the results of concentrating minerals workings in one part of the county. Sensitive receptors, including archaeological assets, water resources and local communities (SA Objectives 2b, 3 and 8), are more likely to be affected as there would be less choice for alternative sites where impacts are likely to arise and less opportunity to dilute negative effects over a larger area. The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs would be less in northern Oxfordshire, than southern[83]. As such, it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel, which could help minimise impacts, although this remains uncertain as this depends on the exact location of workings. Restricting sharp sand and gravel workings to either northern or southern Oxfordshire is likely to result in a greater weighted average distance to market, as both Options 1 and 4 would involve excavating minerals for markets on the other side of the county (whereas Option 3 would enable minerals to be worked closer to where the demand lies), although exact distances between source and market depend on the locations of mineral workings. This is expected to result in increased emissions of air pollution and greenhouse gases from HGV transport, as well as negative impacts on transport (SA Objectives 4, 5 and 7). Some market areas (particularly those that are the furthest from sharp sand and gravel workings) may start to source more aggregate from outside the county, rather than from within Oxfordshire. This could result in negative impacts for SA Objective 11, self-sufficiency and lower economic gains within Oxfordshire (SA Objective 12). The implications of Option 2 are less certain in this regard, as it could result in allocations in all SRAs, which are relatively well-located in terms of markets, but would result in greater provision of sharp sand and gravel in northern Oxfordshire, when demand is predicted to be equal between northern and southern Oxfordshire[84]. Option 3 performs best against SA Objectives 4, 5, 7, 11 and 12. This option recognises that future demand for sharp sand and gravel resources is likely to be split 50:50 between northern and southern Oxfordshire (see **paragraph 3.10** of this appendix). Allocating 75% of the additional requirement of sharp sand and gravel to southern Oxfordshire and the remaining 25% to northern Oxfordshire would result in an equal split of overall sharp sand and gravel provision between northern and southern Oxfordshire. In co-ordinating locations of minerals working with demand, this option is expected to minimise distance to market[85], which is likely to reduce emissions of greenhouse gases and air pollutants and transport effects associated with HGV movements. This option may also encourage self-sufficiency and effective economic investment.

[83] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]
[84] Oxfordshire County Council (2016) Evidence Base for Spatial Strategy Alternatives for Delivery Requirement for Sharp Sand and Gravel
[85] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

4 Summary

4.1 This appendix has considered the likely significant effects of two sets of reasonable alternatives with regards to Policy M3 of the Oxfordshire Minerals and Waste Local Plan Part 1 – Core Strategy.

Inclusion of Bampton/Clanfield

4.2 This SA recommends that the Bampton/Clanfield area is not included as an SRA for sharp sand and gravel in the Core Strategy. Whilst the inclusion of this area would lead to a greater choice of sites for minerals workings, it is likely to lead to negative effects associated with an increased weighted average distance to market. This would lead to increased emissions of air pollution and greenhouse gases associated with HGVs driving a longer distance to market (SA Objectives 4 and 5). The greater distance to market will also have negative implications for transport considerations, as this may increase congestion over a wider area and lead to an increased highway maintenance requirement (SA Objective 7). Economic implications of a greater distance to market remain uncertain (SA Objective 12). Whilst this may make the Bampton/Clanfield area a less attractive area for investment, there are a number of site nominations for minerals workings in the area. In not including Bampton Clanfield, minerals are more likely to be worked closer to the relevant market areas, therefore minimising negative effects associated with transporting minerals longer distances.

4.3 The weighted average area that would need to be worked to provide a million tonnes of mineral resources in all SRAs would be less within Bampton/Clanfield than all other SRAs[86]. As such, it is likely that a smaller area of land would need to be worked in order to yield the same tonnage of sharp sand and gravel, which could help minimise impacts, although this remains uncertain as this depends on the exact location of workings. Nevertheless, this varies within and between SRAs, therefore a degree of uncertainty remains in relation to this.

