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10. Place: Assessment

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Jacobs U.K. Limited

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Executive Summary

This report provides a review and assessment of the three shortlisted airport schemes against the Airports Commission's objective of minimising impacts to 'Place' as defined below. The three schemes assessed are:

- Gatwick Airport Second Runway (Gatwick 2R) promoted by Gatwick Airport Limited (GAL);
- Heathrow Airport Northwest Runway (Heathrow NWR) promoted by Heathrow Airport Limited (HAL); and,
- Heathrow Airport Extended Northern Runway (Heathrow ENR) promoted by Heathrow Hub Limited (HH).

In April 2014, an Appraisal Framework was published by the Airport Commission which identified the methodology that was to be used to further assess the three shortlisted schemes, (Airports Commission, 2014a). This report has been prepared in accordance with the Appraisal Framework and considers the environmental implications of the proposed schemes on Place.

The sub-topics identified in the Appraisal Framework to be considered within the assessment of Place impacts are:

- Planning and land take;
- Landscape, townscape and waterscape;
- Heritage; and
- Waste.

Each of the sub-topics is addressed as separate assessments with their own methodology and combined within this single overall report. The assessment uses the 'Do Minimum' baseline information in the Place: Baseline report, (Jacobs, 2014f).

Land Take

The land take assessment is a desk based review of the type and quantity of land take (classified by its land use and coverage) for each of the three shortlisted airport schemes.

This review has looked at direct land take and property loss required for the Airport expansion areas. In addition, potential impacts from surface access construction and flood storage areas have been considered. These areas have been defined based on Jacobs' assessment of the airport development footprint and surface access requirements as provided by the scheme promoters. Areas affected by high noise levels which could be subject to planning constraints and areas within Public Safety Zones (PSZs) where planning restrictions apply to minimise risk to life in the event of an airport accident have also been considered. The results of Jacobs' assessment have been compared against the information provided by each of the scheme promoters to identify areas of difference.

Direct land take and potential indirect land use impacts have been identified separately. The analysis undertaken is based on the mapping shown in the accompanying Place Figures report.

Gatwick Airport Second Runway Land Take Assessment

The land take associated with the proposed Gatwick Airport Second Runway (Gatwick 2R) expansion and the areas potentially affected by surface access construction[1] is estimated as 624 ha and 78.2 ha respectively.

No agricultural land within the land take area was found to be with grades 1 or 2. Approximately 189.3 ha is ALC grade 3 and 172.9 ha is ALC grade 4, whilst the rest is of unknown classification.

A total of 168 residential properties lie within the predicted Gatwick 2R expansion land take and are likely to need to be demolished. An additional 37 residential properties are within the 100m buffer that has been applied either side of the proposed transport infrastructure routes and could potentially be lost to the surface access improvements depending on detailed route and construction design.

Approximately 9.2ha of the proposed airport expansion for the Gatwick 2R scheme is within designated Green Belt.

Heathrow Airport Northwest Runway Land Take Assessment

The land take associated with the proposed Heathrow Airport Northwest Runway (NWR) airport expansion and potential land affected by surface access construction[2], is approximately 568.8 ha and 294.2 ha respectively. An additional 42.9 ha of land is identified for flood storage.

Of the potential agricultural land lost, approximately 181.5 ha is Agricultural Land Classification (ALC) grade 1, 2 or 3 land (grade 1, 2 and 3a is considered as best and most versatile agricultural land). An additional 19.1 ha of grade 1 and 3 ALC land lies within the flood storage areas identified. The quality of the remaining agricultural land is not classified.

A total of 783 residential properties lie within the Heathrow NWR airport expansion land take and are likely to need to be demolished. An additional 289 residential properties are within the 100m buffer that has been applied either side of the proposed transport infrastructure routes and could potentially be lost to the surface access improvements depending on detailed route and construction design.

Approximately 431 ha of the Heathrow NWR airport expansion is within designated Green Belt land. As a result the development would significantly change the land use within this Green Belt area which was designated to control urban sprawl and maintain largely undeveloped land between urban areas.

Heathrow Airport Extended Northern Runway Land Take Assessment

The land take associated with the Heathrow Airport Extended Northern Runway (ENR) airport expansion and potential land affected by surface access construction[3] is approximately 335.7 ha and 329.8 ha respectively. An additional 57.3 ha of land is identified for flood storage.

[1] Areas potentially affected by surface access infrastructure construction are based on a 100m buffer area defined either side of each route; this is intended as an indicative area appropriate for this strategic stage given uncertainties in route alignment, design and construction approaches.
[2] As above.
[3] As above.

Of the potential agricultural land lost, approximately 69.1 ha is ALC grade 1, 2 or 3 land (grade 1, 2 and 3a are considered best and most versatile land) and the classification of the remaining area is unknown. In addition, a further approximately 27 ha of grade 1 to 3 land lies within the flood storage areas.

A total of 242 residential properties lie within the airport land take and are likely to need to be demolished. An additional 165 residential properties are within the 100m buffer that has been applied either side of the proposed transport infrastructure routes and could potentially be lost to the surface access improvements depending on detailed route and construction design.

Approximately 278.2 ha of proposed the Heathrow ENR airport expansion is within designated Green Belt and would significantly affect the aims of the Green Belt in this area to control urban sprawl and separate maintain largely undeveloped land between urban areas.

Landscape, townscape and waterscape

The landscape, townscape and waterscape assessment considers the potential effects on the landscape, townscape, visual amenity, tranquillity and dark skies as a result of the three shortlisted airport schemes. The assessment was undertaken using the Guidelines for Landscape and Visual Impact Assessment, Third Edition, (Landscape Institute and Institute of Environmental Management and Assessment, 2013).

For tranquillity impacts, predicted N70 (20 event) noise contours were overlaid onto tranquillity mapping and compared for the 'Do Minimum' and 'Do Something' options for each of the three proposed schemes.

For all three schemes, the most significant effects on the landscape, townscape and visual amenity would be experienced during construction. This is due to the loss of landscape or townscape features and the visual intrusion of construction activity. Effects often reduce on the completion of construction, although for some receptors a significant adverse effect would remain.

For all three schemes, there is the potential for some areas to experience a reduction in tranquillity due to the increased area of flight paths associated with the new runway. There is also the potential for increased light levels but this is unlikely to alter the results of the CPRE Dark Skies mapping given the existing conditions.

Mitigation measures proposed by the promoters have been taken into account in the assessment and the beneficial effects of this mitigation reflected in the overall conclusion of assessment.

Gatwick Airport Second Runway Landscape Assessment

For the Gatwick 2R Scheme, the West Sussex: LW8 Northern Vales character area would be the only landscape or townscape area to experience a significant adverse effect as the majority of construction works would take place here. This construction impact would result in a permanent loss of landscape features and so the significant adverse effect would continue into the operation of the airport.

Ifieldwood, B2036 and Radford Road properties, Crawley public rights of way and the Tandridge Border Path would experience a significant adverse effect on views during construction, due to their proximity to the works and open views. The significant adverse effect would continue into the operation of the airport for

Ifieldwood and the Tandridge Border Path as the receptors would have relatively open views towards the operational site, with little scope for mitigation.

Heathrow Airport Northwest Runway Landscape Assessment

For the Heathrow NWR scheme the Colne Valley Regional Park would experience a significant adverse effect during construction as some of the park would be lost to accommodate the new runway and there would be views from the park towards the construction works. The park would conversely experience a beneficial effect, although not significant beneficial effect during operation as there are extensive mitigation measures proposed by HAL which would help to improve the quality and appearance of the remaining park close to the airport.

The Hillingdon Lower Colne Floodplain character area would experience the most significant adverse effect in terms of landscape and townscape character as the majority of construction works would take place here. There would also be a significant adverse effect on Hillingdon Open Gravel Terrace character area, Slough Road Infrastructure character area and the Hillingdon Historic Core character area, due to physical changes for airport infrastructure and a reduction in visual amenity. The loss of landscape features would be permanent for the Hillingdon Lower Colne Floodplain and so the significant adverse effect would continue into the operational phase of the airport. There would also be a significant adverse effect on Hillingdon Historic Core due to the permanent loss of Longford village and part of Harmondsworth.

Properties in Stanwell, Stanwell Moor, Harmondsworth and Sipson would all experience a significant adverse effect on views during construction due to the proximity of works and the open nature of views. The significant adverse effect would continue into the operation of the airport for properties in Harmondsworth and Sipson. This is because the operational airport would be in very close proximity and although partially screened by bunding, the bunding itself would have a visual impact.

Public rights of way south of the M4, including the Colne Valley Way, and Harmondsworth Moor would also experience a significant effect on views during construction of Heathrow NWR. This is because these areas would have close range views towards construction works. The significant adverse effect would not continue into the operational phase for these receptors. Conversely, public rights of way south of the M4 would experience a beneficial effect, although not significant beneficial effect during operation as the extensive mitigation measures proposed by HAL would improve the setting of the public rights of way and help screen views of the airport.

Heathrow Airport Extended Northern Runway Landscape Assessment

For the Heathrow ENR scheme the Colne Valley Regional Park would experience a significant adverse effect during construction as some of the park would be lost to accommodate the new runway and there would be views from the park towards the construction works. The park would not experience a significant adverse effect during operation as mitigation measures would help to offset adverse effects from the new runway and associated airport infrastructure.

The Hillingdon Lower Colne Floodplain character area would experience the most significant adverse effect in terms of landscape and townscape character as the majority of construction works would take place here. There would also be a significant adverse effect on the Windsor and Maidenhead Settled Developed

Floodplain character area and the Hillingdon Historic Core character area due to physical changes resulting from airport infrastructure and a reduction in visual amenity. For Hillingdon Lower Colne Floodplain where loss of landscape features would be permanent the significant adverse effect would continue into the operation of the airport.

Properties in Stanwell, Stanwell Moor, Colnbrook, Horton and Longford and the Poyle Industrial Estate would all experience a significant adverse effect on views during the construction of Heathrow ENR due to the proximity of works and the open nature of views. The significant adverse effect would continue into operation for properties in Colnbrook, Horton and Longford. This is because the operational site would be a dominant feature in their view with limited scope for mitigation.

The Colne Valley Way and Wraysbury Reservoir would also experience a significant effect on views during construction, particularly the Colne Valley Way which would be adjacent to the works for the new runway. For the Colne Valley Way the significant adverse effect would continue into the operational phase of the airport due to the proximity of the operational runway and the open views towards it.

Heritage Assessment

The heritage assessment focuses on designated heritage assets, namely Scheduled Monuments, Listed Buildings, Conservation Areas, Registered Parks and Gardens, and World Heritage Sites that could be affected, potential mitigation and residual impacts.

Heritage assets were identified from existing data sources including the National Heritage List and the assessment methodology used was based on national heritage guidance, and in particular the methodology contained in the Design Manual for Roads and Bridges Volume 11, Section 3 Part 2 Cultural Heritage (HA 208/07), (DMRB, 2010). For tranquillity impacts, predicted N70 (20 event) noise contours were compared for 'Do Minimum' and 'Do Something' options for each of the proposals to identify designated heritage assets where impacts on their tranquillity could occur from aircraft noise as a result of increases or other changes in air traffic.

Gatwick Airport Second Runway Heritage Assessment

The assessment of the Gatwick 2R scheme identified 22 potential impacts on designated assets within the scheme land take, the setting of a further ten designated heritage assets could be affected within 300m of the scheme area and from 300m to 2km the setting of a further 160 designated assets could potentially be affected.

Heathrow Airport Northwest Runway Heritage Assessment

For the Heathrow NWR scheme 21 potential impacts were identified within the scheme land take, the setting of 54 designated heritage assets could be affected within 300m of the scheme area and from 300m to 2km the setting of a further 166 designated assets could potentially be affected.

Heathrow Airport Extended Northern Runway Heritage Assessment

For the Heathrow ENR scheme seven potential impacts were identified within the scheme land take, the setting of 30 designated heritage assets could be affected

within 300m of the scheme area and from 300m to 2km the setting of a further 168 designated assets could potentially be affected.

Waste Assessment

This assessment considers how waste would be managed both during construction of each option and operationally for each of the shortlisted airport options. The approach focuses on three elements:

1. An assessment against modelled waste forecast scenarios for 'Do Minimum' and 'Do Something';
2. The potential impacts during the construction phase; and
3. The potential impacts during the operational phase.

Operational waste projections within each submission have been assessed against waste forecasts calculated by Jacobs, based on waste generation levels (i.e. kg/passenger).

The growth scenarios modelled for each airport are summarised in Table D. They reflect the different starting points and the different waste generation levels used to forecast operational waste. Along with the growth scenarios, different recycling performance levels were modelled to show the tonnage of material that could be recycled in the future. The resultant waste/passenger factors were then applied to the passenger number forecasts in the Assessment of Need (AoN Carbon Capped) projections provided by the Airports Commission, (Airports Commission, 2014b).

Table D - Waste Growth Scenarios

Waste Growth Scenario	Heathrow	Gatwick
1: No change in waste/ passenger from most recently reported data	No growth in waste/passenger, with the figure remaining at the 2013 level of 0.369 kg/passenger.	No growth in waste/passenger, with the figure remaining at the 2012 level of 0.260 kg/passenger.
2: Waste prevention based on the average reduction in waste/ passenger over recent years	The average growth rate between 2008 and 2013 of minus 3.7% per annum continues until 2020, then 0% growth	The average growth rate between 2008 and 2012 of minus 8.7% per annum continues until 2020, then 0% growth
3: Waste prevention using a more conservative waste reduction assumption than that experienced over recent years.	A growth rate of minus 2% per annum until 2020, then 0% growth	A growth rate of minus 2% per annum until 2020, then 0% growth

The waste assessment was undertaken for the operational phase only. However, likely construction and demolition (C&D) waste arisings were estimated for the purpose of comparison against C&D forecasts provided by each of the scheme promoters. The approach considered the application of available industry benchmark data, including use of generic resource benchmarks for different types of construction projects.

Due to the considered low levels of robustness of available benchmark data, and the limited application to the proposed airport schemes, it is considered inappropriate at this stage to include any quantified assessment of likely construction waste forecasts for each of the schemes.

Gatwick Airport Second Runway Waste Assessment

There is a notable difference in passenger number projections, with the Gatwick Airport Limited (GAL) submission estimating approximately 40% higher passenger numbers over the headline years (the GAL submission forecast is 65Mppa by 2030 and 95Mppa by 2050, compared with the Airports Commission's Assessment of Need Carbon Capped (AoN Carbon Capped) scenario 2014, of 46Mppa in 2030 and 69Mppa by 2050), (Airports Commission, 2014b). The GAL submission estimates higher operational waste arisings with 16,250 tonnes of operational waste arising by 2030 compared with the Jacobs 'Do Something' estimates of 12,000 tonnes by 2030, (Scenario 1). This is due to the differences in forecast passenger numbers.

GAL's projection of 0.25 kg waste per passenger is within the range considered reasonable and utilised in the Jacobs waste forecast. Compared against the Jacobs 2050 forecasts for 'Do Minimum', the Gatwick 2R scheme would result in an increase in operational waste of between 100% (Scenario 1) and 400% (Scenario 2).

The approach for identification and management of construction and operational waste outlined by the scheme promoter is well considered, and adopts the principles of the waste hierarchy. GAL assumes (based on previous construction projects) a recycling rate of 96% of construction waste will be achieved, with the remaining 4% destined for disposal or recovery off-site. This relies on there being sufficient local/regional treatment capacity for at least 60,000 tonnes of construction and demolition waste that is likely to contain hazardous substances. In the context of wider construction and demolition waste arisings from development, projected for the South East over this development period, arisings from Gatwick 2R are less significant.

Some of the treatment routes identified for operational waste arisings from the proposed development have yet to be installed. In particular, the energy from waste (EfW) capability and a separate anaerobic digestion (AD) plant for processing organic/food waste (referred to in the GAL submission) are both still proposed developments. Consent and subsequent development of major waste facilities has been subject to challenge during planning stages and therefore delivery of these facilities cannot be guaranteed. It is suggested that an assessment is carried out into the level of off-site energy recovery and organic waste processing capacity available, should either of these developments prove not to be economically viable, or encounter problems with either planning or permitting consent.

Heathrow Airport Northwest Runway Waste Impact Assessment

The Heathrow Airport Limited (HAL) submission predicts the number of passengers moving through the airport following the runway development to be in the region of 103mpppa in 2030, 130Mppa in 2040 and 135Mppa in 2050, which compares favourably with Airports Commission Demand Forecasts over these same headline years (a slight difference for the year 2030). HAL forecasts 46,000 tonnes of operational waste arisings by 2040, which is consistent with Jacobs 'Do Something' estimates of 47,000 tonnes (Scenario 1) for 2040.

The overall approach to management of waste during the operational phase of the third runway outlined within the HAL submission, particularly beneficial use of wastes and application of the waste hierarchy, is forward thinking and in line with national good practice. The application of solutions which reduce waste at source

and increase levels of recycling appear to be appropriate, however the assumptions have not been substantiated and are therefore subject to a level of uncertainty.
As a result of reviewing the HAL submission against the Appraisal Framework provided by the Airports Commission, (Airports Commission, 2014a) it is considered that the scheme promoters have considered construction wastes associated with the development but only in outline. A lack of construction waste arisings forecasts means that proposals for managing waste materials effectively and sustainably are generic.

Proposals by HAL to develop a revised plan which seeks to keep the site for the replacement EfW plant as close to its existing location as possible is likely to ensure that impacts of road traffic movements from waste will be similar to existing traffic impacts (although traffic movements will increase as a consequence of increased operational waste being taken off-site). HAL has also provided an updated plan, which shows the location of the EfW re-provision, however it is not possible to determine the dimensions of the proposed location from this plan. Confirmation of the size and suitability of the site identified for re-provision would need to be confirmed should the scheme progress.

Heathrow Airport Extended Northern Runway Waste Impact Assessment

Heathrow Hub (HH) forecast passenger numbers for 2050 as being 130Mppa, which compares favourably against Airports Commission's AoN Carbon Capped scenario 2014, of 129Mppa in the same year (taking into account limitations of waste data presented by HH), (Airports Commission, 2014b). Similarly, HH forecasts 48,000 tonnes of operational waste arisings by 2050, which is identical to Jacobs 'Do Something' estimates of 48,000 tonnes (Scenario 1). Compared against the Jacobs 'Do Minimum' scenario forecasts, the HH scheme would result in an increase in operational waste of between 60-85% (Scenario 1- 3).

The broad approach described by HH to managing waste on the scheme is consistent with the waste hierarchy and there are examples of good practice for reducing and recycling waste. However, the absence of site-specific information has resulted in a submission that is generic, with limited detail.

At this stage of the process, the scheme promoter has provided insufficient detail relating to proposed plans and strategies for managing construction and operational wastes to determine whether these will be effective in mitigating the environmental impacts of waste management on place. There is limited evidence on how the targets proposed for waste management can be met. Construction and demolition forecasts and construction wastes for each element of the development are limited, with no supply/demand assessment for recycling/composting waste management capacity supplied as evidence of what facilities will be required on and off-site.

Whilst a Construction Environmental Plan is proposed, it is largely limited to water impacts; therefore it is not possible to conclude if waste impacts will successfully be mitigated. Neither does the submission contain a contamination assessment. Should the HH scheme progress is suggested that geo-technical investigations are undertaken and a MMP and WMP (supported by detailed waste forecasts, a facility capacity review and the identification/mitigation of environmental impacts of waste management) are prepared, to enable the impact of waste management on place to be more meaningfully assessed.

1 Introduction

The Place module of the Airports Commission's Appraisal Framework includes an assessment of:

- Land Take;
- Landscape, Townscape and Waterscape;
- Heritage; and
- Waste.

This report provides a review and assessment of the three shortlisted airport schemes against the Airports Commission's objective of minimising impacts to 'Place' as defined below. The three schemes assessed are:

- Gatwick Airport Second Runway (Gatwick 2R) promoted by Gatwick Airport Limited (GAL);
- Heathrow Airport Northwest Runway (Heathrow NWR) promoted by Heathrow Airport Limited (HAL); and
- Heathrow Airport Extended Northern Runway (Heathrow ENR) promoted by Heathrow Hub Limited (HH).

In April 2014, an Appraisal Framework was published by the Airport Commission which identified the methodology that was to be used to further assess the three shortlisted schemes. This report details the Place assessment and has been prepared in accordance with the Appraisal Framework. The assessment uses the baseline information provide in the Place: Baseline report, (Jacobs, 2014f)

The sub-topics identified in the Appraisal Framework to be considered within the assessment of Place impacts are:

- Planning and Land Take;
- Landscape, Townscape and Waterscape;
- Heritage; and
- Waste

For each topic there is an explanation of the methodology and study area used in the assessment, the assumptions and limitations within the assessment and an assessment divided into four sections one for each of the proposed airport schemes. The structure of the report is:

- Chapter 1 introduces the report and content of the 'Place' assessment.
- Chapters 2 to 5 provide the assessment for each of the topics within the 'Place' assessment.

2 Land Take

This section presents the land take assessment within the Appraisal Framework for Place. This includes consideration of:

- The potential land take from each proposed scheme;
- The land uses potentially affected; and
- Land uses and properties numbers within land affected by increased noise and also within public safety zones.

2.1 Context and Methodology

The Land Take appraisal of the three proposed airport schemes is based on the requirements of the Airports Commission Appraisal Framework, (Airports Commission, 2014a). This states that the airport proposals should be assessed in terms of:

''…the type and quantity of land developed (classified by its use and cover), and the direction and magnitude of the impacts of changing land use"

In relation to land use categorisation to be used in the assessment, the Appraisal Framework states that:

"*The type of land that will be developed will be classified by its land use and cover. This classification can be based on the National Land Use Database (NLUD), which categorises land as follows: agriculture and fisheries, forestry, minerals, recreation and leisure, transport, utilities and infrastructure, residential, community services, retail, industry and business, vacant and derelict, defence and unused land.*" (Airports Commission, 2014a).

This report therefore focusses upon the direct impacts of land take for airport expansion and for surface access, the land potentially affected by construction. It also includes consideration of 'indirect' impacts which could have implications for future land uses.

The outputs of this report are a quantitative assessment of the land take impacts of the shortlisted schemes, with additional commentary on the magnitude and direction of land use change. The results of the Jacobs assessment have then been compared against the information provided by each of the scheme promoters to identify areas of difference.

The Appraisal Framework also refers to the 'urbanisation' effect of the proposals and such impacts, along with landscape and townscape considerations, (Airports Commission, 2014a). These are considered in the Assessment of Landscape, Townscape and Waterscape Impacts section of this report.

2.2 Methodology

To understand the current use of land affected by each proposal, data was collected and mapped from the sources set out below. Existing land use mapping is provided in the Place Baseline Report, (Jacobs, 2014f).

2.2.1 Inputs

Airport expansion and surface access information

For each of the three submissions, the additional land area required for the airport expansion is based on the airport footprint provided in a CAD digital form by the scheme promoter as part of its submission. This information was analysed by Jacobs and an airport expansion outline area generated to include all the related airport development indicted by the proposers. Some adjustments were made to ensure consistency and to take account of additional promoter identified areas around the perimeter of the airport involving land take. Land Take Figures are contained within accompanying Place Figures report.

Gatwick 2R: the airport footprint is based on the promoter's expansion area provided and includes related ancillary development and flood storage areas and balancing ponds within the outline area.

Heathrow NRW: the airport footprint is based on the outline provided for the expansion area for the proposed runway development but also includes the additional areas of land take around the existing airport which the promoter has indicated as being required for the scheme development and the areas of land take indicated for flood storage use located within the compensation land area.

Heathrow ENR: the airport footprint includes the expansion areas for the proposed runway extension as provided by the promoter, with the addition of a possible location for balancing ponds to the south of the airport footprint.[4] Flood storage areas are indicated separately in the HH submission, and have also been included in the land take assessment. The Heathrow Hub interchange has been excluded from the footprint and the assessment. The Commission stated in its Interim Report its intention to consider HH's proposed transport hub as a detachable component which could be associated with either of the Heathrow runway options under consideration. Accordingly, the core appraisal case for the Heathrow ENR option includes a more traditional surface access package, whose rail components are identical to those proposed by Heathrow Airport Limited, but whose road components have some variations to junctions and access road layouts to reflect the different configuration of the airfield site.

For all three schemes, additional areas of potential land take impact for surface access infrastructure construction have been estimated by Jacobs based upon the details of routes for new infrastructure or capacity improvements provided within the promoter submissions. An indicative 100m buffer has been applied either side of the route locations to cover potential land take associated with the construction works. The actual land take required for surface access purposes is likely to change in the future with the emerging detailed design, and in many cases is likely to be less than the indicative 100m applied each side for the purpose of this assessment and in some instances the impact may be limited to one side of the highway. However, in some cases the impact it could potentially be more. The 100m buffer is considered an acceptable approach at this strategic stage of assessment given the uncertainty over final alignment and the approach to construction.

[4] The HAL submission for Heathrow NWR includes an area at this location near to the existing airport boundary and a similar requirement may be required for the Heathrow ENR development however, as the site identified by HAL would be within the footprint of the airport expansion area for Heathrow ENR, the balancing ponds for Heathrow ENR have been located just south of the Heathrow NWR pond location.

Areas identified for compensation habitat or recreation provision are not included in the land take assessment where these are additional to the airport development footprint (these are considered in the Assessment of Biodiversity Impacts, Jacobs 2014b).

Land use information

For the land use categories in this report, data was obtained from The Geo Information Group (GIG), as this was the most complete and detailed GIS Land Use data that was available. The associated land use categories were then rationalised to fit with the established National Land Use Database (NLUD) categories in order to match the land use descriptions as closely as possible (see Appendix A for details of the land uses categories rationalisation). It was considered preferable to present the data in the form of NLUD categories, rather than retaining the GIG categories, as NLUD is the nationally recognised format for land use data and to present it in this way is consistent with the guidance in the Commission Appraisal Framework, (Airports Commission, 2014a). Consequently the impact upon the following NLUD land uses forms the basis of this report:

- Agricultural land (categorised according to its Agricultural Land Classification – see below);
- Forestry;
- Minerals;
- Recreation and leisure;
- Transport;
- Utilities and infrastructure;
- Residential;
- Community services;
- Retail;
- Industry and business; and
- Unused land.

Water bodies are included within the most suitable category depending on the use identified in the GIG data either in recreation and leisure, reservoir use in utilities and infrastructure or if use is unspecified as unused land (see Appendix A). The NLUD 'Vacant and Derelict' land and 'Defence' land is not identified under these categories in the GIG data.

Agricultural Land Quality

Department for Environment, Food and Rural Affairs (Defra) Agricultural Land Classification (ALC) data was used to identify the quality of the agricultural land. The ALC system classifies land into five grades based on the potential for agricultural production: Grade 1 (excellent); Grade 2 (very good); Grade 3 which subdivided into Subgrades 3a (good) and 3b (moderate); Grade 4 (poor) and Grade 5 (very poor). Policy guidance defines 'best and most versatile' land as Grades 1, 2 and 3a. This is the land which is most flexible, productive and efficient in response to inputs and which can best deliver future crops for food and non-food uses such as biomass, fibres and pharmaceuticals (Note: Grade 3 land is however, not subdivided in to 3a and 3b for the strategic level mapping that the GIG data is based on and actual quality grade would need to be determined through detailed survey).

The 'Unknown' classification results from where areas of agriculture land as defined by the GIG overlap with non-agricultural as defined by the ALC. This discrepancy can be accounted for due to the varying definitions of agricultural land

between the NLUD, GIG and ALC datasets. For example, in the NLUD agricultural (and fisheries) land can include cropland, grassland or fallow land; orchards and other cultivated trees; land use for horticulture; all ancillary land; unimproved or improved grasslands; and associated buildings (National Land Use Database: Land Use and Land Cover Classification, 2006). ALC definitions vary with this and do not include agricultural buildings, and soft land (land not used for agricultural but "could be easily returned to agriculture") which fall within Section U011 of land use for agriculture (NLUD, 2007).

GIG Data

Like all land use data, the GIG data is not 100% accurate, but it was considered to be the best source of data available for this appraisal. It is noted that the predominant use for an area of land is often selected in the data, meaning that ancillary or subordinate uses are not necessarily identified, for example there were few specific 'community land uses' included within the GIG dataset.

Address Base Plus Point Data

Additional property number data was secured from the 'Address Base Plus Point Data' dataset in order to provide a 'finer grain' of detail in terms of land uses (specific properties and facility locations rather than site coverage areas). The data is arranged by main category groups and subdivided further. The categories chosen to focus on to supplement the land use data were residential, educational, community services, places of worship, parks, and allotments, given their potential sensitivity.

Local Planning Authority Data

Additionally, GIS data was requested from all the Local Planning Authorities (LPA) that were potentially affected by the three airport submissions in order to enable an assessment of land take in terms of the effect on higher level policy designations. Information was sought in respect of:

- Local development plan allocations; and
- Green Belt planning designations.

Public Open Space (POS) has legal protection and should be replaced if lost. The identification of POS was initially considered as part of this assessment, but has not been included as there was not sufficient meaningful or complete data available. In this respect, it was considered that the data was likely to be incomplete due to the potentially large numbers of sites of all shapes and sizes, which would not all be identified in local plans. Also, there was an apparent lack of consistency in respect of the definition of POS between each local planning authority. It may be possible to identify precise areas of POS affected within each LPA in a separate exercise, but this would be likely to involve detailed discussions with each LPAs individually. Notwithstanding this, the GIG data has identified recreational areas, some of which are likely to be areas of POS. Address Point data also identifies numbers of parks, which are potentially POS.

Noise level information

Noise contour information for the each of the schemes has been generated by modelling work undertaken by the Civil Aviation Authority (CAA)'s Environmental Research and Consultancy Department (ERCD) on behalf of the Commission. This covered baseline 'without scheme' noise contours for 2030, 2040 and 2050 and 'with scheme' noise contours for 2030, 2040 and 2050.

As the National Planning Policy Framework (NPPF), the National Policy Statement for England (NPSE) and the new Practice Guideline on Noise do not relate planning policy guidance to specific noise levels, we have used the 63 LAeq 16hr noise contour level as an indicative level within which local authorities might apply restrictions or conditions on new development. The selection of this contour is informed by the now rescinded PPG 24[5], as this identified the 63 LAeq 16hr noise contour as the level where aviation or mixed source noise would need to be considered within a planning application.

The use of the 63 LAeq16hr noise contour was considered appropriate for this analysis to indicate where land use implications from noise are most likely to occur. Therefore, the area outside the airport footprint boundary but within the noise contour may be subject to limitations on the type of development in line with NPSE/NPPF guidance although this is not a specific restriction.

Public Safety Zone information
Public Safety Zones (PSZs) are areas of land at the ends of the runways at the busiest UK airports within which development is restricted in order to control the number of people on the ground at risk of death or injury in the event of an aircraft accident on take-off or landing. The PSZs for the new runways have been determined by Jacobs PSZs based on risk contours.

Government policy, as set out in DfT circular 01/10, (DfT, 2010) is to *'avoid an increase in the number of people living, working or congregating in Public Safety Zones and that, over time, the number should be reduced as circumstances allow'*. The circular annex also sets out the general presumption against new development within PSZ and details potential permissible development. The annex also set out expectations for airports to offer to purchase property within specified risk levels.

2.2.2 Method

The analysis covers:

1) Direct land take areas - land potentially lost to the development. These areas are subject to direct land use change within development area boundaries including:

    - Airport expansion areas;
    - Surface access infrastructure capacity improvements. (This includes a 100m buffer that has been applied either side of proposed transport infrastructure routes for potential construction impacts. Although not of all this land may be required following detailed design of routes and construction, this buffer is intended to covers areas most likely to be at risk); and
    - Flood storage areas (where these are additional to the outline for the airport expansion area).

[5] Noise planning policy guidance note, PPG24, set out Noise Exposure Categories (NEC) for aircraft noise to guide planning decisions. NEC category B was the noise level range where noise should be taken into account in planning and conditions applied in order to provide protection against noise. NEC category C was the range at which planning permissions would not normally be granted without specific reasons and protection. PPG24 has now been superseded by the National Policy Planning Framework (NPPF).

It may be possible that a specific land use within the development footprints is retained where it can be incorporated within the development design for example, as part of mitigation proposals.

For the airport development and surface access land take the following analysis is provided for each airport scheme:

- Land loss by land use type using the GIG database ;
- Agricultural land loss by land quality grade based upon areas for each Agricultural Land Classification (ALC) grade;
- Local Planning Authority land use allocations;
- Green Belt designated land; and
- Property numbers by category (from the Address point data).

2) Land areas outside the direct land take could be subject to indirect land use change over time as a result of planning restrictions due to health or safety reasons. This element of the analysis considered:

   - Land within the 63 LA_{eq16hr} noise contour[6] associated with the airport expansion: and
   - Public safety zones (PSZs) at the proposed runway ends, outside the proposed development land take. This is where new development would be subject to planning restrictions.

3) Comparison of Jacobs' findings with the scheme promoter's information; including comments on where the Jacobs' assessment supports the promoter's submission information, where there are differences and the likely reasons for any differences.

Whilst not considered in this report, it should be noted that land uses around the airport (beyond the areas identified in this assessment of areas of direct land take) are likely to be indirectly affected in the medium to long term by the opportunities afforded by proximity to the airport and also how local authority land allocations and markets respond to these opportunities.

2.2.3 Mitigation

Land take related to an airport expansion could have negative impacts upon existing land uses and this will need to be addressed in any development of a proposed scheme. This response can either be in terms of mitigation or compensation (or potentially a combination of the two).

In assessing the land take implications the main impacts likely to require mitigation relate to:

- the loss of recreational land; and
- the loss of other community facilities.

To comply with planning policy an effect upon Green Belt would need to be justified by arguing that the associated development is 'appropriate' or by providing

[6] Noise contours for 2030 with development modelled by ERCD for the CAA (2014) on behalf of the Airports Commission and based on the least number of total people affected carbon capped scenario.

'very special circumstances' that justify the impact upon the Green Belt. This reflects that it is not normally possible to compensate for the loss of Green Belt land by provision of alternative land elsewhere due to the location-specific nature of the designation and its purposes.

As a result of the nature of the impact the loss of agricultural land, residential and commercial properties would usually be compensated for rather than mitigated against. This is usually in the form of financial compensation, though in some cases it may be possible that alternative sites for re-location of the use could be found.

In relation to mitigation and compensation for loss of biodiversity habitat and indirect impacts on biodiversity as a result of the proposed airport schemes, this is covered in the Biodiversity: Assessment Report, (Jacobs 2014e). The Local Noise assessment (Jacobs, 2014g) addresses impacts from noise on people rather than the land use aspects covered in this report.

Notwithstanding this, it is considered that a detailed appraisal of appropriateness of the land take mitigation/compensation will need to be considered at more detailed planning stages and not at this 'high level' stage.

2.3 Assumptions and Limitations

Key assumptions for the assessment are:

- The land use data from Geo-information Group and the local authorities' data is accurate, comprehensive and current and that the Address Base Plus Point Data is used to add detail to these data sources (which should take prominence in case of a conflict);
- For the purposes of this report, the data is assumed to be relevant to the target date for new runway opening in 2025 or 2026, with development plan allocations coming forward; and
- No significant change to land uses within the land take areas, outside those reflected in local development plan allocations, prior to the new runway opening.

Key exclusions and limitations for the assessment are:

- It should be noted that not all GIS data layers from LPAs have been received nor verified with the LPAs concerned. Appendix C identifies the situation regarding data requested and received from the relevant LPAs;
- No assessment of existing and possible future planning permissions has been undertaken as part of this high level assessment;
- No consideration has been given in this high level assessment to the potential for further land use changes due to severance effects, for example where remaining land uses become isolated or unviable and mitigation options are limited (this can be quite a complex and detailed process, which we would recommend is undertaken as part of a separate exercise);
- Fragmentation of the land uses in the long term could also be affected, however due to the strategic scope of this study, this needs to be addressed properly in later, detailed studies;
- Public Open Space (POS) has not been specifically identified (see section 2.2.1) and although the Address Point data identifies POS along with

nature reserves under a 'Parks' category, the definition used for identifying POS and nature reserves is not clear;

- In terms of how the baseline land use will develop in the future, it is not known at this stage what level of growth is likely beyond the end date of current development plans, which will typically run up to the year 2030. Future trends in the next series of development plans will be influenced by the need for climate change adaption and a level of development pressures for more housing, business use, infrastructure and other uses. The future without new runway scheme proposals is described further in the Place Baseline Report (Jacobs, 2014f);
- No predictions of land use change outside the local development allocations have been made, although a number of drivers for change are identified in the baseline report; and
- It is likely that there will be changes in planning policy, in future local authority development plans, and future market conditions are also difficult to predict by the time the new runway opens. Both these factors can influence land use change, but at this high level stage no forecasts are made.

2.4 Assessment of Land Take Implications

This assessment of land take includes:

- The land uses affected by each scheme, the associated land take and land affected areas and the numbers of properties/facilities affected (in certain cases);
- Agricultural Land quality implications;
- Green Belt implications;
- Property types within land take area;
- Land uses and properties numbers within land affected by increased noise and also within public safety zones; and
- Comment on the Promoter's submission information

2.5 Land Take Assessment - Gatwick Airport Second Runway

2.5.1 Land Use

The land uses affected by the Gatwick 2R scheme are shown on Land Take - Figure 2 in the accompanying Place Figures report and the total land take for airport expansion and surface access area potentially affected, is calculated as approximately 624ha and 78.2 ha respectively.

Table 2.1 sets out the land take by land use classification as a result of the Gatwick 2R proposal. It shows the land use, the gross amount of land taken in hectares (ha) and the local authorities affected. Flood storage areas are integrated within the airport land take area and are therefore not measured separately.

Table 2.1 - Land Take – Gatwick 2R

Land Use	Land Take (Airport Expansion (ha)	Potential Land Affected (Surface Access) (ha)	Breakdown of Land Take by Local Authorities (ha)[7]
Agricultural and Fisheries land	381.9 ha	39.4 ha	Crawley District – **292.3** ha (up to 296.9 ha) Horsham District - **83.8** ha Mole Valley District - **5.9** ha Reigate & Banstead District – 0 (up to 16.1 ha) Tandridge District – 0 (up to 18.6 ha)
SUB-TOTAL			**381.9 ha** (up to 421.3 ha)
Forestry	54.8 ha	9.1 ha	Crawley District – **39.2** ha (up to 40.5 ha) Horsham District - **12.7** ha Mole Valley District - **2.9** ha Reigate & Banstead District – 0 (up to 5.3 ha) Tandridge District – 0 (up to 2.5 ha)
SUB-TOTAL			**54.8 ha** (up to 63.9 ha)
Minerals	NA	NA	NA
Recreation and leisure (incl. open space)	31.8 ha	0.3 ha	Crawley District – **28.0** ha (up to 28.3 ha) Horsham District - **3.8** ha
SUB-TOTAL			**31.8** ha (up to 32.1 ha)
Transport	29.0 ha	20.6 ha	Crawley District – **27.3** ha (up to 40.3 ha) Horsham District - **1.5** ha Mole Valley District - **0.2** ha Reigate & Banstead District – 0 (up to 4.6 ha) Tandridge District – 0 (up to 3.0)
SUB-TOTAL			**29 ha** (up to 49.6 ha)
Utilities and infrastructure	NA	NA	NA
Residential	56.4 ha	8.3 ha	Crawley District – **45.1** ha (up to 45.9 ha) Horsham District - **10.9** ha Mole Valley District – **0.4** ha Reigate & Banstead District – 0(up to 4.6 ha) Tandridge District – 0 (up to 2.8 ha)
SUB-TOTAL			**56.4 ha** (up to 64.7 ha)
Community services	0.9 ha	NA	Crawley District - **0.9** ha
SUB-TOTAL			**0.9 ha**
Retail	6.8 ha	NA	Crawley District - **6.8** ha
SUB-TOTAL			**6.8 ha**
Industry and business	51.4 ha	0.1 ha	Crawley District - **51.4** ha Tandridge District – 0 (up to 0.1)
SUB-TOTAL			**51.4 ha** (up to 51.5 ha)
Unused land	11.0 ha	0.4 ha	Crawley District – **10.9** ha Horsham District - **0.1** ha Reigate & Banstead District – 0(up to 0.4)
SUB-TOTAL			**11.0 ha** (up to 11.4 ha)
TOTAL	**624 ha**	**78.2ha**	**624 ha** (up to 702.2 ha)

[7] The area of land take for the airport expansion within each authority is identified in bold. The figure in brackets, if applicable is the maximum potential affect allowing for additional land take for surface access.

Land Take Figure 3 in in the Figures section of this report shows the extent of the impact of the Gatwick 2R scheme on agricultural land and Table 2.2, sets out the amount of agricultural land loss by Agricultural Land Classification (ALC) quality grade from the GIG database, within the footprint of the Gatwick 2R proposal and potentially with the surface access construction area. A total of 205.1 ha of agricultural land is identified as ALC grade 3 with 189.3 ha in the land take for the expansion of the airport and 15.8 ha within land potentially affected by surface access improvements.

Table 2.2 – Loss of Agricultural Land – Gatwick 2R

Agricultural land grade	Land Take (Airport Expansion (ha)	Potential Land Affected(Surface Access) (ha)	Total Land Affected (ha)[8]
Grade 1	0	0	0
Grade 2	0	0	0
Grade 3	189.3 ha	15.8 ha	**189.3** ha (up to 205.1 ha)
Grade 4	172.9 ha	23.6 ha	**172.9** ha (up to 196.5 ha)
Unknown	19.7 ha	0	**19.7** ha
Total	381.9 ha	39.4 ha	**381.9 ha** (up to 421.3 ha)

Table 2.3 sets out the number of residential properties and certain property types/land uses (as identified in the Address Base Plus Point Data) within the land take areas identified.

Table 2.3 - Number and type of properties/land uses – Gatwick 2R

ID	Category	Sub-Category	Number of properties/facilities		
			Within Land Take (Airport Expansion)	Within Potential Land Affected (Surface Access)	Total No's
1	**Residential**		**168**	**37**	**205**
		Dwelling	*165*	*37*	*202*
		Residential Institution	*1*	*0*	*1*
		Not Specified	*2*	*0*	*2*
2	**Education**		**6**	**0**	**6**
		Children's Nursery / Crèche	*4*	*0*	*4*
		Not Specified	*2*		*2*
3	**Community Services & Medical**[9]	*Health Centres*	**2**	**0**	**0**
4	**Allotments**		**0**	**0**	**0**
5	**Parks**		**1**	**0**	**1**
6	**Place of Worship**[10]	*Church*	**1**	**0**	**1**

[8] The area of land take for the airport expansion within each ALC grade is identified in bold. The figure in brackets, if applicable is the maximum potential affect allowing for additional land take for surface access.
[9] A separate Medical category included general practices and surgeries with a sub category of health centres (included here with community services)
[10] Places of worship are listed under object of interest category

2.5.2 Local Authority Land Allocations

Table 2.4 sets out the land take for allocations from local authority development plans, potentially impacted by the Gatwick 2R proposal. It shows the allocation type, the amount of land taken in hectares (ha) and the local authority affected (it should be noted that all these allocations are located on areas that have been identified as having an Industry and Business land use class in Table 1).

Table 2.4 - Local Authority Allocations – Gatwick 2R

Specific Allocation	Land Take (ha)	Local Authority
Allocation – Main Employment Area	67.4 ha	Crawley

2.5.3 Green Belt

Land Take - Figure 4 shows the predicted impact of the Gatwick 2R scheme upon the Green Belt and Table 2.5 lists the amount of Green Belt land affected in the various Local Authorities – measured in hectares (ha).

Table 2.5 - Green Belt – Gatwick 2R

Local Authority	Green Belt Land Take (ha)	
	Land Take (Airport Expansion)	Potential Land Affected (Surface Access)
Mole Valley	9.2 ha	0
Reigate and Banstead	0	23.9 ha
Tandridge	0	26.5 ha
TOTAL	**59.6 ha**	

2.5.4 Public Safety Zones

Land Take Figure 5 shows the outline of the PSZs associated with the runway proposal and Table 2.6 sets out the main land use types within the area of PSZs beyond the potential land take areas identified for the airport expansion and surface access. Currently around 0.5 ha of residential land would be located within the PSZ for the proposed runway. Planning restrictions will limit future development within the PSZ.

Table 2.6 - Public Safety Zones Land Uses – Gatwick 2R

Type of Land Use	Land Use within PSZ (ha)
Recreation and Leisure	0.3 ha
Residential	0.5 ha
Transport	0.1 ha

Table 2.7 identifies the sensitive properties and land uses (using the Address Base Plus Point Data) located within the proposed runway PSZ (and outside the land potential take areas identified for the airport expansion and surface access). 1 residential property has been identified with the PSZ.

Table 2.7 - Public Safety Zones Sensitive Properties/Land Uses – Gatwick 2R

ID	Category	Sub-category	Number of properties/ facilities affected
1	Residential	*Dwelling*	1
2	Education	0	0
3	Community Services	0	0
4	Allotments	0	0
5	Parks	0	0

2.5.5 Noise Contours

Potential sensitive land uses within the 63 LAeq 16 hr noise contour[11] for the proposed runway located outside the land take areas and existing airport noise contour, are highlighted in Table 2.8 (also see Land Take Figure 5). Future development within this noise contour area may be subject to restrictions and conditions requiring noise mitigation.

Table 2.8 - Noise Contour Areas – Gatwick 2R

Type of Land Use	Area (ha) for 63 LAeg contour (carbon capped)
Industry and Business	13.3 ha
Recreation and Leisure	16.5 ha
Residential	28.4 ha

The number of properties potentially affected by the Gatwick 2R scheme is described in the Noise: Local Assessment report, (Jacobs, 2014d).

2.5.6 Comments on the Gatwick Airport Limited Submission

Land Take Comparison

The total area of land take is not provided in the GAL submission, although a breakdown of land use is set out in Appendix 13: Place, (Gatwick Airport Limited, 2014a). The land use areas listed in GAL's Appendix 13, Table 2.9, amount to 641.9 ha and not all land use types appear to be covered. The area indicated on the Appendix 13 Land use plan appears to include the area east of the existing airport runway and terminals also part of the current airport facilities. The area assessed by Jacobs excludes existing airport land. The overall total area indicated in the valuation report is also much larger than the total area within the boundary used by Jacobs and potentially includes compensation areas and surface access improvement areas, but a breakdown for this figure is not given.

[11] Under Carbon capped scenario

Table 2.9 - Land Use in the Land Take Areas

Land Use	Jacobs Estimate		GAL Submission- Airport Expansion Land Take Estimate (ha)
	Land Take - Airport Expansion (ha)	Potential Land Affected (Surface Access) (ha)	
Agricultural and Fisheries land	381.9 ha	39.4 ha	371 ha
Forestry	54.8 ha	9.1 ha	133 ha
Minerals	NA	NA	NA
Recreation and leisure (incl. open space)	31.8 ha	0.3 ha	4.9 ha
Transport	29.0 ha	20.6 ha	98 ha car parks
Utilities and infrastructure	NA	NA	
Residential	56.4 ha	8.3 ha	
Community services	0.9 ha	NA	
Retail	6.8 ha	NA	35* ha
Industry and business	51.4 ha	0.1 ha	9.n.o hotels/boarding houses
Unused land and Defence (if stated)	11.0 ha	0.4 ha	
TOTAL	**624 ha**	**78.2 ha**	**641.9 (577ha**)**

*Retail Industry and Business
**(GAL, 2014a)

Sensitive Properties/Land Uses

The total number of residential properties identified by Jacobs is 168 compared to the 163 estimated by GAL. This may reflect some minor boundary differences (see Land Take Figure 15 which contains an extract of the masterplan as provided by (GAL, 2014b) but also may relate to data categorisation.

Table 2.10 - Number and type of properties/facilities

Property Type/ Land Use	Jacobs Estimate	GAL Submission Land Take Estimate (No's within area)
	Airport Expansion (No's within area)	
Residential	168	163 plus 9 hotels/guest houses
Education	6 (4 nursery/crèche and 2 non- specified)	4 (nurseries)
Community Services	2 health centres	2 (an outreach facility and a care home)
Allotments	0	0
Parks	1	0
Places of worship*	1	2

2.5.7 Land Take Assessment Conclusion - Gatwick Airport Second Runway

The land take associated with the proposed Gatwick Airport Second Runway (Gatwick 2R) expansion and the areas potentially affected by surface access construction is estimated as 624 ha and 78.2 ha respectively.

No agricultural land within the land take area was found to be with grades 1 or 2. Approximately 189.3 ha is ALC grade 3 and 172.9 ha is ALC grade 4, whilst the rest is of unknown classification.

A total of 168 residential properties lie within the predicted Gatwick 2R expansion land take and are likely to need to be demolished. An additional 37 residential properties are within the 100m buffer around proposed transport infrastructure and could potentially be lost to the surface access improvements depending on detailed route and construction design.

Approximately 9.2ha of the proposed airport expansion for the Gatwick 2R scheme is within designated Green Belt.

2.6 Land Take Assessment - Heathrow Airport Northwest Runway

2.6.1 Land Use

The land uses potentially affected by the Heathrow NWR scheme are shown on Land Take Figure 7 in the accompanying Place Figures report and the total land take (relating to airport expansion and surface access) for the submission is calculated as 568.8 ha for the airport development with an additional 294.2 ha for related surface access construction and an additional 42.9 ha for flood storage. Table 2.11 sets out the land take by land use classification as a result of the Heathrow NWR scheme. It shows the land uses, the amount of land taken by airport expansion and the additional land taken by associated surface access works and flood storage in hectares (ha), and the local authorities affected.

Table 2.11 - Land Use Classification – Heathrow NWR

Land Use	Land Take (Airport Expansion (ha)	Potential Land Affected (Surface Access) (ha)	Potential Land Affected (Flood Storage) (ha)	Breakdown of Land Take by Local Authority (ha) [12]
Agricultural and Fisheries land	235.1 ha	160.1 ha	35.3 ha	Hillingdon London Borough – **148.3** ha (up to 213.7 ha) Hounslow London Borough - **45.9** ha Slough Borough – **20.2** ha (up to 80.9 ha) South Bucks Dist. - **4.3** ha Spelthorne Dist. – **20.7** ha (up to 65.7 ha)
SUB-TOTAL				**235.1 ha** (up to 430.5 ha)
Forestry	47.5 ha	36.5 ha	3.3 ha	Hillingdon London Borough – **17.1** ha (up to 34.1 ha) Hounslow London Borough - **13.5** ha Slough Borough – **8.4** ha (up to 24.4 ha) South Bucks Dist. – 0 (up to 1.4 ha) Spelthorne Dist. – **8.5** ha (up to 13.9 ha)
SUB-TOTAL				**47.5 ha** (up to 87.3 ha)
Minerals	32.5 ha	1.9 ha	0	Hillingdon London Borough – **32.5** ha (up to 34.4ha) Hounslow London Borough - 0 Slough Borough - 0 South Bucks Dist. - 0 Spelthorne Dist. – 0
SUB-TOTAL				**32.5 ha** (up to 34.4 ha)
Recreation and leisure (incl. open space)	53.2 ha	12.2 ha	4.3 ha	Hillingdon London Borough – **42.8** ha (up to 57.7 ha) Hounslow London Borough - **6.1** ha Slough Borough – **4.3** ha (up to 5.8 ha) South Bucks Dist. - De minimis Spelthorne Dist. – 0 (up to 0.1 ha)
SUB-TOTAL				**53.2 ha** (up to 69.7 ha)
Transport	47.7 ha	34.2 ha	0	Hillingdon London Borough – **38.4** ha (up to 58.1 ha) Hounslow London Borough – **0.9** ha Slough Borough – **8.1** ha (up to 12.5 ha) South Bucks Dist. - **0.2** ha Spelthorne Dist. – **0.3** ha (up to 10.2 ha)
SUB-TOTAL				**47.7 ha** (up to 81.9 ha)
Utilities and infrastructure	6 ha	2.5 ha	0	Hillingdon London Borough – 0 Hounslow London Borough – **6**

[12] The area of land take for the airport expansion within each authority is identified in bold. The figure in brackets, if applicable is the maximum potential affect allowing for additional land take for surface access.

Land Use	Land Take (Airport Expansion (ha)	Potential Land Affected (Surface Access) (ha)	Potential Land Affected (Flood Storage) (ha)	Breakdown of Land Take by Local Authority (ha) [12]
				Slough Borough – 0 South Bucks Dist. – 0 Spelthorne Dist. – 0 (up to 2.5 ha)
SUB-TOTAL				**6 ha** (up to 8.5 ha)
Residential	45.1 ha	16 ha	0	Hillingdon London Borough – **39.7** ha (up to 45.7 ha) Hounslow London Borough - **1.1** ha Slough Borough – **3.3** ha (up to 12.9 ha) South Bucks Dist. – De minimis Spelthorne Dist. – **1** ha (up to 1.4 ha)
SUB-TOTAL				**45.1 ha** (up to 61.1 ha)
Community services	14.7 ha	4.1 ha	0	Hillingdon London Borough – **14.7** ha (up to 18.6 ha) Hounslow London Borough - 0 Slough Borough – 0 (up to 0.2 ha) South Bucks Dist. - 0 Spelthorne Dist. - De minimis
SUB-TOTAL				**14.7 ha** (up to 18.8 ha)
Retail	3.2 ha	0.7 ha	0	Hillingdon London Borough – **3.2** ha (up to 3.9 ha) Hounslow London Borough - 0 Slough Borough - 0 South Bucks Dist. - 0 Spelthorne Dist. Borough - 0
SUB-TOTAL				**3.2 ha** (up to 3.9 ha)
Industry and business	50.4 ha	16.2 ha	0	Hillingdon London Borough – **40 9** ha (up to 43.2) Hounslow London Borough - **0.9** ha Slough Borough – **9.2** ha (up to 19.4 ha) South Bucks Dist. - 0 Spelthorne Dist. – **0.3** ha (up to 3.1)
SUB-TOTAL				**50.4 ha** (up to 66.6 ha)
Unused land	33.4 ha	9.8 ha	0	Hillingdon London Borough – **17.2** ha (up to 22 ha) Hounslow London Borough - **7.6** ha Slough Borough – **6.3** ha (up to 9.9 ha) South Bucks Dist. – de minimis Spelthorne Dist. – **2.3** ha (up to 3.7 ha)
SUB-TOTAL				**33.4 ha** (up to 43.2 ha)
Total Land Take Area	**568.8ha**	**294.2 ha**	**42.9 ha**	**568.8 ha** (up to 905.9 ha)

Land Take Figure 8 shows the predicted impacts on agricultural land and Table 2.12, sets out the amount of agricultural land loss by Agricultural Land Classification (ALC) quality grade. A total of 200.6 ha of the potential agricultural land take is classed as either ALC grade 1, 2 or 3 of which 121.8 ha of the loss would result from the airport expansion alone. The remaining area is within land potentially affected by surface access or flood storage (19.1 ha within areas of flood storage and 59.7 ha within the 100m buffer for surface access construction).

Table 2.13 sets out the number of sensitive properties and land use types (as identified in the Address Base Plus Point Data) that are located within the land take areas identified.

2.6.2 Local Authority Land Allocations received

Table 2.14 sets out the land take for allocations from local authority development plans, potentially impacted by the Heathrow NWR proposal. It relates to the areas of land allocated in development plans (and received from the LPAs concerned) including allocation type and the local authority affected (it should be noted that all these allocations are located on areas that have been identified as having an Industry and Business land use class in Table 2.11 above).

Table 2.12: Loss of Agricultural Land – Heathrow NWR

Agricultural Land Grade	Land Take - Airport Expansion (ha)	Potential Land Affected – Surface Access (ha)	Potential Land Affected – Flood Storage (ha)	Potential Total Land Affected (ha)[13]
Grade 1	104.9 ha	46.8 ha	17 ha	**104.9** ha (up to168.7 ha)
Grade 2	3 ha	3.4 ha	0	**3** ha (up to 6.4 ha)
Grade 3	13.9 ha	9.5 ha	2.1 ha	**13.9** ha (up to 25.5 ha)
Grade 4	0	0	0	0
Unknown ALC classification	112.1 ha	96.1 ha	16.6 ha	**112.1** ha (up to 224.8 ha)
ALC 'urban land'	1.2 ha	4.2 ha	0	**1.2** ha (up to 5.40 ha)
TOTAL	**235.1 ha**	**160 ha**	**35.7 ha**	**235.1 ha** (up to 430.8 ha)

Table 2.13 - Number and type of properties/land uses – Heathrow NWR

ID	Category	Sub-Category	Number of properties/ facilities affected		
			Within Land Take Area (Airport Expansion)	Within Potential Land Affected (Surface Access)	Total No's
1	**Residential**	**Total**	**783**	**289**	**1072**
		Dwelling	*771*	*288*	*1059*
		House in Multiple Occupation	*11*	*0*	*11*
		Residential Institution	*1*	*0*	*1*
		Not Specified	*-*	*1*	*1*
2	**Education**	**Total**	**1**	**0**	**1**
		Preparatory/ First/Primary /Infant/Junior/ Middle School	*1*	*0*	*1*
3	**Community Services**	**Total**	**3**	**1**	**4**
		Cemetery/ Crematorium/ Graveyard.	*0*	*1*	*1*
		Immigration Centre (AIT Harmondsworth)	*1*	*0*	*1*
		Public/Village Hall Other Community Facility	*2*	*0*	*2*
5	**Allotments**		**15**	**25**	**40**
6	**Parks**		**9**	**0**	**9**
		Playground	*5*	*0*	*5*
		Public Open Space / Nature Reserve	*4*	*0*	*4*

[13] The area of land take for the airport expansion within each ALC grade is identified in bold. The figure in brackets, if applicable is the maximum potential affect allowing for additional land take for surface access.

Table 2.14 - Local Authority Allocations – Heathrow NWR

Allocation Type	Local Authority	Land Take (Airport Expansion) (ha)	Potential Land Affected (Surface Access) (ha)
Allocation – Significant employment location	Hillingdon	18.5 ha	0
Allocation – Main industrial sites	Slough	6.5 ha	7.4 ha

2.6.3 Green Belt

Land Take Figure 9 shows the predicted impact of the Heathrow NWR scheme upon the Green Belt and Table 2.15 lists the amount of Green Belt land affected in the various Local Authorities measured in hectares (ha).

Table 2.15 - Green Belt Land Affected – Heathrow NWR

Local Authority	Amount Green Belt Land Affected (ha)	
	Land Take Area (Airport Expansion)	Potential Land Affected (Surface Access)
Hillingdon	263.5 ha	115.8 ha
Hounslow	81.1 ha	0
Slough	53.2 ha	80.0 ha
Spelthorne	33.2 ha	67.8 ha
SUB-TOTAL	**431 ha**	**263.6 ha**
TOTAL	**694.6 ha**	

2.6.4 Public Safety Zones (PSZ)

Land Take Figure 10 outlines the Public Safety Zones (PSZ) associated with the proposed runway and Table 2.16 sets out the main land use types within the area of PSZs beyond the potential land take areas identified for the airport expansion, surface access and flood storage. Currently around 3.6 ha of residential land would be located within the PSZ for the proposed runway. Planning restrictions will limit future development within the PSZ.

Table 2.16 - Public Safety Zones Land Affected – Heathrow NWR

Type of Land Use	Area Affected (ha)
Recreation and Leisure	1.0 ha
Residential	3.6 ha
Transport	0.5 ha

Table 2.17 identifies the sensitive property types within the PSZs (beyond the potential land take areas identified for the airport expansion, surface access and flood storage) using the Address Base Plus Point Data. A total of 126 residential properties are located in the PSZ area for the runway extension.

Table 2.17 - Public Safety Zones Sensitive Land Uses – Heathrow NWR

ID	Property/Land Use Main category Type	Sub category	Number of properties/ facilities affected
1	**Residential**		**126**
		Dwelling	*124*
		Not specified	*2*
2	**Education**		**0**
3	**Community Services**		**1**
		Church Hall /Religious Meeting Place/ Hall	*1*
4	**Allotments**		**0**
5	**Parks**		**0**

2.6.5 Noise Contours

Potential sensitive land uses within the 63 LAeq 16 hr noise contour[14] for the proposed runway located outside the land take areas and existing airport noise contour, are highlighted in Table 2.18 (also see Land Take Figure 10). Future development within this noise contour area may be subject to restrictions and conditions requiring noise mitigation.

Table 2.18 - Noise Contour Areas Land Uses – Heathrow NWR

Type of Land Use	Area (ha) for 63 LAeq contour
Community Services	25.3 ha
Industry and Business	22.6 ha
Recreation and Leisure	57.7 ha
Residential	157.7 ha

The number of properties potentially affected by the Heathrow NWR scheme is described in the Noise: Local Assessment report, (Jacobs, 2014d).

2.6.6 Comments on the Heathrow Airport Limited Submission

Land Take Comparison

The HAL submission indicates a total land take of around 500 ha while Jacob's assessment indicates that approximately 569ha of land would be lost to the airport expansion development, (Land Take Figure 16 contains the masterplan as provided by HAL (HAL, 2014). The reason for difference could be the related to whether all the ancillary development is included in the HAL area estimate although the overall land take boundaries are taken directly from the HAL submitted information. There are potentially small differences in the detailed boundary used for the existing airport. There is no detailed breakdown of land use within the area in the HAL submission. Land take estimates associated with surface access infrastructure and flood storage are also not provided by HAL.

[14] Under carbon capped scenario

Table 2.19 - Land Take Areas – HAL

	Jacobs Estimates			Land Take from HAL Submission (ha)
	Land Take (Airport Expansion) (ha)	Potential Land Affected (Surface Access) (ha)	Potential Land Affected (Flood Storage) (ha)	
TOTAL	568.8 ha	294.2 ha	42.9 ha	Around 500 ha for compulsory acquisition*

*(HAL submission, 2014)

Sensitive Properties/Land Uses

The number of residential properties within the airport land take area is estimated as 750 by HAL whereas Jacob's assessment using the Address base point data is 783. This difference is may be due to differences in the categorisation of properties in different datasets used or minor boundary differences with the existing airport outline. An additional 289 residential properties are within the 100m buffer either side of the proposed transport infrastructure and could potentially be lost to the surface access improvements depending on detailed route and construction design. Surface transport related property losses are not covered in HAL's submission.

Table 2.20 - Number and Type of Properties/Facilities - HAL

Property Type/Land Use	Jacobs Estimate			HAL Submission
	Land Take (Airport Expansion)	Potential Land Affected (Surface Access)	TOTAL	Property/Land Take Estimate
Residential	783	289	1072	750
Education	1	0	1	1
Community Services	3	1	4	
Allotments	15	25	40	
Parks	9	0	9	

2.6.7 Land Take Assessment Conclusion - Heathrow Airport Northwest Runway

The land take associated with the proposed Heathrow NWR airport expansion and surface access areas is approximately 568.8 ha and 294.2 ha respectively. An additional 42.9 ha of land is identified for flood storage.

Of the potential agricultural land lost through the airport expansion and potential impacts from surface access approximately 181.5 ha is Agricultural Land Classification (ALC) grade 1, 2 or 3 land (grade 1, 2 and 3a is considered as best and most versatile agricultural land). 121.8 ha of the loss would result from the airport expansion alone. An additional 19.1 ha of grade 1 and 3 ALC land lies within the flood storage areas identified. The quality of the remaining agricultural land is not classified.

A total of 783 residential properties lie within the Heathrow NWR airport expansion land take and are likely to need to be demolished. An additional 289 residential properties are within the 100m buffer either side of proposed transport infrastructure and could potentially be lost to the surface access improvements depending on detailed route and construction design.

Approximately 431 ha of the Heathrow NWR airport expansion is within designated Green Belt land. As a result the development would significantly change the land use within this Green Belt area which was designated to control urban sprawl and maintain largely undeveloped land between urban areas.

2.7 Land Take Assessment - Heathrow Airport Extended Northern Runway

2.7.1 Land Use

The land uses potentially affected by the land take associated with the Heathrow ENR scheme are shown on Land Take Figure 11 in the accompanying Place Figures report and the total land take for airport expansion and surface access is calculated as 335.7 ha and 329.8 ha respectively[15]. An additional 57.3 ha of land is identified for flood storage. Table 2.21, sets out the land take (in Hectares) by land use classification and local authorities affected.

Table 2.21 - Land Use Classification - Heathrow ENR

Land Use	Land Take (Airport Expansion (ha)	Potential Land Affected(Surface Access) (ha)	Potential Land Affected (Flood Storage) (ha)	Breakdown of Land Take by Local Authority (ha)[16]
Agricultural land Fisheries	167.9 ha	156.8 ha	45.9 ha	Hillingdon London Borough – **63.1** ha (up to 104.4 ha) Slough Borough – **46.4** ha (up to 59.3) South Bucks District – 0 (up to 9.5) Spelthorne District – **31.7** ha (up to 150.5 ha) Windsor & Maidenhead Borough – **26.7** ha (up to 46.9 ha)
SUB-TOTAL				**167.9 ha** (up to 370.6 ha)
Forestry	25.3 ha	44.5 ha	2.4 ha	Hillingdon London Borough – **11.3** ha (up to 22.4 ha) Slough Borough – **8.7** ha (up to 13.6 ha) South Bucks District – 0 (up to 14.5 ha) Spelthorne District – **4.5** ha (up to 16.9 ha) Windsor & Maidenhead

[15] 'Heathrow Hub interchange has been excluded from the footprint and the assessment. The Commission stated in its Interim Report its intention to consider HH's proposed transport hub as a detachable component which could be associated with either of the Heathrow runway options under consideration. Accordingly, the core appraisal case for the Heathrow ENR scheme includes a more traditional surface access package

[16] The area of land take for the airport expansion within each authority is identified in bold. The figure in brackets, if applicable is the maximum potential affect allowing for additional land take for surface access.

Land Use	Land Take (Airport Expansion (ha)	Potential Land Affected(Surface Access) (ha)	Potential Land Affected (Flood Storage) (ha)	Breakdown of Land Take by Local Authority (ha)[16]
				Borough – **0.8** ha (up to 4.8 ha)
SUB-TOTAL				**25.3 ha** (up to 72.2 ha)
Minerals	23.6 ha	3.3 ha	0	Hillingdon London Borough – **11.4** ha (up to 12.2 ha) Slough Borough - **5.4** ha South Bucks District - 0 Spelthorne District Borough – **6.8** ha (up to 8.2 ha) Windsor & Maidenhead Borough - **1.1** ha
SUB-TOTAL				**23.6 ha** (up to 26.9 ha)
Recreation and leisure (incl. open space)	1.6 ha	11.6 ha	8.3 ha	Hillingdon London Borough – **0.1** ha (up to 14.8 ha) Slough Borough – **1.1** ha (up to 6.5 ha) South Bucks District – 0 ha Spelthorne District – **0.4** ha (up to 1.2 ha) Windsor & Maidenhead Borough – 0
SUB-TOTAL				**1.6 ha** (up to 21.5 ha
Transport	29.6 ha	42.3 ha	0.3 ha	Hillingdon London Borough – **25 ha** (up to 33.8 ha) Slough Borough – **0.9** ha (up to 3.5 ha) South Bucks District – 0 (up to 5.2 ha) Spelthorne District – **3.7** ha (up to 25.3 ha) Windsor & Maidenhead Borough – 0 (up to 4.4 ha)
SUB-TOTAL				**29.6 ha** (up to 72.2 ha)
Utilities and infra-structure	0	9 ha	0	Hillingdon London Borough - 0 Slough Borough - 0 South Bucks District - 0 Spelthorne District – 0 (up to 9 ha) Windsor & Maidenhead Borough – 0
SUB-TOTAL				**0 ha (**Up to 9 ha)
Residential	16.7 ha	12.4 ha	0.2 ha	Hillingdon London Borough – **4.2** ha (up to 5.9 ha) Slough Borough – **9.2** ha (up to 11.8 ha) South Bucks District - 0 Spelthorne District – **3.3** ha (up to 8.3 ha) Windsor & Maidenhead - **3.3** ha
SUB-TOTAL				**16.7 ha** (up to 29.3 ha)
Community services	0	11 ha	0	Hillingdon London Borough – **9.8** ha Slough Borough - 0 South Bucks District - 0 Spelthorne District - **1.2** ha Windsor & Maidenhead Borough – 0
SUB-TOTAL				**0 ha** (Up to 11 ha)
Retail	0	0	0	N/A
SUB-TOTAL				**0**

Land Use	Land Take (Airport Expansion (ha)	Potential Land Affected(Surface Access) (ha)	Potential Land Affected (Flood Storage) (ha)	Breakdown of Land Take by Local Authority (ha)[16]
Industry and business	48.1 ha	18.3 ha	0.1 ha	Hillingdon London Borough – **2.5** ha (up to 2.6 ha) Slough Borough – **41.8** ha (up to 59.3 ha) South Bucks District - 0 Spelthorne District – **3.8** ha (up to 4.6 ha) Windsor & Maidenhead Borough – 0
SUB-TOTAL				**48.1 ha** (up to 66.5 ha)
Unused land	22.9 ha	20.6 ha	0.1 ha	Hillingdon London Borough – **13.5** ha (up to 17.8 ha) Slough Borough – **1.6** ha (up to 2.3 ha) South Bucks District – 0 (up to 2 ha) Spelthorne District – **0.9** ha (up to 11.2 ha) Windsor & Maidenhead Borough – **6.9** ha (up to 10.3 ha)
SUB-TOTAL				**22.9 ha** (up to 43.6 ha)
Total land take area	**335.7 ha**	**329.8 ha**	**57.3 ha**	**335.7 ha** (up to 723.8 ha)

Land Take Figure 12 shows the agricultural land potentially affected by the Heathrow ENR scheme and Table 2.22 sets out the amount of agricultural land lost by quality grade under the Agricultural Land Classification (ALC). A total of 96.1 ha of the potential agricultural land affected are classed as ALC Grade 1, 2 or 3 land. 42.5 ha of this area is land take for the expansion of the airport within the Heathrow NWR scheme. 26.6 ha of the land is within the 100 m buffer for surface access construction and potentially affected and 27ha is in land potentially affected by flood storage areas.

Table 2.22 - Loss of Agricultural Land - Heathrow ENR

Agricultural Land Grade	Land Take – Airport Expansion (ha)	Potential Land Affected – Surface Access (ha)	Potential Land Affected – Flood Storage (ha)	Potential Total Land Affected (ha)[17]
Grade 1	12.6ha	5.7ha	14.4ha	**12.6** ha (Up to 32.7 ha)
Grade 2	11.8ha	0.6ha	0	**11.8** ha (Up to 12.4 ha)
Grade 3	18.1ha	20.3ha	12.6ha	**18.1** ha (Up to 51.0 ha)
Grade 4	0	0	0	0
UNKNOWN ALC classification	125.4ha	130.2ha	18.9ha	**125.4** ha (Up to 274.5 ha)
TOTAL	**167.9ha**	**156.8ha**	**45.9ha**	**167. ha** (Up to 370.6 ha)

[17] The area of land take for the airport expansion within each ALC grade is identified in bold. The figure in brackets, if applicable is the maximum potential affect allowing for additional land take for surface access.

Table 2.23 sets out the number of sensitive properties and land uses in the land take area (as identified in the Address Base Plus Point Data).

Table 2.23 - Number and type of properties/Land Uses - Heathrow ENR

ID	Category	Sub-Category	Number of properties/facilities affected:			
			Within Land Take (Airport Expansion Area)	Within Potential Land Affected (Surface Access)	Within Potential Land Affected (Flood Storage Area)	TOTAL
1	**Residential**		**242**	**165**	**0**	**407**
		Dwelling	*241*	*165*	*0*	*406*
		Not specified	*1*			*1*
2	**Education**		**0**	**0**	**0**	**0**
			0	*0*	*0*	*0*
3	**Community Services**		**0**	**1**	**0**	**1**
		Public / Village Hall / Other Comm-unity Facility	*0*	*1*	*0*	*1*
		Not specified	*1*			*1*
5	**Allotments**		**1**	**0**	**0**	**1**
6	**Parks**		**0**	**2**	**3**	**5**
		Play-ground	0	1	0	1
		Public Open Space / Nature Reserve	0	0	3	3
		Public Park / Garden	0	1	0	1

2.7.2 Local Authority land allocations

Table 2.24 sets out the land take for allocations from local authority development plans, potentially impacted by the Heathrow ENR proposal. It shows the allocation type, the amount of land taken in hectares (ha) and the local authority affected (it should be noted that all these allocations are located on areas that have been identified as having an Industry and Business land use class in Table 21 above).

Table 2.24 - Local Authority Allocations - Heathrow ENR

Allocation Type	Local Authority	Land Take (Airport Expansion)	Potential Land Affected (Surface Access)
Allocation – Main industrial sites	Slough	38.6 ha	13.6 ha

2.7.3 Green Belt

Land Take Figure 13 shows the predicted impact of the Heathrow ENR scheme on designated Green Belt and Table 2.25 lists the amount of Green Belt land affected

by land take in the various Local Authorities, measured in hectares (ha). Land take for the airport expansion within the Green Belt totals 278.2 ha.

Table 2.25 - Green Belt - Heathrow ENR

Local Authority	Green Belt Land Take (ha)		
	Land Take (Airport Expansion)	Potential Land Affected (Surface Access)	TOTAL
Hillingdon	119.5 ha	31.1 ha	150.6 ha
Slough	69.5 ha	28.4 ha	97.6 ha
Spelthorne	55.0 ha	162.4 ha	217.4 ha
Windsor	34.2 ha	20.9 ha	55.14 ha
TOTAL	**278.2 ha**	**242.8 ha**	**521 ha**

2.7.4 Public Safety Zones (PSZ)

Land Take Figure 14 outlines the extent of the Public Safety Zones (PSZ) and Table 2.26, sets out the main land use types within the area of PSZs beyond the potential land take area identified for the airport expansion, surface access and flood storage. Currently around 2.7 ha of residential land would be located within the PSZ for the proposed runway. Planning restrictions will limit future development within the PSZ.

Table 2.26 - Public Safety Zones Land Uses - Heathrow ENR.

Type of Land Use	Actual Land Take (ha)
Recreation and Leisure	0.2 ha
Residential	2.7 ha
Transport	0

Table 2.27 identifies the sensitive land uses within the PSZs (beyond the potential land take areas identified for the airport expansion, surface access and flood storage), using the Address Base Plus Point Data. A total of eight residential properties are located in the PSZ area for the runway extension.

Table 2.27 - Public Safety Zones - Heathrow ENR

ID	Property/ Land Use Main category	Sub category	Number of properties/ facilities affected
1	Residential	Dwelling	8
2	Education		0
3	Community Services		0
4	Allotments		0
5	Parks		0

2.7.5 Noise

Potential sensitive land uses within the 63 LAeq 16 hr noise contour[18] for the proposed runway located outside the land take areas and existing airport noise contour, are highlighted in Table 2.28 (also see Land Take Figure 14). Future development within this noise contour area may be subject to restrictions and conditions requiring noise mitigation.

Table 2.28 - Noise Contour Areas Land Uses - Heathrow ENR.

Type of Land Use	Area (ha) for 63 LAeg contour
Industry and Business	19.4 ha
Recreation and Leisure	126.6 ha
Residential	295.1 ha

The number of properties potentially affected by the Heathrow ENR schemes is described in the Noise: Local Assessment report, (Jacobs, 2014d).

2.7.6 Comments on the Heathrow Hub Submission

Land Take

The total footprint area is not specified in the Heathrow Hub Submission and no estimate of land take for surface access infrastructure is given. See Land Take Figure 17 for the masterplan as provided by Heathrow Hub.

Table 2.29 – Land Take Land Uses - Heathrow Hub

	Jacobs Land Take Estimates			Heathrow Hub Submission
Land Use	Airport Expansion (ha)	Surface Access (ha)	Flood Storage Area (ha)	Land Take (ha)
Industry and business	48.1 ha	18.3 ha	0	65.5ha
TOTAL	**335.7ha**	**329.8 ha**	**57.3 ha**	**Not specified**

Sensitive Land Uses affected by Land Take

The total number of residential properties within the land take area, within the HAL submission, is 246 whereas the Jacobs' assessment identified 242 residential properties within the proposed airport footprint. This may be due to differences in the detailed scheme boundary or in property classification data.

We have also identified that an additional 165 residential properties are within the 100m buffer either side of the proposed transport infrastructure and could potentially be lost to the surface access improvements depending detailed route and construction design. Surface transport related property losses are not covered in HH's submission.

[18] Under carbon capped scenario

Table 2.30 – Sensitive Land Uses - Heathrow Hub

Property Type/Land Use	Jacobs Estimate	Heathrow Hub Submission
	Airport Expansion Land take (No's within area)	Airport Land Take Estimate (No's within area)
Residential	242	246
Educational	1	
Community Services	1	
Allotments	1	
Parks	0	

Green Belt Impacts

In the HH submission a total of 420 ha of land was identified within designated Green Belt whereas Jacobs identified a total of 278.2 ha for the extension of the airport and a total of 521 ha that could potentially be affected allowing for surface access impacts, (see Table 2.31). It is not clear however, if HH included the hub interchange in their estimate.

Table 2.31 – Land Take Impact upon Green Belt Land

Jacobs Estimate		Heathrow Hub Submission
Land Take (Airport Expansion)	Potential Land Affected(Surface Access)	
278.2 ha	242.8 ha	420 ha

2.7.7 Land Take Assessment Conclusion – Heathrow Airport Extended Northern Runway

The land take associated with the proposed Heathrow ENR airport expansion and surface access areas is approximately 335.2 ha and 329.8 ha respectively. An additional area of 57.3 ha of land lies within flood storage areas.

Of the agricultural land potentially affected by the airport expansion and surface access, approximately 69.1 ha is ALC grade 1, 2 or 3 land (grade 1, 2 and 3a are considered best and most versatile land) and the classification of the remaining area is unknown. 42.5 ha of this area is land take for the expansion of the airport within the Heathrow NWR scheme. In addition, approximately 27 ha of grade 1 to 3 land lies within the flood storage areas

A total of 242 residential properties lie within the airport land take and are likely to need to be demolished. An additional 165 residential properties are within the 100m buffer either side of the proposed transport infrastructure and could potentially be lost to the surface access improvements depending on detailed route and construction design.

Approximately 278.2 ha of proposed the Heathrow ENR airport expansion is within designated Green Belt and would significantly affect the aims of the Green Belt in this area to control urban sprawl and separate maintain largely undeveloped land between urban areas.

3 Landscape, townscape and waterscape

This section presents the landscape, townscape and waterscape impact assessment within the Appraisal Framework for Place. This includes consideration of:

- Potential impacts on landscape character;
- Views that may be affected by the proposed schemes; and
- Changes in areas of tranquillity and dark skies around the proposed schemes.

3.1 Context and Methodology

3.1.1 Assessment of Landscape, Townscape and Waterscape Impacts

The process of Landscape and Visual Impact Assessment (LVIA) takes account of potential changes to physical elements within the landscape as well as the way in which people visually perceive it. The landscape takes its character from a combination of elements, including landforms, land-use, vegetation cover, field patterns and boundaries, settlement patterns and types of buildings, roads, railways and rights of way. Landscapes vary considerably in both character and quality, and they are key components of the distinctiveness of any local area or region. The assessment of effects on landscape therefore addresses changes in any of these components that would be caused by a proposed development.

Townscape can be described as *"…areas where the built environment is dominant. Villages, towns and cities often make important contributions as elements in wider-open landscapes, but townscape means the landscape within the built-up area, including the buildings, the relationships between them, the different types of urban open spaces, including green spaces, and the relationship between buildings and open spaces",* (Landscape Institute and Institute of Environmental Management and Assessment, 2013).

Waterscape is broadly understood as a landscape in which an expanse of water is a dominant feature, but is not a recognised technical term in landscape guidance. In referring to an expanse of water, waterscape covers lakes and rivers which are addressed for landscape purposes under 'hydrological features' and coastal aspects are addressed under 'seascapes'. The latter is defined as *"landscapes with views of the coast or seas, and coasts and adjacent marine environments with cultural, historical and archaeological links with each other",* (Landscape Institute and Institute of Environmental Management and Assessment, 2013).

People also experience landscape and townscape as a visual phenomenon, and the quality of views in any given area can make a significant contribution to 'quality of life'. In some areas, views can also be important to the local economy. Visual Impact Assessment therefore seeks to identify where existing views would be altered by any proposed changes in the landscape, and to assess the significance of those changes, taking into account the quality and extent of existing views, the number of people affected and the nature of the change.

The Appraisal Framework summarised the elements within the assessment of effects on landscape character, townscape character and visual amenity (Airports Commission, 2014a) and these have been addressed in this assessment as follows:

- Effects on topography, hydrology and land cover have been considered through the assessment of landscape and townscape character areas directly affected by the scheme;
- Effects on the layout, density and mix of buildings have been addressed through the assessment of townscape character areas directly affected by the scheme;
- Tranquillity effects have been assessed within the area bounded by the N70 (N=20) noise contour, and dark skies effects within the study area as defined;
- Effects on cultural spaces and human interaction are included within the appraisal of visual effects on recreational areas and as townscape character areas directly affected by the scheme; and,
- Effects on 'beauty' have been addressed in the effects on landscapes designated for their natural beauty.

3.1.2 Methodological Summary

A high level desk based assessment has been undertaken in line with Guidelines for Landscape and Visual Impact Assessment Third Edition (Landscape Institute and Institute of Environmental Management and Assessment, 2013) and the Airports Commission Appraisal Framework (Chapter 10), (Airports Commission, 2014a). A full methodology is described in Appendix C.

Landscape and townscape effects have been broadly assessed by determining the effects on district and/or county level character areas. This includes consideration of hydrological features. A high level visual assessment has also been undertaken by identifying key visual receptors to the scheme and the potential effects on them.

A study area for the assessment of effects has been defined as a 5km area around the proposed scheme. It is anticipated that the most significant effects on landscape character and views from the proposed ground based elements of the scheme (such as buildings and runways), would only occur within an area of approximately 5km. Beyond 5km, even though some elements might be visible, they would be barely perceptible due to the distance away from the airport and the filtering effect of intervening vegetation.

Areas of Outstanding Natural Beauty (AONBs) and Areas of Great Landscape Value (or locally designated landscapes) have been assessed within a 15km study area as they are of significant importance to the landscape surrounding the airports.

The study area for the assessment of flight paths and their relevance for tranquillity and Dark Skies is based on the N70 (20 event) noise contour.

Timescales for the assessment have been determined as during construction (when the majority of the site is under construction) and operation. Although temporary, construction effects are usually the most significant for landscape character and visual amenity. The operation of an airport development will have the potential for landscape and visual effects. Therefore, both construction and operation effects have been assessed. In the report, construction is discussed first as it would occur first temporally. Operation effects have then been discussed afterwards.

Baseline information has been gathered through a desk study of the existing documents listed and review of aerial photography, Ordnance Survey mapping and Google Street View.

For the tranquillity assessment tranquillity mapping has been obtained from the Campaign for the Protection of Rural England (CPRE). The rationale for tranquillity mapping is described in the CPRE publication 'Developing an Intrusion Map of England', 2007, (CPRE, 2007). The resulting tranquillity mapping takes account of Civil Aviation Authority information on airports and the '57Leq contour and a 1km radius. For the purposes of this report, CPRE's Tranquillity mapping is overlain by noise mapping of the predicted noise levels at 2030 and 2050 for both the existing airport configurations without further development, as well as for the proposed schemes. These noise contours provide an illustration of the likely areas where there may be changes in noise levels due to air traffic movements. These changes may be either positive or negative, depending upon location of receptors. No attempt is made within this report to quantify these changes in terms of acceptability or nuisance, or indeed the level at which a landscape character area may be significantly affected.

An assessment has also been made in relation to 'Dark Skies'. In 2003, the CPRE acquired satellite imagery (source unknown) and translated the data into mapping to represent 'Dark Skies' maps, (CPRE, 2003). These maps were created from pixels representing a square kilometre, and are therefore the level of detail is relatively course grained when dealing with individual developments. They are a colour representation of satellite measurements of artificial light at night. The light is measured on a range from 0 to 255; 0 means the satellite is detecting no light in that pixel and 255 means the satellite's detector is saturated with light. The measure is therefore of light detected from above, and is not a representation of the visibility of air traffic lights in the sky, when viewed from the ground. The presence of ground lighting has been considered with the report as a whole when dealing with visual impacts. The potential aircraft routes have been superimposed onto the CPRE Dark Sky data for illustrative purposes only, see Landscape Figures 8 and 9.

Documents consulted in the desk study for the Gatwick 2R Scheme include:

- National Character Area 121 (Low Weald,) (Natural England, 2013B) and Area 122 (High Weald), (Natural England, 2014C);
- County Character Areas from Surrey (Low Weald: Open Weald and Wooded Weald), (Surrey County Council, 1997) and West Sussex (LW8 Northern Vales, LW4 Low Weald Hills, HW1 High Weald and HW2 High Weald Forests), (West Sussex County Council, 2007);
- District Character Areas from Reigate and Banstead (C1 Low Weald), (Reigate and Banstead Borough Council, June 2008), Mole Valley (4A Open Weald), (Mole Valley District Council, July 2013), Crawley Borough (Area 1 Upper Mole Farmlands and Area 6 High Woodland Fringes), (Crawley Borough Council, October 2012), Horsham (K1 Upper Mole Farmlands and I2 Warnham and Rusper Wooded Ridge), (Horsham District Council, October 2003) and Mid Sussex (LCA7 High Weald Plateau), (Mid Sussex District Council, November 2005); and,
- Townscape information from Crawley Borough (Crawley Borough Council, May 2009).

Documents consulted in the desk study for both the Heathrow NWR and the Heathrow ENR include:

- National Character Area 111 (Northern Thames Basin), (Natural England, 2013a) and Area 115 (Thames Valley), (Natural England, 2012);
- County Character Areas from Surrey (Thames Valley: Thames Floodplain), (Surrey County Council, 1997);
- District Character Areas from South Bucks (Colne Valley Floodplain, Iver Heath Mixed Use Terrace and Stoke and Langley Park Lowland Fringe), (Buckinghamshire County Council and South Bucks District Council, 2011),
- Windsor and Maidenhead (Settled Developed and Farmed Floodplain), (Royal Borough of Windsor and Maidenhead, 2004) and Hillingdon (Gravel Terrace Infrastructure, Lower Colne Floodplain, Open Gravel Terrace and Stockley Gravel Terrace Recreation), (London Borough of Hillingdon, 2012), and,
- Townscape information from Hillingdon (Commercial Airport, Historic Core, Inter War Suburb Metroland), (Royal Borough of Windsor and Maidenhead, 2004) and Hounslow (Bedfont, Feltham, Hounslow West and Cranford and Heston), (London Borough of Hounslow, 2014).

In addition to the documents identified above, the following documents supplied by the Airport Scheme Promoters were also consulted:

- The Place: Landscape, Townscape and Waterscape, (Gatwick Airport Limited, 2014a) for the Gatwick 2R Scheme as proposed by GAL;
- Landscape and Visual Impact Assessment, AMEC (Heathrow Airport Limited 2014b) for the Heathrow NWR, as proposed by HAL; and
- The Place - Townscape, (Runway Innovations Ltd and Heathrow Hub Ltd, 2014) for the Heathrow ENR as proposed by HH.

3.1.3 Assumptions and Limitations

The following assumptions and limitations apply to this assessment:

- The desk based assessment presented here highlights the most significant effects on the landscape and townscape character and visual receptors;
- Site visits have not been undertaken at this stage;
- Assessments of quality, value, sensitivity and magnitude of impact have been discussed only where it was deemed that there would be the potential for ‘significant’ effects. ‘Large’ and ‘moderate’ effects have been deemed as ‘significant’ for this assessment. Criteria for the assessment of effects have been summarised below;
- A Zone of Theoretical Visibility (ZTV) has not been determined due to the high level, desk based nature of this assessment;
- Baseline tranquillity and dark skies have been described using mapping from CPRE;
- Visual effects are described for groups of receptors and the worst case effects identified. Not all individual receptors within the group would necessarily experience the same effects and so the assessment is precautionary;
- The mitigation considered in the assessment of effects is that proposed by the scheme promoters, GAL, HAL and HH;

- An assumption on the screening provided by vegetation is based on desk based information including aerial photography, Ordnance Survey mapping and Google Street View;
- It is assumed that the existing vegetation identified as providing screening will still exist during the construction and operation phases of the scheme (unless clearly lost as a result of the proposed scheme);
- Existing Public Rights of Way that are within the footprint of a proposed scheme are assumed to be diverted unless it is clear from the Promoter's submission that the path is to be permanently lost. For Public Rights of Way adjacent to the scheme it is assumed these are all retained;
- It is assumed that the construction of the airport can be completed within the footprint identified by the Promoters; and
- All flight routes indicated in the Landscape Figures must be considered indicative only. They have been prepared as a result of a workshop between the Commission, the CAA, NATS and the promoters, for noise modelling purposes. They should not be considered definitive route indications.

3.1.4 Criteria for Assessment of Effects

The following describes the criteria used for the assessment of landscape, townscape and visual effects. For full details of all criteria used in the assessment see Appendix C. All criteria have been informed by GLVIA, (Landscape Institute and Institute of Environmental Management and Assessment, 2013) and DMRB guidance, (Highways Agency, 2010).