Distribution options

4.4 This SA recommends a distribution of 75% of new sharp sand and gravel provision in southern Oxfordshire and 25% in northern Oxfordshire (Option 3). This is the distribution required to achieve an equal distribution of supply between northern and southern Oxfordshire, in line with the distribution of expected demand for aggregates between the northern and southern parts of the county. This option is considered to be the most sustainable as it minimises weighted average distance to market, whilst allowing a greater choice of locations for minerals workings. Option 3 performs best against SA Objectives 4, 5, 7, 11 and 12. In co-ordinating locations of sharp sand and gravel working with aggregates demand, this option is expected to minimise transport distance to market, which is likely to reduce emissions of greenhouse gases and air pollutants and transport effects associated with HGVs. This option may also encourage self-sufficiency and effective economic investment.

4.5 Issues associated with a greater weighted average distance between source and market are described in the 'Inclusion of Bampton/Clanfield' section above. These would be exacerbated by Options 1 and 4 (100% additional provision from northern and 100% additional provision from southern Oxfordshire respectively), as concentrating minerals workings on one half of the County would increase distances to markets in the other half of the County.

4.6 Options 1 and 4 tend to have more negative effects, due to the results of concentrating minerals workings in one half of the county. Sensitive receptors, including archaeological assets and water resources (SA Objectives 2b and 3), are more likely to be affected as there would be less choice for alternative sites where impacts are likely to arise and less opportunity to dilute negative

[86] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

effects over a larger area. Likewise, effects on local communities are more likely to be concentrated in certain areas, particularly in the case of Option 1, where there is only one SRA for sharp sand and gravel (i.e. SRA6) (SA Objective 8). Option 1 performs slightly better against SA Objectives 1, 2a, 2b, 3 and 9, as it would concentrate new sand and gravel extraction in northern Oxfordshire, where the weighted average area that would need to be worked to provide a million tonnes of mineral resources is less[87]. As such, this is likely to lessen any impacts associated with land take, including the likelihood of workings being in proximity to sensitive features, although this depends on the exact location of mineral workings.

[87] OCC (2016) Weighted averages for distance to markets and weighted average of area per mt resource [Spreadsheet]

Appendix A: SA Framework

SA Objective			
1	To protect, maintain, and enhance Oxfordshire's biodiversity and geological diversity including natural habitats, flora and fauna and protected species	Will the Plan protect, maintain and enhance UK BAP Priority Habitats? Will the Plan conserve and enhance internationally, nationally and regionally important sites of nature conservation importance? Will the Plan protect, maintain and enhance UK BAP Priority Species? Will the Plan contribute to the aims of the Conservation Target Areas? Will the Plan protect and conserve geological SSSIs and Local Geology Sites?	Number/percentage of permitted applications for minerals and waste development which include a restoration scheme which contributes to the objectives of Oxfordshire Habitats Plans for the creation of calcareous grasslands, lowland acid grassland and reedbeds. Number/percentage of planning applications which have an impact on designated sites or BAP habitats. Number/percentage of permitted applications which result in restoration of favourable recovering condition or buffering of designated areas through appropriate habitat creation. Number/percentage of permitted applications for minerals and waste development which include a restoration scheme which contributes to the objectives of Oxfordshire Species Plans. Contribution of the Local Plan policies to Conservation Target Areas for restoration of minerals and waste management sites. Number/percentage of permitted applications which include conditions for the protection or enhancement of Local Geology Sites or geological SSSIs.
2a	To protect and enhance landscape character and local distinctiveness	Will the Plan conserve and enhance Oxfordshire's AONBs & their settings and take into account guidelines associated with specific landscape types? Will the Plan respect, maintain and strengthen local character and distinctiveness?	Minerals and waste development where the anticipated residual landscape impact is neutral or positive. Number/percentage of permitted applications for minerals and waste development which include conditions for the protection or restoration of statutory or non-statutory landscape designations.