Landscape and townscape effects:

- *Major Adverse / Beneficial: A permanent, large scale, long term deterioration/ improvement in the landscape/ townscape resource. (Significant effect);*
- *Moderate Adverse / Beneficial: Noticeable deterioration/ improvement in the existing landscape / townscape resource. (Significant effect);*
- *Minor Adverse / Beneficial: Barely noticeable deterioration/ improvement in the existing landscape/ townscape resource; and,*
- *Negligible: No noticeable deterioration/improvement in the existing landscape/ townscape resource.*

Visual effects:

- *Major Adverse / Beneficial: Where the scheme would cause a permanent, large scale, long term deterioration/ improvement in the existing view. (Significant effect);*
- *Moderate Adverse / Beneficial: Where the scheme would cause a noticeable deterioration/ improvement in the existing view;*
- *Minor Adverse / Beneficial: Where the scheme would cause a barely perceptible deterioration / improvement in the existing view; and,*
- *Negligible: Where the scheme would cause no discernible deterioration/ improvement in the existing view.*

The Place Figures report accompanying this report contains figures for the Gatwick 2R Scheme, Heathrow NWR and Heathrow ENR. These include details of:

- The location of landscape designations on the Landscape Designations Figures;

- The shape of the landform and existing significant vegetation on the Landscape Features Figures;
- For the Gatwick 2R Scheme, the National Character Areas (NCAs) on the National and County Landscape Character Areas Figure;
- For the Heathrow NWR and Heathrow ENR, the National Character Areas (NCAs) on the Local Landscape and Townscape Character Areas Figures;
- The local landscape and townscape character areas on the Local Landscape and Townscape Character Areas Figures;
- The location of potential visual receptors on the Visual Receptors Figures;
- CPRE tranquillity mapping overlaid with N70 noise contours and landscape designations;
- CPRE tranquillity mapping overlaid with proposed flight paths;
- Dark skies mapping overlaid with proposed flight paths; and
- Proposed flight paths with 1.5km buffer area.

3.2 Landscape, Townscape and Visual Impact Assessment – Gatwick Airport Second Runway Scheme

Information on the scheme proposals has been taken from GAL's SD2 Airport Master Plan and SD4 Mitigation Proposals documents (GAL, 2014d and 2014e). The promoter's scheme would include the construction and operation of the following elements:

- Full length second runway;
- Noise attenuation bunds;
- New buildings east of the main railway line to Brighton;
- New terminal buildings and associated stands;
- Remote piers;
- Diversion of the A23; and,
- Lighting of all hardstanding areas and buildings.

Further changes would include:

- River diversions to accommodate the new runway;
- Property demolition and removal of existing infrastructure to accommodate the new runway;
- Vegetation removal including ongoing management of vegetation for the take-off and climb surfaces;
- New boundary treatments within landscape areas including native planting on noise bunds and along the excavated river channel to the west and south; and,
- New flight paths.

Temporary construction works within the boundary of the site would include:

- Construction compound, which would move location throughout the construction period;
- Large construction plant;
- Materials storage;
- Construction traffic, including to site along the major road network (M23, A23); and,
- Evening construction lighting during winter.

3.2.1 Effects on Landscape Designations

Landscape Figure 1 in the accompanying Place Figures report shows the location of landscape related designations:

The Surrey Hills and High Weald AONB are both located on areas of higher ground to the north and south of the study area. Due to their elevated position, it is likely that there would be views towards construction and/or operation of the proposed scheme. However, the AONBs are located at such a distance from the scheme that the construction works, and operational buildings and infrastructure, would be viewed in the context of the existing airport in a wide panorama. It is, therefore, unlikely that there would be a significant effect on the scenic quality of the AONB, on their landscape character or on their visual amenity. The effects on the AONB during both construction and operation would be negligible.

The locally designated landscape (Area of Great Landscape Value)[19] overlaps the Surrey Hills AONB and is at a similar distance from the study area. It is unlikely that there would be significant adverse effects on the scenic quality, landscape character or visual amenity of this designated landscape. Therefore, effects on the locally designated landscape during both construction and operation would be negligible.

Buchan and Tilgate Country Parks are situated within the study area to the south of the built up area of Crawley. The existing built form would be likely to screen any views towards the construction and operation of the scheme, therefore, effects would be negligible.

One area of Ancient Woodland on Bonnetts Lane to the south west of the scheme would be likely to need to be removed under the Gatwick 2R scheme. Ancient Woodland is of high sensitivity due to its ecological and historical significance. Loss of one small area of Ancient Woodland from a study area that contains numerous blocks of Ancient Woodland is only likely to result in a minor adverse magnitude of impact. However, this would be a permanent impact and so the significance of effect would be minor adverse during both construction and operation.

3.2.2 Effects on Landscape elements and character

Landscape Figure 2 shows the nature of landform and vegetation around the existing Gatwick Airport. Landscape Figures 3 and 4 show the location of landscape and townscape character areas, firstly at a national and county level, secondly at a local level:

West Sussex: LW8 Northern Vales

The Northern Vales character area is an ordinary quality landscape due to the appearance of major infrastructure and urban influences from Crawley and Gatwick Airport. It is of medium value, as although it has not been designated for its landscape importance, it is valued by local residents for recreation and as a buffer around the edge of built up areas such as Crawley and Horsham. The farmland in this character area is heavily influenced by development and is common throughout the surrounding area. It is reasonably tolerant of change and is of moderate sensitivity.

19 As designated in the Mole Valley Local Plan (2000), Reigate and Banstead Borough Local Plan (2005), Tandridge District Local Plan (2007/2008) and Horsham Local Plan (2007).

The majority of construction works and site operation would take place within this character area. During construction, there would be vegetation and field pattern removal, changes to land cover, hydrological features and topography for the airport as well as the introduction of construction activity, construction traffic, storage mounds and compounds. The River Mole would need to be diverted around the new runway. These impacts would take place over a small part of the overall character area but many impacts would be permanent. In addition much of the rest of the character area is already dominated by the airport and rail and road infrastructure, so adjacent farmland is of value to local residents and its loss would be a significant change in the local area.

It is likely that there would be a major adverse magnitude of impact and a moderate adverse effect during construction. As many of the construction effects would result in a permanent loss of landscape features (vegetation and field pattern loss, changes to land cover, hydrological features and topography) the moderate adverse magnitude of impact and residual moderate adverse effect would continue into operation of the airport.

Other County Landscape Character Areas

The West Sussex LW4 Low Weald Hills, HW1 High Weald and HW2 High Weald Forests county character areas and the Surrey Low Weald Open Weald and Wooded Weald county character areas would not be physically affected by the scheme. It is likely that there would be views towards both construction and operation from these character areas, mainly from higher ground and through gaps in vegetation. In addition, there would be background noise from construction works and from operational aircraft.

Available views towards construction and operation of the scheme from surrounding character areas are likely to be middle to long distance, viewed within the context of the existing airport and would make up a small part of the available view. Similarly, tranquillity within these character areas is already impacted on by the existing airport and, therefore, additional impacts would be less significant. For these reasons, effects on other character areas during both construction and operation are likely to be negligible.

3.2.3 Townscape Effects

Effects on the three local townscape areas in Crawley and the Horley Local Townscape Character Area have been considered below. The most significant effects would be within Crawley.

Ifield and Langley Green Local Townscape Character Areas

Both of these character areas are located to the north of Crawley adjacent to the scheme boundary. The planned ‘New Town’ layout within each character area and a high level of maintenance convey a good quality townscape. Neither of these areas are designated for their townscape quality but they are valued as residential areas, therefore, they are of medium value. There is limited potential for the replacement of areas of built form which would have to be removed. These comprise of medium value, medium importance components and therefore, these character areas are of moderate sensitivity.

Neither character area would be physically affected by the scheme and although construction works and operation would be in close proximity to these residential

areas, there is a large amount of vegetation to the northern edge of the urban area, which would help to screen views. It is likely that some areas would notice construction works and operational aircraft through gaps in vegetation, and also a reduction in tranquillity as the scheme would be closer than the existing airport. It is likely that there would be a minor adverse magnitude of impact and a minor adverse effect during construction.

Screening vegetation has been proposed by GAL to the southern boundary of the site to help integrate the scheme into the surrounding area and screen views. Whilst there would continue to be a minor adverse magnitude of impact and a minor adverse effect in early operation, as the vegetation establishes this will help to screen any available views towards the operational airport and act as a buffer for the residential properties. In the longer term, there would be a negligible magnitude of impact and a residual negligible effect.

Manor Royal Local Townscape Character Area

The Manor Royal Industrial Estate is predominantly a commercial and industrial development set within a sprawling complex connected by wide roads. There is little distinctiveness to the modern buildings and the ease with which the surrounding area is understood is poor thus it is an ordinary quality townscape and of low value. The components of the townscape are of low importance and reasonably capable of accommodating change and the townscape character area is of low sensitivity.

Several buildings to the north of the industrial estate would require removal for the runway and the diversion of the A23. The construction works and operational site would be in close proximity to the rest of the character area. Due to the changes at the edge of the character area there would be a moderate adverse magnitude of impact and a minor adverse effect during construction. Effects would not be higher due to the low sensitivity of the area. There is little scope for mitigation between the site and the industrial estate; therefore, a residual minor adverse effect would remain during operation.

Horley Local Townscape Character Area

Horley is located to the north of the existing airport. The scheme would be barely perceptible due to vegetation cover to the south of Horley and the fact any works would be viewed over the M23/ A23 and in the context of the existing airport. Effects during both construction and operation would be negligible.

3.2.4 Waterscape Effects

No waterscape effects beyond those associated with hydrological features (diversion of River Mole and new attenuation pond areas) are anticipated. Effects on these hydrological features are assessed in the landscape character section above.

3.2.5 Visual Effects

The visibility of the scheme would be relatively constrained by rising topography to the north and south and by the high density of vegetation within the surrounding area. The location of potential visual receptors mentioned below is shown on the Visual Receptors Figure (Landscape Figure 5). The most significant views towards the scheme would be from receptors to the immediate south, west and east.

Northern Edge of Crawley

Houses to the northern edge of Crawley within Langley Green and Ifield would be in close proximity to construction works and operational activity. However, there is a large amount of vegetation to the north of the housing, which would help to screen views, thus these properties are of moderate sensitivity.

It is likely that some properties would notice construction works and operational aircraft through gaps in vegetation, particularly as the scheme would be closer than the existing airport. It is likely that there would be a minor adverse magnitude of impact and a minor adverse effect during construction.

Screening vegetation has been proposed by GAL to the southern boundary of the site to help integrate the scheme into the surrounding area and screen views. Whilst there would continue to be a minor adverse magnitude of impact and a minor adverse effect in early operation, as the vegetation establishes this would help to screen any available views so that in the longer term, there would be a negligible magnitude of impact and a residual negligible effect.

As mentioned above for townscape, the Manor Royal Industrial Estate is predominantly made up of commercial and industrial development, which is of low sensitivity. The construction of the Gatwick 2R scheme would be in close proximity to buildings in the industrial estate and views would be relatively open, leading to a moderate adverse magnitude of impact, due to the existing industrial context of the view, and a minor adverse effect during construction. There would also be a permanent impact during operation and as the scope for mitigation in this location is limited, this would be a residual minor adverse effect.

The two public rights of way and a public recreation ground to the north of Crawley are not within the proposed airport footprint, therefore, they are presumed to be retained. Due to their recreational nature where views to surrounding areas are important, these receptors are of high sensitivity. There is some vegetation along field boundaries, which would provide screening of construction works, but due to the proximity of these recreational receptors, it is likely that construction would be highly visible and result in a moderate adverse magnitude of impact and a moderate adverse effect.

As for the properties in Crawley, screening vegetation has been proposed by GAL to the southern boundary of the site, thus providing screening in the longer term, resulting in a minor adverse magnitude of impact and a residual minor adverse effect.

Ifieldwood

Residential properties in Ifieldwood off Ifield Wood Road and on Charlwood Road, including Ifield Court Hotel, would be in close proximity to the western extents of the site and to vegetation management[20] for the new runway and are, therefore, of high sensitivity. There are also several footpaths in this area, including one which runs in close proximity to the western site boundary all the way to Charlwood. It is assumed that this footpath is retained. All of these footpaths are of high sensitivity due to their recreational value and relatively open views.

20 Vegetation management to support take-off and landing of aircraft on the new runway in line with Civil Aviation Authority guidelines.

There is some vegetation around the properties and footpaths which would provide screening but there would still be views possible towards construction of the new runway in the east, and a significant change in view from currently well vegetated, rural farmland to a future view of an open runway. This would result in a moderate adverse magnitude of impact and a moderate adverse effect during construction.

Screening vegetation has been proposed by GAL in the south western part of the Gatwick 2R scheme. In the longer term this would reduce visual impacts resulting in a minor magnitude impact and a minor adverse effect for the footpaths to the south west. However, much of the western boundary would be left relatively open for the runway and during the operation of the airport there would be on-going vegetation management of existing woodland blocks. The majority of receptors and footpaths around Ifieldwood would continue to experience a moderate adverse magnitude of impact and a residual moderate adverse effect during operation.

Charlwood

There are significant vegetation belts to the south and east of properties in Charlwood, which provide screening of the existing airport. This vegetation would also provide screening of the construction and operation of the Gatwick 2R scheme. In addition, the new scheme would be located to the south of the existing runway and its associated infrastructure. It is, therefore, unlikely that the scheme would be significantly perceptible to properties in Charlwood, and effects would be negligible during construction and operation.

Along the B2036 and Radford Road

Many residential properties would be removed to the east of Gatwick Airport for ancillary works and car parking. Remaining properties along Radford Road and the B2036 would be in close proximity to these works and have open views, therefore, they are of high sensitivity.

For these locations there would be open, close range views of construction works for the ancillary works and car parking to the north, and views would change from being well vegetated or of adjacent housing, to airport related infrastructure. This change would result in a major adverse magnitude of impact and a major adverse effect during construction. Once construction was completed the impact on views would reduce. However, the new airport infrastructure would a permanent visual impact and a significant change in the view leading to a moderate adverse magnitude of impact and a residual moderate adverse effect during operation.

Properties on Tinsley Green, including the Greyhound Pub, would be opposite a proposed landscape area within the airport site. It is assumed that the existing vegetation in this landscape area would not be removed to accommodate the new development and so it is presumed that views into the site would be screened. Therefore, it is anticipated that there would be no change to the existing view and that there would be a negligible effect during both construction and operation.

The Tandridge Border Path runs close to Junction 9 of the M23, and would be within the area of car parking and ancillary works proposed at the east of the airport. GAL propose to reconnect severed footpaths or provide alternative routes, therefore, it is assumed Tandridge Border Path would be diverted around the airport, and that there would be open, close range views into the site. Consequently this Path has been assessed as being of high sensitivity.

There would be open, close range views of construction works for the ancillary works and car parking to the west and views would change from being semi-rural to airport related infrastructure. This change would result in a major adverse magnitude of impact and a major adverse effect during construction. Following completion of construction the impact on views would reduce. However, there would still be a permanent significant change in the view as a result of the airport infrastructure leading to a moderate adverse magnitude of impact and a residual moderate adverse effect during operation.

There would also be views possible from higher ground to the north and north west from Russ Hill and Norwood Hill.

Russ Hill

Properties along Russ Hill Road are situated on higher ground to the north west, have open views towards Gatwick Airport and are of high sensitivity. There would be elevated, mid distance views towards construction works and operational aircraft. However, due to the distance of the properties from the proposed scheme, it would not be a dominant feature in views especially when viewed in the context of the existing airport. There would, therefore, be a minor adverse magnitude of impact and a minor adverse effect during construction. The potential for mitigation along the western boundary would be limited due to operational constraints, therefore, the permanent effect of the new airport infrastructure would continue into operation as a minor adverse effect.

The Sussex Border Path runs in close proximity to Russ Hill Road and is also of high sensitivity due to its recreational importance and open views. Effects during construction and operation would be similar to those described above for residential properties, due to the footpath's elevated views over the surrounding area and its distance from the scheme.

Norwood Hill

There are several properties in Norwood Hill with elevated views over the surrounding countryside in the direction of Gatwick Airport, and they are of high sensitivity. There would be elevated, long distance views towards construction works and operational aircraft. However, the scheme would be at such a distance from these properties that it would be barely perceptible amongst the existing airport buildings, and in most cases works would be located behind existing airport infrastructure. There would, therefore, be a negligible magnitude of impact and a negligible effect during construction and operation.

Other Visual Receptors

Any other views from higher ground to the north (Surrey Hills AONB) or south (High Weald AONB) would be at such a distance (over 5km) that the scheme would be viewed in the context of the existing airport and within a wider view. Effects during both construction and operation would be negligible.

3.2.6 Lighting

The Gatwick 2R site would require lighting in winter evenings during construction and overnight to provide illumination for ongoing works. During operation all new terminal buildings, piers, car parks and other external hardstanding around buildings

would require lighting, as well as runway lights in accordance with the applicable security, safety and operational requirements.

There would also be the lights from aircraft whilst on the ground and in the air, (Gatwick Airport Limited, 2014a). However, the Civil Aviation Authority CAP 168 Chapter 6 requires that 'dangerous and confusing lights' must not be exhibited as they may endanger aircraft taking-off and landing. Lighting around the runway would, therefore, be likely to be minimised which would also be of benefit to visual receptors.

All of this lighting would be in the visual context of the lighting at the existing airport. For landscape, townscape and visual receptors close to the scheme, the lighting would appear closer in the view but against the backdrop of existing lighting. Effects would be most significant for those receptors to the west around Ifieldwood where there would be less vegetation cover to absorb some of the light spill.

For landscape, townscape and visual receptors further away from the scheme, the lighting for the new scheme would be hard to distinguish from the lighting at the adjacent Gatwick Airport and within the urban edge of Crawley.

3.2.7 Tranquillity

Landscape Figure 6 shows the CPRE tranquillity mapping overlaid with the 'Do Minimum' N70 noise contours for Gatwick Airport. Landscape Figure 10 shows the tranquillity mapping and the 'Do Minimum' flight routes. Landscape Figures 7 and 11 show plans for noise contours for N70 overflight, flight routes and the CPRE tranquillity mapping for the proposed Gatwick 2R scheme.

Flight Route

The current flight routes have been estimated from reference to the typical Gatwick radar flight tracks (based on Draft ERCD Report 1402 Noise Exposure Contours for Gatwick Airport 2013, (ERCD, 2013a)).

Landscape Figures 10 and 12 show estimated tracks of aircraft joining final approach centreline for the 'Do Minimum' arrival and departure routes. These show that arrivals are directed to the south of the airport, with a dominance (due to prevailing wind direction) of flights around East Grinstead over the High Weald AONB. Departures follow more direct paths; only the southerly departure route overflies the High Weald, with the others tending to be routed in a corridor between the High Weald and Surrey Hills AONBs. This identifies that areas already noted as 'more tranquil' will continue to be overflown by arrivals in the 'Do Minimum' scenario. As aircraft joining these approach routes come from widely dispersed airspace, there is a likelihood of overflight across both the Surrey Hills and the High Weald AONBs.

Landscape Figures 11 and 13 show the effect of the second runway as part of Gatwick 2R and suggest that route rationalisation results in fewer approach tracks. The southern runway requires a slight extension of routes southwards, but also offers the potential for a reduced spread of arrivals overflight, particular of some parts of the Surrey Hills AONB. There may however be increased departure overflight over the same AONB. There is limited opportunity for avoiding this extent of overflight of the protected landscapes once avoiding overflight of built up areas (a primary environmental objective) is taken into account.

There remains significant uncertainty in details of routes. This is not only due to the detailed design issues associated with the scheme development, but also due to the application of the UK Future Airspace Strategy[21] and particularly the ultimate outcome of the recent consultation on the London Airspace Management Programme[22], which described the airspace swathes within which potential corridors might be placed. One finding of the consultation was that there was a public preference for the avoidance of overflying environmentally sensitive areas at the expense of additional fuel burn and carbon emissions, whilst airline preference was expressed for more direct routes that reduced fuel burn and emissions.

At this stage it is therefore not possible to offer a definitive conclusion regarding tranquillity impacts of Gatwick 2R. On balance compared to the baseline ('Do Minimum') situation, it can be observed that whilst there will be increased numbers of aircraft overflying areas currently considered more tranquil than others (due to increased ATMs), the corridors of overflight may be reduced in number and extent, allowing for the potential to reduce visual and noise disturbance above some parts of the AONBs.

Further analysis of both landscape and tranquil areas (including heritage assets) is recommended once detailed airspace design commences, in line with the DfT Guidance on Air Navigation Environmental Objectives (2014)[23], or any successor guidance.

N70 Noise Contours

The N70 noise contours for the existing airport configuration in the 'Do Minimum' scenario indicates overflight effects to the east and west of the airport, (Landscape Figure 6). There are only minor differences between the contours for 2030 and 2050. There are significant areas shown to be affected by the overflight contours that are currently assessed as being of moderate tranquillity.

The N70 noise contours for the proposed Gatwick 2R scheme, (shown in Landscape Figure 7) indicate a potentially wider corridor of areas affected by the noise levels, with two minor 'spurs' to the north of Crawley. The eastern and western extent of the N70 corridor is not significantly different to the 'Do Minimum' scenario. The indication is that there will be increased overflight and the potential for a reduction in tranquillity, in the area indicated by the widened N70 contour as a result of air traffic movement associated with Gatwick 2R.

3.2.8 Dark Skies

Gatwick Airport lies within an area identified within the CPRE 'Dark Skies' mapping as one with the highest relative level of night time lighting when viewed from above, see Landscape Figures 8 and 9. This area contains Gatwick Airport as well as the urban area of Crawley to the south and part of the M23. The flight paths associated with the existing airport pass beyond this area into areas of more moderate to low levels of night time lighting. It is not clear what effect the movement of air traffic or the presence of night time ground lighting would have upon this, but although there

[21] Part of a wider programme to modernise European airspace through the Single European Sky project (SESAR). See http://www.caa.co.uk/default.aspx?catid=2408&pagetype=90
[22] http://www.londonairspaceconsultation.co.uk/wp-content/uploads/2014/04/NATS_GAL_LAC-Report_FINAL-01-04-14.pdf
[23] Guidance to the CAA on Environmental Objectives Relating to the Exercise of its Air Navigation Functions https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/269527/air-navigation-guidance.pdf

is the potential for increased light levels, it is unlikely to alter the results of the CPRE Dark Skies mapping.

3.2.9 Summary of Effects Table

The following table summarises the receptors that would be likely to be subject to 'significant' landscape, townscape and visual effects as detailed in the assessment above, i.e. likely to be subject to effects of a moderate or greater level.

Table 3.1 – Summary of significant landscape and townscape effects – Gatwick 2R

Receptor	Construction Phase	Operational Phase
Landscape effects		
West Sussex: LW8 Northern Vales	Moderate Adverse Effect	Moderate Adverse Effect
Visual effects		
Crawley public rights of way	Moderate Adverse Effect	Minor Adverse Effect
Ifieldwood	Moderate Adverse Effect	Moderate Adverse Effect
B2036 and Radford Road properties	Moderate Adverse Effect	Negligible Effect
Tandridge Border Path	Major Adverse Effect	Moderate Adverse Effect

3.2.10 Comparison of Assessments – Gatwick 2R Scheme

The following is a comparison of the differences between the assessment undertaken by GAL's consultants' RPS 'Place: Landscape, Townscape and Waterscape' (Gatwick Airport Limited, 2014a) and the assessment of the proposed Gatwick 2R Scheme in this Report.

General Points

The Jacobs report is a desk based feasibility review, considering the Gatwick 2R scheme in the context of a high level independent assessment. No field visits have been carried out for this current report.

The Jacobs and RPS methodologies are similar to the point that they discuss criteria for quality, value, sensitivity and magnitude of impact. However, unlike RPS, Jacobs uses a matrix to guide the assessment of significant effects supported by professional judgement. In addition, the significance of effect categories differ between the reports although both include similar scales of effect. The Jacobs criteria are based on GLVIA (Landscape Institute and Institute of Environmental Management and Assessment, 2013) and DMRB guidance, (Highways Agency, 2010). RPS also use GLVIA and DMRB on which to base their criteria.

The Jacobs assessment contains a high level visual assessment to take account of potential visual effects on individual visual receptors. This was touched on by RPS but not fully undertaken.

The Jacobs report has assessed the effects of flight paths on landscape and townscape character, visual amenity, tranquillity and dark skies. This is not considered in the RPS report.

The study areas differ with RPS using 15km. Jacobs anticipated that the most significant effects from elements on the ground would occur within a 5km radius and only Areas of Outstanding Natural Beauty (AONBs) and Areas of Great Landscape Value (or locally designated landscapes) have been assessed up to 15km.

Effects on Designations

Both assessments consider that there would be a negligible (or neutral) effect on Areas of Outstanding Natural Beauty (AONBs) during both construction and operation. Effects on other designations were not identified or assessed in the RPS report.

Landscape Effects

Both assessments identified that the Northern Vales county landscape character area would experience the most significant changes due to the proposed scheme. RPS assesses the construction effect as 'Adverse' and Jacobs 'Moderate Adverse' with the same for operation. It is identified by both assessments that, due to the extent of change in the character area, the same significance of effect score would apply for both construction and operation. Neither assessment used the highest level for significance of effect (High or Major).

Townscape Effects

Both reports carried out an assessment of townscape character using their own character areas as existing townscape character assessment information is limited. Each assessment looked at urban areas in the vicinity of Gatwick Airport and described the composition of these areas. Similar areas were considered and this included the urban areas of Crawley and Horley.

The reports differ in their assessment of effects on the townscape character of Crawley. This report describes that there would be a minor adverse effect during construction due to effects on visual amenity and tranquillity, whilst RPS describes a neutral effect. Both assessments agree that there would be a negligible (neutral) effect during operation in Crawley, and that there would be a negligible (neutral) effect during both construction and operation in Horley.

Visual Effects

The RPS report does not contain a visual assessment rather it briefly describes available views from selected viewpoints. Jacobs has described visual effects for residential properties, public rights of way and recreational receptors. Both assessments agree that the visibility of the proposed scheme would be constrained.

Conclusion

The most significant effects on the landscape, townscape and visual amenity would be experienced during construction. The West Sussex: LW8 Northern Vales character area would be the only landscape or townscape area to experience a significant adverse effect as the majority of construction works would take place here. This construction impact would result in a permanent loss of landscape

features and so the significant adverse effect would continue into the operation of the airport.

Ifieldwood, B2036 and Radford Road properties, Crawley public rights of way and the Tandridge Border Path would experience a significant adverse effect on views during construction, due to their proximity to the works and open views. The significant adverse effect would continue into the operation of the airport for Ifieldwood and the Tandridge Border Path as the receptors would have relatively open views towards the operational site, with little scope for mitigation.

There is the potential for some areas to experience a reduction in tranquillity due to the increased area of flight paths associated with the new runway. There is also the potential for increased light levels but this is unlikely to alter the results of the CPRE Dark Skies mapping.

3.3 Landscape, Townscape and Visual Impact Assessment – Heathrow Airport Northwest Runway

Information on the scheme proposals has been taken from HAL's document Taking Britain Further, (HAL, 2014). The scheme would include the construction and operation of the following elements:

- 3500m runway to the north-west of the existing airport;
- Two terminal buildings;
- Aircraft movement areas and taxiways;
- Pier serviced stands;
- Remote piers;
- Car parking;
- M25 upgrade and tunnelling; and,
- Ancillary uses.

Further changes would include:

- Loss of areas of Colne Valley Park and other public parks;
- River diversions to accommodate the new runway and improved flood storage;
- Improvements to green space to the northern airport boundary;
- Landscape improvements to the Colne Valley Park focused around the diverted rivers and improved flood storage;
- Property demolition and removal of existing infrastructure to accommodate the new runway;
- Vegetation removal including ongoing management of vegetation for the take-off and climb surfaces; and,
- New flight paths.

Temporary construction works within the boundary of the site would include:

- Construction compound;
- Large construction plant;
- Materials storage;
- Construction traffic; and,
- Evening construction lighting during winter.

3.3.1 Effects on Landscape Designations

Landscape Figure 14 in the Place Figures report accompanying this report shows the location of landscape related designations and their proximity to Heathrow NWR. The Chilterns AONB would not have significant views towards the Heathrow NWR scheme, therefore, effects on the AONB during both construction and operation would be negligible.

The locally designated Area of Landscape Importance is likely to have isolated views from higher ground close to the war memorial at Cooper's Hill. Views from this point would be long distance and changes would be in the context of the existing airport. Therefore, effects on the Area of Landscape Importance during both construction and operation would be negligible.

Colne Valley Regional Park is within and immediately to the west of the Heathrow NWR scheme site boundary and is of high sensitivity due to its recreational importance. A portion of the park would be lost to accommodate the new runway and there would be close range views from the park at Colnbrook and Poyle. Impacts would affect a small part of the park but many would be permanent. It is likely that there would be a moderate adverse magnitude of impact and a moderate adverse effect during construction.

A large amount of mitigation is proposed by HAL for Colne Valley Regional Park to offset adverse effects from construction of the new runway. These include habitat creation areas, a diversion of the Colne Valley Way and improvements to recreational areas. As the existing airport was already in close proximity to the park, and bearing in mind the beneficial nature and extent of the mitigation measures, it is anticipated that there would be a minor beneficial magnitude of impact and a residual minor beneficial effect during operation, once mitigation measures have established.

There are various parks scattered around the study area, the majority of which would have no views towards the proposed scheme. Some parks such as Stockley, would have long distance, elevated views but due to the distance of the scheme from these parks, and the context of the existing airport, effects would not be significant. Effects during both construction and operation would be negligible.

No areas of Ancient Woodland would be affected by the proposed scheme, therefore, effects during both construction and operation would be negligible.

3.3.2 Landscape Effects

The district and county level landscape character areas have been assessed below. The most significant effect would be for the character areas directly affected by the scheme, which are Hillingdon Lower Colne Floodplain, Hillingdon Open Gravel Terrace and Slough Road Infrastructure. Effects on remaining character areas have been briefly summarised. The Landscape Figure 15 shows the nature of landform and vegetation around Heathrow.

Landscape Figure 16 shows the location of landscape and townscape character areas at a national and local level:

Hillingdon Lower Colne Floodplain

The Hillingdon Lower Colne Floodplain character area is a very attractive landscape due to its diverse habitats and network of footpaths. It is of high value as it is valued by local residents for recreation and as a green buffer within infrastructure and built form. It also makes up part of the Colne Valley Regional Park. The area is susceptible to relatively small changes and is of high sensitivity.
A large proportion of this character area would be lost to accommodate the new runway and other airport infrastructure. These changes would be permanent. This would result in the loss of vegetation blocks, hedgerows, farmland and field pattern, changes to topography for the runway and the diversion of the River Colne, as well as the introduction of construction activity and construction traffic. There would also be views towards construction from the remaining part of the character area. For these reasons, there would be a major adverse magnitude of impact and a major adverse effect during construction.

Mitigation measures have been proposed by HAL within the Colne Valley Regional Park to offset impacts of the new runway. This includes habitat creation and recreational improvements to the remaining part of the character area. However, even though these improvements would be of benefit to landscape character and would help to screen views towards the proposed scheme, the loss of a large part of the character area would be permanent. There would, therefore, be a moderate adverse magnitude of impact and a residual major adverse effect during operation.

Hillingdon Open Gravel Terrace

The Hillingdon Open Gravel Terrace character area is predominantly made up of large, open arable fields or rough grassland influenced by Heathrow Airport and the M4 and is of ordinary quality. It is of medium value, as although it is not designated for its landscape importance, it is of value to local residents as a green buffer between villages and the existing airport. It is an area that is reasonably tolerant of change and therefore, is of moderate sensitivity.

The south west corner of this character area would be lost to accommodate the new runway for Heathrow NWR. This would result in the loss of small vegetation blocks, arable land and the field pattern as well as the introduction of construction activity and construction traffic. Although the proportion of the character area lost is relatively small the impacts would be permanent. There would be a moderate adverse magnitude of impact and a moderate adverse effect during construction.

Mitigation measures have been proposed by HAL within farmland to the south of the M4 around the remaining villages to improve habitats and green linkages. These mitigation measures would be over a large proportion of the character area, although the loss of the south west corner would be permanent. There would be a minor adverse magnitude of impact and a residual minor adverse effect during operation.

Slough Road Infrastructure

This character area is of ordinary quality as it contains a mismatch of land uses and is in close proximity to existing major infrastructure corridors. However, it is of high value due to the network of footpaths, including the Colne Valley Way, which provide recreation for local residents within the Colne Valley Regional Park. It is an area that is reasonably tolerant of change and is of moderate sensitivity.

A section of the character area would be lost for the construction of the new runway. This would result in the loss of small former gravel pit lakes, the diversion of the River Colne and disruption of the footpath network as well as the introduction of construction activity and construction traffic. There would also be views of construction from the rest of the character area. For these reasons, there would be a moderate adverse magnitude of impact and a moderate adverse effect during construction.

Mitigation measures have been proposed by HAL within the Colne Valley Regional Park to offset impacts of the new runway. This includes the realignment of the River Colne, the Colne Valley Way and other footpaths and the creation of new habitats along the river. There would also be screening provided of the new runway. However, the loss of part of the character area would be permanent and the operational airport would be in close proximity. Therefore, there would be a minor adverse magnitude of impact and a residual minor adverse effect during operation.

Other Landscape Character Areas

There would be minor changes to the Hillingdon Heathrow Gravel Terrace Infrastructure character area where balancing ponds would be reconfigured to the south east. Due to the dominance of the airport in this character area effects during construction and operation would be negligible.

There would also be minor changes to the Surrey Thames Valley character area where parking and ancillary development and balancing ponds would be implemented to the south west boundary of the airport. Again, as the airport is already a dominant feature, and as the changes would be to such a small part of the character area, effects during construction and operation would be negligible.

The South Bucks Colne Valley Floodplain, South Bucks Iver Heath Mixed Use Terrace, Windsor and Maidenhead Settled Developed Floodplain and Windsor and Maidenhead Settled Farmed Floodplain character areas would not be physically affected by the scheme. There are unlikely to be views from the South Bucks character areas towards the proposed scheme due to the screening effect of the M4. There are also unlikely to be views from the Settled Farmed Floodplain character area due to the screening effects of the M4 corridor, the embankments of the Queen Mother and Wraysbury Reservoirs and vegetation along the River Thames. Effects during construction and operation for these areas would therefore be negligible.

There are likely to be views from the Settled Developed character area from the area around Colnbrook and the Queen Mother Reservoir. However, the views from around Colnbrook would be restricted by built form and by vegetation along roads and the River Colne. There are likely to be views from the Queen Elizabeth Reservoir, but due to its distance from the proposed scheme, and the context of the existing airport, effects would not be significant. Effects during construction and operation for these areas would therefore be negligible.

3.3.3 Townscape Effects

Effects on the local townscape areas at Heathrow have been considered below. The most significant effects would be for Hillingdon Commercial Airport, Hillingdon Historic Core and Hillingdon Inter War Suburb Metroland. Effects on remaining character areas have been briefly summarised.

Hillingdon Commercial Airport

The Hillingdon Commercial Airport townscape is of ordinary quality due to the dominance of modern airport related buildings and busy roads. It is of low value with few components of importance. It is tolerant of substantial change and is of low sensitivity.

The majority of the character area would remain as existing, with some changes due to the new runway. There would be a minor adverse magnitude of impact and a minor adverse effect during construction.

Much of the character area would remain as existing or be restored with an airport style development that is similar to the existing environment. It is, therefore, anticipated that there would be a negligible magnitude of impact and a residual negligible effect during operation.

Hillingdon Historic Core

The historic cores in Hillingdon are very attractive and often centred around historically significant buildings or village greens of high value for their important heritage and townscape features. There is limited potential for substitution in these areas and they are of high sensitivity.

The whole of the Longford historic core and half of the Harmondsworth historic core would be permanently lost as part of the proposed Heathrow NWR scheme. The Sipson historic core would also be in close proximity and is likely to have views towards construction. There would be a major magnitude of impact and a major adverse effect during construction.

Longford and parts of Harmondsworth would be permanently lost. However, there would be an improvement, compared to the construction phase, in visual amenity and tranquillity in the remaining historic cores on completion of construction. There would also be improvements to the setting of the historic cores as proposed habitat and green linkage mitigation would be located to the north of these villages. There would be a moderate adverse magnitude of impact as many of the historic cores would be unaffected and a residual moderate adverse effect during operation.

Hillingdon Inter War Suburb Metroland

This Hillingdon Inter War Suburb Metroland townscape is comprised of suburban housing within built up areas, the majority of which are located to the north of the M4. It is a good quality townscape due to its planned ‘garden suburb’ style and well maintained features. It is a medium value townscape as, even though these areas are not designated for their townscape importance, they are valued by residents as residential accommodation. There is some potential for substitution within these areas and so it is of moderate sensitivity.

None of these townscape areas would be directly affected by the proposed scheme. The area at Sipson, which is a small part of the overall townscape area, would be in close proximity to construction works for the new runway and there would be a decrease in visual amenity and tranquillity. There would be a minor adverse magnitude of impact and a minor adverse effect during construction.

Following the completion of construction the impacts on visual amenity and tranquillity within Sipson would reduce. However, the operational runway would be

situated in close proximity to Sipson with no mitigation proposed to screen views. Therefore, there would continue to be a minor adverse magnitude of impact and a residual minor adverse effect during operation.

Other Townscape Character Areas

There would be minor changes to the Hounslow Feltham and Hounslow Cranford and Heston character areas. There would be the reconfiguration of balancing ponds within the Feltham character area, which would not be a significant impact on the character area as a whole. The western boundary of the Cranford and Heston character area, along the London Loop footpath, would be improved under HAL's proposals to create a green space buffer between housing and the airport. This would improve the character of this small area but it would not be a significant impact on the character area as a whole. Therefore, effects in these areas during construction and operation would be negligible.

The Hounslow West, Hounslow Bedfont and Slough Urban Area character areas would not be directly affected and it is unlikely that there would be any significant views towards the proposed scheme. Effects during construction and operation would be negligible.

3.3.4 Waterscape Effects

No waterscape effects beyond those associated with hydrological features are anticipated. Effects on these hydrological features are assessed in the landscape character section above.

3.3.5 Visual Effects

The visibility of the Heathrow NWR scheme would be relatively constrained by built form to the north, east and south and by vegetation and reservoir embankments to the west. The location of potential visual receptors mentioned below is shown on the Visual Receptors Figure (Landscape Figure 17). The most significant views towards the scheme would be from receptors to the immediate north, west and south.

Stanwell and Stanwell Moor

Stanwell and Stanwell Moor are located to the south of the existing airport and have views towards Terminal 5 and the southern runway. Residential properties would have close range views towards some of the construction works, the majority of which would be open or filtered by boundary vegetation. Properties in Stanwell and Stanwell Moor are of moderate sensitivity.

These properties would have views towards the construction of ancillary works and balancing ponds, which would be in close proximity. However, as these properties already have views influenced by the airport, the change in view would be less significant. There would be a moderate adverse magnitude of impact and a moderate adverse effect during construction.

Completion of construction would reduce the visual impact on these properties, but there would be permanent, closer range views of airport infrastructure leading to a minor adverse magnitude of impact and a residual minor adverse effect during operation.

Wraysbury Reservoir is located to the west of Stanwell Moor and is used recreationally by bird watchers and water sport enthusiasts. It is also likely to have open views towards the proposed scheme and is, therefore, of high sensitivity.

The Reservoir would have mid-range views towards the construction of ancillary structures and balancing ponds, and more distant views of construction for the new runway for Heathrow NWR. The impact on views would be within the context of the existing airport, therefore, there would be a minor adverse magnitude of impact and a minor adverse effect during construction.

On completion of construction the impact on views would reduce, and it is likely that the new elements of the airport would blend in with the existing, thus there would be a negligible magnitude of impact and a residual negligible effect during operation.

Poyle and Colnbrook

Poyle Industrial Estate is of low sensitivity due to its use as an indoor place of work. It would be relatively close to construction works for the new runway and new infrastructure east of the M25. However, there is an existing vegetation block to the east of the industrial estate and along the M25. Views from the northern part of the industrial estate would be more open. There would be a moderate adverse magnitude of impact and a minor adverse effect during construction. This is likely to continue into operation as minimal mitigation is proposed to screen views.

Properties in Colnbrook would have relatively filtered views towards the works and are of moderate sensitivity. There is quite a lot of vegetation to the north of Colnbrook, which would help to filter views towards construction works for the new runway as well as a new road link and the River Colne and Colne Valley Way diversions. Some properties would have more open views but on the whole views would be filtered. There would be a minor adverse magnitude of impact and a minor adverse effect during construction.

A lot of planting mitigation is proposed around the new road link and the River Colne and Colne Valley Way diversions, by HAL. This would help to integrate the scheme into the landscape. Those properties closest to the runway have a lot of existing vegetation in adjacent fields to filter views. It is likely that there would be a negligible magnitude of impact and a residual negligible effect during operation.

Properties to the southern edge of Colnbrook would have views south over the River Colne and Colne Valley Way diversions and habitat and recreational improvements. There would be a minor adverse magnitude of impact and a minor adverse effect during construction. However, completion of the habitat and recreation improvement works would increase the quality of views and lead to a minor beneficial magnitude of impact and a residual minor beneficial effect during operation.

There are numerous public rights of way south of the M4, including the Colne Valley Way, which would be disrupted by the works for the proposed new runway. It is assumed that these footpaths would be diverted prior to construction, and would have open, close range views. These footpaths have, therefore, been assessed as being of high sensitivity.

There would be open, close range views towards construction for the new runway and new road link, which would lead to a moderate adverse magnitude of impact and a moderate adverse effect during construction. Mitigation measures including habitat and recreational improvements have been proposed by HAL around the

public rights of way within the Colne Valley Regional Park. It is anticipated that the visual amenity of these footpaths would improve from the existing situation and that the new runway would be relatively well screened. This would lead to a minor beneficial magnitude of impact and a residual minor beneficial effect during operation.

The Queen Mother Reservoir is located to the west of Colnbrook and is used recreationally by bird watchers and water sport enthusiasts. It is also likely to have open views towards the proposed scheme and is, therefore, of high sensitivity.

There would be open views over Colnbrook towards construction for the new runway as well as new road links and the River Colne and Colne Valley Way diversions. The views would be relatively mid-distance and against the backdrop of the existing airport and, therefore, there would be a minor adverse magnitude of impact and a minor adverse effect during construction.

On completion of construction the impact on views would reduce, and it is likely that the new elements of the airport would blend in with the existing and would be screened by mitigation measures in Colne Valley Regional Park. There would be a negligible magnitude of impact and a residual negligible effect during operation.

Northern Villages

Harmondsworth and Sipson villages to the north of the proposed scheme would be in close proximity and would have relatively open views. They have, therefore, been assessed as being of high sensitivity. Much of Harmondsworth village would be removed as part of the scheme so many properties would find themselves along the new airport boundary. Houses in Sipson would also be along the airport boundary. For these receptors there would be close range, open views towards construction works for the new runway and buildings. This would result in a major adverse magnitude of impact and a major adverse effect during construction.

There would be limited scope for mitigation for these properties due to a lack of space. Bunds have been proposed, which would help to screen views, but the bunds themselves would also reduce the quality of views. It is likely that there would be a moderate adverse magnitude of impact and a residual moderate adverse effect during operation.

Harlington and Cranford are located further away from the proposed works and have views west towards the main proposals screened by built form in Sipson and within the airport boundary, therefore, they are of moderate sensitivity. There is also vegetation along the M25 and around the village boundaries. There would be glimpse views towards construction works which would result in a minor adverse magnitude of impact and a minor adverse effect during construction. On completion of construction it is likely that views would return to those similar to the existing conditions and there would be a negligible magnitude of impact and a residual negligible effect during operation.

Harmondsworth Moor park is an ecological and recreational area to the west of Harmondsworth. Part of the park would be lost as part of the scheme and the remaining part of the park is likely to have views towards construction and operation. There is a lot of vegetation within the park that would help to screen views so it has been assessed as being of moderate sensitivity. There would be filtered views towards construction works for the new runway and M25 works leading to a moderate adverse magnitude of impact and a moderate adverse effect during

construction. Mitigation works are proposed by HAL within the park that would improve the quality of views within the park and screen views towards the new runway. This would lead to a minor adverse magnitude of impact and a residual minor adverse effect during operation.

Other Visual Receptors

There are various public rights of way that would have views towards the proposed scheme, but views would either be restricted by vegetation or built form, or receptors would be located at a significant distance away, such that effects would not be that significant. This is the case for the bridleway along the M25, footpaths near Harmondsworth and Harlington and recreational routes near Staines Reservoir.