SA Objective			
2b	To conserve and enhance the historic environment, heritage assets and their settings	Will the Plan protect, conserve and/or enhance heritage assets and the historic/prehistoric environment of Oxfordshire? Will the Plan contribute to the better management of heritage assets? Will the Plan improve the quality of the historic environment? Will the Plan provide for increased access to and enjoyment of the historic environment? Will the Plan alter the hydrological conditions of water dependent heritage assets, including paleoenvironmental deposits? Will the Plan provide for increased understanding and interpretation of the historic environment? Will the Plan secure a supply of local building and roofing materials?	Number/percentage of planning applications where archaeological investigations were required prior to approval. Number/percentage of applications where archaeological mitigation strategies were developed and implemented. Number/percentage of permitted applications for Minerals and Waste development which include conditions for the protection or enhancement of the historic and prehistoric environment in Oxfordshire. Area of highly sensitive historic landscape characterisation type(s) which have been altered and their character eroded.
3	To maintain and improve ground and surface water quality	Will the Plan affect groundwater quality? Will the Plan affect surface water quality?	Number of permitted applications affecting source protection zones 2 and 3. Number of permitted applications which assess the risk of contamination of groundwater. Number of sites within 50m of a watercourse. Number of permitted applications requiring abstraction licences.
4	To improve and maintain air quality to levels which do not damage natural systems	Will the Plan lead to increased traffic congestion in built up areas? Will Plan lead to increased dust and/or odours?	Number of permitted applications with routeing agreements which avoid AQMAs. Survey of trip generation to civic amenity sites. Number of complaints relating to dust/odours.
5	To reduce greenhouse gas emissions to reduce the cause of	Will the Plan lead to a decrease in production of greenhouse gases such as CO2 and	Proportion of waste and aggregates transported by rail or water.

SA Objective			
	climate change	methane?	Quantity of biodegradable wastes diverted from landfill.
6	To reduce the risk of flooding	Will the proposal seek to maintain or reduce flood risk?	Number of permitted sites for minerals and waste development within the flood plain (flood zone 3a). Number of sites that are permitted within flood risk zone as identified by the NPPF and Technical Guidance to NPPF. Number of proposals approved against the recommendation of EA advice. Number of mineral restoration schemes identified for flood attenuation.
7	To minimise the impact of transportation of aggregates and waste products on the local and strategic road network	Will the Plan reduce distances travelled by road? Are sites in the Plan well located in relation to surrounding settlements for waste, or markets for minerals? Will the waste facilities or mineral operation serve local needs? Does the Plan facilitate HGV routeing agreements and developer contributions for infrastructure improvements?	Distances travelled by road from new applications to settlements (waste) or markets (minerals). Number of sites with rail/water access. Number of sites with suitable access to appropriate roads. Average distances travelled to waste recycling sites.
8	To minimise negative impacts of waste management facilities and mineral extraction on people and local communities	Will the Plan have impacts which could have a harmful effect on human health? Will the Plan result in loss of amenity through visual impact, noise, dust or vibration for local communities? Will the Plan provide opportunities for enhancement of local amenity and access to the countryside?	Number of permitted applications for mineral or waste development within 250m of sensitive receptors (settlements). Number of sites for mineral or waste development within 250m of sensitive receptors (settlements). Number of noise complaints relating to minerals and waste processing and transportation. Number of permitted applications with restoration conditions which enhance local amenity and /or improve access to the countryside.
9	To protect, improve and where necessary restore land and soil	Will the Plan affect high grade agricultural land?	Area of high grade agricultural land lost to minerals and waste development.

SA Objective			
	quality	Will the Plan lead to soil pollution or contamination?	Incidences of land contamination related to minerals and waste development.
10	To contribute towards moving up the waste hierarchy in Oxfordshire	Will the Plan increase the amount of waste re-used, recycled or recovered?	Amounts of waste recycled and recovered.
11	To enable Oxfordshire to be self-sufficient in its waste management and to provide for its local need for aggregates as set out in the LAA	Will the Plan reduce the need for waste to be transported outside Oxfordshire for treatment or disposal? Will the Plan reduce the need for Oxfordshire to import aggregates?	Number of permitted applications for waste management to meet targets to achieve net waste self-sufficiency. Number of permitted applications which contribute to meeting minerals supply requirement.
12	To support Oxfordshire's economic growth and reduce disparities across the County	Will the Plan encourage the provision of more locally based skills and facilities? Will the Plan generate new jobs for the county? Will the Plan support and encourage the growth of small and medium size business?	Number of direct jobs created in the waste/mineral sector per year. Number of new mineral and waste permissions.