There would also be long distance views from West Drayton, Stockley Park near West Drayton and Coopers Hill to the south west. The Heathrow NWR scheme would blend in with the context of the existing airport and not be a significant feature in the views from these locations.

Finally, changes would be so minimal for some receptors that there would not be a significant effect on their view. This is the case for the London Loop to the east of the airport where there would be parkland improvements, and for properties and businesses in North Feltham where balancing ponds would be reconfigured.

3.3.6 Lighting

It is likely that the Heathrow NWR site would require lighting in winter evenings during construction and occasionally overnight, to provide illumination for the ongoing works. It is also anticipated that during operation all new terminal buildings, piers, car parks and other external hardstanding around buildings would require lighting, as well as runway lights.

There would also be the lights from aircraft whilst on the ground and in the air. However, the Civil Aviation Authority CAP 168 requires that ‘dangerous and confusing lights’ must not be exhibited as they may endanger aircraft taking-off and landing. Lighting around the runway is, therefore, likely to be minimised which would also be of benefit to visual receptors.

All of this lighting would be in the visual context of the lighting at the existing airport. For landscape, townscape and visual receptors close to the north and west of the scheme, the lighting would appear closer in the view but against the backdrop of existing lighting. This includes the light from the existing Heathrow Airport the major urban areas in the surrounding area and the M25. Effects would be most significant for those receptors to the west around Colnbrook and to the north around Harmondsworth and Sipson.

For landscape, townscape and visual receptors further away from the scheme, the lighting for the new scheme would be hard to distinguish from the lighting at the existing airport and along the urban edges of London, Staines and Slough.

3.3.7 Tranquillity

Landscape Figure 18 shows the CPRE tranquillity mapping overlaid with the ‘Do Minimum’ N70 noise contours for Heathrow Airport. Landscape Figure 22 shows the tranquillity mapping and the ‘Do Minimum’ flight routes. Landscape Figures 19 and

23 show respective plans for noise contours for N70 overflight, flight routes and CPRE tranquillity mapping for the proposed Heathrow NWR scheme.

Flight Paths

The current nature of overflight has been estimated from reference to the typical Heathrow radar flight tracks (based on Draft ERCD Report 1401 Noise Exposure Contours for Heathrow Airport 2013 (ERCD Report, 2013b)).

Landscape Figures 22 and 24 outline the estimated tracks of aircraft joining the final approach centreline for the 'Do Minimum' arrival and departure routes. These have been overlaid on the CPRE tranquillity mapping. This illustrates the areas of overflight of final approaches and departures for easterly arrivals and westerly departures directed between Slough, Maidenhead and High Wycombe overfly the Chilterns AONB currently, but westerly arrivals overfly the less tranquil areas of greater London. This shows that that limited areas already noted as more tranquil would be overflown in the 'Do Minimum' scenario, with arrival routes avoiding the edge of the Chilterns AONB. Aircraft will be joining these approach routes from more widely dispersed airspace and there is limited impact on the most tranquil areas due to these being at some distance from the airport.

Landscape Figures 23 and 25 shows the effect of the Heathrow NWR scheme and suggest that route rationalisation results in an extension of routes to the west both north and south of the M4 corridor, and may increase increased overflight of the Chilterns AONB.

There remains significant uncertainty in details of routes due to the detailed design issues associated with the scheme development and also the application of the UK Future Airspace Strategy[24].

At this stage, it is therefore not possible to offer a definitive conclusion regarding tranquillity impacts. Compared to the baseline ('Do Minimum') situation, it can be observed that the corridors of overflight are increased in number and extent to the west, allowing for the potential to increase visual and noise disturbance above some parts of the Chilterns AONB. Dependent on the specific use of runways, the increase in ATMs may or may not result in increased numbers of aircraft overflying areas in the Chilterns AONB currently considered more tranquil than others.

Further analysis of both landscape and tranquil areas (including heritage assets) is recommended once detailed airspace design commences, in line with the DfT Guidance on Air Navigation Environmental Objectives (2014)[25], or any successor guidance.

Noise Contours

The N70 noise mapping for the existing airport configuration in the 'Do Minimum' scenario indicates overflight effects to the east and west of the airport, (Landscape Figure 18). The areas shown to be affected by the N70 overflight are largely

[24] Part of a wider programme to modernise European airspace through the Single European Sky project (SESAR). See http://www.caa.co.uk/default.aspx?catid=2408&pagetype=90
[25] Guidance to the CAA on Environmental Objectives Relating to the Exercise of its Air Navigation Functions https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/269527/air-navigation-guidance.pdf

currently assessed as being of the 'least tranquil' category. There are areas to the west of the airport that are of a more 'moderate' tranquillity.

Landscape Figure 19 shows the predicted noise contours for the Heathrow NWR scheme and how the change in contours under the proposed scheme would affect areas of tranquillity. Overall, the noise contours for the proposed scheme cover a broader corridor due to the new runway development, but extend to the same distance eastward and westward, with slight variations. To the southwest of the runways, a 'spur' in the N70 corridor covers an area currently indicated as having a medium level of tranquillity.

The indication is that there will be increased overflight mainly to the north of the current flight path corridor and the potential for a reduction in tranquillity as a result of the air traffic movements associated with Heathrow NWR. The areas affected are currently classified as being 'moderate' to 'least' tranquil.

3.3.8 Dark Skies

Heathrow NWR lies within an area identified within the CPRE 'Dark Skies' mapping as having the highest relative level of night time lighting when viewed from above, (see Landscape Figures 20 and 21). This area contains Heathrow Airport as well as the urban areas such as West Drayton, Feltham and Hounslow. The flight paths associated with the existing airport lie largely within this, with only the western extent being within an area of more moderate to low levels of night time lighting.

The proposed flight paths and associated noise contours extend further into areas of lower levels of night time lighting to the west of the airport, and it is not clear what effect the movement of air traffic or the presence of night time ground lighting would have, although there is the potential for increased light levels. However, it is unlikely to alter the results of the CPRE Dark Skies mapping.

3.3.9 Summary of Effects Table

Table 3.2 summarises the 'significant' landscape, townscape and visual effects discussed.

Table 3.2 – Summary of significant landscape and townscape effects – Heathrow NWR

Receptor	Construction Phase	Operational Phase
Designation area effects		
Colne Valley Regional Park	Moderate Adverse Effect	Minor Beneficial Effect
Landscape effects		
Hillingdon Lower Colne Floodplain	Major Adverse Effect	Major Adverse Effect
Hillingdon Open Gravel Terrace	Moderate Adverse Effect	Minor Adverse Effect
Slough Road Infrastructure	Moderate Adverse Effect	Minor Adverse Effect
Townscape effects		
Hillingdon Historic Core	Major Adverse Effect	Moderate Adverse Effect
Visual effects		
Stanwell and Stanwell Moor	Moderate Adverse Effect	Minor Adverse Effect
Public Rights of Way south of M4	Moderate Adverse Effect	Minor Beneficial Effect

Receptor	Construction Phase	Operational Phase
Harmondsworth and Sipson villages	Major Adverse Effect	Moderate Adverse Effect
Harmondsworth Moor	Moderate Adverse Effect	Minor Adverse Effect

3.3.10 Comparison of Assessments - Heathrow NWR

The following is a comparison of the differences between HAL's consultant AMECs document Landscape and Visual Impact Assessment, (Heathrow Airport Limited, 2014b) and their assessment of landscape and visual impacts and the assessment of the proposed Heathrow NWR in this Report.

General Points

This Jacobs report is a desk based feasibility review, considering the promoters scheme in the context of a high level independent assessment. No site visits have been carried out for this current report.

The AMEC report does not propose a methodology except for describing how data will be collected and what sources of information would be used. Jacobs have described a methodology and how the direct or indirect effects will be assessed.

The Jacobs assessment contains a high level landscape, townscape and visual assessment. The AMEC report does not appraise the nature or level of effects that would arise as a result of the impacts they identify.

The Jacobs report has assessed the effects of flight paths on landscape and townscape character, visual amenity, tranquillity and dark skies. This is not considered in the AMEC report.

The study area extents differ with Jacobs using 5km and AMEC using the extent of the Zone of Theoretical Visibility. Jacobs anticipated that the most significant effects from elements on the ground would occur within a 5km radius and only Areas of Outstanding Natural Beauty (AONBs) and Areas of Great Landscape Value (or locally designated landscapes) have been assessed up to 15km. We have not produced a ZTV at this level of assessment.

Effects on Designations

Effects on designations were not described by the AMEC report but are outlined in the Jacobs report.

Landscape Effects

Only impacts of the proposed scheme have been identified by AMEC with no assessment of effects. The Jacobs report has described effects on the landscape character. Similar types of impact have been identified by both reports, for example, on Colne Valley Regional Park, Harmondsworth Moor, the diversion of the Colne Valley Trail, vegetation loss and the diversion of watercourses.

Townscape Effects

The AMEC report identifies that there would be an impact on Harmondsworth and Sipson villages but does not describe how the townscape would be affected. The

Jacobs report has described effects on the townscape character areas, for example, the historic cores of Harmondsworth and Sipson.

Visual Effects

Only impacts of the proposed scheme have been identified by AMEC with no assessment of effects. Jacobs have described visual effects for residential properties, public rights of way and recreational receptors. Both Reports identify visual impacts on Harmondsworth, Sipson, Harlington and Stanwell.

3.3.11 Conclusion

The most significant effects on the landscape, townscape and visual amenity would be experienced during construction. The Colne Valley Regional Park would experience a significant adverse effect during construction as some of the park would be lost to accommodate the new runway and there would be views towards construction works. The park would conversely experience a beneficial effect, although not significant beneficial effect during operation as there are extensive mitigation measures proposed by HAL which would help to improve the quality and appearance of the remaining park close to the airport.

The Hillingdon Lower Colne Floodplain character area would experience the most significant adverse effect in terms of landscape and townscape character as the majority of construction works would take place here. There would also be a significant adverse effect on Hillingdon Open Gravel Terrace character area, Slough Road Infrastructure character area and the Hillingdon Historic Core character area, due to physical changes for airport infrastructure and a reduction in visual amenity. The loss of landscape features would be permanent for the Hillingdon Lower Colne Floodplain and so the significant adverse effect would continue into the operational phase of the airport. There would also be a significant adverse effect on Hillingdon Historic Core due to the permanent loss of Longford village and part of Harmondsworth.

Properties in Stanwell, Stanwell Moor, Harmondsworth and Sipson would all experience a significant adverse effect on views during construction due to the proximity of works and the open nature of views. The significant adverse effect would continue into the operation of the airport for properties in Harmondsworth and Sipson. This is because the operational airport would be in very close proximity and although partially screened by bunding, the bunding itself would have a visual impact.

Public rights of way south of the M4, including the Colne Valley Way, and Harmondsworth Moor would also experience a significant effect on views during construction of Heathrow NWR. This is because these areas would have close range views towards construction works. The significant adverse effect would not continue into the operational phase for these receptors. Conversely, public rights of way south of the M4 would experience a beneficial effect, although not significant beneficial effect during operation as the extensive mitigation measures proposed by HAL would improve the setting of the public rights of way and help screen views of the airport.

There is the potential for some areas to experience a reduction in tranquillity due to the increased area of flight paths associated with the new runway. There is also the potential for increased light levels but this is unlikely to alter the results of the CPRE Dark Skies mapping.

3.4 Landscape, Townscape and Visual Impact Assessment – Heathrow Airport Extended Northern Runway

Information on the scheme proposals has been taken from HH's document Heathrow Expansion as amended, (RPS, 2014). The scheme would include the construction and operation of the following elements:

- Extension of northern runway to the west;
- Diversion of the M25 to the west;
- A new terminal building; and,
- Realignment of the western perimeter road.[26]

Further changes would include:

- Loss of areas of Colne Valley Park and other public parks;
- River diversions to accommodate the new runway and improved flood storage;
- Landscape improvements to the Colne Valley Park focused around the diverted River Colne and to the north of the M4;
- Property demolition and removal of existing infrastructure to accommodate the new runway;
- Vegetation removal including ongoing management of vegetation for the take-off and climb surfaces; and,
- New flight paths.

Temporary construction works within the boundary of the site would include:

- Construction compound;
- Large construction plant;
- Materials storage;
- Construction traffic; and,
- Evening construction lighting during winter.

3.4.1 Effects on Landscape Designations

The Landscape Figure 26 in the Place Figures report accompanying this report shows the location of landscape related designations and their proximity to Heathrow ENR:

The Chilterns AONB would not have significant views towards the Heathrow ENR scheme, therefore, effects on the AONB during both construction and operation would be negligible.

The locally designated Area of Landscape Importance in the Borough of Runnymede is likely to have isolated views from higher ground close to the war memorial at Cooper's Hill, approximately 6km to the south west. The views from this point would be long distance and any changes would be in the context of the

[26] 'Heathrow Hub interchange has been excluded from the footprint and the assessment. The Commission stated in its Interim Report its intention to consider HH's proposed transport hub as a detachable component which could be associated with either of the Heathrow runway options under consideration. Accordingly, the core appraisal case for the Heathrow ENR scheme includes a more traditional surface access package

existing airport. Therefore, effects on the Area of Landscape Importance during both construction and operation would be negligible.

Colne Valley Regional Park is within and immediately to the west of the Heathrow ENR scheme site boundary and is of high sensitivity due to its recreational importance. A portion of the park would be lost to accommodate the new runway. There would also be close range views from the park at Colnbrook, Poyle and Horton. Impacts would affect a small part of the park but many would be permanent. It is likely that there would be a moderate adverse magnitude of impact and a moderate adverse effect during construction.

Mitigation is proposed by HH for Colne Valley Regional Park to offset adverse effects from construction of the new runway and airport infrastructure development. This includes enhancement of meadow areas, a diversion of the Colne Brook and access and green link improvements within Colne Valley Regional Park. These mitigation measures would help to improve the quality of the remaining park and thus it is likely that there would be a negligible magnitude of impact and a residual negligible effect during operation, once mitigation measures have established.

There are various Country Parks scattered around the study area, the majority of which would have no views towards the proposed scheme. Some parks such as Stockley would have long distance, elevated views but due to the distance of the scheme from these parks, and the context of the existing airport, effects would not be significant. Effects during both construction and operation would be negligible.

No areas of Ancient Woodland would require removal, therefore, effects during both construction and operation would be negligible.

3.4.2 Landscape Effects

The district and county level landscape character areas have been assessed below. The most significant effect would be for the character areas directly affected by the scheme, which are Hillingdon Lower Colne Floodplain, South Bucks Iver Heath Mixed Use Terrace, Windsor and Maidenhead Settled Developed Floodplain, Surrey Thames Valley and Slough Road Infrastructure. Effects on remaining character areas have been briefly summarised. Landscape Figure 27 shows the nature of landform and vegetation around Heathrow. Landscape Figure 28 shows the location of landscape and townscape character areas at a national and local level.

Hillingdon Lower Colne Floodplain

The Hillingdon Lower Colne Floodplain character area is a very attractive landscape due to its diverse habitats and network of footpaths. It is of high value as it is valued by local residents for recreation and as a green buffer within infrastructure and built form. It also makes up part of the Colne Valley Regional Park. The area is susceptible to relatively small changes and is of high sensitivity.

A large proportion of this character area would be lost to accommodate the new runway and other airport infrastructure. These changes would be permanent. This would result in the loss of vegetation blocks, hedgerows, farmland and field pattern, changes to topography for the runway and the diversion of the River Colne, as well as the introduction of construction activity, construction traffic, storage mounds and compounds. There would also be views towards construction from the remaining part of the character area. For these reasons, there would be a major adverse magnitude of impact and a major adverse effect during construction.

Mitigation measures have been proposed by HH within the Colne Valley Regional Park to offset impacts of the new runway. This includes meadow enhancement, screening vegetation and improvements to access and linkages. However, even though these improvements would be of benefit to landscape character, the loss of a large part of the character area would be permanent. There would, therefore, be a moderate adverse magnitude of impact and a residual major adverse effect during operation.

Windsor and Maidenhead Settled Developed Floodplain

The Windsor and Maidenhead Settled Development Floodplain character area is made up of a fragmented landscape with some areas of farmland and a diverse range of vegetation types, and is of good quality. It is not designated for its beauty or components but is relatively valued for recreation along footpaths and on the reservoirs and is, therefore, of medium value. The character area has some potential for substitutability and therefore, is of moderate sensitivity.

Much of the character area would remain intact apart from the north eastern corner, which would be directly affected in order to accommodate the end of the new runway. The loss of farmland, vegetation blocks, hedgerows and former gravel pit lakes would be permanent and it is likely that there would be views towards construction works from a large part of the remaining character area. There would also be the introduction of construction activity and construction traffic. For these reasons there would be a moderate adverse magnitude of impact and a moderate adverse effect during construction.

The areas of land taken for the runway would be lost permanently. However, the completion of construction would help to improve visual amenity for other parts of the character area. In addition, screening vegetation and habitat improvements are also proposed, which would help to improve the character and visual amenity of the area. There would be a minor adverse magnitude of impact and a residual minor adverse effect during operation.

Surrey Thames Valley: Thames Floodplain

The Surrey Thames Valley: Thames Floodplain character area is of good quality as although it is heavily influenced by urban development it contains a patchwork of different habitats and farmland areas. It is not designated for its landscape importance, but is of medium value for its footpath network, residential use and recreational areas around lakes. The character area has some potential for substitutability and therefore, is of moderate sensitivity.

Ancillary works and balancing ponds are proposed next to the edge of the airport boundary. Land take for Heathrow ENR would be permanent but not significantly out of character for the type of development and its location. There would be a minor adverse magnitude of impact and a minor adverse effect during construction.

Once construction was complete, it is anticipated that ancillary works would blend into the existing airport and highway corridor and would not be that perceptible, therefore, there would be a negligible magnitude of impact and a residual negligible effect during operation.

Slough Road Infrastructure

This character area is of ordinary quality as it contains a mixture of land uses and is in close proximity to major infrastructure corridors. However, it is of high value due to the network of footpaths, including the Colne Valley Way, which provide recreation for local residents within the Colne Valley Regional Park. It is an area that is reasonably tolerant of change and is of moderate sensitivity.

A section of the character area would be altered for the construction of the new runway. This would result in the loss of small former gravel pit lakes and the diversion of the Colne Brook and Colne Valley Way as well as the introduction of construction activity and construction traffic. There would also be views of construction from the rest of the character area. For these reasons, there would be a moderate adverse magnitude of impact and a moderate adverse effect during construction.

Mitigation measures have been proposed by HH within the Colne Valley Regional Park to offset impacts of the new runway. This includes the realignment of the Colne Brook, meadow enhancement and improvements to access and linkages. However, the loss of part of the character area would be permanent and the operational airport would be in close proximity. Therefore, there would be a minor adverse magnitude of impact and a residual minor adverse effect during operation.

Other Landscape Character Areas

There would be minor changes to the Hillingdon Heathrow Gravel Terrace Infrastructure character area where balancing ponds would be reconfigured to the south east. Due to the dominance of the airport in this character area effects during construction and operation would be negligible.

The Windsor and Maidenhead Settled Farmed Floodplain, South Bucks Iver Heath Mixed Use Terrace, South Bucks Colne Valley Floodplain and Hillingdon Open Gravel Terrace character areas would not be physically affected by the scheme. There are unlikely to be views from the Settled Farmed Floodplain, Iver Heath and Mixed Use Terrace character areas due to the screening effects of the M4 corridor, the embankments of the Queen Mother and Wraysbury Reservoirs and vegetation along the River Thames. Views from Hillingdon Open Gravel Terrace would be screened by vegetation within Harmondsworth Moor. Effects during construction and operation for these areas would therefore be negligible.

3.4.3 Townscape Effects

Effects on the local townscape areas at Heathrow have been considered below. The most significant effects would be for Hillingdon Commercial Airport and Hillingdon Historic Core. Effects on remaining character areas have been briefly summarised.

Hillingdon Commercial Airport

The Hillingdon Commercial Airport townscape is of ordinary quality due to the dominance of modern airport related buildings and busy roads. It is of low value with few components of importance. It is tolerant of substantial change and is of low sensitivity.

The majority of the character area would remain as existing, with some changes due to the new runway. There would be a minor adverse magnitude of impact and a minor adverse effect during construction.

Much of the character area would remain as existing or be restored with an airport style development that is similar to the existing environment. It is, therefore, anticipated that there would be a negligible magnitude of impact and a residual negligible effect during operation.

Hillingdon Historic Core

The historic cores in Hillingdon are very attractive and often centred around important buildings or village greens of high value for their important heritage and townscape features. There is limited potentially for substitution in these areas and they are of high sensitivity.

None of the historic core areas would be physically affected by the Heathrow ENR scheme, but the historic core in Longford would be in close proximity. This would greatly reduce visual amenity and tranquillity as construction works for the new runway and road improvements would be in close proximity. There would be a moderate adverse magnitude of impact and a moderate adverse effect during construction.

The completion of construction work would help to improve visual amenity and tranquillity. In addition, screening vegetation is proposed by HH around the roads to the west. However, the airport infrastructure would be more readily apparent for much of the area due to the runway extension. This would be a permanent impact and there would, therefore, be a minor adverse magnitude of impact and a residual minor adverse effect during operation.

Other Townscape Character Areas

Under the proposed Heathrow ENR scheme there would be minor changes to the Hounslow Feltham character area due to the proposed reconfiguration of balancing ponds to its northern edge. This would not be a significant impact on the character area as a whole and so the effects during construction and operation would be negligible.

The Hounslow West, Hounslow Cranford and Heston, Hounslow Bedfont and Slough Urban Area character areas would not be directly affected and it is unlikely that there would be any significant views towards the proposed scheme. Effects during construction and operation would be negligible.

3.4.4 Waterscape Effects

No waterscape effects beyond those associated with hydrological features are anticipated. Effects on these hydrological features, including rivers, streams and water bodies such as reservoirs, are assessed in the landscape character section above.

3.4.5 Visual Effects

The visibility of the Heathrow ENR scheme would be relatively constrained by built form to the north, east and south and by vegetation and reservoir embankments to the west. The location of potential visual receptors mentioned below is shown on the

Visual Receptors Figure (Landscape Figure 29). The most significant views towards the scheme would be from receptors to the immediate north, west and south.

Stanwell and Stanwell Moor

Stanwell and Stanwell Moor are located to the south of the existing airport and have views towards Terminal 5 and the southern runway. Residential properties would have close range views towards some of the construction works, the majority of which would be filtered by boundary vegetation. Properties in Stanwell and Stanwell Moor are of moderate sensitivity.

These properties would have views towards the construction of ancillary works and balancing ponds in the north, which would be in close proximity. However, as these properties already have views influenced by the airport, the change in view would be less significant. There would be a moderate adverse magnitude of impact and a moderate adverse effect during construction.

Completion of construction would reduce the visual impact on these properties, but there would be permanent, closer range views of airport infrastructure leading to a minor adverse magnitude of impact and a residual minor adverse effect during operation.

Wraysbury Reservoir is located to the west of Stanwell Moor and is used recreationally by bird watchers and water sport enthusiasts. It is also likely to have open views towards the proposed Heathrow ENR scheme and is, therefore, of high sensitivity.

The reservoir would have relatively close range views towards the new runway to the north for Heathrow ENR. The impact on views would be within the context of the existing airport but it is likely that there would be a significant change in the view, a moderate adverse magnitude of impact and a moderate adverse effect during construction.

The completion of construction works would reduce the impact on views. The new runway would still be visible in the context of the existing view of the airport, thus there would be a permanent impact resulting in a minor adverse magnitude of impact and a residual minor adverse effect during operation.

Poyle, Horton and Colnbrook

Poyle Industrial Estate is of low sensitivity due to its use as an indoor place of work. The majority of the industrial estate would require removal for the construction of the new runway. Any remaining buildings to the north or south would have close, open views towards construction for the new runway, including tunnelling over the M25. This would lead to a major adverse magnitude of impact and a moderate adverse effect during construction. Views would improve on completion of construction and some screening vegetation is proposed. However, the operational runway would be in close proximity and there would be a moderate adverse magnitude of impact and a residual minor adverse effect during operation.

Properties to the northern edge of Colnbrook would have filtered views of the works and are of moderate sensitivity. There would be a minor adverse magnitude of impact and a minor adverse effect during construction. Following construction, it is likely that views would be similar to existing and further screening vegetation would

be proposed. There would be a negligible magnitude of impact and a residual negligible effect during operation.

Properties to the south of Colnbrook would be in close proximity to construction works for the new runway and views would be relatively open. Therefore, they are of high sensitivity. Construction of the new runway would be a dominant feature in views that were previously semi-rural. This significant change would lead to a major adverse magnitude of impact and a major adverse effect during construction.

Following construction, the impact on views would reduce and there would be screening vegetation along the new runway and meadow enhancements around the Colne Brook diversion. However, the operational runway would still be a dominant feature in views south. This would result in a moderate adverse magnitude of impact and a residual moderate adverse effect during operation.

Properties in Horton would be in close proximity to construction works for the new runway and views would be relatively open, therefore, they are of high sensitivity. There would be some properties screened by vegetation along the Colne Brook and along Stanwell Road. However, some properties would have open views north east towards the runway construction works. This would lead to a major adverse magnitude of impact and a major adverse effect during construction. Completion of construction would reduce the impact on views but the operational runway would still be a dominant feature resulting in a moderate adverse magnitude of impact and a residual moderate adverse effect during operation.

The Colne Valley Way runs between Horton and Colnbrook and is likely to require a slight diversion due to the new runway. It is assumed that this footpath would be diverted prior to construction, and would have open, close range views of the proposed scheme. It has, therefore, been assessed as being of high sensitivity. There would be close, open views east towards construction works for the new runway, which would be a significant change in the view from semi-rural fields and waterbodies. There would be a major adverse magnitude of impact and a major adverse effect during construction. The impact on views would reduce after construction but the operational runway would be a dominant feature in views east and it is likely the footpath would run along the airport boundary with minimal scope for mitigation. There would, therefore, be a moderate adverse magnitude of impact and a residual moderate adverse effect during operation.

The Queen Mother Reservoir is located to the west of Colnbrook and is used recreationally by bird watchers and water sport enthusiasts. It is also likely to have open views towards the proposed scheme and is, therefore, of high sensitivity.

There would be open views towards construction for the new runway in the east. The views would be relatively mid distance and against the backdrop of the existing airport and, therefore, there would be a minor adverse magnitude of impact and a minor adverse effect during construction. On completion of construction the impact on views would reduce but the runway would be close enough to still have an impact on views, even in the context of the existing airport. There would, therefore be a minor adverse magnitude of impact and a residual minor adverse effect during operation.

Longford and Around the M4

Properties in Longford would be in close proximity to works for the runway extension, would have relatively open views and are, therefore, of high sensitivity.

There would be close, open views south towards construction works for the new runway. Views are already influenced by the existing airport but there would still be a significant change in the view due to the proximity of the works. There would be a major adverse magnitude of impact and a major adverse effect during construction. Completion of construction would reduce the impact on views, but the runway would now stretch across the entire view south and would be in close proximity with little scope for mitigation. There would be a moderate adverse magnitude of impact and a residual moderate adverse effect during operation.

Harmondsworth Moor is an ecological and recreational area to the west of Harmondsworth. There is a lot of vegetation within the park that would help to screen views so it has been assessed as being of moderate sensitivity. There would be filtered views south towards the new runway leading to a minor adverse magnitude of impact and a minor adverse effect during construction. Mitigation works are proposed by HH that would improve the quality of views within the park and screen views towards the new runway, returning views to similar to existing. This would lead to a negligible magnitude of impact and a residual negligible effect during operation.

Other Visual Receptors

There are various public rights of way that would have views towards the proposed scheme, but views would either be restricted by vegetation or built form, or receptors would be located at a significant distance away, such that effects would not be that significant. This is the case for recreational routes near Staines Reservoir.

There would also be long distance views from West Drayton, Stockley Park near West Drayton and Coopers Hill to the south west. The Heathrow ENR scheme would blend in with the context of the existing airport and not be a significant feature in the views from these locations.

Finally, changes would be so minimal for some receptors that there would not be a significant effect on their view (minor or negligible effect). This is the case for properties and businesses in North Feltham where balancing ponds would be reconfigured.

3.4.6 Lighting

It is likely that the Heathrow ENR site would require lighting in winter evenings during construction and occasionally overnight, to provide illumination for the ongoing works. It is also anticipated that during operation all new terminal buildings, piers, car parks and other external hardstanding around buildings would require lighting, as well as runway lights.

There would also be the lights from aircraft whilst on the ground and in the air. However, the Civil Aviation Authority CAP 168 requires that ‘dangerous and confusing lights’ must not be exhibited as they may endanger aircraft taking-off and landing. Lighting around the runway is, therefore, likely to be minimised which would also be of benefit to visual receptors.

All of this lighting would be in the visual context of the lighting at the existing airport. This includes the light from the existing Heathrow Airport the major urban areas in the surrounding area and the M25. For landscape, townscape and visual receptors close to the north and west of the new runway, the lighting would appear closer in the view but against the backdrop of existing lighting. Effects would be most

significant for those receptors to the west around Colnbrook and Horton and to the north at Longford.

For landscape, townscape and visual receptors further away from the scheme, the lighting for the new scheme would be hard to distinguish from the lighting at the existing airport and along the urban edges of London, Staines and Slough.

3.4.7 Tranquillity

Landscape Figure 18 shows the CPRE tranquillity mapping overlaid with the 'Do Minimum' N70 noise contours for Heathrow Airport. Landscape Figure 22 shows the tranquillity mapping and the 'Do Minimum' flight routes. Landscape Figures 30 and 32 show plans for noise contours for N70 overflight, flight routes and CPRE tranquillity mapping for the proposed Heathrow ENR scheme.

Flight Paths

The current nature of overflight has been estimated from reference to the typical Heathrow radar flight tracks (based on Draft ERCD Report 1401 Noise Exposure Contours for Heathrow Airport 2013 (ERCD Report, 2013b)).

Landscape Figures 22 and 24 outline the estimated tracks of aircraft joining the final approach centreline for the 'Do Minimum' arrival and departure routes. These have been overlaid on the CPRE tranquillity mapping. This illustrates the areas of overflight of final approaches and departures for easterly arrivals and westerly departures are directed between Slough, Maidenhead and High Wycombe overfly the Chilterns AONB currently, but westerly arrivals overfly the less tranquil areas of greater London. This shows that limited areas already noted as 'more tranquil' would be overflown by arrivals in the 'Do Minimum' scenario.

Landscape Figures 32 and 33 show the effect of the Heathrow ENR scheme and suggest that route rationalisation could offer the potential for continued overflight of the southern end of the Chilterns AONB. This is because the routes are broadly similar to the 'Do Minimum' scenario despite some rationalisation of routes to the south.

There remains significant uncertainty in details of routes due to the detailed design issues associated with the scheme development and the application of the UK Future Airspace Strategy[27].

At this stage it is therefore not possible to offer a definitive conclusion regarding tranquillity impacts. Compared to the baseline ('Do Minimum') situation, it can be observed that the corridors of overflight are reduced slightly in number and extent to the west, which suggests no significant change to the visual and noise disturbance above some parts of the Chilterns AONB. Dependent on the specific use of runways, the increase in ATMs may or may not result in increased numbers of aircraft overflying areas in the Chilterns AONB currently considered more tranquil than others.

Further analysis of both landscape and tranquil areas (including heritage assets) is recommended once detailed airspace design commences, in line with the DfT

[27] Part of a wider programme to modernise European airspace through the Single European Sky project (SESAR). See http://www.caa.co.uk/default.aspx?catid=2408&pagetype=90

Guidance on Air Navigation Environmental Objectives (2014)[28], or any successor guidance.

Noise contours

The N70 noise contours for the existing airport configuration in the 'Do Minimum' scenario indicates overflight effects to the east and west of the airport, (Landscape Figure 18). The areas shown to be affected by the N70 overflight are largely currently assessed as being of the 'least tranquil' category. There are areas to the west of the airport that are of a more 'moderate' tranquillity.

Figure 30 shows the predicted noise contours for the Heathrow ENR scheme and how the change in contours under the proposed scheme would affect areas of tranquillity. To the east of the airport, the noise contours for the proposed scheme cover a broadly similar area, although the level of overflight is increased. To the west, the corridor spreads out further, reflecting the increased runway length to the west and the level of overflight is also increased notably with 'spurs' to the north-west, the west and south.

The indication is that there will be increased overflight mainly to the west of the airport, and the potential for a reduction in tranquillity as a result of the air traffic associated with Heathrow ENR. The areas affected are currently classified as being 'moderate' to 'least tranquil'.

3.4.8 Dark Skies

Heathrow ENR lies within an area identified within the CPRE 'Dark Skies' mapping as having the highest relative level of night time lighting when viewed from above, see Landscape Figure 31. This area contains Heathrow Airport as well as the urban areas such as West Drayton, Feltham and Hounslow. The flight paths associated with the existing airport lie largely within this, with only the western extent being within an area of more moderate to low levels of night time lighting.

The proposed flight paths and associated noise contours extend further into areas of lower levels of night time lighting to the west of the airport, and it is not clear what effect the movement of air traffic or the presence of night time ground lighting would have, although there is the potential for increased light levels. However, it is unlikely to alter the results of the CPRE Dark Skies mapping.

3.4.9 Summary of Effects Table

Table 3.3 summarises the 'significant' landscape, townscape and visual effects discussed above.

[28] Guidance to the CAA on Environmental Objectives Relating to the Exercise of its Air Navigation Functions https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/269527/air-navigation-guidance.pdf

Table 3.3 – Summary of significant landscape and townscape effects – Heathrow ENR

Receptor	Construction Phase	Operational Phase
Designation area effects		
Colne Valley Regional Park	Moderate Adverse Effect	Negligible Effect
Landscape effects		
Hillingdon Lower Colne Floodplain	Major Adverse Effect	Major Adverse Effect
Windsor and Maidenhead Settled Developed Floodplain	Moderate Adverse Effect	Minor Adverse Effect
Townscape effects		
Hillingdon Historic Core	Moderate Adverse Effect	Minor Adverse Effect
Visual effects		
Stanwell and Stanwell Moor properties	Moderate Adverse Effect	Minor Adverse Effect
Wraysbury Reservoir	Moderate Adverse Effect	Minor Adverse Effect
Poyle Industrial Estate	Moderate Adverse Effect	Minor Adverse Effect
Colnbrook (southern edge)	Major Adverse Effect	Moderate Adverse Effect
Horton	Major Adverse Effect	Moderate Adverse Effect
Colne Valley Way	Major Adverse Effect	Moderate Adverse Effect
Longford	Major Adverse Effect	Moderate Adverse Effect

3.4.10 Comparison of Assessments - Heathrow Hub

The following is a comparison of the differences between the HH consultants URS' document Place Townscape, (Runway Innovations Ltd and Heathrow Hub Ltd, 2014) and their assessment of landscape and townscape impacts and the assessment of the proposed Heathrow ENR in this Report.

General Points

The Jacobs report is a desk based feasibility review, considering the promoters scheme in the context of a high level independent assessment. No field visits have been carried out for this current report.

The URS document does not propose a methodology except for undertaking the assessment in line with best practice. Jacobs have described a methodology and how the direct or indirect effects will be assessed.

The Jacobs assessment contains a high level landscape, townscape and visual assessment. The URS report describes what changes might occur due to the scheme but it does not appraise the nature or level of effects that would arise. It also does not separate out landscape, townscape and visual effects.

The Jacobs report has assessed the effects of flight paths on landscape and townscape character, visual amenity, tranquillity and dark skies. This is not covered in the URS report.

The study area extents differ with Jacobs using 5km and URS using the immediate area of direct impacts and not wider impacts. Jacobs anticipated that the most significant effects from elements on the ground would occur within a 5km radius and only AONBs and Areas of Great Landscape Value (or locally designated landscapes) have been assessed up to 15km.

Effects on Designations

Effects on designations were not described by the URS report but are outlined in the Jacobs report.

Landscape Effects

The URS report summarises the impacts that would occur due to the proposed scheme and discusses what elements of the scheme would result in changes to the landscape resource and landscape character. However, the report does not provide an assessment of effects. The Jacobs report has described effects on the landscape character. Both reports identify potential impacts on watercourses, vegetation, public rights of way, tranquillity and visual amenity.

Townscape Effects

The URS report does not discuss townscape character in the baseline or within the assessment. The Jacobs report has described effects on the townscape character areas, for example, the historic core of Longford.

Visual Effects

The URS report identifies that the scheme would be visually prominent from nearby receptors during both construction and operation but provides no assessment of effects. Jacobs have described visual effects for residential properties, public rights of way and recreational receptors.

3.4.11 Conclusion

The most significant effects on the landscape, townscape and visual amenity would be experienced during construction. The Colne Valley Regional Park would experience a significant adverse effect during construction as some of the park would be lost to accommodate the new runway and there would be views towards construction works. The park would not experience a significant adverse effect during operation as mitigation measures would help to offset adverse effects from the new runway and associated airport infrastructure.

The Hillingdon Lower Colne Floodplain character area would experience the most significant adverse effect in terms of landscape and townscape character as the majority of construction works would take place here. There would also be a significant adverse effect on the Windsor and Maidenhead Settled Developed Floodplain character area and the Hillingdon Historic Core character area due to physical changes resulting from airport infrastructure and a reduction in visual amenity. For Hillingdon Lower Colne Floodplain where loss of landscape features would be permanent the significant adverse effect would continue into the operation of the airport.

Properties in Stanwell, Stanwell Moor, Colnbrook, Horton and Longford and the Poyle Industrial Estate would all experience a significant adverse effect on views during the construction of Heathrow ENR due to the proximity of works and the open nature of views. The significant adverse effect would continue into operation for properties in Colnbrook, Horton and Longford. This is because the operational site would be a dominant feature in their view with limited scope for mitigation.

The Colne Valley Way and Wraysbury Reservoir would also experience a significant effect on views during construction, particularly the Colne Valley Way which would be adjacent to the works for the new runway. For the Colne Valley Way the significant adverse effect would continue into the operational phase of the airport due to the proximity of the operational runway and the open views towards it.

There is the potential for some areas to experience a reduction in tranquillity due to the increased area of flight paths associated with the new runway. There is also the potential for increased light levels but this is unlikely to alter the results of the CPRE Dark Skies mapping.

4 Heritage

This section presents the heritage impact assessment within the Appraisal Framework for Place. This includes consideration of:

- Potential impacts on designated assets including Scheduled Monuments, Listed Buildings and Conservation Areas;
- Changes in tranquillity affecting designated heritage assets; and,
- The feasibility and practicality of the mitigation measures suggested by the schemes' promoters.

4.1 Methodology

A high level desk based assessment has been undertaken for heritage in line with the Airports Commission Appraisal Framework (Chapter 10), (Airports Commission, 2014a) and using a methodology based on the guidance provided by:

- The National Planning Policy Framework (NPPF; DCLG, 2012);
- Conservation Principles (English Heritage 2008);
- The Setting of Heritage Assets (English Heritage 2011); and,
- Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3 Part 2 Cultural Heritage (HA 208/07), (Highways Agency et al, 2007).

DMRB (HA 208/07), (Highways Agency et al, 2007) was used as it provides a robust and accepted method for the assessment of impacts from nationally important transport projects on cultural heritage assets. In respect of both physical effects and effects on setting, those assessed as being of 'moderate' or greater significance are generally considered significant in the context of the Environmental Impact Assessment Regulations 2011. The full assessment methodology is described in Appendix D.

In order to establish the cultural heritage baseline for each of the proposed options and to identify potential impacts on designated heritage assets that may arise from their construction and/or operation, three study areas were defined:

- The 'Land Take Study Area'. This comprises the development footprint of each of the proposed options and the surface access corridors. This defines the area where designated heritage assets are at greatest risk from physical impact from construction of the proposed airport expansion options.
- An 'Intermediate Study Area' was defined as a 300m study area around the development footprint of each of the proposed options. A 300m study area was used as this is the size of the study area suggested in HA208/07 for scoping studies. The purpose of the Intermediate Study Area was to identify those designated heritage assets where the settings are at risk of impact from construction and operation of the proposed airport expansion options.
- The 'Outer Study Area'. A wider 2km study area was defined around each of the proposed options. This was to identify designated heritage assets with settings at risk of impact from operation of the proposed airport expansion options.

To identify potential impacts on the setting of assets arising from changes in tranquillity, the number of assets located within N70[29] (20 events) daytime noise contour generated for 2030 and 2050 without the scheme being in place ('Do Minimum') were compared with the number of assets located inside the N70 (20 events) daytime contour generated for the same years with the scheme in place ('Do Something'). Figures showing these areas are contained with the Place Figures report.

For these study areas baseline data was gathered from the following sources of information:

- The National Heritage List for information on national designated heritage assets (World Heritage Sites, Scheduled Monuments, Listed Buildings, Registered Parks and Gardens, Registered Battlefields and Protected Wrecks); and,
- Local authority lists of Conservation Areas (Local councils consulted: Mole Valley District Council; Reigate and Banstead District Council; Crawley District Council; Tandridge District Council; Hillingdon District Council; Slough District Council; Hounslow District Council; Spelthorne District Council; and Runnymede District Council).

Detailed information on the cultural heritage baseline is presented in the Place Baseline report (Jacobs, 2014f).

Information contained in the following reports was also taken into consideration:

- Information from the Airports Commission Appraisal Framework (Airports Commission, 2014a);
- Information from the Gatwick promoter's document A Second Runway for Gatwick: Appendix A13, (GAL, 2014a).
- Information from the Heathrow Airport Limited promoter's document Taking Britain Further – Volume 1 (HAL, 2014a); and,
- Information from the Heathrow Hub promoter's document Heathrow Expansion, Runway Innovations Limited, Airport Commission, Stage 2 Submission and 5-1 addendum, (Runway Innovations Ltd and HH, 2014).

The feasibility, practicality and effectiveness of the mitigation measures suggested by the scheme promoters was assessed (i.e. the ability of the mitigation proposed to reduce the Significance of a Residual Impact) and where appropriate further mitigation options were proposed.

4.1.1 Assumptions and Limitations

This assessment is based on designated heritage assets only. Construction and operation of any of the proposed options has the potential to impact on non-designated heritage assets. Data held by local Historic Environment Records (HER) regarding non-designated heritage assets has not been obtained from the Greater London Archaeology Advisory Service (GLAAS), Surrey County Council, West Sussex County Council or Berkshire Archaeology.

1. N70 measures the contours where the number of events have a maximum external noise level of 70 dB(A) or more).

Only the sources identified in section 4.1 have been consulted. No other desk based sources have been used at this stage. No site inspections, walkover surveys or fieldwork have been undertaken.

4.2 Heritage Assessment - Gatwick Airport Second Runway

The baseline data gathering undertaken by Jacobs for this assessment identified a combined total of 192 designated heritage assets within the Land Take Study Area, Intermediate Study Area and the Outer Study Area for the Gatwick 2R scheme as detailed below:

- Land Take Study Area – 22 designated assets;
- Intermediate Study Area – 10 designated assets, and
- Outer Study Area – 160 designated assets.

The locations of these assets are shown on Heritage Figures 1 – 5 in the Place Figures report.

The values of these assets range from Medium to High. More detailed information on the baseline conditions for this proposed option can be found in the Place Baseline (Jacobs, 2014f).

A total of 33 designated heritage assets were identified by GAL in its submission, (RPS, 2014).

4.2.1 Heritage Land Take Study Area

A total of 22 designated heritage assets have been identified within the Land Take Study Area and have the potential to be impacted by Gatwick 2R. This is consistent with the assessment made by GAL within their submission. Of these 22 designated heritage assets, six comprise Grade II* Listed Buildings and 16 comprise Grade II Listed Buildings. Potential impacts on 20 of these designated heritage assets were identified by the GAL. The remaining two designated heritage assets were correctly identified as having been recently demolished or relocated.

A summary of the number of each type of designated heritage asset, an assessment of their value, and the magnitude and significance of impact is presented in Table 4.1.

It is anticipated that designated heritage assets located within the Land Take Study Area are at greatest risk from physical impacts (i.e. whole or partial removal of associated remains or fabric) during construction of the proposed option. Where it was proposed to retain cultural heritage assets *in situ* there are still likely to be significant impacts on the setting of these assets during the construction and operation of the proposed scheme.

Table 4.1 – Heritage Land Take Study Area: Summary Assessment of Impacts

Designation	No. Within Study Area	Value	Magnitude of Impact (unmitigated)	Significance of Impact (unmitigated)
Listed Building: Grade II*	6	High	Major	Large
Listed Building: Grade II	16	Medium	Major	Large

4.2.2 Surface Access Study Area

No direct impacts on any designated assets are predicted to arise from the surface access corridors. There is potential that construction and/or operation of the surface access corridors may impact on designated assets. However, the design of these corridors is not sufficiently advanced to allow this to be qualified at present.

4.2.3 Heritage Intermediate Study Area

A total of ten designated heritage assets have been identified by Jacobs within the Intermediate Study Area. A summary of the number of each type of designated heritage asset, an assessment of their value, and the magnitude and significance of effect is presented in Table 4.2.

Four of the 33 designated heritage assets identified by GAL in their submission are located within the Intermediate Study Area (potentially as a result of differing study area boundaries). These designated heritage assets comprise two Scheduled Monuments and two Conservation Areas. Potential impacts on the two Conservation Areas were identified by the promoter.

Jacobs identified six further Medium value Grade II Listed Buildings not identified by the promoter within their submission. It is anticipated that as these designated heritage assets are located outside of the proposed land take, the risk of physical impact is low. However, due to their proximity to the proposed scheme there is a high potential for impacts on the setting of these designated assets both during the construction and during the operation of the proposed scheme.

Table 4.2 – Intermediate Study Area: Summary Assessment of Impacts

Designation	No. Within Study Area	Value	Magnitude of Impact (unmitigated)	Significance of Impact (unmitigated)
Listed Building: Grade II	6	Medium	Major	Large
Scheduled Monument	2	High	Major	Large
Conservation Area	2	High	Major	Large

4.2.4 Heritage Outer Study Area

A total of 160 designated heritage assets have been identified with the potential to be impacted within the Outer Study Area. A summary of the number of each type of designated asset, and assessment of their value, and the magnitude and significance of effect is presented in Table 4.3.

Seven of the 33 designated heritage assets identified by GAL in their submission are located within the Outer Study Area. These designated heritage assets comprise two Scheduled Monuments and five Conservation Areas. Potential impacts on the Conservation Areas were identified by the promoter.

Jacobs have identified a further five High value Grade I Listed Buildings, four further High value Grade II* Listed Buildings and 144 Medium value Grade II Listed Buildings. Given the distance from the proposed scheme option, it is highly unlikely that designated heritage assets located within the Outer Study Area will be at risk from physical impacts or impacts on settings during construction. However, there is potential for impact on the settings of these designated heritage assets during operation.

Table 4.3 – Outer Study Area: Summary Assessment of Impacts

Designation	No. Within Study Area	Value	Magnitude of Impact (unmitigated)	Significance of Impact (unmitigated)
Listed Building: Grade I	5	High	Moderate	Moderate
Listed Building: Grade II*	4	High	Moderate	Moderate
Listed Building: Grade II	144	Medium	Moderate	Moderate
Scheduled Monument	2	High	Moderate	Moderate
Conservation Area	5	High	Moderate	Moderate

4.2.5 Tranquillity

Tables 4.4 and 4.5 present the number of each heritage designation predicted to be located within the N70 Contour for the 'Do Minimum' and 'Do Something' scenarios for 2030 and 2050, see also Heritage Figures 6 and 7.

By 2030, without the proposed Gatwick 2R scheme in place a total of 146 designated heritage assets are predicted to be within the N70 contour of the 'Do Minimum' scenario. For the Do Something scenario, this is predicted to be 293. Therefore there is the potential for impacts on tranquillity to 147 more designated assets.

By 2050 without the proposed Gatwick 2R scheme in place a total of 149 designated heritage assets are predicted to be within the N70 contour. For the 'Do Something' scenario, this is predicted to be 350.

Therefore there is the potential for impacts on tranquillity of 201 more designated assets by 2050 with the proposed scheme in place than without it.

Table 4.4 – Number of each Designation within N70 Contour for 'Do Minimum' 2030 and 'Do Something' 2030

Designation	Do Minimum 2030	Do Something 2030	Difference
Conservation Areas	2	2	0
World Heritage Sites	0	0	0
Scheduled Monuments	0	2	+2
Listed Buildings: Grade I	4	8	+4
Listed Buildings: Grade II*	13	24	+11
Listed Buildings: Grade II	126	256	+130

Table 4.5 – Number of each Designation within N70 Contour for 'Do Minimum' 2050 and 'Do Something' 2050

Designation	Do Minimum 2050	Do Something 2050	Difference
Conservation Areas	1	2	+1
World Heritage Sites	0	0	0
Scheduled Monuments	0	2	+2
Listed Buildings: Grade I	4	9	+5
Listed Buildings: Grade II*	13	28	+15
Listed Buildings: Grade II	130	308	+178

4.2.6 Mitigation

In their submission, GAL has predicted an impact on 29 out of a total of 33 designated heritage assets, and identified mitigation for 28 of these. These designated heritage assets, a description of the impact, the mitigation proposed in the submission and an assessment of the Significance of Residual Impact undertaken by Jacobs are presented in Table 4.6; along with a commentary on the feasibility and effectiveness of the proposed mitigation by the promoter.

In addition to designated heritage assets, this table also includes impacts and mitigation identified by the promoter on non-designated archaeological remains and historic landscapes; and a general comment on possible mitigation strategies for designated heritage assets not considered by the promoter.

Table 4.6 – Gatwick 2R Heritage Mitigation

Asset Number and Name	Designation	Location	promoter's Description of Impact	Mitigation proposed by promoter	Significance of Residual Impact (after mitigation)	Comments
LB1: County Oak Cottage	Grade II Listed Building	See Fig .1	Complete removal of building	English Heritage Level 1 building recording and external photographic survey to inform further mitigation proposals, to be decided following discussions with statutory and non-statutory consultees.	Moderate	Historic building recording of a Grade II Listed Building is a feasible and practical mitigation strategy, as would be further recording at a more detailed level. If further mitigation proposals include relocation, this is also feasible, but potentially impractical for a building of this type. If the building is dismantled for reconstruction elsewhere, there is likely to be impact on the building's special interest due to the loss of historic fabric during dismantling. If the building is translocated (a process involving moving the building in its current state to a new location, without prior dismantling of the building) then little damage is done to the building fabric. Practical consideration should be given to the cost implications of both options for a building of this size, and in both cases, there is likely to be a significant adverse impact on the setting of the building. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB2: St Barbe Cottage	Grade II Listed Building	See Fig. 1	Complete removal of building	English Heritage Level 1 building recording and external photographic survey to inform further mitigation proposals, to be decided following discussions with statutory and non-statutory consultees.	Moderate	Historic building recording of a Grade II Listed Building is a feasible and practical mitigation strategy, as would be further recording at a more detailed level. If further mitigation proposals include relocation, this is also feasible, but potentially impractical for a building of this type. If the building is dismantled for reconstruction elsewhere, there is likely to be impact on the building's special interest due to the loss of historic fabric during dismantling. If the building is translocated (a process involving moving the building in its current state to a new location, without prior dismantling of the building) then little damage is done to the building fabric. Practical consideration should be given to the cost implications of both options for a building of this size, and in both cases, there is likely to be a significant adverse impact on the setting of the building. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB3: Poles Acre Barn	Grade II Listed Building	See Fig. 1	Complete removal of building	English Heritage Level 1 building recording and external photographic survey to inform further mitigation proposals, to be decided following discussions with statutory and non-statutory consultees.	Moderate	Historic building recording of a Grade II Listed Building is a feasible and practical mitigation strategy, as would be further recording at a more detailed level. If further mitigation proposals include relocation, this is also feasible, but potentially impractical for a building of this type. If the building is dismantled for reconstruction elsewhere, there is likely to be impact on the building's special interest due to the loss of historic fabric during dismantling. If the building is translocated (a process involving moving the building in its current state to a new location, without prior dismantling of the building) then little damage is done to the building fabric. Practical consideration should be given to the cost implications of both options for a building of this size, and in both cases, there is likely to be a significant adverse impact on the setting of the building. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB4: Gatwick Manor Inn/Hyders Hall	Grade II* Listed Building	See Fig. 1	Complete removal of building	English Heritage Level 1 building recording and external photographic survey to inform further mitigation proposals, to be decided following discussions with statutory and non-statutory consultees.	Large	Historic building recording of a Grade II* Listed Building is a feasible and practical mitigation strategy, as would be further recording at a more detailed level. If further mitigation proposals include relocation, this is also feasible, but potentially impractical for a building of this type. If the building is dismantled for reconstruction elsewhere, there is likely to be impact on the building's special interest due to the loss of historic fabric during dismantling. If the building is translocated (a process involving moving the building in its current state to a new location, without prior dismantling of the building) then little damage is done to the building fabric. Practical consideration should be given to the cost implications of both options for a building of this size, and in both cases, there is likely to be a significant adverse impact on the setting of the building. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB5: Old Bonnetts Cottage	Grade II Listed Building	See Fig. 1	Complete removal of building	English Heritage Level 1 building recording and external photographic survey to inform further mitigation proposals, to be decided following discussions with statutory and non-statutory consultees.	Moderate	Historic building recording of a Grade II Listed Building is a feasible and practical mitigation strategy, as would be further recording at a more detailed level. If further mitigation proposals include relocation, this is also feasible, but potentially impractical for a building of this type. If the building is dismantled for reconstruction elsewhere, there is likely to be impact on the building's special interest due to the loss of historic fabric during dismantling. If the building is translocated (a process involving moving the building in its current state to a new location, without prior dismantling of the building) then little damage is done to the building fabric. Practical consideration should be given to the cost implications of both options for a building of this size, and in both cases, there is likely to be a significant adverse impact on the setting of the building. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.

Asset Number and Name	Designation	Location	promoter's Description of Impact	Mitigation proposed by promoter	Significance of Residual Impact (after mitigation)	Comments
LB6: Barn at Gatwick Manor	Grade II Listed Building	See Fig. 1	Complete removal of building	English Heritage Level 1 building recording and external photographic survey to inform further mitigation proposals, to be decided following discussions with statutory and non-statutory consultees.	Moderate	Historic building recording of a Grade II Listed Building is a feasible and practical mitigation strategy, as would be further recording at a more detailed level. If further mitigation proposals include relocation, this is also feasible, but potentially impractical for a building of this type. If the building is dismantled for reconstruction elsewhere, there is likely to be impact on the building's special interest due to the loss of historic fabric during dismantling. If the building is translocated (a process involving moving the building in its current state to a new location, without prior dismantling of the building) then little damage is done to the building fabric. Practical consideration should be given to the cost implications of both options for a building of this size, and in both cases, there is likely to be a significant adverse impact on the setting of the building. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB7: Crown post barn to east of Rowley Farmhouse	Grade II Listed Building	See Fig. 1	Complete removal of building	English Heritage Level 1 building recording and external photographic survey to inform further mitigation proposals, to be decided following discussions with statutory and non-statutory consultees.	Moderate	Historic building recording of a Grade II Listed Building is a feasible and practical mitigation strategy, as would be further recording at a more detailed level. If further mitigation proposals include relocation, this is also feasible, but potentially impractical for a building of this type. If the building is dismantled for reconstruction elsewhere, there is likely to be impact on the building's special interest due to the loss of historic fabric during dismantling. If the building is translocated (a process involving moving the building in its current state to a new location, without prior dismantling of the building) then little damage is done to the building fabric. Practical consideration should be given to the cost implications of both options for a building of this size, and in both cases, there is likely to be a significant adverse impact on the setting of the building. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB8: Rowley Farmhouse	Grade II* Listed Building	See Fig. 1	Complete removal of building	English Heritage Level 1 building recording and external photographic survey to inform further mitigation proposals, to be decided following discussions with statutory and non-statutory consultees.	Large	Historic building recording of a Grade II* Listed Building is a feasible and practical mitigation strategy, as would be further recording at a more detailed level. If further mitigation proposals include relocation, this is also feasible, but potentially impractical for a building of this type. If the building is dismantled for reconstruction elsewhere, there is likely to be impact on the building's special interest due to the loss of historic fabric during dismantling. If the building is translocated (a process involving moving the building in its current state to a new location, without prior dismantling of the building) then little damage is done to the building fabric. Practical consideration should be given to the cost implications of both options for a building of this size, and in both cases, there is likely to be a significant adverse impact on the setting of the building. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB9: Spikemead Farmhouse	Grade II Listed Building	See Fig. 1	Complete removal of building	English Heritage Level 1 building recording and external photographic survey to inform further mitigation proposals, to be decided following discussions with statutory and non-statutory consultees.	Moderate	Historic building recording of a Grade II Listed Building is a feasible and practical mitigation strategy, as would be further recording at a more detailed level. If further mitigation proposals include relocation, this is also feasible, but potentially impractical for a building of this type. If the building is dismantled for reconstruction elsewhere, there is likely to be impact on the building's special interest due to the loss of historic fabric during dismantling. If the building is translocated (a process involving moving the building in its current state to a new location, without prior dismantling of the building) then little damage is done to the building fabric. Practical consideration should be given to the cost implications of both options for a building of this size, and in both cases, there is likely to be a significant adverse impact on the setting of the building. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB10: Brookside	Grade II Listed Building	See Fig. 1	Complete removal of building	English Heritage Level 1 building recording and external photographic survey to inform further mitigation proposals, to be decided following discussions with statutory and non-statutory consultees.	Moderate	Historic building recording of a Grade II Listed Building is a feasible and practical mitigation strategy, as would be further recording at a more detailed level. If further mitigation proposals include relocation, this is also feasible, but potentially impractical for a building of this type. If the building is dismantled for reconstruction elsewhere, there is likely to be impact on the building's special interest due to the loss of historic fabric during dismantling. If the building is translocated (a process involving moving the building in its current state to a new location, without prior dismantling of the building) then little damage is done to the building fabric. Practical consideration should be given to the cost implications of both options for a building of this size, and in both cases, there is likely to be a significant adverse impact on the setting of the building. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB11: Radford	Grade II Listed Building	See Fig. 1	Complete removal of building	English Heritage Level 1 building recording and external photographic survey to inform further mitigation proposals, to be decided following discussions with statutory and non-	Moderate	Historic building recording of a Grade II Listed Building is a feasible and practical mitigation strategy, as would be further recording at a more detailed level. If further mitigation proposals include relocation, this is also feasible, but potentially impractical

Asset Number and Name	Designation	Location	promoter's Description of Impact	Mitigation proposed by promoter	Significance of Residual Impact (after mitigation)	Comments
Farmhouse				statutory consultees.		for a building of this type. If the building is dismantled for reconstruction elsewhere, there is likely to be impact on the building's special interest due to the loss of historic fabric during dismantling. If the building is translocated (a process involving moving the building in its current state to a new location, without prior dismantling of the building) then little damage is done to the building fabric. Practical consideration should be given to the cost implications of both options for a building of this size, and in both cases, there is likely to be a significant adverse impact on the setting of the building. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB12: Lowfield Heath Windmill	Grade II Listed Building -	See Fig. 1	-	-	-	No longer within promoter's study area – relocated to Outer Study Area.
LB13: Charlwood House	Grade II* Listed Building	See Fig. 1	Complete removal of building	English Heritage Level 1 building recording and external photographic survey to inform further mitigation proposals, to be decided following discussions with statutory and non-statutory consultees.	Large	Historic building recording of a Grade II* Listed Building is a feasible and practical mitigation strategy, as would be further recording at a more detailed level. If further mitigation proposals include relocation, this is also feasible, but potentially impractical for a building of this type. If the building is dismantled for reconstruction elsewhere, there is likely to be impact on the building's special interest due to the loss of historic fabric during dismantling. If the building is translocated (a process involving moving the building in its current state to a new location, without prior dismantling of the building) then little damage is done to the building fabric. Practical consideration should be given to the cost implications of both options for a building of this size, and in both cases, there is likely to be a significant adverse impact on the setting of the building. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB14: The Beehive (Former combined control tower and terminal)	Grade II* Listed Building	See Fig. 1	Change of setting	English Heritage Level 1 building recording and external photographic survey. Retained *in situ*.	Neutral	Historic building recording of a Grade II* Listed Building is both a feasible and practical mitigation option. Implementation of this mitigation will not affect the level of residual impact on the designated heritage asset, which, given the building's historical relationship with the airport, is predicted to remain Neutral.
LB15: Church of St Michael and All Angels	Grade II* Listed Building	See Fig. 1	Complete removal of building	English Heritage Level 1 building recording and external photographic survey to inform further mitigation proposals, to be decided following discussions with statutory and non-statutory consultees.	Large	Historic building recording of a Grade II* Listed Building is a feasible and practical mitigation strategy, as would be further recording at a more detailed level. If further mitigation proposals include relocation, this is also feasible, but potentially impractical for a building of this type. If the building is dismantled for reconstruction elsewhere, there is likely to be impact on the building's special interest due to the loss of historic fabric during dismantling. If the building is translocated (a process involving moving the building in its current state to a new location, without prior dismantling of the building) then little damage is done to the building fabric. Practical consideration should be given to the cost implications of both options for a building of this size, and in both cases, there is likely to be a significant adverse impact on the setting of the building. For this type of building the mitigation may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB16: Teizers Farm House	Grade II Listed Building	See Fig. 1	Complete removal of building	English Heritage Level 1 building recording and external photographic survey to inform further mitigation proposals, to be decided following discussions with statutory and non-statutory consultees.	Moderate	Historic building recording of a Grade II Listed Building is a feasible and practical mitigation strategy, as would be further recording at a more detailed level. If further mitigation proposals include relocation, this is also feasible, but potentially impractical for a building of this type. If the building is dismantled for reconstruction elsewhere, there is likely to be impact on the building's special interest due to the loss of historic fabric during dismantling. If the building is translocated (a process involving moving the building in its current state to a new location, without prior dismantling of the building) then little damage is done to the building fabric. Practical consideration should be given to the cost implications of both options for a building of this size, and in both cases, there is likely to be a significant adverse impact on the setting of the building. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB17: Old Cottage	Grade II Listed Building	See Fig. 1	Complete removal of building	English Heritage Level 1 building recording and external photographic survey to inform further mitigation proposals, to be decided following discussions with statutory and non-statutory consultees.	Moderate	Historic building recording of a Grade II Listed Building is a feasible and practical mitigation strategy, as would be further recording at a more detailed level. If further mitigation proposals include relocation, this is also feasible, but potentially impractical for a building of this type. If the building is dismantled for reconstruction elsewhere, there is likely to be impact on the building's special interest due to the loss of historic fabric during dismantling. If the building is translocated (a process involving moving the building in its current state to a new location, without prior dismantling of the building) then little damage is done to the building fabric. Practical consideration should be given to the cost implications of both options for a building of this size, and in both cases,

Asset Number and Name	Designation	Location	promoter's Description of Impact	Mitigation proposed by promoter	Significance of Residual Impact (after mitigation)	Comments
						there is likely to be a significant adverse impact on the setting of the building. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB18: Wing House	Grade II Listed Building	See Fig. 1	None	English Heritage Level 1 building recording and external photographic survey. Retained *in situ*.	Neutral.	Historic building recording of a Grade II Listed Building is both a feasible and practical mitigation option. Implementation of this mitigation will not affect the level of residual impact on the designated heritage asset, which is predicted to remain Neutral.
LB19: Edgeworth House	Grade II Listed Building	See Fig. 1	None	English Heritage Level 1 building recording and external photographic survey. Retained *in situ*.	Neutral.	Historic building recording of a Grade II Listed Building is both a feasible and practical mitigation option. Implementation of this mitigation will not affect the level of residual impact on the designated heritage asset, which is predicted to remain Neutral.
LB20: Lilac Cottage	Grade II Listed Building	See Fig. 8	Complete removal of building	English Heritage Level 1 building recording and external photographic survey to inform further mitigation proposals, to be decided following discussions with statutory and non-statutory consultees.	Moderate	Historic building recording of a Grade II Listed Building is a feasible and practical mitigation strategy, as would be further recording at a more detailed level. If further mitigation proposals include relocation, this is also feasible, but potentially impractical for a building of this type. If the building is dismantled for reconstruction elsewhere, there is likely to be impact on the building's special interest due to the loss of historic fabric during dismantling. If the building is translocated (a process involving moving the building in its current state to a new location, without prior dismantling of the building) then little damage is done to the building fabric. Practical consideration should be given to the cost implications of both options for a building of this size, and in both cases, there is likely to be a significant adverse impact on the setting of the building. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB21: Charlwood Park	Grade II Listed Building	See Fig. 1	-	-	-	Now demolished and built over
LB22: Charlwood Park Farmhouse	Grade II* Listed Building	See Fig. 1	Possible views of new hangars from upper floors of building	English Heritage Level 1 building recording and external photographic survey. Retained *in situ*.	Moderate	Historic building recording of a Grade II* Listed Building is both a feasible and practical mitigation option. The mitigation proposed is unlikely to reduce the significance of impact on the building's setting, and the residual impact is predicted to remain significant
LB26: Oldlands Farmhouse	Grade II Listed Building	See Fig. 1	Possible change in setting	None	Moderate	The preferred option is to preserve a building *in situ*. However this would not mitigate against any impacts on setting, and is unlikely to reduce the significance of impact. Therefore the residual impact is likely to remain significant
SM1: Medieval moated site at Ifield Court	Scheduled Monument	See Fig. 1	Boundary treatment, including noise bund, would affect the asset's setting.	Archaeological investigation in order to better understand the context of the site.	Very Large	The mitigation strategy proposed by the promoter is both feasible and practical, although the archaeological works would require Scheduled Monument Consent. The type of investigation carried out and the amount and character of any remains discovered during this process are predicted to have an implication on both the time and costs involved with this mitigation strategy. This type of mitigation will not reduce the magnitude of impact on the setting of the designated heritage asset. Therefore the implementation of this mitigation is unlikely to reduce the significance of impact, and the residual impact is predicted to remain significant.
SM2: Medieval settlement remains 100m south east and 150m south west of Oldlands Farm, Tinsley Green	Scheduled Monument	See Fig. 1	Realigned route of the A23 will affect the tranquillity of the asset.	None	Large	With no mitigation strategy proposed for the potential effects of the scheme on the tranquillity of the designated heritage asset, the significance of impact and residual impact will remain unchanged. Mitigation strategies such as noise bunding (if feasible) may reduce the significance of impact, but the level of residual impact is predicted to remain significant.
SM3: Moated site at Ewhurst Place	Scheduled Monument	See Fig. 1	None	None	Large	This designated heritage asset is likely to be subject to impacts on its setting. With no mitigation strategy proposed, the significance of impact and residual impact will remain unchanged. Mitigation strategies such as landscape screening (if feasible) may reduce the significance of impact, but the level of residual impact is predicted to remain significant.
SM4: Thunderfield Castle medieval moated site	Scheduled Monument	See Fig. 1	None	None	Large	This designated heritage asset is likely to be subject to impacts on its setting. With no mitigation strategy proposed, the significance of impact and residual impact will remain unchanged. Mitigation strategies such as landscape screening (if feasible) may reduce the significance of impact, but the level of residual impact is predicted to remain significant.

Asset Number and Name	Designation	Location	promoter's Description of Impact	Mitigation proposed by promoter	Significance of Residual Impact (after mitigation)	Comments
CA1: Church Road, Horley	Conservation Area	See Figs. 1, 3	None	Exclusion of construction traffic from Conservation Areas.	Moderate	Exclusion of construction traffic from the Conservation Area is a feasible mitigation strategy. This type of mitigation will reduce the magnitude of impact on the setting of the designated heritage asset during construction. Therefore the implementation of this mitigation is likely to reduce the significance of impact, although the residual impact is predicted to remain significant.
					Large	No mitigation strategy has been proposed during the operation of the scheme. With no mitigation strategy proposed, the significance of impact and residual impact will remain unchanged. Mitigation strategies such as landscape screening (if feasible) may reduce the significance of impact, but the level of residual impact is likely to remain significant.
CA2: Ifield Village	Conservation Area	See Figs. 1, 4	Increased noise and visual intrusion on the Conservation Area's setting	Exclusion of construction traffic from Conservation Areas. Creation of an earthwork bund around the south western part of the land take area to visually screen views of the airport from the asset.	Moderate	Exclusion of construction traffic from the Conservation Area is a feasible mitigation strategy. This type of mitigation will reduce the magnitude of impact on the setting of the designated heritage asset during construction. Therefore the implementation of this mitigation is likely to reduce the significance of impact, although the residual impact is predicted to remain significant.
					Large	The implementation of an earthwork bund may have a Moderate impact on the setting of the designated heritage asset. This mitigation is unlikely to reduce the significance of impact, so the residual impact is predicted to remain significant
					Large	No mitigation strategy has been proposed during the operation of the scheme. With no mitigation strategy proposed, the significance of impact and residual impact will remain unchanged. Mitigation strategies such as landscape screening (if feasible) may reduce the significance of impact, but the level of residual impact is predicted to remain significant.
CA3: Charlwood		See Figs. 1, 2	Possible visibility of new airport structures within context of present visibility of similar structures	Exclusion of construction traffic from Conservation Areas.	Moderate	Exclusion of construction traffic from the Conservation Area is a feasible mitigation strategy. This type of mitigation will reduce the magnitude of impact on the setting of the designated heritage asset during construction. Therefore the implementation of this mitigation is likely to reduce the significance of impact, although the residual impact is predicted to remain significant.
					Large	No mitigation strategy has been proposed during the operation of the scheme. With no mitigation strategy proposed, the significance of impact and residual impact will remain unchanged. Mitigation strategies proposed in the future may reduce the significance of impact, but the level of residual impact is predicted to remain significant.
CA4: Burstow		See Fig. 1	Possible visibility of new airport structures within context of present visibility of similar structures	Exclusion of construction traffic from Conservation Areas.	Moderate	Exclusion of construction traffic from the Conservation Area is a feasible mitigation strategy. This type of mitigation will reduce the magnitude of impact on the setting of the designated heritage asset during construction. Therefore the implementation of this mitigation is likely to reduce the significance of impact, although the residual impact is predicted to remain significant.
					Large	No mitigation strategy has been proposed during the operation of the scheme. With no mitigation strategy proposed, the significance of impact and residual impact will remain unchanged. Mitigation strategies proposed in the future may reduce the significance of impact, but the level of residual impact is predicted to remain significant.
CA5: Dyers Company Almshouses		See Fig. 1	None	Exclusion of construction traffic from Conservation Areas.	Moderate	Exclusion of construction traffic from the Conservation Area is a feasible mitigation strategy. This type of mitigation will reduce the magnitude of impact on the setting of the designated heritage asset during construction. Therefore the implementation of this mitigation is likely to reduce the significance of impact, although the residual impact is predicted to remain significant.
					Large	No mitigation strategy has been proposed during the operation of the scheme. With no mitigation strategy proposed, the significance of impact and residual impact will remain unchanged. Mitigation strategies proposed in the future may reduce the significance of impact, but the level of residual impact is predicted to remain significant.
CA6: Sunnymead Flats		See Fig. 1	None	Exclusion of construction traffic from Conservation Areas.	Moderate	Exclusion of construction traffic from the Conservation Area is a feasible mitigation strategy. This type of mitigation will reduce the magnitude of impact on the setting of the designated heritage asset during construction. Therefore the implementation of this mitigation is likely to reduce the significance of impact, although the residual impact is predicted to remain significant.
					Large	No mitigation strategy has been proposed during the operation of the scheme. With no mitigation strategy proposed, the significance of impact and residual impact will remain unchanged. Mitigation strategies proposed in the future may reduce the significance of impact, but the level of residual impact is predicted to remain significant.

Asset Number and Name	Designation	Location	promoter's Description of Impact	Mitigation proposed by promoter	Significance of Residual Impact (after mitigation)	Comments
CA7: Massetts Road		See Fig. 1	None	Exclusion of construction traffic from Conservation Areas.	Moderate	Exclusion of construction traffic from the Conservation Area is a feasible mitigation strategy. This type of mitigation will reduce the magnitude of impact on the setting of the designated heritage asset during construction. Therefore the implementation of this mitigation is likely to reduce the significance of impact, although the residual impact is predicted to remain significant.
					Large	No mitigation strategy has been proposed during the operation of the scheme. With no mitigation strategy proposed, the significance of impact and residual impact will remain unchanged. Mitigation strategies proposed in the future may reduce the significance of impact, but the level of residual impact is predicted to remain significant.
Non-designated archaeological remains	-	-	Total removal of archaeological remains in construction areas	Initial programme of evaluation, including LiDAR survey, geophysical survey and a programme of trial trenching and test pitting, to inform further field work during the construction phase, such as watching briefs	Moderate	The mitigation strategy proposed by the promoter is both feasible and practical. The type and amount of remains discovered during this process are predicted to have an implication on both the time and costs involved with this mitigation strategy. The implementation of this mitigation is likely to reduce the significance of impact, but the residual impact is predicted to remain significant.
Historic Landscape Character	-	-	Complete change of historic landscape character within scheme design land take boundary	Detailed desk-based analysis of the historic landscape prior to commencement of construction.	Large	Carrying out a detailed desk-based analysis of the existing historic landscape is both a feasible and practical mitigation strategy. The implementation of this mitigation is unlikely to reduce the significance of impact, and the residual impact is predicted to remain significant.
Additional Designated Heritage Assets within the Intermediate Study Area	Grade II Listed Buildings	See Fig. 1	None	None Proposed	Unknown	These Medium value designated heritage assets may be subject to setting and noise impacts. Feasible and practical mitigation strategies may include a programme of historic building recording, followed by potential implementation of noise mitigation measures and screening options.
	Scheduled Monuments	See Fig. 1	None	None Proposed	Unknown	This High value designated heritage asset is likely to be subject to impacts on its setting. A feasible and practical mitigation strategy could include a programme of archaeological works, for which Scheduled Monument Consent would have to be sought. The type of investigation carried out and the amount and character of any remains discovered during this process are predicted to have an implication on both the time and costs involved with this mitigation strategy. Options to screen the designated heritage asset could be considered to mitigate impacts on setting.
	Conservation Area	See Fig. 1	None	None Proposed	Unknown	These High value designated heritage assets may be subject to setting and noise impacts. Feasible and practical mitigation strategies may include a programme of historic building recording, followed by potential implementation of noise mitigation measures and screening options.
Additional Designated Heritage Assets within the Outer Study Area	Grade I Listed Buildings	See Fig. 1	None	None Proposed	Unknown	These High value designated heritage assets may be subject to setting and noise impacts. Feasible and practical mitigation strategies may include a programme of historic building recording, followed by potential implementation of noise mitigation measures and screening options.
	Grade II* Listed Buildings	See Fig. 1	None	None Proposed	Unknown	These High value designated heritage assets may be subject to setting and noise impacts. Feasible and practical mitigation strategies may include a programme of historic building recording, followed by potential implementation of noise mitigation measures and screening options.
	Grade II Listed Buildings	See Fig.1	None	None Proposed	Unknown	These Medium value designated heritage assets may be subject to setting and noise impacts. Feasible and practical mitigation strategies may include a programme of historic building recording, followed by potential implementation of noise mitigation measures and screening options.

4.2.7 Residual Impacts

Based on the assessment it is considered unlikely that all the impacts predicted on cultural heritage assets or groups of assets could be wholly mitigated. Residual impacts of Very Large to Moderate are therefore predicted.

4.2.1 Conclusion Gatwick Airport Second Runway - Heritage Assessment

The assessment of the Gatwick 2R scheme identified 22 potential impacts on designated assets within the scheme land take; the setting of a further ten designated heritage assets could be affected within 300m of the scheme area and from 300m to 2km the setting of a further 160 designated assets could potentially be affected.

Using the impacts identified by GAL the effectiveness of the proposed mitigation measures has been considered by Jacobs. Table 4.7 provides a summary of the moderate – large residual impacts based on a high level assessment; a range is provided where there are multiple impacts of different levels of significance:-

Table 4.7 – Significance of Residual Impacts (After Mitigation)

Asset Number and Name	Designation	Significance of Residual Impact (after mitigation)
LB1: County Oak Cottage	Grade II Listed Building	Moderate
LB2: St Barbe Cottage	Grade II Listed Building	Moderate
LB3: Poles Acre Barn	Grade II Listed Building	Moderate
LB4: Gatwick Manor Inn/Hyders Hall	Grade II* Listed Building	Large
LB5: Old Bonnetts Cottage	Grade II Listed Building	Moderate
LB6: Barn at Gatwick Manor	Grade II Listed Building	Moderate
LB7: Crown post barn to east of Rowley Farmhouse	Grade II Listed Building	Moderate
LB8: Rowley Farmhouse	Grade II* Listed Building	Large
LB9: Spikemead Farmhouse	Grade II Listed Building	Moderate
LB10: Brookside	Grade II Listed Building	Moderate
LB11: Radford Farmhouse	Grade II Listed Building	Moderate
LB13: Charlwood House	Grade II* Listed Building	Large
LB15: Church of St Michael and All Angels	Grade II* Listed Building	Large
LB16: Teizers Farm House	Grade II Listed Building	Moderate
LB17: Old Cottage	Grade II Listed Building	Moderate
LB20: Lilac Cottage	Grade II Listed Building	Moderate
LB22: Charlwood Park Farmhouse	Grade II* Listed Building	Moderate
LB26: Oldlands Farmhouse	Grade II Listed Building	Moderate
SM1: Medieval moated site at Ifield Court	Scheduled Monument	Very Large
SM2: Medieval settlement remains 100m south east and 150m south west of Oldlands Farm, Tinsley Green	Scheduled Monument	Large
SM3: Moated site at Ewhurst Place	Scheduled Monument	Large
SM4: Thunderfield Castle medieval moated site	Scheduled Monument	Large
CA1: Church Road, Horley	Conservation Area	Moderate - Large
CA2: Ifield Village	Conservation Area	Moderate - Large
CA3: Charlwood	Conservation Area	Moderate - Large
CA4: Burstow	Conservation Area	Moderate - Large
CA5: Dyers Company Almshouses	Conservation Area	Moderate -Large

Asset Number and Name	Designation	Significance of Residual Impact (after mitigation)
CA6: Sunnymead Flats	Conservation Area	Moderate - Large
CA7: Massetts Road	Conservation Area	Moderate - Large
Non-designated archaeological remains	-	Moderate

In addition, there are a number of assets that could be affected through change in setting or tranquillity the significance of which cannot be predicted at this stage of assessment.

4.3 Heritage Assessment - Heathrow Northwest Runway

The data gathering undertaken by Jacobs for this assessment identified a combined total of 241 designated heritage assets within the Land take Study Area, Intermediate Study Area and the Outer Study Area for the Heathrow NWR Option as detailed below:

- Land Take Study Area – 21 designated assets;
- Intermediate Study Area – 54 designated assets;
- Outer Study Area – 166 designated assets.

The locations of these assets are shown in Heritage Figures 8 – 14 in the Place Figures report.

These assets have been assessed to be of Medium to High value. More detailed information on the baseline conditions for this proposed option can be found in the Place Baseline (Jacobs, September 2014).

HAL's submission did not define the size of the study area used to inform their impact assessment within their submission. Their submission identified 28 designated heritage assets, compared to the 241 designated heritage assets which have been identified in this heritage assessment. This is because the promoter focussed their assessment on the north western part of the Land Take Study Area.

4.3.1 Heritage Land Take Study Area

A total of 21 designated heritage assets have been identified within the Land Take Study Area and have the potential to be impacted. A summary of the number of each type of designated asset, an assessment of their value, and the magnitude and significance of impact is presented in Table 4.8.

In comparison, of the 28 designated heritage assets identified by HAL within its submission, 19 are located within the Land Take Study Area defined by Jacobs. Of these 19 designated heritage assets, 17 comprise Grade II Listed Buildings and two comprise Conservation Areas. Potential impacts on all 19 designated heritage assets were identified by the promoter.

Jacobs have identified one further Medium value Grade II Listed Building and two High value Scheduled Monuments not identified by HAL within their submission.

It is anticipated that designated heritage assets located within the Land Take Study Area are at greatest risk from physical impacts (i.e. whole or partial removal of associated remains or fabric) during construction of the proposed option. Where it is proposed to retain designated heritage assets *in situ* there would remain the

potential for significant impacts on the setting of these assets during the construction and operation of the proposed scheme.

Table 4.8 – Land Take Study Area: Summary Assessment of Impacts

Designation	No. Within Study Area	Value	Magnitude of Impact (unmitigated)	Significance of Impact (unmitigated)
Listed Building: Grade II	17	Medium	Major	Large
Scheduled Monument	2	High	Major	Very Large
Conservation Area	2	High	Major	Very Large

4.3.2 Surface Access Corridors

Eight designated assets were identified within a study area extending 100m either side of the proposed surface access corridors for the Heathrow NWR scheme. These consisted of one High value Grade I Listed Building, five Medium value Grade II Listed Buildings, and two High value Conservation Areas. A summary of the number of each type of designated asset, an assessment of their value, and the magnitude and significance of effect is presented in Table 4.9.

It is anticipated that designated heritage assets located within the study area for the proposed surface access routes are at greatest risk from physical impacts (i.e. whole or partial removal of associated remains or fabric) during construction of the proposed option. Where it is proposed to retain designated heritage assets *in situ* there would remain the potential for significant impacts on the setting of these assets during the construction and operation of the proposed scheme.

Table 4.9 – Surface Access Corridors: Summary Assessment of Impacts

Designation	No. Within Study Area	Value	Magnitude of Impact (unmitigated)	Significance of Impact (unmitigated)
Listed Building: Grade I	1	High	Major	Very Large
Listed Building: Grade II	5	Medium	Major	Large
Conservation Area	2	High	Major	Very Large

4.3.3 Heritage Intermediate Study Area

A total of 54 designated heritage assets were identified in the Intermediate Study Area. A summary of the number of each type of designated asset, and assessment of their value, and the magnitude and significance of effect is presented in Table 4.10.

Seven of the 28 designated heritage assets identified by the HAL within their submission are located within the Intermediate Study Area. This is because a wider study area was used by Jacobs than by the promoter. These seven designated

heritage assets comprise a Grade I Listed Building, a Grade II* Listed Building, two Grade II Listed Buildings and three Conservation Areas. Potential impacts on these designated heritage assets were identified by the promoter.

Jacobs identified two further High value Grade II* Listed Buildings, 42 Medium value Grade II Listed Buildings, one High value Scheduled Monument and two High value Conservation Areas not identified by HAL within their submission.

It is anticipated that as these designated heritage assets are located outside of the proposed land take, the risk of physical impact from this option is low. However, due to their proximity to the proposed scheme there is a high potential for impact on the settings of these designated assets both during the construction and during the operation of the proposed scheme.

Table 4.10 - Intermediate Study Area: Summary Assessment of Impacts

Designation	No. Within Study Area	Value	Magnitude of Impact (unmitigated)	Significance of Impact (unmitigated)
Listed Building: Grade I	1	High	Major	Large
Listed Building: Grade II*	3	High	Major	Large
Listed Building: Grade II	44	Medium	Moderate	Moderate
Scheduled Monument	1	High	Major	Large
Conservation Area	5	High	Major	Large

4.3.4 Heritage Outer Study Area

Based on the number of designated assets identified in HAL's submission it does not appear that the study area used by the promoter extended as far as the Outer Study Area.

Jacobs identified a total of 166 designated heritage assets with the potential to be impacted within the Outer Study Area. A summary of the number of each type of designated asset, an assessment of their value, and the magnitude and significance of effect is presented in Table 4.11.

Given the distance from the proposed scheme option, it is highly unlikely that designated heritage assets located within the Outer Study Area will be at risk from physical impacts or impacts on their settings during construction. However, there is potential for impacts on the settings of these designated heritage assets during operation.

Table 4.11 – Outer Study Area: Summary Assessment of Impacts

Designation	No. Within Study Area	Value	Magnitude of Impact (unmitigated)	Significance of Impact (unmitigated)
Listed Building: Grade I	2	High	Moderate	Moderate
Listed Building: Grade II*	11	High	Moderate	Moderate
Listed Building: Grade II	147	Medium	Moderate	Moderate
Scheduled Monument	1	High	Moderate	Moderate
Conservation Area	5	High	Moderate	Moderate

4.3.5 Tranquillity

Tables 4.12 and 4.13 present the number of each heritage designation predicted to be located within the N70 Contour for the 'Do Minimum' and 'Do Something' scenarios for 2030 and 2050, see also Heritage Figures 15 and 16.

By 2030 without the proposed Heathrow NWR scheme in place, a total of 1411 designated heritage assets are predicted to be within the N70 contour of the 'Do Minimum' scenario. For the 'Do Something' scenario, this is predicted to be 1954, therefore there is the potential for impacts on tranquillity of 543 more designated assets.

By 2050 without the proposed Heathrow NWR scheme in place, a total of 1280 designated heritage assets are predicted to be within the N70 contour. For the 'Do Something' scenario, this is predicted to be 1902.

Therefore, there is the potential for impacts on tranquillity on 622 more designated assets by 2050 with the proposed scheme in place that without it.

Table 4.12- Number of each Designation within N70 Contour for 'Do Minimum' 2030 and 'Do Something' 2030

Designation	Do Minimum 2030	Do Something 2030	Difference
Conservation Areas	21	18	-3
Registered Parks and Gardens	9	15	+6
World Heritage Sites	1[30]	1	0
Scheduled Monuments	8	8	0
Listed Buildings: Grade I	41	62	+21
Listed Buildings: Grade II*	102	140	+38
Listed Buildings: Grade II	1229	1710	+481

Table 4.13 – Number of each Designation within N70 Contour for 'Do Minimum' 2050 and 'Do Something' 2050

Designation	Do Minimum 2050	Do Something 2050	Difference
Conservation Areas	19	18	-1
Registered Parks and Gardens	8	12	+4
World Heritage Sites	1	1	0
Scheduled Monuments	6	5	-1
Listed Buildings: Grade I	38	58	+20
Listed Buildings: Grade II*	89	132	+43
Listed Buildings: Grade II	1119	1676	+557

[30] The one WHS refers to Kew Gardens, which is a World Heritage Centre

4.3.6 Mitigation

In their submission, HAL identified mitigation for the 20 designated heritage assets on which they have predicted an impact. These designated heritage assets, a description of the impact, the mitigation proposed in the submission and an assessment of the Significance of Residual Impact undertaken by Jacobs are presented in Table 4.14, along with a commentary on the feasibility and practicality of the mitigation proposed by the promoter.

In addition to designated heritage assets, this table also includes impacts and mitigation identified by HAL on non-designated archaeological remains and historic landscapes, and a general comment on possible mitigation strategies for designated heritage assets not considered by the promoter.

Table 4.14 – Heathrow NWR Heritage Mitigation

Asset Number and Name	Designation	Location	Proposers Description of Impact	Mitigation proposed by Promoter	Significance of Residual Impact (after mitigation)	Comments
CA1: Harmondsworth Village	Conservation Area	See Figs.8, 11	Loss of *c.*50% of the Conservation Area	To agree with the Local Authority a strategy to strengthen the remaining part of the Conservation Area (Section 5.6.7.6)	Very Large	Strengthening the remaining part of the Conservation Area is feasible. However, this mitigation is not predicted to reduce significance of impact, and after mitigation the significance of residual impact is predicted to remain unchanged.
CA2: Longford Village	Conservation Area	See Figs.8, 10	Loss of c.100% of the Conservation Area	Enhancements to other Conservation Areas in the vicinity or improvements to areas that could replace CA2, e.g. to improve the quality of public spaces within Harlington, West Drayton Green and Cranford Park, to be agreed with the Local Authority (Section 5.6.7.6)	Very Large	Enhancing other local Conservation Areas or public spaces is feasible, and may have a Beneficial impact on those Conservation Areas. However, this would not reduce the impact on CA2: Longford Village Conservation Area. After mitigation the significance of residual impact is predicted to remain unchanged.
LB3: King's Bridge	Grade II Listed Building	See Fig. 8	Complete removal of building	Relocation following a programme of building recording	Moderate	Historic building recording of a Grade II Listed Building is a feasible and practical mitigation strategy. The subsequent relocation of the building is also feasible, and for a building of this type is practical. If the building is dismantled for reconstruction elsewhere, there is likely to be impact on the building's special interest due to the loss of historic fabric during dismantling. If the building is translocated (a process involving moving the building in its current state to a new location, without prior dismantling of the building) then little damage is done to the fabric of the building. In both cases, there is likely to be a significant adverse impact on the setting of the building. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB4: Monument at north western end of General Roy's Service Base	Grade II Listed Building	See Fig. 8	Complete removal of building	Relocation following a programme of building recording	Moderate	Historic building recording of a Grade II Listed Building is a feasible and practical mitigation strategy. The subsequent relocation of the building is also feasible, and for a building of this type is practical. If the building is dismantled for reconstruction elsewhere, there is likely to be impact on the building's special interest due to the loss of historic fabric during dismantling. If the building is translocated (a process involving moving the building in its current state to a new location, without prior dismantling of the building) then little damage is done to the fabric of the building. In both cases, there is likely to be a significant adverse impact on the setting of the building. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB5: Barn to west of Weekly House	Grade II Listed Building	See Figs. 8, 11	Complete removal of building	Recommendation to carry out building recording prior to demolition, and the retention of selected architectural materials at a suitable museum repository	Moderate	Historic building recording of a Grade II Listed Building is both a feasible and practical mitigation strategy. The retention of selected architectural materials at a suitable museum repository is also feasible, although practical consideration would have to be given to the cost implications involved in the need for long-term specialist storage and conservation. This type of mitigation will also result in the loss of historic fabric and setting as a result of dismantling. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB6: Weekly House	Grade II Listed Building	See Fig. 8	Complete removal of building	Recommendation to carry out building recording prior to demolition, and the retention of selected architectural materials at a suitable museum repository	Moderate	Historic building recording of a Grade II Listed Building is both a feasible and practical mitigation strategy. The retention of selected architectural materials at a suitable museum repository is also feasible, although practical consideration would have to be given to the cost implications involved in the need for long-term specialist storage and conservation. This type of mitigation will also result in the loss of historic fabric and setting as a result of dismantling. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB7: Wall to north west of Weekly House	Grade II Listed Building	See Fig. 8	Complete removal of building	Recommendation to carry out building recording prior to demolition, and the retention of selected architectural materials at a suitable museum repository	Moderate	Historic building recording of a Grade II Listed Building is both a feasible and practical mitigation strategy. The retention of selected architectural materials at a suitable museum repository is also feasible, although practical consideration would have to be given to the cost implications involved in the need for long-term specialist storage and conservation. This type of mitigation will also result in the loss of historic fabric and setting as a result of

Asset Number and Name	Designation	Location	Proposers Description of Impact	Mitigation proposed by Promoter	Significance of Residual Impact (after mitigation)	Comments
						dismantling. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB8: Longford Close	Grade II Listed Building	See Fig. 8	Complete removal of building	Recommendation to carry out building recording prior to demolition, and the retention of selected architectural materials at a suitable museum repository	Moderate	Historic building recording of a Grade II Listed Building is both a feasible and practical mitigation strategy. The retention of selected architectural materials at a suitable museum repository is also feasible, although practical consideration would have to be given to the cost implications involved in the need for long-term specialist storage and conservation. This type of mitigation will also result in the loss of historic fabric and setting as a result of dismantling. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB9: Flats 1-3 (Yeomans)	Grade II Listed Building	See Fig. 8	Complete removal of building	Recommendation to carry out building recording prior to demolition, and the retention of selected architectural materials at a suitable museum repository	Moderate	Historic building recording of a Grade II Listed Building is both a feasible and practical mitigation strategy. The retention of selected architectural materials at a suitable museum repository is also feasible, although practical consideration would have to be given to the cost implications involved in the need for long-term specialist storage and conservation. This type of mitigation will also result in the loss of historic fabric and setting as a result of dismantling. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB10: The White Horse Public House	Grade II Listed Building	See Figs. 8	Complete removal of building	Recommendation to carry out building recording prior to demolition, and the retention of selected architectural materials at a suitable museum repository	Moderate	Historic building recording of a Grade II Listed Building is both a feasible and practical mitigation strategy. The retention of selected architectural materials at a suitable museum repository is also feasible, although practical consideration would have to be given to the cost implications involved in the need for long-term specialist storage and conservation. This type of mitigation will also result in the loss of historic fabric and setting as a result of dismantling. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB11: Queen River Cottage Willow Tree Cottage	Grade II Listed Building	See Figs. 8, 10	Complete removal of building	Recommendation to carry out building recording prior to demolition, and the retention of selected architectural materials at a suitable museum repository	Moderate	Historic building recording of a Grade II Listed Building is both a feasible and practical mitigation strategy. The retention of selected architectural materials at a suitable museum repository is also feasible, although practical consideration would have to be given to the cost implications involved in the need for long-term specialist storage and conservation. This type of mitigation will also result in the loss of historic fabric and setting as a result of dismantling. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB12: Longford Cottage	Grade II Listed Building	See Figs. 8, 10	Complete removal of building	Recommendation to carry out building recording prior to demolition, and the retention of selected architectural materials at a suitable museum repository	Moderate	Historic building recording of a Grade II Listed Building is both a feasible and practical mitigation strategy. The retention of selected architectural materials at a suitable museum repository is also feasible, although practical consideration would have to be given to the cost implications involved in the need for long-term specialist storage and conservation. This type of mitigation will also result in the loss of historic fabric and setting as a result of dismantling. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB13: Orchard Cottage	Grade II Listed Building	See Figs. 8, 10	Complete removal of building	Recommendation to carry out building recording prior to demolition, and the retention of selected architectural	Moderate	Historic building recording of a Grade II Listed Building is both a feasible and practical mitigation strategy. The retention of selected architectural materials at a suitable museum repository is also feasible, although practical consideration would have to be given to the cost implications involved in the

Asset Number and Name	Designation	Location	Proposers Description of Impact	Mitigation proposed by Promoter	Significance of Residual Impact (after mitigation)	Comments
				materials at a suitable museum repository		need for long-term specialist storage and conservation. This type of mitigation will also result in the loss of historic fabric and setting as a result of dismantling. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB14: King Henry Public House The Stables	Grade II Listed Building	See Figs. 8, 10	Complete removal of building	Recommendation to carry out building recording prior to demolition, and the retention of selected architectural materials at a suitable museum repository	Moderate	Historic building recording of a Grade II Listed Building is both a feasible and practical mitigation strategy. The retention of selected architectural materials at a suitable museum repository is also feasible, although practical consideration would have to be given to the cost implications involved in the need for long-term specialist storage and conservation. This type of mitigation will also result in the loss of historic fabric and setting as a result of dismantling. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB15: Wall to east of The Grange	Grade II Listed Building	See Figs. 8, 10	Complete removal of building	Recommendation to carry out building recording prior to demolition, and the retention of selected architectural materials at a suitable museum repository	Moderate	Historic building recording of a Grade II Listed Building is both a feasible and practical mitigation strategy. The retention of selected architectural materials at a suitable museum repository is also feasible, although practical consideration would have to be given to the cost implications involved in the need for long-term specialist storage and conservation. This type of mitigation will also result in the loss of historic fabric and setting as a result of dismantling. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB16: Wall and gates to south of Harmondsworth Hall	Grade II Listed Building	See Figs. 8, 10	Complete removal of building	Recommendation to carry out building recording prior to demolition, and the retention of selected architectural materials at a suitable museum repository	Moderate	Historic building recording of a Grade II Listed Building is both a feasible and practical mitigation strategy. The retention of selected architectural materials at a suitable museum repository is also feasible, although practical consideration would have to be given to the cost implications involved in the need for long-term specialist storage and conservation. This type of mitigation will also result in the loss of historic fabric and setting as a result of dismantling. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB17: Harmondsworth Hall	Grade II Listed Building	See Figs. 8, 10	Complete removal of building	Recommendation to carry out building recording prior to demolition, and the retention of selected architectural materials at a suitable museum repository	Moderate	Historic building recording of a Grade II Listed Building is both a feasible and practical mitigation strategy. The retention of selected architectural materials at a suitable museum repository is also feasible, although practical consideration would have to be given to the cost implications involved in the need for long-term specialist storage and conservation. This type of mitigation will also result in the loss of historic fabric and setting as a result of dismantling. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB18: Wall to west and north of The Grange	Grade II Listed Building	See Fig. 8	Complete removal of building	Recommendation to carry out building recording prior to demolition, and the retention of selected architectural materials at a suitable museum repository	Moderate	Historic building recording of a Grade II Listed Building is both a feasible and practical mitigation strategy. The retention of selected architectural materials at a suitable museum repository is also feasible, although practical consideration would have to be given to the cost implications involved in the need for long-term specialist storage and conservation. This type of mitigation will also result in the loss of historic fabric and setting as a result of dismantling. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB61: Church of St Mary,	Grade II* Listed	See Fig. 8	Noise effects,	Retention *in situ* with adaptation to provide flexible space	Large	The preferred option is to preserve a building in situ. However this would not

Asset Number and Name	Designation	Location	Proposers Description of Impact	Mitigation proposed by Promoter	Significance of Residual Impact (after mitigation)	Comments
Harmondsworth	Building		leading to loss of significance	for worship/community use, or relocation.		mitigate against setting or noise impacts, and the significance of residual impact on the designated heritage asset is predicted to remain unchanged.
					Large	Should preservation in situ not be a viable option, relocation of the building is also feasible, but a less practical option. If the building is dismantled for reconstruction elsewhere, this will have a significant impact on the building's special interest due to the loss of historic fabric during dismantling. Relocation would not mitigate the impacts on setting of the building. The implementation of this mitigation is unlikely to reduce impact, and the residual impact is likely to remain unchanged.
					Moderate	If the building is translocated (a process involving moving the building in its current state to a new location, without prior dismantling of the building) then little damage is done to the fabric of the building. However there is still likely to be a significant impact on the setting of the building. This mitigation may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB63: Harmondsworth Great Barn	Grade I Listed Building	See Fig. 8	Noise effects, leading to loss of significance	Retention *in situ*, or relocation to Chiltern Open Air Museum.	Large	The preferred option is to preserve a building in situ. However this would not mitigate against setting or noise impacts, and the significance of residual impact on the designated heritage asset is predicted to remain unchanged.
					Large	Should preservation in situ not be a viable option, relocation of the building is also feasible, but a less practical option. If the building is dismantled for reconstruction elsewhere, this will have a significant impact on the building's special interest due to the loss of historic fabric during dismantling. However there is still likely to be a significant impact on the setting of the building. The implementation of this mitigation is unlikely to reduce impact, and the residual impact is likely to remain unchanged.
					Moderate	If the building is translocated (a process involving moving the building in its current state to a new location, without prior dismantling of the building) then little damage is done to the fabric of the building. However there is still likely to be a significant impact on the setting of the building. This mitigation may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
Non-designated archaeological remains	-	-	Loss of up to 175 hectares of river terrace land form associated with non-designated archaeological remains	Investigate this area through a programme of archaeological research investigations, post excavation analysis and public dissemination	Moderate/ Unknown	The mitigation strategy proposed by the promoter is both feasible and practical. The type of investigation carried out and the amount and character of any remains discovered during this process will have an implication on both the time and costs involved with this mitigation strategy. The implementation of this evaluation/mitigation strategy may reduce the significance of impact to Moderate, but the residual impact will remain unknown until the results of the evaluation are known.
Historic Landscape Character	-	-	None	None proposed	Unknown	The promoter has not identified any impacts or mitigation on historic landscape character, which is classed as an undesignated heritage asset. However, this report identifies that there will be a Major Adverse impact on landscape character types within the Land take Study Area. Until the results of an evaluation are known, the level of residual impact remains unknown.
Additional Designated Heritage Assets Within Land Take Study Area	Grade II Listed Buildings	See Fig. 8	None	None proposed	Unknown	As these buildings are located within the Land take Study Area, it seems practical to apply the same mitigation strategy suggested by the promoter for other buildings in this Study Area: Historic building recording of a Grade II Listed Building is both a feasible and practical mitigation strategy. The retention of selected architectural materials at a suitable museum repository is

Asset Number and Name	Designation	Location	Proposers Description of Impact	Mitigation proposed by Promoter	Significance of Residual Impact (after mitigation)	Comments
						also feasible, although practical consideration would have to be given to the cost implications involved in the need for long-term specialist storage and conservation. This type of mitigation will also result in the loss of historic fabric and setting as a result of dismantling. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
	Scheduled Monuments	See Fig.8	None	None Proposed	Unknown	These High value designated heritage assets may be subject to physical and setting impacts. A feasible and practical mitigation strategy could include a programme of archaeological works, for which Scheduled Monument Consent would have to be sought. The type of investigation carried out and the amount and character of any remains discovered during this process are predicted to have an implication on both the time and costs involved with this mitigation strategy. Options to screen the designated heritage asset could be considered to mitigate impacts on setting.
Additional Designated Heritage Assets within the Intermediate Study Area	Grade II* Listed Buildings	See Fig. 8	None	None Proposed	Unknown	These High value designated heritage assets may be subject to setting and noise impacts. Feasible and practical mitigation strategies may include a programme of historic building recording, followed by potential implementation of noise mitigation measures and screening options.
	Grade II Listed Buildings	See Fig. 8	None	None Proposed	Unknown	These Medium value designated heritage assets may be subject to setting and noise impacts. Feasible and practical mitigation strategies may include a programme of historic building recording, followed by potential implementation of noise mitigation measures and screening options.
	Scheduled Monument	See Fig. 8	None	None Proposed	Unknown	This High value designated heritage asset is likely to be subject to impacts on its setting. The type of investigation carried out and the amount and character of any remains discovered during this process are predicted to have an implication on both the time and costs involved with this mitigation strategy. Options to screen the designated heritage asset could be considered to mitigate impacts on setting.
	Conservation Areas	See Fig. 8	None	None Proposed	Unknown	These High value designated heritage assets may be subject to setting and noise impacts. Feasible and practical mitigation strategies may include a programme of historic building recording, followed by potential implementation of noise mitigation measures and screening options.
Additional Designated Heritage Assets within the Outer Study Area	Grade I Listed Buildings	See Fig. 8	None	None Proposed	Unknown	This High value designated heritage asset may be subject to setting and noise impacts. Feasible and practical mitigation strategies may include a programme of historic building recording, followed by potential implementation of noise mitigation measures and screening options.
	Grade II* Listed Buildings	See Fig. 8	None	None Proposed	Unknown	These High value designated heritage assets may be subject to setting and noise impacts. Feasible and practical mitigation strategies may include a programme of historic building recording, followed by potential implementation of noise mitigation measures and screening options.
	Grade II Listed Buildings	See Fig. 8	None	None Proposed	Unknown	These Medium value designated heritage assets may be subject to setting and noise impacts. Feasible and practical mitigation strategies may include a programme of historic building recording, followed by potential implementation of noise mitigation measures and screening options.
	Scheduled Monument	See Fig. 8	None	None Proposed	Unknown	This High value designated heritage asset is likely to be subject to impacts on its setting. A feasible and practical mitigation strategy could include a programme of archaeological works, for which Scheduled Monument Consent would have to be sought. The type of investigation carried out and the amount and character of any remains discovered during this process are predicted to have an implication on both the time and costs involved with this mitigation strategy. Options to screen the designated heritage asset could be considered to mitigate impacts on setting.
	Conservation Areas	See Fig. 8	None	None Proposed	Unknown	These High value designated heritage assets may be subject to setting and noise impacts. Feasible and practical mitigation strategies may include a programme of historic building recording, followed by potential implementation of noise mitigation measures and screening options.

4.3.7 Residual Impacts

Based on the assessment it is considered unlikely that all the impacts predicted on cultural heritage assets or groups of assets could be wholly mitigated. Residual impacts of Very Large to Moderate are therefore predicted.

4.3.8 Conclusion Heathrow Airport Northwest Runway - Heritage Assessment

For the Heathrow NWR scheme 21 potential impacts were identified within the scheme land take; the setting of 54 designated heritage assets could be affected within 300m of the scheme area and from 300m to 2km the setting of a further 166 designated assets could potentially be affected. HAL identified a total of 28 heritage assets in their study.

Using the impacts identified by HAL the effectiveness of proposed mitigation measures has been considered by Jacobs. Table 4.15 provides a summary of the moderate to large residual impacts based on a high level assessment; a range is provided where there are multiple impacts of different levels of significance:-

Table 4.15 – Significance of Residual Impacts (After Mitigation)

Asset Number and Name	Designation	Significance of Residual Impact (after mitigation)
CA1: Harmondsworth Village	Conservation Area	Very Large
CA2: Longford Village	Conservation Area	Very Large
LB3: King's Bridge	Grade II Listed Building	Moderate
LB4: Monument at north western end of General Roy's Service Base	Grade II Listed Building	Moderate
LB5: Barn to west of Weekly House	Grade II Listed Building	Moderate
LB6: Weekly House	Grade II Listed Building	Moderate
LB7: Wall to north west of Weekly House	Grade II Listed Building	Moderate
LB8: Longford Close	Grade II Listed Building	Moderate
LB9: Flats 1-3 (Yeomans)	Grade II Listed Building	Moderate
LB10: The White Horse Public House	Grade II Listed Building	Moderate
LB11: Queen River Cottage	Grade II Listed Building	Moderate
LB12: Longford Cottage	Grade II Listed Building	Moderate
LB13: Orchard Cottage	Grade II Listed Building	Moderate
LB14: King Henry Public House/ The Stables	Grade II Listed Building	Moderate
LB15: Wall to east of The Grange	Grade II Listed Building	Moderate
LB16: Wall and gates to south of Harmondsworth Hall	Grade II Listed Building	Moderate
LB17: Harmondsworth Hall	Grade II Listed Building	Moderate
LB18: Wall to west and north of The Grange	Grade II Listed Building	Moderate
LB61: Church of St Mary, Harmondsworth	Grade II* Listed Building	Moderate - Large
LB63: Harmondsworth Great Barn	Grade I Listed Building	Moderate - Large
Non-designated archaeological remains	-	Moderate/ Unknown

In addition, there are a number of assets that could be affected through change in setting or tranquillity, the significance of which cannot be predicted at this stage of assessment.

4.4 Heritage Assessment - Heathrow Airport Extended Northern Runway

The data gathering undertaken by Jacobs for this assessment identified a combined total of 205 designated heritage assets within the Land Take Study Area, Intermediate Study Area and the Outer Study Area for Heathrow ENR:[31]

- Land Take Study Area – 7 designated assets;
- Intermediate Study Area – 30 designated assets, and
- Outer Study Area – 168 designated assets.

The locations of these assets are shown on Heritage Figures 17 – 25 in the Place Figures report.

The values of these assets range from Medium to High. More detailed information on the baseline conditions for this proposed option can be found in the Place Baseline produced by Jacobs (September 2014).

A total of 40 designated heritage assets were identified by HH in its submission.

4.4.1 Heritage Land Take Study Area

A total of seven designated heritage assets, all of which are Grade II Listed Buildings, have been identified within the Land Take Study Area and have the potential to be impacted. A summary of these designated assets, an assessment of their value, and the magnitude and significance of impact is presented in Table 4.16.

In comparison, of the 40 designated heritage assets identified by HH within their submission, five are located within the Land Take Study Area. These five designated heritage assets all comprise Grade II Listed Buildings. The difference in numbers of assets is probably the result of changes to the development boundary for the proposed Heathrow ENR scheme since the production of the promoter's submission.

It is anticipated that designated heritage assets located within the Land Take Study Area are at greatest risk from physical impacts (i.e. whole or partial removal of associated remains or fabric) during construction of the proposed option. Where it is proposed to retain designated heritage assets *in situ* there would remain the potential for significant impacts on the setting of these assets during the construction and operation of the proposed scheme.

Table 4.16 – Land Take Study Area: Summary Assessment of Impacts

Designation	No. Within Study Area	Value	Magnitude of Impact (unmitigated)	Significance of Impact (unmitigated)
Listed Building: Grade II	7	Medium	Major	Large

[31] 'Heathrow Hub interchange has been excluded from the footprint and the assessment. The Commission stated in its Interim Report its intention to consider HH's proposed transport hub as a detachable component which could be associated with either of the Heathrow runway options under consideration. Accordingly, the core appraisal case for the Heathrow ENR scheme includes a more traditional surface access package

4.4.2 Surface Access Corridors

One designated asset, a Conservation Area assessed to be of High value has been identified within a study area extending 100 m either side of the proposed surface access routes for the Heathrow ENR scheme. The predicted magnitude and significance of impact is presented in Table 4.17.

It is anticipated that designated heritage assets located within the surface access study area for the proposed surface access routes are at greatest risk from physical impacts (i.e. whole or partial removal of associated remains or fabric) during construction of the proposed option. Where it is proposed to retain designated heritage assets *in situ* there would remain the potential for significant impacts on the setting of these assets during the construction and operation of the proposed scheme.

Table 4.17 – Surface Access Routes: Summary Assessment of Impacts

Designation	No. Within Study Area	Value	Magnitude of Impact (unmitigated)	Significance of Impact (unmitigated)
Conservation Area	1	High	Major	Very Large

4.4.3 Heritage Intermediate Study Area

A total of 30 designated heritage assets were identified in the Intermediate Study Area. A summary of the number of each type of designated asset, and assessment of their value, and the magnitude and significance of effect is presented in Table 4.18.

Of the 40 designated heritage assets identified by HH within its submission 21 are located within the Intermediate Study Area. The difference in numbers of assets identified by Jacobs and HH is probably the result of changes to the development boundary for the proposed Heathrow ENR scheme since the production of the promoter's submission. These 21 designated heritage assets comprise 14 Grade II Listed Buildings, five Conservation Areas, and two Scheduled Monuments.

Jacobs identified a High value Grade II* Listed Building, and eight further Medium value Grade II Listed Buildings not identified by the HH within their submission.

It is anticipated that as these designated heritage assets are located outside of the proposed land take, the risk of physical impact is low. However, due to their proximity to the proposed scheme there is a high potential for impact on the settings of these designated assets both during the construction and during the operation of the proposed scheme.

Table 4.18 - Intermediate Study Area: Summary Assessment of Impacts

Designation	No. Within Study Area	Value	Magnitude of Impact (unmitigated)	Significance of Impact (unmitigated)
Listed Building: Grade II*	1	High	Major	Large
Listed Building: Grade II	22	Medium	Moderate	Moderate
Scheduled Monument	2	High	Major	Large
Conservation Area	5	High	Major	Large

4.4.4 Heritage Outer Study Area

Jacobs identified a total of 168 designated heritage assets with the potential to be impacted within the Outer Study Area. A summary of the number of each type of designated asset, and assessment of their value, and the magnitude and significance of effect is presented in Table 4.19.

Of the 40 designated assets identified by HH within its submission 14 are located within the Outer Study Area. This comprises 154 designated heritage assets less than identified by Jacobs. This is probably as a result of the changes to the development boundary for the proposed Heathrow ENR scheme since the production of the promoter's submission, and because a wider study area was used by Jacobs than by the promoter.

Given the distance from the proposed scheme option, it is highly unlikely that designated heritage assets located within the Outer Study Area will be at risk from physical impacts or impacts on their settings during construction. However, there is potential for impacts on the settings of these designated heritage assets during operation.

Table 4.19 – Outer Study Area: Summary Assessment of Impacts

Designation	No. Within Study Area	Value	Magnitude of Impact (unmitigated)	Significance of Impact (unmitigated)
Listed Building: Grade I	4	High	Moderate	Moderate
Listed Building: Grade II*	5	High	Moderate	Moderate
Listed Building: Grade II	151	Medium	Moderate	Moderate
Scheduled Monument	1	High	Moderate	Moderate
Conservation Area	6	High	Moderate	Moderate
Registered Park or garden: Grade I	1	High	Moderate	Moderate

4.4.5 Tranquillity

Tables 4.20 and 4.21 present the number of each heritage designation predicted to be located within the N70 Contour for the 'Do Minimum' and 'Do Something' scenarios for 2030 and 2050 see also Heritage Figures 15 and 26.

By 2030 without the proposed HH scheme in place a total of 1411 designated heritage assets are predicted to be within the N70 contour of the 'Do Minimum' scenario. For the 'Do Something' scenario, this is predicted to be 2322, therefore there is the potential for impacts on tranquillity of 911 more designated assets in 2030.

By 2050 without the proposed Heathrow ENR scheme in place a total of 1280 designated heritage assets are predicted to be within the N70 contour.

For the 'Do Something' scenario, this is predicted to be 2168. Therefore there is the potential for impacts on tranquillity of 888 more designated assets by 2050 with the proposed scheme in place than without it.

Table 4.20 – Number of each Designation within N70 Contour for 'Do Minimum' 2030 and 'Do Something' 2030

Designation	Do Minimum 2030	Do Something 2030	Difference
Conservation Areas	21	21	0
Registered Parks and Gardens	9	10	+1
World Heritage Sites	1	1	0
Scheduled Monuments	8	9	+1
Listed Buildings: Grade I	41	61	+20
Listed Buildings: Grade II*	102	167	+65
Listed Buildings: Grade II	1229	2053	+824

Table 4.22 – Number of each Designation within N70 Contour for 'Do Minimum' 2050 and 'Do Something' 2050

Designation	Do Minimum 2050	Do Something 2050	Difference
Conservation Areas	19	19	0
Registered Parks and Gardens	8	8	0
World Heritage Sites	1	1	0
Scheduled Monuments	6	7	+1
Listed Buildings: Grade I	38	60	+22
Listed Buildings: Grade II*	89	147	+58
Listed Buildings: Grade II	1119	1926	+807

4.4.6 Mitigation

HH has identified mitigation for the eight Grade II Listed Buildings on which they have predicted a physical impact. HH predicts an impact on the setting of the other designated heritage assets identified within their submission, and has identified a general mitigation strategy for all of these. These designated heritage assets, a description of the impact, the mitigation proposed in the submission and an assessment of the Significance of Residual Impact undertaken by Jacobs are presented in Table 4.22; along with a commentary on the feasibility and practicality of the mitigation proposed by the promoter.

In addition to designated heritage assets, this table also includes impacts and mitigation identified by the HH promoter on non-designated archaeological remains and historic landscapes; and a general comment on possible mitigation strategies for designated heritage assets not considered by the promoter.

Table 4.22 – Heathrow ENR Heritage Mitigation

Asset Number and Name	Designation	Location	Proposers Description of Impact	Mitigation proposed by Promoter	Significance of Residual Impact (after mitigation)	Comments
LB2: The Hollies	Grade II Listed Building	See Fig. 18	Complete removal of building	Recommendation to carry out historic building recording prior to demolition	Moderate	Historic building recording of a Grade II Listed Building is both a feasible and practical mitigation strategy. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB3: City Post	Grade II Listed Building	See Fig. 18	Complete removal of building	Relocation following a programme of building recording	Large	The preferred option is to preserve a building *in situ*. However this would not mitigate against setting or noise impacts, and the significance of residual impact on the designated heritage asset is predicted to remain unchanged.
					Large	Should preservation *in situ* not be a viable option, relocation of the building is also feasible, but a less practical option. If the building is dismantled for reconstruction elsewhere, this will have a significant impact on the building's special interest due to the loss of historic fabric during dismantling. Relocation would not mitigate the impacts on setting of the building. The implementation of this mitigation is unlikely to reduce impact, and the residual impact is likely to remain unchanged.
					Moderate	If the building is translocated (a process involving moving the building in its current state to a new location, without prior dismantling of the building) then little damage is done to the fabric of the building. However there is still likely to be a significant impact on the setting of the building. This mitigation may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB4: Windsor House	Grade II Listed Building	See Fig. 18	Complete removal of building	Recommendation to carry out historic building recording prior to demolition	Moderate	Historic building recording of a Grade II Listed Building is both a feasible and practical mitigation strategy. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB5: King's Bridge	Grade II Listed Building	See Fig. 18	Complete removal of building	Recommendation to carry out historic building recording prior to demolition	Moderate	Historic building recording of a Grade II Listed Building is both a feasible and practical mitigation strategy. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB9 Milestone at Madbridge	Grade II Listed Building	See Fig. 18	Complete removal of building	Relocation following a programme of building recording	Large	The preferred option is to preserve a building *in situ*. However this would not mitigate against setting or noise impacts, and the significance of residual impact on the designated heritage asset is predicted to remain unchanged.
					Large	Should preservation *in situ* not be a viable option, relocation of the building is also feasible, but a less practical option. If the building is dismantled for reconstruction elsewhere, this will have a significant impact on the building's special interest due to the loss of historic fabric during dismantling. Relocation would not mitigate the impacts on setting of the building. The implementation of this mitigation is unlikely to reduce impact, and the residual impact is likely to remain unchanged.
					Moderate	If the building is translocated (a process involving moving the building in its current state to a new location, without prior dismantling of the building) then little damage is done to the fabric of the building. However there is still likely to be a significant impact on the setting of the building. This mitigation may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB10 - Water-Pump approximately 75 yards east of the Punchbowl Inn	Grade II Listed Building	See Fig. 18	Complete removal of building	Relocation following a programme of building recording	Large	The preferred option is to preserve a building *in situ*. However this would not mitigate against setting or noise impacts, and the significance of residual impact on the designated heritage asset is predicted to remain unchanged.
					Large	Should preservation *in situ* not be a viable option, relocation of the building is also feasible, but a less practical option. If the building is dismantled for reconstruction elsewhere, this will have a significant impact on the building's special interest due to the loss of historic fabric during dismantling. Relocation would not mitigate the impacts on setting of the building. The implementation of this mitigation is unlikely to reduce impact, and the residual impact is likely to remain unchanged.
					Moderate	If the building is translocated (a process involving moving the building in its current state to a new location, without prior dismantling of the building) then little damage is done to the fabric of the building. However there is still likely to be a significant impact on the setting of the building. This mitigation may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.

Asset Number and Name	Designation	Location	Proposers Description of Impact	Mitigation proposed by Promoter	Significance of Residual Impact (after mitigation)	Comments
LB19 - Stable Range at Thorney Farm	Grade II Listed Building	See Fig. 18	Complete removal of building	Recommendation to carry out historic building recording prior to demolition	Moderate	Historic building recording of a Grade II Listed Building is both a feasible and practical mitigation strategy. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
LB51 - Poyle Farmhouse	Grade II Listed Building	See Fig. 18	Complete removal of building	Recommendation to carry out historic building recording prior to demolition	Moderate	Historic building recording of a Grade II Listed Building is both a feasible and practical mitigation strategy. For this type of building the mitigation proposed may potentially reduce the significance of impact to Moderate. This level of residual impact is still considered significant.
Non-designated archaeological remains	-	-	Potential loss of archaeological remains associated with non-designated heritage assets within the Land take Study Area	Investigate this area through a programme of archaeological research investigations, post excavation analysis and public dissemination	Moderate/ Unknown	The mitigation strategy proposed by the promoter is both feasible and practical. The type of investigation carried out and the amount and character of any remains discovered during this process will have an implication on both the time and costs involved with this mitigation strategy. The implementation of this evaluation/mitigation strategy may reduce the significance of impact to Moderate, but the residual impact will remain unknown until the results of the evaluation are known.
Historic Landscape Character	-	-	None	None proposed	Unknown	The promoter has not identified any impacts or mitigation on historic landscape character, which is classed as an undesignated heritage asset. However, this report identifies that there will be a Major Adverse impact on landscape character types within the Land take Study Area. Until the results of an evaluation are known, the level of residual impact remains unknown.
Additional Designated Heritage Assets within the Intermediate Study Area	Grade II* Listed Buildings	See Fig. 18	Potential noise impacts and changes to setting	Flight sequencing and noise respite measures	Unknown	The mitigation strategy proposed by the promoter is both feasible and practical, but will need to be refined at a later stage. Other feasible and practical mitigation strategies may include a programme of historic building recording, followed by potential implementation of noise mitigation measures and screening options.
	Grade II Listed Buildings	See Fig. 18	Potential noise impacts and changes to setting	Flight sequencing and noise respite measures	Unknown	The mitigation strategy proposed by the promoter is both feasible and practical, but will need to be refined at a later stage. Other feasible and practical mitigation strategies may include a programme of historic building recording, followed by potential implementation of noise mitigation measures and screening options.
	Scheduled Monument	See Fig. 18	Potential noise impacts and changes to setting	Flight sequencing and noise respite measures	Unknown	The mitigation strategy proposed by the promoter is both feasible and practical, but will need to be refined at a later stage. Options to screen the designated heritage asset could be considered to mitigate impacts on setting.
	Conservation Areas	See Fig. 18	Potential noise impacts and changes to setting	Flight sequencing and noise respite measures	Unknown	The mitigation strategy proposed by the promoter is both feasible and practical, but will need to be refined at a later stage. Other feasible and practical mitigation strategies may include a programme of historic building recording, followed by potential implementation of noise mitigation measures and screening options.
Additional Designated Heritage Assets within the Outer Study Area	Grade I Listed Buildings	See Fig. 18	Potential noise impacts and changes to setting	Flight sequencing and noise respite measures	Unknown	The mitigation strategy proposed by the promoter is both feasible and practical, but will need to be refined at a later stage. Other feasible and practical mitigation strategies may include a programme of historic building recording, followed by potential implementation of screening options.
	Grade II* Listed Buildings	See Fig. 18	Potential noise impacts and changes to setting	Flight sequencing and noise respite measures	Unknown	The mitigation strategy proposed by the promoter is both feasible and practical, but will need to be refined at a later stage. Other feasible and practical mitigation strategies may include a programme of historic building recording, followed by potential implementation of screening options.
	Grade II Listed Buildings	See Fig. 18	Potential noise impacts and changes to setting	Flight sequencing and noise respite measures	Unknown	These Medium value designated heritage assets may be subject to setting and noise impacts. Feasible and practical mitigation strategies may include a programme of historic building recording, followed by potential implementation of screening options.
	Scheduled Monument	See Fig. 18	Potential noise impacts and changes to setting	Flight sequencing and noise respite measures	Unknown	The mitigation strategy proposed by the promoter is both feasible and practical, but will need to be refined at a later stage. Options to screen the designated heritage asset could be considered to mitigate impacts on setting.
	Conservation Areas	See Fig. 18	Potential noise impacts and changes to setting	Flight sequencing and noise respite measures	Unknown	The mitigation strategy proposed by the promoter is both feasible and practical, but will need to be refined at a later stage. Other feasible and practical mitigation strategies may include a programme of historic building recording, followed by potential implementation of screening options.
	Grade I Registered Parks or Gardens	See Fig. 18	Potential noise impacts and changes to setting	Flight sequencing and noise respite measures	Unknown	The mitigation strategy proposed by the promoter is both feasible and practical, but will need to be refined at a later stage. .Other feasible and practical mitigation strategies may include a programme of historic landscape recording, followed by potential implementation of screening options.

4.4.7 Residual Impacts

Based on the assessment it is considered unlikely that all the impacts predicted on cultural heritage assets or groups of assets could be wholly mitigated. Residual impacts of Large to Moderate are therefore predicted.

4.4.8 Conclusion Heathrow Airport Extended Northern Runway - Heritage Assessment

For the Heathrow ENR scheme seven potential impacts were identified within the scheme land take; the setting of 30 designated heritage assets could be affected within 300m of the scheme area and from 300m to 2km the setting of a further 168 designated assets could potentially be affected. HH identified impacts on 40 designated heritage assets in their assessment.

Using the impacts identified by HH the effectiveness of mitigation has been considered by Jacobs. Table 4.23 provides a summary of the moderate to large residual impacts based on a high level assessment; a range is provided where there are multiple impacts of different levels of significance.

Table 4.23 – Significance of Residual Impacts (After Mitigation)

Asset Number and Name	Designation	Significance of Residual Impact (after mitigation)
LB2: The Hollies	Grade II Listed Building	Moderate
LB3: City Post	Grade II Listed Building	Moderate - Large
LB4: Windsor House	Grade II Listed Building	Moderate
LB5: King's Bridge	Grade II Listed Building	Moderate
LB9: Spikemead Farmhouse	Grade II Listed Building	Moderate - Large
LB10: Brookside	Grade II Listed Building	Moderate - Large
LB19: Stable Range at Thorney Farm	Grade II Listed Building	Moderate
LB51: Poyle Farmhouse	Grade II Listed Building	Moderate
Non-designated archaeological remains	-	Moderate/ Unknown

In addition, there are a number of assets that could be affected through change in setting or tranquillity, the significance of which cannot be predicted at this stage of assessment.

5 Waste

This section presents the waste sub-topic assessment of the Place module including:

- Potential waste generated during construction; and,
- Potential waste generated during operation.

5.1 Introduction and Methodology

This assessment considers how waste will be managed for each of the airport options both during construction and operational in accordance with the Airports Commission's Appraisal Framework, (Airports Commission, 2014a).

5.1.1 Assessment Methodology

In undertaking the assessment of the scheme promoter submissions, the approach considers three different elements:

1. Assessment against modelled waste forecast scenarios for 'Do Minimum' and 'Do Something';
2. Potential impacts during the construction phase; and
3. Potential impacts during the operational phase.

5.1.2 Assessment against Jacobs waste forecast

Operational waste projections within each airport submission have been assessed against waste forecasts calculated by Jacobs (Jacobs, 2014f), which are based on waste generation levels (i.e. kg/passenger) and the Airports Commission Demand Forecast passenger forecast data, AoNCC, (Airports Commission, 2014b). The Place Baseline Report (Jacobs, 2014f) includes waste forecasts for 'Do Minimum' scenarios (i.e. no development) from 2025 to 2050. Alongside the 'Do Minimum' forecasts, Jacobs developed a series of 'Do Something' waste forecasts to allow direct comparison with the scheme promoters' forecasts contained within their submissions. The assessment compared the total waste generation levels and recycling performance and highlights notable variation and potential justification of such variation.

The assessment against Jacobs' waste forecast has focused on operational phase only. The assessment has estimated likely construction and demolition (C&D) waste arisings, for the purpose of comparison against C&D forecasts provided by each of the scheme promoters. The approach considered the application of available industry benchmark data such as Waste and Resources Action Programme (WRAP) Resource Efficiency Benchmarks for Construction Projects, and Buildings Research Establishment (BRE) Waste Benchmark Data (WRAP, 2014) including use of generic resource benchmarks for different types of construction projects. It is considered inappropriate at this stage to include any quantified assessment of likely construction waste forecasts for each of the schemes, due to the limited robustness in available benchmark data, and the limited applicability to airport schemes.

Table 5.1 summarises the growth scenarios model for each airport and reflects the different starting points and the different waste generation levels.

Table 5.1 - Waste Growth Scenarios

Waste Growth Scenario	Heathrow	Gatwick
1: No change in waste per passenger from most recently reported data	No growth in waste per passenger, with the figure remaining at the 2013 level of 0.369 kg per passenger.	No growth in waste per passenger, with the figure remaining at the 2012 level of 0.260 kg per passenger.
2: Waste prevention based on the average reduction in waste per passenger over recent years	The average growth rate between 2008 and 2013 of minus 3.7% per annum continues until 2020, then 0% growth.	The average growth rate between 2008 and 2012 of minus 8.7% per annum continues until 2020, then 0% growth.
3: Waste prevention using a more conservative waste reduction assumption than that experienced over recent years.	A growth rate of minus 2% per annum until 2020, then 0% growth.	A growth rate of minus 2% per annum until 2020, then 0% growth.

The resultant waste per passenger factors were then applied to the passenger number forecasts. For the purpose of this assessment, figures for years 2030, 2040 and 2050 are presented for 'Do Something' scenarios based on passenger numbers derived from the Airports Commission's AoN Carbon Capped passenger demand forecasts (Airports Commission, 2014b). For completeness and context the 'Do Minimum' forecasts have been provided for each scheme.

5.1.3 Potential waste impacts during construction and operational phase

The assessment considers how each of the airport submissions has addressed key impacts associated with waste during the construction and operational phases, including:

- On-site storages of wastes in respect to visual amenity, harm to human health, water quality, release of hazardous substance, risk to natural resources;
- Transportation of waste in respect to local amenity associated with transport, air quality (vehicle emissions), escape of waste, landscape character and heritage; and,
  Management of waste in respect to the beneficial use of waste, application of the waste hierarchy, amenity at receptor sites, capacity availability and implication for local/regional capacity based on published information.

The assessment considers how the scheme promoter has addressed key impacts associated with waste during the construction and operational phases. The assessment has been tabulated to include:

- Proposal – a summary of the waste management activity or intervention suggested by the scheme promoter;
- Potential risk – including impacts resulting from the identified approach to managing construction and/or operational waste;
- Applicable legislation / guidance – including relevant waste legislation and regulation, planning and permitting legislation and contaminated land guidance and regulations;

- Coverage in submission – identifying where each proposal suggested by the scheme promoter is contained within the submission documentation submitted;
- Proposed mitigation – including relevant measures identified by the scheme promoter to address waste impacts;
- Justification and evidence – where evidence has been provided by the scheme promoter to support the proposal; and,
- Additional information requirements – where further explanation, clarification or evidence is suggested as being necessary to support the proposal.

5.1.4 Assumptions and Limitations

For the purpose of the waste assessment, Jacobs developed a bespoke model that applies waste per passenger (kg/Pax) estimates, waste data reported by each airport, and passenger number forecasts, to project annual total waste and recycling tonnages from 2025 to 2050. Waste (kg) per passenger is a recognised and consistent quantitative method of reporting used by the various airports for the purpose of reporting on waste, (Global Reporting Initiative, 2009).

For the purpose of this assessment, figures for years 2030, 2040 and 2050 are presented with the full details in Place Baseline Report (Jacobs, 2014f). The assessment uses Airports Commission AoN Carbon Capped demand forecast, which provides forecasts to 2050. For the purpose of the assessment, this is considered to represent maximum passenger capacity for each of the three schemes. It is considered that projection beyond 2050 introduces a level of uncertainty which is too high to provide robust, meaningful data, due to the complexities and wide range of variants involved in waste projections. For example: as a minimum waste outputs will be subject to changes in consumer attitudes; airline service provision (e.g. sustainable procurement); product design for reuse, durability and the embedding of closed loop resource efficiency.

In addition, the Airports Commission passenger number forecasts used in the model only project to 2050. Therefore, for the period 2050 to 2085/2086, if passenger numbers remain relatively constant it could be assumed that waste generation would also remain relatively constant at the 2050 estimated levels. If passenger numbers continued to increase beyond 2050, the waste per passenger estimate for 2050 could be applied to future passenger numbers to provide an indication of the

The analysis has been undertaken using AoN Carbon Caped demand forecast ATMs and passenger numbers. Other scenarios have been prepared that do not cap carbon within the aviation sector (i.e. carbon traded with other sectors to allow for no net CO_2 increase against target, but without a constraint of 37.5Mt on the aviation sector), and as a result see a variance of ATMs and passenger numbers. Such variance will have a consequential impact (all else being equal) to any environmental effect directly proportional to ATMs or passenger numbers. For Gatwick 2R, the difference between AoN Carbon Capped and carbon traded scenarios ATMs is between circa +7% in 2030 rising to up to +20% in 2050. The variance between passenger numbers is an increase of between circa +9% in 2030 rising to up to circa +38% in 2050. For Heathrow NWR, the difference between AoN Carbon Capped and carbon traded scenarios ATMs is between circa +5% in 2030 with no significant difference in ATMs in 2050. The variance between passenger numbers is between slightly more than +6% in 2030 and up to +10% in 2050. For Heathrow ENR the difference between AoN Carbon Capped and carbon traded scenarios ATMs is between circa +5% in 2030 with no significant difference in ATMs in 2050. The variance between passenger numbers is between slightly less than +6% in 2030 and up to +10% in 2050. Impacts on waste driven by ATMs or passenger numbers are sensitive to any such variance.

5.2 Waste Impact Assessment - Gatwick Airport Second Runway

5.2.1 Assessment against waste forecasts - Gatwick Airport Second Runway

Reported waste and recycling data

Data on waste generation levels and recycling performance were sourced from recent sustainability reports published by GAL (2010 and 2012) and are summarised in Table 5.2.

Table 5.2 - Gatwick Airport Ltd waste generation levels and recycling performance 2008 to 2012

Year	2008	2009	2010	2011	2012
Waste produced (tonnes)	12,297	10,177	9,685	9,206	8,803
Total per passenger (kg/Pax)	0.360	0.310	0.310	0.270	0.260
% Change in kg/Pax for previous year	n/a	-16.1%	0.0%	-14.8%	-3.8%
Waste recycled or composted (%)	26.6%	39.0%	41.0%	54.6%	40.0%
Sources: Our Decades of Change reports 2010 and 2012					

GAL's Our Decades of Change Report 2012 includes a commitment to recycle 70% of waste by 2020.

Jacobs model

Waste forecasts for both a 'Do Minimum' and a 'Do Something' have been drawn from the Jacobs bespoke model for the years 2030, 2040 and 2050, summarised in Table 5.3. Waste growth scenarios used in the model are summarised, Section 2.2.1.

Table 5.3 - Jacobs Waste Forecasts for Gatwick 2030, 2040 and 2050

Total per passenger (kg/Pax)	2030	2040	2050
Scenario 1 - No change in waste growth per passenger	0.260	0.260	0.260
Scenario 2 - Waste Prevention	0.138	0.138	0.138
Scenario 3 - Conservative Waste Prevention	0.221	0.221	0.221
Do Minimum: High Level Traffic Forecasts - Capacity constrained, carbon capped			
Year	**2030**	**2040**	**2050**
Airports Commission AoNCC 2014 passenger estimates	41,082,700	44,241,800	46,589,192
Waste produced (tonnes)			
Scenario 1 - No change in waste growth per passenger	10,700	11,500	12,100
Scenario 2 - Waste Prevention	5,600	6,100	6,400
Scenario 3 - Conservative Waste Prevention	9,100	9,800	10,300
With Development: High Level Traffic Forecasts - Capacity constrained, carbon capped			
Year	**2030**	**2040**	**2050**
Airports Commission AoNCC 2014 passenger estimates	45,599,168	55,606,912	69,414,512
Waste produced (tonnes)			
Scenario 1 - No change in waste growth per passenger	11,900	14,500	18,000
Scenario 2 - Waste Prevention	6,300	7,600	9,500

Total per passenger (kg/Pax)	2030	2040	2050
Scenario 3 - Conservative Waste Prevention	10,100	12,300	15,400

Table 5.4 shows the recycled tonnages by growth and recycling scenario in 2030, 2040 and 2050 for the 'Do Something' passenger estimates.

Table 5.4 - Jacobs Gatwick model with development - Summary of recycling tonnages 2030, 2040 and 2050

Recycling Scenario	Recycling (tonnes) range per annum		
	2030	2040	2050
Scenario A - No change in recycling rate (40%)	2,520 – 4,760	3,040 – 5,800	3,800 – 7,200
Scenario B - Recycling target of 70% in 2020 achieved and maintained	4,410 – 8,330	5,320 – 10,150	6,650 – 12,600
Scenarios C - Recycling target of 55% in 2020 achieved and maintained	3,465 – 6,545	4,180 – 7,975	5,225 – 9,900

GAL submission waste forecasts

The GAL submission has predicted the number of passengers moving through the airport following the runway development to be in the region of 65 million passengers per annum (Mppa) by 2030 and 95Mppa by 2050. The GAL submission, Appendix 31 has also assumed that the waste generated to be around 0.25 kg per passenger throughout this period (ERM, 2014; and Gatwick Airport Limited, 2014c) which assumes improved public attitudes towards recycling and legislative changes that will minimise the volume of packaging placed on the market. This assessment by GAL results in overall waste predictions of 16,250 tonnes of operational waste arising by 2030 and 23,750 tonnes by 2050.

Following on from the 'Decade of Change' (GAL, 2012) target to achieve 70% recycling of all airport waste by 2020, GAL has projected that the recycling targets achieved by the years 2030 and 2050 will be 75% and 80% respectively.

The GAL submission estimates the quantities of waste arising from the construction phase of the proposed development as being 1.6 million tonnes (0.8 million tonnes from construction, 0.5 million tonnes from excavation, 0.3 million tonnes from demolition). Due to limitations (noted in Section 2.2.1) it has not been possible to fully appraise these estimates, due to the lack of available and robust benchmark data, and therefore our assessment focusses on estimates provided by GAL for operational waste only.

Assessment of GAL waste forecasts against Jacobs waste forecasts

Waste forecast projections developed by Jacobs have been compared against waste forecasts provided by GAL in its submission. GAL's projection of 0.25 kg per passenger is within in the range considered in the Jacobs assessment (0.138 to 0.26kg per passenger) and it is acknowledged that these assumptions are difficult to quantify and are subject to levels of uncertainty.

Using the data produced by Jacobs and GAL for 2050, it would appear that the Gatwick 2R scheme would result in almost doubling the operational waste arisings (23,750 tonnes compared to the Jacobs 'Do Minimum' forecast of 12,300 tonnes). This ties in with differences in passenger numbers projected.

There is a notable difference in passenger number projections, with the GAL submission estimating approximately 40% higher passenger numbers over the headline years (the GAL submission forecast is 65Mppa by 2030 and 95Mppa by 2050, compared with the Airports Commission's AoN Carbon Capped scenario 2014, of 46Mppa in 2030 and 69Mppa by 2050), (Airports Commission, 2014b). As a consequence, the GAL submission estimates higher operational waste arisings (16,250 tonnes of operational waste arising by 2030 compared with the Jacobs 'Do Something' estimates of 12,000 tonnes by 2030, Scenario 1), due to the differences in passenger numbers noted. GAL forecasts a recycling rate of 75% by 2030, which is higher than recycling rates used in the Jacobs model (70% recycling achieved and maintained, Scenario B).

Overall, waste per passenger forecasts provided by GAL compare favourably against the Jacobs 'Do Something' waste per passenger estimates, however there are noted differences in passenger number forecasts, which resulted in higher levels of waste forecasted up to 2050. Overall, waste projections appear to be appropriate to the passenger numbers forecasted by GAL.

5.2.2 Assessment of Impacts during Construction Phase - Gatwick Airport Second Runway

The assessment considers how GAL has addressed key impacts associated with waste during the construction phase. The assessment is based on the contents of the submission 'A Second Runway for Gatwick' by GAL, specifically Appendix A31 relating to waste management, and the responses subsequently obtained to requested clarifications.

Table 5.5 - On-site management of construction, demolition and excavation waste

Proposal 1	GAL proposes to manage the majority of construction, demolition and excavation wastes on-site. GAL proposes increased off-site treatment of significant tonnage of residual non-hazardous and hazardous wastes arising from demolition activities.
Potential risk	Larger than expected tonnages of construction waste arising from demolition and enabling works cannot be dealt with effectively by GAL's integrated waste management facility 'The Care Centre', leading to potential increased noise/dust/vehicle emissions from on-site/off-site transport plus an increase in off-site vehicle movements. Any increase of off-site treatment requirement could result in increased noise/dust/vehicle emissions from on-site/off-site transport, potential surface water contamination from run-off of hazardous wastes or insufficient on-site storage facilities, and loss of landscape character and heritage assets.
Applicable legislation / Guidance	Environmental Permitting (England & Wales) Regulations 2010 (as amended). Waste (England & Wales) Regulations 2011. The Hazardous Waste (England & Wales) Regulations 2005. Waste (England and Wales) Regulations 2011. EPA 1990 Part 2A: Contaminated Land Statutory Guidance (2012). CL:AIRE Code of Practice. Landfill (England and Wales) Regulations 2002 as amended.
Coverage in submission	Sections 2.2, 2.4, 5.6.
Proposed	GAL state that the expectation is for the majority of waste arising from the Gatwick

mitigation	2R scheme will be reused or recycled due to proposed expansions to the Care Centre. This will accommodate on-site management of the increased tonnage of construction waste from the Gatwick 2R scheme.
Justification and evidence	Previous construction projects have achieved recycling levels in excess of 95% therefore it is considered that a target of 96% for the Gatwick 2R scheme could be realistic. According to GAL, the Care Centre will be utilised to work towards Gatwick's target of 70% recycling of all airport waste by 2020. Initiatives detailed in the 'Decade of Change' report suggest greater source segregation of waste streams in the future. Specific landfills have been identified by GAL that will accept certain hazardous substances – e.g. Pinden Landfill will accept asbestos materials. Formal assessment of available hazardous landfill capacity for circa 4,000 tonnes is recognised by GAL as being required but has not been undertaken at this stage. Disposal to landfill is the proposed mitigation strategy, along with transfer to an appropriately licensed/permitted facility.
Additional information requirements	In response to clarification questions, GAL stated that 'overall recycling levels for the previous four years are 98.07% (2010); 95.08% (2011); 99.2% (2012); 96.68% (2013)'. However, it is evident that the targeted residual construction waste still represents a significant tonnage and consideration should be given to the potential impact should the 96% not be attainable. No capacity analysis has been carried out by GAL; however a review of published Environment Agency hazardous waste capacity data (EA, 2012) indicates that there was approximately 600,000 tonnes of merchant hazardous waste landfill capacity available in London and the South East of England at the end of 2012, and it is conceivable that more hazardous landfill capacity will become available in the South East as new facilities gain approval. Available capacity would need to be ascertained prior to commencement of any construction activities. Although it has been identified by GAL that treatment routes potentially exist pending further assessment, capacity should be ascertained prior to construction activities to minimise pollution of the immediate surroundings during the construction phase.

Table 5.6 - Installation of new waste treatment facilities

Proposal 2	GAL proposes that new waste treatment facilities, or variations to existing facilities will be installed on-site (expansion of crushing/shredding facilities; installation of organic processing).
Potential risk	(i) Additional noise/dust/emissions from increased waste treatment facilities on-site, increased on-site/off-site waste transport, loss of landscape character and heritage assets. (ii) Insufficient treatment capacity, should any planning or permit application fail to be approved by the regulatory authority, which could result in increased waste moving off-site for treatment/disposal.
Applicable legislation / Guidance	Environmental Permitting (England & Wales) Regulations 2007 (as amended).
Coverage in submission	Section 3.3 (regulatory requirements); Section 4.6 (treatment requirements under Construction Waste Management Plan (CWMP)).
Proposed mitigation	Construction Waste Storage & Recycling Plan forms part of the overall CWMP for the Gatwick 2R scheme and will detail any treatment routes and regulatory requirements.
Justification and evidence	Construction Waste Storage & Recycling Plan – section 2.1.2 in GAL's submission on enabling and construction works states that 'the natural ground will as far as possible be used as fill material for the Gatwick 2R scheme, including surface treatment and engineering structures.' The response to clarification questions states that no waste management permit is required as all waste is used at point of production (i.e. within the site boundary). It is considered that this approach to waste management is achievable, where waste types and waste sinks to absorb waste materials are accurately profiled.

Additional information requirements	The response to clarification questions confirms that inert construction waste will be processed at the on-site crushing, shredding and composting facilities, and organic waste will be treated at a proposed on-site food processing plant and biomass boiler.

General Observations

The comments raised above predominantly relate to specific, detailed waste assessments for a construction project scheduled for completion in 2025. In light of this and the high level of uncertainty on key factors such as future treatment capacity, it is considered that a detailed assessment at this time may not add value. GAL, at the very least, has demonstrated the need for a detailed waste treatment capacity assessment to be carried out in the future.

Many of the issues detailed above crucially link back to the construction and demolition waste tonnage estimates provided by GAL in their assessment. Should it be the case that these tonnages are not accurate the effect could be a potential increase in waste transportation both on-site and off-site compared with that predicted. This would result in increased noise and emissions and would have an impact on the local amenity resulting in a potential loss of landscape character. This would appear to be a significant dis-benefit of under-estimating waste tonnages. The GAL assessment makes little reference to this.

The detailed assessment below is based on the contents of the submission 'A Second Runway for Gatwick' by GAL, specifically appendix A31 relating to waste management, and the responses subsequently obtained to requested clarifications.

5.2.3 Waste Impacts during Operational Phase - Gatwick Airport Second Runway

The assessment below considers potential operational waste impacts and is based on the contents of the submission 'A Second Runway for Gatwick' by GAL, specifically appendix A31 relating to waste management, and the responses subsequently obtained to requested clarifications.

Table 5.7 - On-site/off-site treatment

Proposal 3	GAL proposes on-site/off-site treatment of projected operational waste arisings.
Potential risk	Assumed data for projected waste per passenger are too low, which could result in increased waste treatment off-site. This could result in noise/dust/vehicle emissions from increased on-site/off-site waste transport, and loss of landscape character and heritage assets.
Applicable legislation/ Guidance	Producer Responsibility Obligations (Packaging Waste) Regulations 2007 (as amended). Increased tonnages of packaging sold to passengers at the airport will increase Gatwick's recycling obligations under the Producer Responsibility Obligations (Packaging Waste) Regulations. Waste (England and Wales) Regulations 2011.
Coverage in submission	Sections 6.1-6.4 cover how GAL has addressed operational waste arising predictions. It should be noted that Jacobs' forecast of a 'Do Minimum' option, projects an operational waste arising of 12,300 tonnes p.a. by 2050 (at the upper limit) assuming no change to the amount of waste generated per passenger. With development scenario indicates c. 18,000 tonnes p.a. of waste. GAL's predictions estimate that the 'Do Minimum' tonnage will be approximately doubled (23,750 tonnes p.a) in 2050 from the impact of the Gatwick 2R scheme. As discussed earlier the discrepancy with the Jacobs forecast is the result of differences in assumptions around passenger numbers between the promoter and those derived from Airports Commission's AoN Carbon Capped scenario 2014s (Airports

	Commission, 2014b).
Proposed mitigation	GAL's 'Decade of Change' initiatives are to achieve an overall 70% recycling rate by 2020 through utilisation of the Care Centre (GAL's on-site integrated waste management facility). It is proposed by GAL that increased source segregation of wastes at Gatwick will result in increased recycling rates, but it is not specified how this will be achieved. GAL is also relying on increased awareness of recycling initiatives and improved attitudes towards waste, driving down 'per passenger' waste arisings, but as detailed above, there is no reference of a technical methodology by which GAL has arrived at this figure.
Justification and evidence	The responses to clarifications questions confirm that projected passenger numbers are based on current levels extrapolated to 2030 and 2050 and reductions have been applied to the kg/passenger arising per year due to 'public awareness of recycling initiatives and improved legislation around producer responsibility'.
Additional information requirements	It is suggested that the impact of likely changes to future legislation on waste per passenger (including producer responsibility) is an area which warrants further scrutiny at a later date in the event that the scheme is approved. The GAL submission forecasts higher passenger numbers than the Airports Commission forecasts. This warrants further investigation, since an over estimation of passenger numbers will also result in an over estimation of waste arisings, potentially leading to under capacity of waste infrastructure on and off-site.

Table 5.8 - On-site recycling infrastructure

Proposal 4	GAL proposes 70% recycling of all operational airport waste, by development of new on-site recycling infrastructure to process operational waste. Energy from Waste (EfW) plant and Anaerobic Digestion (AD) plants are both proposed to handle residual waste and organic waste respectively.
Potential risk	(i) Additional noise/dust/emissions from increased waste treatment facilities on-site, increased on-site/off-site waste transport, loss of landscape character and heritage assets. (ii) Insufficient treatment capacity should any planning or permit application fail to be approved by the regulatory authority, which will result in increases of waste moving off-site for treatment/disposal.
Applicable legislation / Guidance	Environmental Permitting (England & Wales) Regulations 2007; any applicable planning legislation.
Coverage in submission	Section 6.6 and Table 6.6.1 detail the range of proposals put forward to manage the additional waste volumes arising from the Gatwick 2R scheme.
Proposed mitigation	Installation of new on-site waste processing facilities (EfW, AD) is proposed to avoid the need to manage residual and organic waste streams off site.
Justification and evidence	Increases of residual and organic waste streams as predicted in GAL's operational waste predictions and strategy.
Additional information requirements	A detailed approach is required if GAL is proposing to develop new on-site waste handling facilities such as an EfW facility and an AD plant. Both of these facilities would require planning consent and environmental permits (which could present an obstacle) and would benefit from the appropriate level of pre-application discussion with the relevant authorities. The submission does not comment on any physical space constraints which would impact or limit the construction of new waste facilities on site, which would require further investigation should the scheme progress. Consideration should be given to analysing existing off-site EfW and AD treatment capacity should new treatment facility proposals not be approved by either a planning authority or the Environment Agency. Analysis of existing or future regional capacity to manage operational wastes.

General Observations

This expansion of on-site treatment capability would mitigate some of the concerns raised about increased volumes of future waste movements as a result of under-estimating waste arisings. However the development of an EfW facility at the airport potentially adjacent to flight paths could present a risk in terms of planning. Additionally, gaining planning consent for such facilities can take a significant amount of time. The submission does indicate that GAL is aware that planning will be a factor of the development of waste infrastructure, however there is no mention of a detailed approach to planning permission in relation to proposed new waste treatment facilities in the submission, which is something that GAL will need to consider progressing in more detail, should the scheme progress further.

No detailed analysis has been carried out by GAL of existing or future regional capacity to manage operational wastes, although the submission acknowledges this as being required should the scheme progress.

Modelling by Jacobs has demonstrated that airport waste arisings are declining due to sustainable waste management practices and waste minimisation, although this will be offset by increases in passenger numbers. They will constitute only a small proportion of total waste arisings in the South East of England. A number of the industry reports highlighted in the Place Baseline report (Jacobs, 2014f) draw attention to the fact that most biodegradable waste will appear in the residual waste stream, and that there should be specific consideration of residual waste treatment capacity in the UK. Studies including those published by the waste management service provider SITA (SITA, 2014), and environmental consultants Eunomia (Eunomia, 2011), highlight conflicting opinions of the residual waste treatment capacity by 2025, and this should be recognised when considering long-term airport capacity increase.

The current debate over future waste infrastructure capacity divides opinion, particularly over EfW demand up to 2015 and considered to have undermined investor confidence in developing new capacity. Defra's guide to the EfW debate (Defra, 2014a) concluded that there was sufficient EfW capacity to enable the UK to satisfy Landfill Directive commitments but acknowledged there was a capacity gap which the market will be left to address. Defra's (Defra, 2014b) call for evidence surrounding the growing demand to export refuse derived wastes driven by surplus European EfW capacity and the lack of UK capacity was followed by the repeat of an earlier warning of a risk of surplus UK EfW being built (Eunomia, 2011). But the overcapacity risk continues to be questioned with warnings of capacity gaps of up to 20 million tonnes by 2020 from the waste industry (SITA, 2014), including the Chartered Institute of Wastes Management (CIWM) (Ricardo AEA, 2013) and most recently in July by the Green Investment Bank (GIB) (Green Investment Bank, 2014).

5.2.4 Contamination assessment - Gatwick Airport Second Runway

The following section assesses the submission's evaluation of contaminated ground and groundwater issues and how any contamination may impact the construction and operational phases of the scheme. Where an assessment of potential risks (or impacts) has been made, the terminology used to describe the severity of such impacts has been reproduced here. The following table summarises the coverage within the GAL submission of the baseline conditions with respect to potential contaminant sources, receptors and pathways, the potential impacts and mitigation measures proposed and provides an assessment of the adequacy of the information

provided. Where it is considered that pertinent information is lacking, an assessment of the additional information required is given.

Table 5.9 – Gatwick 2R contaminated land assessment

Baseline	**Potential Contamination Sources** The following information is based on information given in the GAL submission unless stated otherwise. Potential contamination sources are identified as follows: • There is one historical landfill on site. • There is one licensed waste management facility on site. • There are 18 registered pollution incidents on site. One is classed as major (unknown chemicals). There have also been 5 registered pollution incidents within 250m of the site, one of which is classified as significant. The time period for these incidents is not stated in the submission. A contaminated land assessment undertaken by Jacobs Engineering UK Ltd in January 2010 for the Pier 1 and Pier 2 areas of the site did not identify substantial levels of soil contamination in the Pier 1 and 2 areas (Jacobs, 2010). The following historic land uses could be potential contamination sources: • Farming practises on agricultural land at and surrounding the site; • Industrial uses including workshops, storage depots, and retail/business parks; and • Military use of Gatwick Airport and Racecourse during World War 2, including squadron operations and maintenance. **Potential Contamination Pathways** • Direct human contact with soil, dust and groundwater; • Build-up of gases in enclosed spaces; • Migration of contaminants to groundwater; and • Migration of contaminants to surface water. **Potential Contaminant Receptors** The centre of the site consists of Quaternary Head Deposits. Bedrock is The Weald Clay Formation, limited areas of Ironstone Weald Clay and in the southeast corner, Upper Tunbridge Wells Sands. There is an Adopted Greenbelt area on the eastern side of the site as well as north of the existing airport. **Groundwater:** The River Terrace Deposits and Alluvium are classed as Secondary A Aquifers, Head deposits are classed as a Secondary Undifferentiated Aquifer. The Weald Clay is classed as Unproductive Strata. Upper Tunbridge Wells Sand is classed as a Secondary A Aquifer. The site is not within a Groundwater Source Protection Zone or a Groundwater Nitrate Vulnerable Zone. **Surface Water:** There are five main watercourses located on the site. Four have a moderate ecological status; the River Mole (Crawley to Gatwick), the River Mole (Gatwick Airport), Mans Brooke and Tilgate Brooke. The River Mole (Horley to Hersham) has poor ecological quality. There are no registered surface water abstractions within the site or within 250m of the site boundary. The site is located within a Surface Water Nitrate Vulnerable Zone. **Future Baseline Conditions** An assessment of future baseline conditions has been included in the GAL submission and includes changes to the geology, groundwater flow patterns and

	drainage caused by the development.
Potential risks	**Potential Contamination Impacts During Construction** GAL have stated that measures would be put in place to prevent any contaminated material impacting on groundwater or surface waters, including segregation of contaminated material into areas where it cannot leach into water bodies/courses. **Potential Contamination Impacts During Operation** There is the potential for impacts through fuel spills, de-icing materials and hazardous materials used during maintenance. It is proposed by GAL that the drainage design and run-off would mitigate this and the airport's emergency spill procedures would be extended. The impact is assessed as of minor significance by GAL. The potential build-up of ground gases in underground structures and the potential risks to human health have not been mentioned in the geo-environmental report.
Applicable legislation	The regulatory definition of contaminated land is contained within Part 2A of the Environmental Protection Act (EPA) 1990 (Defra, 2012). The relevant national planning policy and associated guidance with respect to land contamination are presented under Section 11 of The National Planning Policy Framework (Department for Communities and Local Government (DCLG), 2012) - Conserving and enhancing the natural environment. In addition to the above, the Water Resources Act (1991) provides the Environment Agency with powers to enforce action to address pollution of controlled waters.
Coverage in submission	A geo-environmental assessment report is provided within the GAL submission which refers to desk study reviews and an Envirocheck report. The desk studies cover the relevant topics normally expected of a contamination assessment, although not all information has been carried forward into the geo-environmental assessment. The submission states that an intrusive ground investigation will be needed to confirm and assess contamination within the site. The risks and mitigation measures are generally appropriate for the study undertaken at present, however further mitigation measures may need to be provided and the current measures refined and updated when further information becomes available after any site investigations. Contaminated soil removal and disposal has been considered, with options presented for reuse of materials and landfill disposal. Specific quantities of waste expected from contaminated land or groundwater have not been assessed.
Proposed mitigation	**During Construction** The submission provides that: • Detailed site investigation would be undertaken with results of soil and water samples assessed. Risk assessments would be amended as necessary. • Mitigation for contamination would be adopted based on the risk assessments. • Dust and noise monitoring would be undertaken during construction. • Any required contamination remediation would be done ahead of construction work where feasible. • The scheme would use appropriate contaminant-resistant materials where necessary. • A Materials Management Plan will be produced. **During Operation** The submission states that operational practises already adopted by Gatwick Airport would be extended to the site, including storage and handling practices for contaminative materials. Other measures that have not been included in the submission but would be advisable to mitigate impacts are: • Assess the need for gas protection measures if buildings are constructed over ground gas sources (such as landfilled areas). • Undertake environmental monitoring during operational phase to assess risks

	and modify mitigation measures as necessary.
Justification and evidence	The geo-environmental report generally uses adequate information from sources including desk study and an Envirocheck report. It considers the majority of the main contamination risks and sources likely to be present on such a development. However potential impacts and mitigation measures should include the potential for ground gases to be present at the site.
Additional information requirements	Reconnaissance followed by investigations including ground gas monitoring to assess and confirm contamination in relevant areas of the site should be undertaken prior to any detailed design or construction works. This is confirmed in the submitted geo-environmental report. The site investigation should take account of the findings of the desk study and assess the potential contamination sources identified therein. Risk assessments and refinement of mitigation measures will be needed following the site investigations.

5.2.5 Waste Assessment Conclusions - Gatwick Airport Second Runway

There is a notable difference in passenger number projections, with the GAL submission estimating approximately 40% higher passenger numbers over the headline years (the GAL submission forecast is 65Mppa by 2030 and 95Mppa by 2050, compared with the Airports Commission's AoN Carbon Capped scenario 2014 of 46Mppa in 2030 and 69Mppa by 2050), (Airports Commission, 2014b). Compared against the Jacobs 2050 forecasts for 'Do Minimum', the Gatwick 2R scheme would result in an increase in operational waste of between 100% (Scenario 1) and 400% (Scenario 2). The GAL submission estimates higher operational waste arisings (16,250 tonnes of operational waste arising by 2030 compared with the Jacobs 'Do Something' estimates of 12,000 tonnes by 2030, Scenario 1), due to the differences in passenger numbers noted, and GAL's projection of 0.25 kg waste per passenger is within the range considered reasonable and utilised in the Jacobs waste forecast.

The approach for identification and management of construction and operational waste outlined by the scheme promoter is well considered, and adopts the principles of the waste hierarchy. GAL assumes (based on previous construction projects) a recycling rate of 96% of construction waste will be achieved, with the remaining 4% destined for disposal or recovery off-site. This relies on there being sufficient local/regional treatment capacity for at least 60,000 tonnes of construction and demolition waste a proportion of which is likely to contain hazardous substances. No detailed assessment has been carried out of what the projected regional capacity is likely to be once construction begins, nor has there been an assessment of current capacity.

The anticipated need for 60,000 tonnes of treatment capacity to manage projected construction and demolition waste arisings from Gatwick 2R can be considered in the context of the latest West Sussex C&D waste arisings forecasts, (West Sussex County Council, 2010) which are projected to be 1.34 million tonnes in the year 2025/26. The GLA Future Waste Arisings in London 2010-2031 study (Greater London Authority, 2010) further projects solid waste (including construction, demolition and excavation waste) arisings for all London Boroughs as being in the region of 23 million tonnes in the year 2031. In the context of wider construction and demolition waste arisings projected in these studies overall, arisings from Gatwick 2R scheme are less significant.

Assumptions used in compiling estimates for future waste arisings (0.25 kg per passenger) rely on factors such as improved public attitudes towards recycling and legislative changes that will minimise the volume of packaging placed on the market. These assumptions are difficult to quantify and are subject to levels of uncertainty and therefore there is a risk that waste arisings have been underestimated by GAL.

More detailed analysis of treatment options is possible, however, at this stage in the design process the approach taken seems reasonable.

No detailed analysis has been carried out by GAL of existing or future regional capacity to manage operational wastes, although the submission acknowledges this as being required should the scheme progress. A lot of the existing waste infrastructure included in current industry forecasts will have reached the end of its operational life and will therefore require replacement. Therefore the availability of waste treatment capacity to manage the wastes generated from future airport developments is unknown at present. Modelling by Jacobs has demonstrated however that airport waste arisings are declining due to sustainable waste management practices and waste minimisation. They will constitute only a small proportion of total waste arisings in the South East of England.

Some of the treatment routes identified for operational waste arisings from the Gatwick 2R scheme have yet to be installed in particular, the EfW capability as a tie-in to the Gatwick Energy Centre and a separate AD plant for processing organic/food waste referred to in the submission are both only proposed developments. It is reasonable to conclude that the proposed AD facility will be annexed, or close to the existing Gatwick Energy Centre, although the submission does not specify locations of proposed facilities. Consent and subsequent development of major waste facilities have been subject to challenge during their planning stages and subsequent delay and therefore delivery of these facilities cannot be guaranteed. It is suggested that as part of these plans an assessment is carried out into the level of off-site energy recovery and organic waste processing capacity available, should either of these developments prove not to be economically viable, or encounter problems with regards to obtaining planning consent and an environmental permit.

5.3 Waste Impact Assessment - Heathrow Northwest Runway

5.3.1 Assessment against waste forecasts - Heathrow Northwest Runway

Reported waste and recycling data

Data on waste generation levels and recycling performance were sourced from recent sustainability reports published by HAL and are summarised in Table 5.10.

Table 5.10 - Heathrow Airport Ltd waste generation levels and recycling performance 2008 to 2013

Year	2008	2009	2010	2011	2012	2013
Waste produced (tonnes)	29,502	26,489	24,906	26,220	26,441	26,693
Total per passenger (kg/Pax)	0.441	0.402	0.379	0.377	0.378	0.369
% Change in kg/Pax for previous year	n/a	-9.7%	-6.0%	-0.3%	0.1%	-2.5%
Waste recycled or composted (%) including Aircraft Cabin Waste	44.3%	40.6%	38.0%	29.2%	31.0%	41.7%
Sources: Heathrow Sustainability Performance Summaries 2010 to 2013						

Jacobs' model

Waste forecasts for both a 'Do Minimum' and a 'Do Something' have been drawn from the Jacobs bespoke model for the years 2030, 2040 and 2050, summarised in Table 5.11. The waste growth scenarios used in the model are summarised in Section 5.1.2.

Table 5.11 - Jacobs Waste Forecasts for Heathrow 2030, 2040 and 2050

Total per passenger (kg/Pax)	2030	2040	2050
Scenario 1 - No change in waste growth per passenger	0.369	0.369	0.369
Scenario 2 - Waste Prevention	0.284	0.284	0.284
Scenario 3 - Conservative Waste Prevention	0.321	0.321	0.321
Do minimum: High Level Traffic Forecasts - Capacity constrained, carbon capped			
Year	**2030**	**2040**	**2050**
Airports Commission AoNCCt 2014 passenger estimates	84,919,152	88,614,304	93,533,736
Waste produced (tonnes)			
Scenario 1 - No change in waste growth per passenger	31,400	32,700	34,500
Scenario 2 - Waste Prevention	24,100	25,200	26,600
Scenario 3 - Conservative Waste Prevention	27,200	28,400	30,000
With Development: High Level Traffic Forecasts - Capacity constrained, carbon capped			
Year	**2030**	**2040**	**2050**
Airports Commission AoNCC 2014 passenger estimates	109,264,920	127,879,384	134,983,696
Waste produced (tonnes)			
Scenario 1 - No change in waste growth per passenger	40,300	47,200	49,800
Scenario 2 - Waste Prevention	31,000	36,300	38,300
Scenario 3 - Conservative Waste Prevention	35,000	41,000	43,300

Table 5.12 shows the recycled tonnages by growth and recycling scenario in 2030, 2040 and 2050 for the 'Do Something' passenger estimates.

Table 5.12 - Jacobs Heathrow model with development - Summary of recycling tonnages 2030, 2040 and 2050

Recycling Scenario	Recycling (tonnes) range per annum		
	2030	2040	2050
Scenario A - No change in recycling rate (40%)	12,927 - 16,805	15,137 – 19,682	15,971 – 20,767
Scenario B - Recycling target of 70% in 2020 achieved and maintained	21,700 - 28,210	25,410 – 33,040	26,810 – 34,860
Scenarios C - Recycling target of 55% in 2020 achieved and maintained	17,050 - 22,165	19,965 – 25,960	21,065 – 27,390

In terms of recycling tonnages, all scenarios show an increasing trend in line with increasing passenger numbers.

HAL submission waste forecasts

The HAL submission predicts the number of passengers moving through the airport following the runway development to be in the region of 103Mpppa in 2030, 130Mppa in 2040 and 135Mppa in 2050. It is noted that the Resource Use appendix

(HAL, 2014) which supports HAL's main submission uses worst case passenger forecasts of 130Mppa by the year 2030, which is in contradiction to forecasts quoted above. For the purpose of this assessment, passenger forecasts contained within the main HAL submission (HAL, 2014) have been used to calculate waste volumes.

The HAL submission forecasts waste per passenger to be in the region of 0.35 kg from 130Mppa capacity onwards, which assumes improved attitudes towards recycling, and waste prevention and reduction initiatives (HAL, 2014) to improve waste performance from 0.41 kg waste per passenger in 2010. Although total waste arisings are not presented in the HAL submission, total operational waste is assumed to be 46,000 tonnes[32] per year by 2040, achieving 38,046 tonnes of recycling by the same year (a recycling performance of 83%). For the purpose of context, total operational waste generated by HAL in 2010 was 25,000 tonnes.

Assessment of HAL waste forecasts against Jacobs waste forecasts

No C&D waste estimates associated with HAL development phase are contained within the HAL submission and it has not been possible to forecast C&D waste arisings for HAL development phase at this time. This is due to the lack of available, comparable and benchmark data. Therefore the focus of this assessment relates to operational waste only.

Operational waste forecast projections developed by Jacobs have been compared against waste forecasts provided by HAL in its submission. HAL's submission projection of 0.353 kg per passenger is within in the range considered in the Jacobs model assumptions (0.280 – 0.369 kg per passenger).

The Jacobs model for the 'Do Something' position uses the Airports Commission's AoN Carbon Capped scenario 2014, passenger numbers at Heathrow airport in the region of 109Mppa in 2030, 128Mppa in 2040 and 135Mppa in 2050, with the HAL submission forecasting 103Mppa in 2030, 130Mppa in 2040 and 135Mppa in 2050.

The HAL submission forecasts passenger numbers for 2030, 2040 and 2050 are in line with (a slight difference for the year 2030). HAL forecasts 46,000 tonnes of operational waste arisings by 2040, which is consistent with Jacobs 'Do Something' estimates of 47,000 tonnes (Scenario 1) for 2040.

Compared with the Jacobs waste forecasts of the baseline 'Do Minimum', the proposed third runway for Heathrow would result in an increase in operational waste arisings between 30% and 50%, when peak capacity is reached. These tie in with differences in passenger numbers between 'Do Minimum' used in the Jacobs model, and those presented in the HAL submission for when peak capacity is reached.

The HAL submission is based on a higher recycling rate at 83% (which would be challenging to achieve) compared with the scenarios modelled by Jacobs of 55% and 70%. HAL has assumed that their increased recycling performance will be achieved by implementing a range of operational solutions. It is acknowledged that these assumptions are difficult to quantify and are subject to levels of uncertainty.

[32] 130Mppa x 0.369 kg = 46,000 tonnes

5.3.2 Assessment of Impacts during Construction Phase - Heathrow Northwest Runway

The assessment is based upon key documents submitted by HAL, including Taking Heathrow Further Volume 1 and 2, and the accompanying Waste Assessment appendices.

Table 5.13 - Avoiding waste impacts on communities and natural environment

Proposal 1	HAL proposes to design its master plan to avoid impacts on communities and the natural environment wherever possible.
Potential risks	A lack of waste forecasting data provided within the HAL submission means that impacts and management approaches to mitigation of land losses, heritage sites and greenfield/conservation-sites are difficult to substantiate based on the information available at this time. Potential noise/dust/vehicle emissions from on/off site transport are realised from wastes arising.
Applicable legislation / Guidance	Planning Act 2008. Waste (England and Wales) Regulations 2011.
Coverage in submission	Taking Britain Further - 5.1 A sustainable Heathrow, Part 05, p250.
Proposed mitigation	The submission states “We have designed our master plan to avoid impacts on communities and the natural environment wherever possible, with more detail related to water and drainage strategies including the results of the modelling undertaken to ensure that proposals work as intended including waste forecasts, to be available within one month of the submission”.
Justification and evidence	Section 5.1 within the HAL submission identifies that a report on sustainable issues at Heathrow will be available shortly after the submission and that it would include waste forecasts, however no additional detail has been provided by HAL at the time of this assessment. Clarifications were requested including waste forecasts and supporting waste data estimates, basis of estimates and assumptions that were indicated to form part of this report.
Additional information requirements	Waste forecasts and supporting waste data estimates, basis of estimates and assumptions that are indicated to form part of the proposed report on sustainability.

Table 5.14 - Re-provision of the existing EfW facility

Proposal 2	HAL proposes the re-provision of the existing Lakeside EfW facility to an adjacent site.
Potential risks	Planning or permitting difficulties in relocating the EfW on to the adjacent site specified by HAL. Insufficient space available at proposed site to practically re-locate facilities. Delays or failure to re-provision could reduce capacity to treat and manage operational waste, transport and emissions off-site could increase, as a consequence of waste being transferred further for treatment. Any loss or delay could impact on the overall regional waste treatment capacity. If Lakeside is unavailable, there could be significant strain on regional capacity and therefore resilience indicated is not guaranteed or substantiated. A formal response from Grundon Waste Management Ltd (Grundon, Waste Management, 2014), in response to the Delivery Discussion Paper (No. 7 Delivery of new Runway Capacity) (has identified concerns, which include: • Whether re-provisioning proposals have considered a site at least 15 acres (6 hectares) in size. • Impacts on current local authority and regional/national contracts[33], which are currently serviced by the facility. • Loss of high temperature incinerator for hazardous and difficult wastes, for which limited capacity exists nationally. Clarifications have been requested from HAL regarding these concerns, including: • Confirmation that the area currently presumed for EfW site re-provision is of sufficient size to accommodate the new facility. • That interim replacement EfW capacity available during the transition to the re-provisioned facility has been considered. • That a feasibility assessment of transport impact studies for the proposed EfW re-provision has been considered. • Estimated cost of re-provision, including land, planning, design, build and integration. • Evidence that consideration has been given to how the existing waste contract arrangements that Lakeside currently holds will be honoured as a consequence of site re-provisioning. • Evidence that consideration has been given to the regulatory impacts of the re-provision of the EfW site (e.g. Waste Incineration Directive, Air Quality Directive, London Plan, local planning authority Development Plan Documents.
Applicable legislation	Planning Act 2008. Environmental Permitting (England & Wales) 2010 as amended.
Coverage in submission	Taking Britain Further - Figure 5.2: Summary of Key Mitigation Measures.
Proposed mitigation	Summary of Key Mitigation Measures (Appendix 17 of the submission) – this appendix was referenced in the contents of Taking Britain Further but not supplied in the main submission. Section 6.8.4.1 Utilities, describes that 'Heathrow is well served by all major utilities, including waste….there is planned resilience built into current (services) to the existing airport'.
Justification and evidence	A copy of Appendix 17 (Summary of Key Mitigation Measures) is referred to in Figure 5.2, which summarises the submissions intentions to manage loss of the existing EfW capacity, through relocation to an adjacent site within the master plan.

[33] Desk research indicates that Councils using Lakeside (and therefore potentially impacted by any re-provision) include South East and South West Borough of Poole, Wiltshire Council, West London Waste Authority, Dorset County Council, Reading Borough Council, Bracknell Forest and Wokingham Borough Council and wider authorities in the South East and South West.

Additional information requirements	Responses to clarifications have been received from HAL, which confirms: • The assumption that the current EfW plant would be re-provisioned before the need to demolish the existing plant to make way for the development of the runway arises. This would avoid impacts on the continuity of the current operation with its consequent effects on local authorities' strategies for waste. • The party making any planning application for re-provision is not yet clear, but opportunities may exist for including the issue as associated development in any larger Development Consent Order (DCO) application for the main works. No discussions with the Planning Inspectorate (responsible for DCO applications) have as yet taken place. • Further to discussions with local authorities and local residents HAL has developed a revised plan which seeks to keep the site for the replacement plant as close to its existing location as possible. This is likely to ensure that original site selection process which was validated in the original planning application will still be broadly applicable, impacts of road traffic movements will be the same as the existing impact, and impacts on local residents, should be improved as a result of the new site being located further from Colnbrook / Poyle and (with no residential properties). • Whilst the cost of re-provision of the plant has been included in the overall budget for Commercial compensation, there are reasons of commercial confidence as to why HAL chose not to share this information at this stage. HAL has also provided an updated plan, which shows the location of the EfW re-provision, however it is not possible to determine the dimensions of the proposed location from this plan. Confirmation of the size of the site identified for re-provision must be confirmed should the scheme progress.

Table 5.15 - On-site management of construction, demolition and excavation waste

Proposal 3	HAL proposes to: • Manage the construction and demolition waste and aims to minimise the quantity of material taken off-site. • Reuse excavation wastes including reuse of all non-hazardous wastes on-site. • Treat materials that cannot be remediated, using off-site treatment methods.
Potential risks	Larger quantities of waste generated as a consequence of construction activity, or limitations on the ability to treat or reuse waste on-site, leading to potential increased noise/dust/vehicle emissions from on-site/off-site transport plus an increase in off-site vehicle movements.
Applicable legislation / Guidance	Environmental Permitting (England & Wales) Regulations 2010 (as amended). Waste (England & Wales) Regulations 2011. The Hazardous Waste (England & Wales) Regulations 2005. Waste (England and Wales) Regulations 2011. EPA 1990 Part 2A: Contaminated Land Statutory Guidance (2012). CL:AIRE Code of Practice. Landfill (England and Wales) Regulations 2002 as amended.
Coverage in submission	Taking Britain Further - 5.10.1 Our objectives, Part 05, p332. Taking Britain Further - Section 5.10.6 Managing the effects of our masterplan, Part 05, p334.
Proposed mitigation	The submission: • States that a desk-based assessment has been undertaken to establish likely effects of the scheme on existing contamination and assess potential waste reduction and management options, to reduce waste taken off-site. • Includes objectives to reuse all non-hazardous waste on-site as part of the land-raising to create various landforms. • Includes proposals for remediation of soils classified as hazardous waste, where possible, which will be reused on-site. • States that any materials that cannot be remediated will be safely disposed of off-site in line with UK legislation and Duty of Care requirements.
Justification and evidence	Geo Environmental Assessment – 4, Mitigation Strategy, Table 4.1 – covers material resource efficiency options, such as reuse of materials, in limited detail. No forecasts of waste arisings from construction or excavation phase are provided, or waste reduction and material management options which would be relevant to specific waste types. No projections are provided by HAL for potential material quantities requiring off-site disposal or assessment of off-site capacity. Clarifications were sought on intended waste reduction and material management options including approaches to achieving the aim to reduce the amount of waste that has to be taken off site for disposal.
Additional information requirements	Forecasts for waste arisings from construction and excavation phase, including any option appraisal process for management of specific waste types in accordance with waste hierarchy. Estimated forecast of materials likely to require remediation and/or disposal off-site, including surplus and method of management and assessment of available off-site capacity for managing such material. Evidence base to support projected reuse of all non-hazardous waste on-site.

Table 5.16 - Engineering and excavation of historic landfills

Proposal 4	Engineering and excavation of historic landfills is proposed as part of the mitigation strategy.
Potential risk	Limited quantification of historic landfill material requiring excavation and removal may result in underestimate of quantity and type of waste, resulting in increased noise/dust/vehicle emissions as a consequence of material being removed off-site.
Applicable legislation / Guidance	EPA 1990 Part 2A: Contaminated Land Statutory Guidance (2012), CL:AIRE Code of Practice. Waste (England & Wales) Regulations 2011. Landfill (England and Wales) Regulations 2002 as amended. Environmental Permitting (England & Wales) 2010 as amended.
Coverage in submission	Section 6.8.3.1 (Ground Conditions), Taking Britain Further, states that 'extensive (historical) extraction of sands and gravel…has been backfilled with landfill.' Section 4 (Mitigation Strategy), Geo-Environmental Assessment.
Proposed mitigation	A range of mitigation measures are included within Section 4 of the Geo-Environmental Assessment, including: • Material reuse (and appropriate permitting). • Managing waste appropriately during construction. • Completing a Materials Management Plan. • Completing an Environmental Management Plan. The submission assumes that the mitigation will be undertaken through design rather than remediation of contaminated land due to the extensive area of landfill present and associated treatment and disposal costs.
Justification and evidence	No forecast of quantities arising from waste excavation. No detailed explanation of how proposed approaches would reduce environmental impact of specific waste streams, or types of procedures which would reduce loss of agricultural land, loss of habitat or visual impact on landscape, reduce transport impacts.
Additional information requirements	Forecasts which quantify the extent to which landfills are likely to be removed or disturbed as part of the proposed scheme development.

Table 5.17 - Management of construction, demolition and excavation

Proposal 5	HAL proposes to undertake management of construction, demolition and excavation waste in accordance with a Site Waste Management Plan (SWMP).
Potential risk	Limited forecasting of waste data means that the risk of off-site disposal of construction waste cannot be fully assessed. Off-site disposal of construction waste could result in increased noise/dust/vehicle emissions as a consequence of off-site transport of material.
Applicable legislation	Waste (England and Wales) Regulations 2011.
Coverage in submission	Section 6.10.5 Construction Environmental Management Plan (CEMP), Part 06, p422.
Proposed mitigation	The submission states that a SWMP will be developed in accordance with the Sustainability Action Plan, which would seek to minimise the amount of waste disposed of to landfills and increase recycling rates of materials generated during the construction phase.
Justification and evidence	Whilst a detailed SWMP would not be expected at this stage, the submission contains: • no forecast of construction, demolition or excavation waste; • limited detail of benchmarks to justify proposed performance; and • limited detail of how waste management performance will be monitored and reported.
Additional information requirements	Waste forecast (type/how much/when) for each element of the development. Proposed benchmarking of waste management performance to ensure a high level of waste management performance is achieved. Details of how waste management performance will be monitored and reported.

General Observations

The overall consideration of the construction waste management contained within the HAL submission is limited by the absence of a detailed Construction Waste Management Plan (CWMP). No forecasting of waste arisings resulting from the construction process is contained within the document. Whilst the Geo Environmental Assessment supporting document makes reference to the need to manage waste appropriately during construction, to complete a Materials Management Plan, and mitigate the loss of agricultural soils, no further detailed plans or proposals are obvious from the documents which have been made available.

Since construction waste arisings (and therefore specific recovery mechanisms) are highly dependent on the specific scheme and the types of material that may arise, it is therefore important that the scheme promoter addresses this point.

In the absence of forecasted waste arising from the construction process, there is no suggestion of KPIs or targets which might be set for construction waste management and performance. It is further considered that the re-provision of the EfW facility could potentially impact on local waste capacity, with a number of challenges in moving the location of such capacity to an alternative location, including planning and permitting.

In summary, limited data has been provided by the scheme promoter to substantiate how key points of the assessment framework have been addressed.

5.3.3 Waste Impacts during Operational Phase - Heathrow Northwest Runway

The assessment is based upon key documents submitted by HAL, including Taking Heathrow Further Volume 1 and 2, and the accompanying Resource Use Assessment appendices.

Table 5.18 - Waste reduction and increased recycling

Proposal 6	HAL proposes to reduce waste arisings per passenger by 14% and increase recycling to at least 80% through various interventions.
Potential impact	Limited forecasting in waste arisings and recycling performance could result underestimates of the quantity of waste generated. Increased levels of waste would result in increased quantities requiring off-site treatment, increased vehicle movements and emissions.
Applicable legislation / Guidance	Waste (England and Wales) Regulations 2011.
Coverage in submission	Taking Britain Further, Volume 1 – 5.8.5, less waste per passenger, p326. Heathrow's North-West Runway – Resource Use Assessment, Appendix to 5.8, page 15.
Proposed mitigation	Implementation of waste reduction and recycling solutions to address increase in waste arisings.
Justification and evidence	The submission states that a 2020 target to recycle 70% of waste is predicted to improve to at least 80% of waste being recycled. The submission's Resource Use appendices state that (HAL, 2014) waste reduction innovations and best practice measures are expected to deliver significant reductions in per passenger waste from 0.41 kgs per passenger in 2010 to 0.35 kgs per passenger by the time the airport is operating at 130Mppa. It is acknowledged that these assumptions are difficult to quantify and are subject to levels of uncertainty. This 15% reduction is not an unreasonable assumption, as it appears in line with other airport ambitions and best practice guidance (Auckland Airport, 2013 and FAA 2013). However, no further detail or evidence was provided to support the indicated reduction. The submission states that full capacity, Heathrow can reduce waste arisings per passenger by 14% and increase recycling to at least 80% (83% with the full adoption of eight solutions) against a 2010 baseline.
Additional information requirements	Evidence to support claims that a reduction to 0.35 kg/passenger is achievable. Further clarity as to when the reduction of waste to 0.35 kg of waste will be met. Additional evidence is required to support the predicted improvement in recycling rate from the current target. Modelling data (including waste arisings and composition) and assumptions used to forecast impact of individually proposed solutions on waste reduction and recycling (including specific waste streams).

Table 5.19 - Off-site waste treatment

Proposal 7	Use of waste treatment providers is identified as the preferred option for management of operational waste, rather than additional on-site waste management capacity.
Potential risk	Any constraints in local waste management treatment capacity could result in operational waste needing to be transported greater distances, resulting in increased transport emissions and potential impacts on the regional waste treatment capacity.
Applicable legislation / Guidance	Waste (England & Wales) Regulations 2011.
Coverage in submission	Section 6.8.4 Utilities/Section 6.8.4.1 Requirements for the Proposal, Part 06, p403. The submission states that Heathrow is well-served by all major utilities including waste services.
Proposed mitigation	The submission states that "Heathrow…has not yet entered into consultation with (utilities) providers regarding responses to meeting any increased demand at the airport.
Justification and evidence	No details of utilities' resilience plans to cope with increased levels of waste generated during operational phase are contained in the submission. Lack of consultation with local waste utility providers could have implication for the local waste management capacity.
Additional information requirements	Clarify the planned resilience built into current waste treatment capacity and how will this be strengthened for the expanded capacity requirement, particularly in the event that Lakeside EfW facility is re-provisioned.

Table 5.20: Waste reduction and increased recycling

Proposal 8	HAL acknowledges how overall waste arisings will increase as a consequence of airport expansion and proposes solutions for reducing waste per passenger and improving recycling performance.
Potential risk	Higher levels of waste generation will require increased vehicle movements and emissions to transport off-site.
Applicable legislation / Guidance	Waste (England and Wales) Regulations 2011.
Coverage in submission	Heathrow's North-West Runway – Resource Use Assessment, Appendix to 5.8, page 13.
Proposed mitigation	Continued use of waste management contactors as preference over installation of on-site treatment facilities.
Justification and evidence	The submission states that: • On-site treatment facilities have been forecast to not contribute to increased recycling rates. • On-site waste treatment facilities, such as AD, require feedstock volumes greater than Heathrow's to be economically viable[34]. • Sourcing additional feedstock from external sources presents many supply chain risks. • Higher net waste arisings in a three-runway scenario also presents an opportunity for Heathrow to demand greater performance and transparency from their waste management contractors. • Over the modelling time period, the increasing prevalence of circular economy business models are likely to further improve waste arisings reduction and recycling performance at Heathrow.
Additional information requirements	Evidence base or reference information to support the assertion that on-site treatment facilities will not contribute to increased recycling. Evidence or reference information to support the assertion that on-site treatment of waste will be economically unviable. Provide evidence of how increased waste arisings present opportunities for increased performance or transparency from waste contractors, or why current waste arisings should offer lesser levels of performance or transparency.

Table 5.21: Reducing waste arisings and increasing recycling

Proposal 9	Increased waste arisings are anticipated as a consequence of increased passenger capacity.
Potential risk	Increased off-site movement of waste (dust/noise/emissions), as on-site treatment of waste not proposed.
Applicable legislation / Guidance	Waste (England and Wales) Regulations 2011.
Coverage in submission	Heathrow's North-West Runway – Resource Use Assessment, Appendix to 5.8, page 24.
Proposed mitigation	The submission details a number of solutions which are proposed to tackle reduce waste arisings and increase recycling, which include: • Decreasing newspapers and magazines at gates; • Collaboration with shops and retailers to minimise waste at source; • Sustainable procurement; • Improved in-office communication for staff; and • Improved in-terminal communications for staff, targeting an increase of in-terminal non-office dry recycling.

[34]AD cannot be used as a waste management option for international catering waste, under Animal By-Product Regulations https://www.gov.uk/handling-and-disposing-of-international-catering-waste

Justification and evidence	The submission identifies: • Collaborate with shops and retailers to reduce packaging, Sustainable procurement to address waste packaging. • In-office communication for staff to increase recycling. • In-terminal communications to increase waste segregation.
Additional information requirements	The HAL submission does not explain whether newspapers/magazines will be phased out as a consequence of anticipated reduced demand, or whether the airport will introduce a process of phasing out newspapers/magazines regardless of demand. Additionally no evidence is provided that indicates demand for newspapers/magazines is declining. Waste arising (total waste and composition) data has not been provided within the submission, therefore it is unclear what type of collaboration between shops and retailers may be appropriate. No details have been provided of how specifically sustainable procurement will impact on waste reduction or recycling. The Scheme promoter does not substantiate how a HAL sustainable procurement policy of its own impacts on HAL's suppliers/supply chain, with respect to third runway scheme objectives and targets for waste or recycling. Additional evidence is required to substantiate the assertion that reporting of waste recycling performance will improve pre-segregation of paper and improve recycling levels. In-terminal waste data should be provided (total arisings, composition, recycling rates, from 2010 baseline to 2013).

General Observations

The overall approach to management of waste during the operational phase of the third runway outlined within the HAL submission, particularly beneficial use of wastes and application of the waste hierarchy, is forward thinking and in line with national good practice. The application of solutions which reduce waste at source and increase levels of recycling appear to be appropriate

HAL's submission projection of 0.353 kg per passenger is within in the range considered in the Jacobs model assumptions (0.280 – 0.369 kg per passenger). Compared with the Jacobs baseline forecasts, the proposed third runway for Heathrow would result in an increase in operational waste arisings between 30% and 50%, compared with a 'Do Minimum' scenario. This is consistent with the projected increases in passenger numbers.

5.3.4 Contamination assessment - Heathrow Northwest Runway

The following section assesses the submission's evaluation of contaminated ground and groundwater issues and how any contamination may impact the construction and operational phases of the scheme. Where an assessment of potential risks (or impacts) has been made, the terminology used to describe the severity of such impacts has been reproduced here.

The following table summarises the submission's coverage of the baseline conditions with respect to potential contaminant sources, receptors and pathways, the potential impacts and mitigation measures proposed and provides an assessment of the adequacy of the information provided. Where it is considered that pertinent information is lacking, an assessment of the additional information required is given.

Table 5.22 – Heathrow NWR contaminated land assessment

Baseline	**Potential Contamination Sources** The following information is based on information given in the HAL submission unless stated otherwise. Potential Contamination sources are identified as follows: There are two active landfills and 16 historic landfills within the footprint of the site. There is the potential for gas migration, contaminated fill material and perched water. Eleven pollution incidents have been recorded, with five being significant. Oils, chemicals, inert material/waste and miscellaneous pollutants are included. The time periods of these incidents have not been stated in the submission. Press reports from September 2010 indicate that the Environment Agency was informed of a leak in the fuel support pipeline to airport stands in Heathrow Terminal 1 building, which resulted in at least 139,000l of aviation fuel contaminating the Taplow Gravels groundwater. The following historic land uses could be potential contamination sources: Active and inactive landfills, fire engine house, road research laboratory, gravel pits and other pits, sand and ballast works, energy from waste plant, disused railway, fuel stations, several large distribution warehouses, BPA fuel pipeline site, piggeries and large drains. **Potential Contamination Pathways** • Direct human contact with soil, dust and groundwater; • Build-up of gases in enclosed spaces; • Migration of contaminants to groundwater; • Migration of contaminants to surface water. **Potential Contaminant Receptors** Superficial deposits include Alluvium, Langley Silt Member and River Terrace Deposits. The bedrock is the London Clay Formation. The site is within an Adopted Greenbelt area. **Ground water** The River Terrace Deposits are classed as a Principal Aquifer, and the Alluvium is a Secondary A Aquifer. The bedrock, London Clay, is classed as Unproductive Strata. Groundwater vulnerability is medium to high due to permeable soils. There are no source protection zones[35] (SPZ) within the site boundary. There is an SPZ1 100m to the north west of the site. The site is within a Nitrate Vulnerable Zone. **Surface water:** There are four rivers in the western half of the site flowing north to south. All four rivers have moderate ecological quality. In zones 1 and 3 there are numerous ponds, lakes and in-filled gravel pits.
Potential risks	**Potential Contamination Impacts During Construction** During the construction phase, construction workers are likely to come into direct contact with contaminated made ground, particularly in areas of landfill and areas of excavation, tunnelling and levelling. However risks to construction and maintenance workers have been assessed as low, assuming that appropriate Personal Protective Equipment (PPE) is used during intrusive works, monitoring of dust and vapour is undertaken and good hygiene is used as appropriate. Risks to off-site residents are considered to be moderate. Given the scale of the development and the associated disturbance of landfill materials, it is likely that

[35] Defined by the Environment Agency as wells, boreholes and springs used for public drinking water supply.

	dusts and odours may be produced. Risks during construction are generally assessed as low to moderate and mainly relate to creation of pathways due to potential piling and drainage, and potential spills and leaks from equipment. It is considered that these risks can be managed and mitigated by ensuring good construction practice through use of a Construction Environmental Management Plan. **Potential Contamination Impacts During Operation** A low risk to human health during the operational phase will be associated with any underground structures (e.g. tunnels and the potential presence of ground gas) based on the assumption that appropriate ground gas mitigation measures and ventilation if required will be installed during construction. During operation, due to the site use as an operational runway, spills, leaks and de-icing are likely to pose the greatest risk of contamination. However, recycling of de-icer materials will be undertaken as part of plans to more effectively manage de-icer use on the airport. Risks to surface water bodies can be mitigated by use of appropriate drainage. Rivers will have been either culverted or diverted off site.
Applicable legislation	The regulatory definition of contaminated land is contained within Part 2A of the Environmental Protection Act (EPA) 1990 (Defra, 2012). The relevant national planning policy and associated guidance with respect to land contamination are presented under Section 11 of The National Planning Policy Framework (Department for Communities and Local Government (DCLG), 2012) - Conserving and enhancing the natural environment. In addition to the above, the Water Resources Act (1991) provides the Environment Agency with powers to enforce action to address pollution of controlled waters.
Coverage in submission	The contamination assessment submitted for this proposal is well thought out and uses relevant sources of information. A geo-environmental assessment report is provided which covers the relevant topics. The report was completed using desk study information and a site walkover. The information appears adequate, however an intrusive ground investigation will be needed to confirm and assess contamination within the site. The risks and mitigation measures are appropriate for the study undertaken at present, however these may require updating and refining after any site investigations and when further information becomes available about specific construction requirements at the site. Specific quantities of waste from contaminated land or groundwater have not been assessed.
Proposed mitigation	**During Construction** • Materials re-use (with appropriate permitting). • Foundation works risk assessment. • Engineered drainage with spill capture. • Use of correct materials in the construction of any potable water pipes and other structures. • Ensure appropriate H&S measures during construction (Including but not limited to use of appropriate personal protective equipment, respiratory protective equipment, confined spaces working, good site hygiene etc). • Construction Environmental Management Plan (CEMP) including but not limited to dust suppression, odour management, environmental monitoring, storage of materials, management of surface water and runoff etc). • Undertake environmental monitoring during the construction phase. • Manage waste appropriately during construction. • Complete a materials management plan for the site works which would include procedures for sustainable use of soils on site where possible. Compensation may be required for the loss of grade 1 or 2 agricultural soils. **During Operation** • Gas protection measures for buildings and confined spaces (if constructed over former landfills/ground gas sources).

	• Infiltration drainage (for un-impacted surface and roof runoff only) only through unworked ground with no significant contamination. • Environmental Management Plan for Operational Phase (including spill procedures/capture, fuel storage, contained de-icing, drainage). • Undertake environmental monitoring during the operation phase.
Justification and evidence	The baseline given in the submitted proposal appears to be robust with relevant information considered. Risks and mitigation have been included in the report and these appear adequate for the stage of the proposal.
Additional information requirements	Site investigations including ground gas monitoring to assess and confirm contamination in relevant areas of the site should be undertaken prior to any construction works. This is confirmed in the submitted geo-environmental report. Risk assessments and refinement of mitigation measures will be needed following the site investigations.

5.3.5 Waste Assessment Conclusions - Heathrow Northwest Runway

HAL passenger number forecasts for 2030, 2040 and 2050 compare favourably with Airports Commission Demand Forecasts over these same headline years (a slight difference for the year 2030). HAL forecasts 46,000 tonnes of operational waste arisings by 2040, which is consistent with Jacobs 'Do Something' estimates of 47,000 tonnes (Scenario 1) for 2040.

As a result of reviewing the HAL submission against the Appraisal Framework provided by the Airports Commission, (Airports Commission, 2014a) it is considered that the scheme promoters have addressed construction wastes associated with the development but only in outline.

Consideration and approaches to the management of construction waste arising as a consequence of the development contained within the HAL submission is limited by the absence of a Site Waste Management Plan. A lack of construction waste arisings forecasts means that proposals for managing waste materials effectively and sustainably are essentially generic. Supporting technical appendices documents identify the need to manage waste appropriately during construction, with commitments to completing a Materials Management Plan also referenced; however no further detailed plans or proposals have been made available at the time of writing.

In the absence of forecasted waste arising from the construction process, there is no suggestion of KPIs or targets which would support aspirations for waste prevention, reuse, recycling and diversion from landfill.

Responses to clarifications have been received from HAL, confirming the assumption that the current Lakeside EfW plant would be re-provisioned before the need to demolish the existing plant to make way for the development of the runway arises. This would avoid impacts on the continuity of the current operation with its consequent effects on local authorities' strategies for waste.

Proposals by HAL to develop a revised plan which seeks to keep the site for the replacement EfW plant as close to its existing location as possible is likely to ensure that impacts of road traffic movements from waste will be similar to existing traffic impacts (although traffic movements will increase as a consequence of increased operational waste being taken off-site). HAL has also provided an updated plan, which shows the location of the EfW re-provision, however it is not possible to determine the dimensions of the proposed location from this plan. Confirmation of the size and suitability of the site identified for re-provision would need to be confirmed should the scheme progress.

The submission acknowledges that HAL is yet to enter into discussions with existing and additional waste management providers, which would more robustly inform the resilience of existing waste management capacity to handle the increased quantities of waste generated as a consequence of increased operations from a third runway. However, the potential re-provisioning of Lakeside EfW facility could have a significant impact on the current waste treatment capacity and the practicality (i.e. obtaining the relevant permissions within appropriate timescales) and implication of this have not been considered in the submission. It is suggested that further clarity is needed on the resilience and availability of local and regional waste management capacity, to manage increased operational waste arising from the Heathrow NWR scheme.

HAL proposes to reduce waste arisings per passenger by 14% and increase recycling to at least 80% through various interventions, reducing waste per passenger to 0.35 kg. The overall approach to management of waste during the operational phase of the third runway outlined within the HAL submission, particularly beneficial use of wastes and application of the waste hierarchy, is forward thinking and in line with national good practice. The application of solutions which reduce waste at source and increase levels of recycling appear to be appropriate, however the assumptions have not been substantiated and are therefore subject to a level of uncertainty. Evidence is therefore required to support claims that a reduction to 0.35 kg/passenger is achievable.

Detailed compositional waste data has not been provided as part of the submission. The absence of such data means it is difficult to scrutinise the forecasted impacts on waste reduction and recycling in more detail.

5.4 Waste Impact Assessment -Heathrow Extended Northern Runway

5.4.1 Assessment against waste forecasts - Heathrow Extended Northern Runway

Reported waste and recycling data

Data on waste generation levels and recycling performance were sourced from recent sustainability reports published by HAL and are summarised in Table 5.23.

Table 5.23 - Heathrow Airport Ltd waste generation levels and recycling performance 2008 to 2013

Year	2008	2009	2010	2011	2012	2013
Waste produced (tonnes)	29,502	26,489	24,906	26,220	26,441	26,693
Total per passenger (kg/Pax)	0.441	0.402	0.379	0.377	0.378	0.369
% Change in kg/Pax for previous year		-9.7%	-6.0%	-0.3%	0.1%	-2.5%
Waste recycled or composted (%) including Aircraft Cabin Waste	44.3%	40.6%	38.0%	29.2%	31.0%	41.7%
Sources: Heathrow Sustainability Performance Summaries 2010 to 2013						

Jacobs' model

Waste forecasts for both a 'Do Minimum' and a 'Do Something' have been drawn from the Jacobs bespoke model for the years 2030, 2040 and 2050, summarised in

Table 5.24. The waste growth scenarios used in the model are summarised in Section 5.2.1.

Table 5.24 - Jacobs Waste Forecasts for Heathrow 2030, 2040 and 2050

Total per passenger (kg/Pax)	2030	2040	2050
Scenario 1 - No change in waste growth per passenger	0.369	0.369	0.369
Scenario 2 - Waste Prevention	0.284	0.284	0.284
Scenario 3 - Conservative Waste Prevention	0.321	0.321	0.321
Do minimum: High Level Traffic Forecasts - Capacity constrained, carbon capped			
Year	**2030**	**2040**	**2050**
Airports Commission AoNCC 2014 passenger estimates	84,919,152	88,614,304	93,533,736
Waste produced (tonnes)			
Scenario 1 - No change in waste growth per passenger	31,400	32,700	34,500
Scenario 2 - Waste Prevention	24,100	25,200	26,600
Scenario 3 - Conservative Waste Prevention	27,200	28,400	30,000
With Development: High Level Traffic Forecasts - Capacity constrained, carbon capped			
Year	**2030**	**2040**	**2050**
Airports Commission AoNCC 2014 passenger estimates	109,824,896	123,550,160	128,614,152
Waste produced (tonnes)			
Scenario 1 - No change in waste growth per passenger	40,500	45,600	47,500
Scenario 2 - Waste Prevention	31,200	35,100	36,500
Scenario 3 - Conservative Waste Prevention	35,200	39,600	41,200

Table 5.25 shows the recycled tonnages by growth and recycling scenario in 2030, 2040 and 2050 for the 'Do Something' passenger estimates.

Table 5.25 - Jacobs HH model with development - Summary of recycling tonnages 2030, 2040 and 2050

Recycling Scenario	Recycling (tonnes) range		
	2030	2040	2050
Scenario A - No change in recycling rate (40%)	13,010 - 16,889	14,637 – 19,015	15,221 – 19,808
Scenario B - Recycling target of 70% in 2020 achieved and maintained	21,840 - 28,350	24,570 – 31,920	25,550 – 33,250
Scenarios C - Recycling target of 55% in 2020 achieved and maintained	17,160 - 22,275	19,305 – 25,080	20,075 – 26,125

HH submission waste forecasts

The HH submission has calculated waste forecasts assuming that the development will become fully operational in 2023. However, it is more likely that the development will not operate at full capacity until 2050. This view is justified on the basis that the submission's own passenger forecasts (Updated Scheme Design, Section 2.4, Figure 2.5), which show a staggered growth in passenger numbers of 84Mppa in 2023 (i.e. the earliest date the runway extension could become available) through to 130Mppa by 2050. For the purpose of our assessment, we assume that the development will be fully operational in 2050 with 130Mppa.

The HH submission uses the document *"A focus on waste – towards a Sustainable Heathrow" (2011)* as a basis for the quantity of waste expected to be generated per passenger. This document reports that an estimated 110,000 tonnes of waste was generated by Heathrow Airport in 2007. This is an estimate for all operational waste, with around 25% of this managed through the HAL waste contract and the remainder by individual companies through other contracts. The scheme promoter has calculated that based on 66 million passengers in 2011, the 110,000 tonnes would equate to 1.6 kg waste per passenger. By taking the view that all operational waste should be considered (instead of just the 25% of waste managed through the HAL waste contract), waste forecasts included within the HH submission are notably higher than forecasts contained within the Jacobs model (1.6 kg waste per passenger, compared against Jacobs waste per passenger forecasts of 0.28 – 0.37 kg waste per passenger, Table 24).

Using the passenger forecasts within the submission and the assumption of 1.6 kg of waste produced per passenger per year, estimated waste generation for the development (excluding construction waste) would be as summarised in Table 5.26.

Table 5.26 - HH assumed waste generation 2030, 2040 and 2050

Year	2030	2040	2050
Forecasted passenger numbers (millions)	106	122	130
Estimated waste generation (tonnes)	169,600	195,200	208,000

Assessment of HH waste forecasts against Jacobs waste forecasts

No C&D waste estimates associated with HH development phase are contained within the HH submission (see Section 5.2). Due to limitations (noted above) it has not been possible to forecast C&D waste arisings for HAL development phase at this time, due to the lack of available, comparable and benchmark data, and therefore the focus of this assessment relates to operational waste only.

Waste forecasts developed by Jacobs have been compared against the HH submission. Whilst there is no waste prevention target within the HH submission, the recycling target of 70% is the same as the maximum recycling performance for the Jacobs model Scenario B (Table 5.25).

In order to compare the submission to the Jacobs forecast, waste not managed through the HAL waste contract would need to be excluded. HH's projection of 1.6 kg per passenger is based on all existing operational waste at the Airport. To overcome this inconsistency, the impact of increased passenger numbers as a result of the HH development was modelled using the Jacobs assumptions for waste per passenger, which use historical HAL waste contract data up to 2013. Table 5.27 shows the estimated increase in operational waste arisings from the HH development based on the above assumption and the assumption that waste per passenger remains constant over the time period.

Operational waste arisings provided by HH compare favourably with the forecasts produced by Jacobs for 'Do Something'. HH forecasts passenger numbers for 2050 as 130Mppa, which compares favourably with Airports Commission's AoN Carbon Capped scenario 2014 of 129Mppa in the same year, (Airports Commission, 2014b). Similarly, HH forecasts 48,000 tonnes of operational waste arisings by 2050, which is identical with Jacobs 'Do Something' estimate of 48,000 tonnes (Scenario 1).

Table 5.27 - Estimated[36] HH operational waste arisings 2030, 2040 and 2050

Year	2030	2040	2050
Forecasted passenger numbers (million)	106	122	130
Estimated waste generation (tonnes)	39,100	45,000	48,000

5.4.2 Waste Impacts during Construction Phase – Heathrow Extended Northern Runway

The assessment is based upon key documents submitted by HH, including Heathrow Expansion Updated Scheme Design, Stage 2 submission: Attachment 5-1 (technical notes), Stage 2 Submission: Attachment 5-1 (Addendum), and HH response to clarifications.

Table 5.28 - Reuse of materials on-site

Proposal 1	The HH submission proposes the reuse of clean excavated material soils on-site (topsoil and agricultural soils), and importation of fill material to site.
Potential risk	Loss of agricultural land, loss of landscape character and heritage assets, ecological disturbance, noise/dust/vehicle emissions from moving clean excavated material on-site from point of excavation to area of stockpile and onto to point of use, on and off-site transport of surplus material, risk of surface water contamination from stockpile run off. The excavated materials potentially contain contamination.
Applicable legislation / Guidance	CL:AIRE Code of Practice. EPA 1990 Part 2A: Contaminated Land Statutory Guidance (2012). Waste (England & Wales) Regulations 2011 (Duty of Care requirements). Note - If there is no intent to discard these materials and they are used on-site, materials are unlikely to be legally defined as waste. Code of Practice for contamination would still apply.
Coverage in submission	Attachment 5-1 Construction Phase, Section 8.4.2.1 (page 263). Attachment 5-1, Excavation waste, 8.5.2.1 (page 265). Updated Scheme Design, Section 5.5.8/Attachment 5-1, 8.5.2.1. Attachment 5-18.4.2.1, page 264.
Proposed mitigation	The HH submission refers to the following:- Development of an integrated design approach (IDA), referenced in Section 5.5.8 (Place, Waste) of the HH submission, however not referenced elsewhere in the submission. Excavated topsoil and agricultural subsoil will be reused as fill where reasonably practicable and close to the point of excavation as practicable. Geo-environmental (contaminated land) investigations, including desk study, historical site review, soil analysis, risk assessments to confirm excavated materials are clean and uncontaminated. Preparation of a CL:AIRE Code of Practice Materials Management Plan (MMP). Agreed locations of material stockpiles will be included in the WMP along with monitoring requirements. Surplus excavated material from other developments in London and South East

[36] Adjusted to take account of inconsistency between the waste baseline data projections and the operational waste forecast contained within the HH submission.

	would be a source of fill material. This could potentially include High Speed 2 (HS2), Thames Tideway Tunnel or the Northern Line Extension projects which could lessen impact on agricultural or green field excavation of materials.
Justification and evidence	No documentation was submitted relating to the IDA, geo-assessment or MMP. No further evidence was available at the time of writing. There is no commitment from the scheme promoter identified within the submission in relation to fill materials at this stage of the process.
Additional information requirements	Whilst the submission contains mitigation measures on how to reduce clean top soils to be managed as waste, the submission does not explain what the environmental impacts of the reuse activities will be and how they will be mitigated. Additional information would include output from geo-environmental assessment, IDA and MMP required, outline diagrams to illustrate where excavation of soils will be necessary, and analysis of the environmental impact of excavation. Further evidence required to quantify fill materials and number of vehicle movements that could to be required in order to transport material to site.

Table 5.29 - Treating and managing contaminated soils

Proposal 2	The HH submission proposes treating and managing contaminated soils on-site and off-site.
Potential risk	Noise/dust/vehicle emissions from moving soils on-site from point it arises/to treatment site/to point of use, off-site transport of unsuitable soils. Surface/ground water contamination from soil remediating sites/disturbed soils, human health through direct contact and inhalation of substances in contaminated soils.
Applicable legislation / Guidance	Environmental Permitting (England & Wales) Regulations 2010 (as amended). Waste (England & Wales) Regulations 2011. The Hazardous Waste (England & Wales) Regulations 2005. Waste (England and Wales) Regulations 2011. EPA 1990 Part 2A: Contaminated Land Statutory Guidance (2012). CL:AIRE Code of Practice. Landfill (England and Wales) Regulations 2002 as amended.
Coverage in submission	Section 8.5.2.1 Excavation Waste, Attachment 5.-1 & Section 5.5.8. Updated Scheme Design (page 106). Attachment 5-1, Construction - 2.7 Assessment and Mitigation, Disturbance of landfills, 2.7.5.
Proposed mitigation	A Materials Management Plan (MMP) will be prepared to set out how suitable excavated materials will be used on-site (Updated Scheme Design, page 106). Updated Scheme Design as the preferred option. Any residual waste will be transported off-site. Material than cannot be reuse on-site or elsewhere may need to be disposed of to landfill.
Justification and evidence	At this point in the process, a geo-environmental (contaminated land) investigation has not been undertaken. Consequently, the submission does not determine the extent and nature of any contamination, and hence whether material is suitable for reuse or if remediation is required (and what this remediation would entail).
Additional information requirements	If on-site treatment/remediation is required, the impact of this treatment would need to be identified and how it would be mitigated including calculation of the quantities of material that require treatment. This information should be contained within the MMP. The MMP should link to the following other mitigation documents proposed by the scheme promoter: • WMP for construction;

	• Safe working procedures for working with potentially contaminated soils; and • Construction Environmental Management Plan (Appendix E of Attachment 5-1).

Table 5.30 - Management of demolition waste

Proposal 3	The HH submission proposes crushing, segregating and on-site reuse of demolition waste, with segregation, bulking and storage of construction waste on-site; before transporting waste off-site to achieve high levels of recycling and recovery.
Potential risk	Noise/dust from dismantling / crushing / segregating, risk to surface and ground water contamination through run/off or inappropriate storage of waste, vehicle emissions on-site, direct contact and inhalation of substances in demolition waste (e.g. asbestos). Increased transportation and disposal of material at licensed facilities (e.g. landfill) if reuse, recycling and recovery targets are not achieved.
Applicable legislation / Guidance	Waste (England and Wales) Regulations 2011. Mayor of London's Business Waste Strategy (2011).
Coverage in submission	Section 5.5.8 and in Attachment 5-1, Section 8.4.2.1. Attachment 5-1, Section 5.4.3 Calculating Construction Emissions. Attachment 5-1, Construction and Demolition waste, 8.5.2.2. Updated Scheme Design, page 106. Construction Environmental Management Plan, Appendix E.
Proposed mitigation	Mitigation measures proposed for demolition waste detailed in the submission include reuse of demolition rubble on-site. Demolition waste mitigation measures would be included in the Waste Management Plan (WMP), but no further detail is provided. The submission also details:- • Development of WMP to reflect principles of waste hierarchy, to include guidance on waste prevention, segregation, storage, handling, transportation, reuse, recycling, treatment and disposal of specific waste stream. • WMP will include the following subjects: Introduction; Project Description, Management Arrangements, Waste Management Arrangements[37].
Justification and evidence	No information is provided on estimated requirements for reuse of demolition waste on-site and how it would be covered in the WMP. The 97% target is based on performance achieved in the development of the Heathrow Terminal 5. 95% diversion of construction/demolition waste from landfill also form part of credit requirements under BREEAM, which are often achieved on construction schemes. Since previous airport construction projects have achieved recycling levels in excess of 95%, it is therefore conceivable that a target of 97% could be achieved, however the submission does not contain any forecasts for the quantity and type of waste that will be produced from the development. The lack of sufficient data to quantify and itemise reuse, recycling and recovery of waste materials arising through construction supports our assessment that site-specific requirements for waste have not been determined at this stage of the process.
Additional information requirements	A separate forecast for demolition waste (type/how much/when), the potential for reuse on-site, how material unsuitable for reuse. Waste forecast for each element of the development i.e. for the runway extension, rail interchange, road surface access changes, and terminal building development. Forecast for the different types of construction waste i.e. workforce waste, new build activities, demolition.

[37] Response to clarifications

	Forecast of areas of development where construction wastes materials could be utilised in new construction and identify secondary material specifications that are required. Evidence for achievement of 97% waste diversion rate. Identification of all impacts associated with the segregation, bulking and storage of waste and how these would be mitigated. Assessment of waste quantities that would require transporting off-site for recycling & recovery, and how road transport impacts would be reduced. Development of the WMP to cover separately all wastes produced during construction phase. Expansion of the Construction Environmental Management Plan to include environmental impacts other than just water.

General Observations

The overall consideration of the construction waste management contained within the HH submission is limited by the absence of a Construction WMP. There is no draft Construction WMP in the submission, only a list of proposed headings and brief overview of content at this stage of the proposal. Furthermore, the scheme promoter does not demonstrate how the construction WMP will separately cover excavation, demolition and construction wastes generated from the new build elements and workforce.

Since construction waste arisings (and therefore specific recovery mechanisms) are highly dependent on the specific scheme and the types of material that may arise, it is therefore important that the scheme promoter addresses this point.

There is limited evidence on how the targets proposed for waste management can be met. No supporting waste forecasts for construction and demolition wastes are contained for each element of the proposed development, with no supply/demand assessment for recycling/composting waste management capacity provided, to evidence what facilities will be required on and off-site. Neither does the submission contain a contamination assessment.

The environmental impacts of waste management on place are not identified in the submission (either within Section 8 of the Attachment 5-1, or within the Updated Scheme Design. There is a proposed Construction Environmental Plan where the environmental impact of construction wastes on water quality is acknowledged. Given then there is no WMP currently and the Construction Environmental Plan is limited to water impacts of waste management, it is not possible to conclude if the WMP will successfully mitigate the environmental impacts.

5.4.3 Waste Impacts during Operational Phase – Heathrow Extended Northern Runway

The assessment is based upon key documents submitted by HH, including Heathrow Expansion Updated scheme design, Stage 2 submission: Attachment 5-1 (technical notes), Stage 2 Submission: Attachment 5-1 (Addendum), HH response to clarifications.

Table 5.31 - Use of existing waste facilities for the management of increased waste

Proposal 4	The HH submission proposes the use of existing waste facilities for the management of increased waste arisings as a result of additional passengers at the airport.
Potential risk	Quantities of operational waste produced are greater than forecast resulting in noise from moving and depositing materials in containers for recycling/composting/recovery, odour & litter from storage of waste, risk of accidental spillage of hazardous wastes (e.g. cleaning/maintenance fluids), emissions to air and noise from vehicles transporting waste on-site and off-site.
Applicable legislation / Guidance	Waste (England and Wales) Regulations 2011 (Waste hierarchy). Heathrow Airport target of 70% recycling of waste by 2020.
Coverage in submission	Attachment 5-1, Operational Phase, page 264. Basis of forecast is "A focus on waste – towards a Sustainable Heathrow" (2011). Attachment 5-1, addendum, page 53.
Proposed mitigation	It is expected that the current approach to managing Heathrow's operational waste would continue, with additional waste resulting from the Heathrow ENR scheme managed via the HAL waste contract. Materials will be segregated and EfW technology will be utilised. This will ensure that the targets outlined above are met. Lakeside EfW will be used to manage international catering waste.
Justification and evidence	The HH submission states that waste produced would be 1.6 kg[38] per additional passenger, (HAL, 2011). When the development is fully operation it is expected to receive 130Mppa (2050). This will increase waste quantities from an estimated 110,000 tonnes in 2011 to 208,000 tonnes. Even accounting for just waste that would be directly under control of a HAL contract as identified in Section 4.1, the additional quantities of waste cannot be guaranteed to be treated through existing waste contracts as Jacobs understands a number of the these facilities, for example Lakeside EfW to be at or near capacity. The waste sections of the submission have used 2023 as the date for when the maximum passenger numbers will be achieved. This does not match the passenger forecast in Section 2.4 of the Updated Scheme Design. Waste from proposed development will be managed by HAL's contractors or subject to the influence of HAL's sustainability policies, and will be similar in type to that currently managed.
Additional information requirements	Only a quarter of Heathrow's waste was managed through the HAL contract, of which 50 % is managed via the EfW facility. Heathrow Airport has set a target of 70% recycling of waste by 2020. If a 70% recycling rate is the target then alternative waste management arrangements will need to be made to increase waste segregation and recycling. Confirmation is required that the existing HAL contract can manage the increased waste quantities in the proportions proposed by the HH development.

[38] The HH submission uses the document *"A focus on waste – towards a Sustainable Heathrow" (2011)* as a basis for the quantity of waste expected to be generated per passenger. This document reports that 110,000 tonnes of waste was generated by Heathrow Airport in 2011 (i.e. total quantity of waste produced). The scheme promoter has calculated that based on 66 million passengers in 2011, the quantity of waste per passenger was 1.6 kg

Table 5.32 - Use of existing facilities for the management of non-recyclable waste

Proposal 5	The HH submission proposes the use of existing facilities for the management of non-recyclable wastes.
Potential risk	Modifications to surface access, resulting in noise/dust/vehicle emissions from on-site and off-site transport of material, human health, litter control, on-site treatment emissions.
Applicable legislation / Guidance	Animal By-products Regulations
Coverage in submission	Attachment 5-1, page 267, 268.
Proposed mitigation	EfW facility will be utilised to manage residual wastes and international catering wastes.
Justification and evidence	Existing practice and close proximity of Lakeside EfW.
Additional information requirements	Whilst the submission indicates that this facility would continue to be used during the development of the HH scheme, the modifications to surface access and full consideration of the expanded airport may have a significant impact on access or even re-provision of the facility. Contingency arrangements maybe required should this facility be closed temporarily or permanently.

Table 5.33 - Management of organic waste on-site

Proposal 6	The HH submission proposes on-site waste treatment facilities for organic waste.
Potential risk	Odour from the storage of organic waste prior to treatment, risk of surface water contamination from uncontrolled run off from storage areas, risk of vermin (e.g. birds, rodents), emissions to air/water from the treatment facility, storage and usage of output from facility.
Applicable legislation / Guidance	Waste (England and Wales) Regulations 2011. Mayor of London's Business Waste Strategy (2011).
Coverage in submission	Attachment 5-1, Sustainability, 10.2.4.2 Operational Phase.
Proposed mitigation	No information provided on how environmental impacts of these facilities would be mitigated.
Justification and evidence	No information provided at this stage, limited to how these facilities 'could' contribute to sustainability and the need for feasibility studies.
Additional information requirements	The requirements for these facilities would become clearer once forecasts for waste arisings by waste type, quantity and location are undertaken. This information would be required for any feasibility study.

General Observations

In summary, the assessment of operational waste by HH is limited in content. There is an underlying assumption that it will be possible to extend the current approach to waste management at Heathrow to the proposed development. Whilst this assumption appears reasonable, it is not substantiated within the submission, with evidence to support the mechanisms by which it will be managed. Therefore, there is limited evidence at this stage to assess if this is achievable.

In addition, the availability of suitable recycling/composting and non-hazardous waste treatment capacity to handle the forecasted operational waste quantities is absent.

5.4.4 Contamination assessment - Heathrow Extended Northern Runway

The following section assesses the submission's evaluation of contaminated ground and groundwater issues and how any contamination may impact the construction and operational phases of the scheme. Where an assessment of potential risks (or impacts) has been made, the terminology used to describe the severity of such impacts has been reproduced here. The following table summarises the submission's coverage of the baseline conditions with respect to potential contaminant sources, receptors and pathways, the potential impacts and mitigation measures proposed and provides an assessment of the adequacy of the information provided. Where it is considered that pertinent information is lacking, an assessment of the additional information required is given.

Table 5.34 - HH contaminated land assessment

Baseline	Baseline conditions have not been assessed in the HH submission. The following information is based on information made publically available via the Environment Agency What's in Your Backyard (EA,2014)' website and the "Magic"(Magic website, 2014) website. Further assessment will need to be undertaken to provide accurate and up to date information. Heathrow Hub – Airport scheme **Potential Contamination Sources** It is likely that the scheme will be impacted by numerous historic landfills and several historic industrial activities. Press reports from September 2010 indicate that the Environment Agency was informed of a leak in the fuel support pipeline to airport stands in Heathrow Terminal 1 building, which resulted in at least 139,000l of aviation fuel contaminating Taplow Gravels groundwater. **Potential Contamination Pathways** • Direct human contact with soil, dust and groundwater; • Build-up of gases in enclosed spaces; • Migration of contaminants to groundwater; and • Migration of contaminants to surface water. **Potential Contaminant Receptors** Superficial: Alluvium with the possibility of the Langley Silt Member, Shepperton Gravel Member and Lynch Hill Gravel Member. Bedrock: London Clay Formation **Groundwater:** Superficial: Principal aquifer, Unproductive Strata. Bedrock: Unproductive Strata. The site is not within a groundwater protection zone. Two groundwater abstraction licences are listed on the Environment Agency website. **Surface water:** One surface water abstraction licence is listed. The east of the site is within a surface water nitrate vulnerable zone.
Potential risks	The impacts below are based on information provided in the submission as well as impacts that should be considered in further submissions. Impacts will need to be updated following geo-environmental investigations. **Potential Contamination impacts during construction** Construction workers are likely to come into direct contact with contaminated soil

	during the construction phase. This risk is considered low, depending on what contamination is found to be present during desk study review and site investigation. Correct personal protective equipment should be worn to militate against this. Risks to the environment are mainly the creation of pollution pathways, as well as potential spillages of harmful substances. **Potential Contamination impacts during Operation** Risks of contamination will be largely due to spillages of hazardous materials used during operation and the potential presence of ground gases. Appropriate mitigation measures should be implemented during construction.
Applicable legislation	The regulatory definition of contaminated land is contained within Part 2A of the Environmental Protection Act (EPA) 1990 (Defra, 2012). The relevant national planning policy and associated guidance with respect to land contamination are presented under Section 11 of The National Planning Policy Framework (Department for Communities and Local Government (DCLG), 2012) - Conserving and enhancing the natural environment. In addition to the above, the Water Resources Act (1991) provides the Environment Agency with powers to enforce action to address pollution of controlled waters.
Coverage in submission	There is limited information provided in the submission. A geo-environmental assessment report has not been included in the submission to date. The risks and mitigation measures have been included only at a very high level and do not include all relevant aspects usually expected in a contamination assessment. Specific quantities of waste from contaminated land or groundwater have not been assessed. The Main Design Report states that 'a series of detailed geo-environmental investigations will be carried out' as part of the design process, which will include a desk study review and intrusive investigations.
Proposed mitigation	**During Construction** The submission states:- • A materials management plan will be produced in advance of the implementation of the project; • Any contaminated material identified will be treated on-site as the preferred option such that it is suitable for beneficial reuse within the development; and • Any residual wastes which cannot be reused or recycled, for example any contaminants remaining after treatment of contaminated soils, will be stored safely on site prior to being disposed of to a suitably licensed waste management facility, located as near as possible to the proposed development so as to reduce the impact of any road transported waste. Other measures that Jacobs advises should be considered by HH are: • Further mitigation measures will need to be determined following completion of site investigations and risk assessments; • Ensure that appropriate H&S measures are used during construction, including the correct use of personal protective equipment in any contaminated ground; and • Undertake environmental monitoring during the construction phase to assess and amend mitigation measures as needed. **During Operation** The submissions states:- • Run-off from paved areas should receive at least two levels of treatment and run-off containing de-icer and anti-icer contamination should be contained and prevented from being directed into the receiving watercourses or groundwater; and • Petrol interceptors will be included, should run-off from adopted highways not be passed via two levels of treatment. Pumped systems are only likely to be required where the M25 is directed into a tunnel below the airport. Other measures that Jacobs advises that should be considered by HH are: • Assess the need for gas protection measures if buildings are constructed over

	ground gas sources (such as landfills); and • Undertake environmental monitoring during the operational phase to assess risks and modify mitigation measures as necessary.
Justification and evidence	A geo-environmental report has not been included in this submission and therefore there has been limited assessment of potential contamination impacts. All contamination information provided in the submission is contained within the Main Scheme Design Reports.
Additional information requirements	A full geo-environmental assessment will be needed to provide full baseline conditions and assess risks and mitigation measures using information from desk study reviews, site reconnaissance and site investigation. Site investigations should include ground gas monitoring, surface water and soil sampling to assess and confirm contamination prior to any detailed design and construction works. The geo-environmental assessment and site investigation works will need to be undertaken for both the main airport areas and the transport hub site.

5.4.5 Waste Assessment Conclusions – Heathrow Airport Extended Northern Runway

HH operational waste arisings forecasts compare favourably with data produced by Jacobs for 'Do Something'. HH forecasts passenger numbers for 2050 as being 130Mppa, which compares favourably against the Airports Commission's AoN Carbon Capped scenario 2014, of 129Mppa in the same year (taking into account limitations of waste data presented by HH, discussed in Section 5.1.3). Similarly, HH forecasts 48,000 tonnes of operational waste arisings by 2050, which is identical to Jacobs' 'Do Something' estimates of 48,000 tonnes (Scenario 1). Compared against the Jacobs forecasts, the HH scheme would result in an increase in operational waste of between 60-85%, compared with a 'Do Minimum' scenario (Scenario 1- 3).

Only a quarter of Heathrow's waste was managed through the HAL contract, of which 50% is managed via the EfW facility. Heathrow Airport has set a target of 70% recycling of waste by 2020. If a 70% recycling rate is the target then alternative waste management arrangements will need to be made to increase waste segregation and recycling. Confirmation is required that the existing HAL contract can manage the increased waste quantities in the proportions proposed by the HH development.

The assessment of the HH submission concludes that, at this stage of the process, the scheme promoter has provided insufficient detail relating to proposed plans and strategies for managing construction and operational wastes to determine whether these will be effective in mitigating the environmental impacts of waste management on Place.

There is limited evidence on how the targets proposed for waste management can be met. Construction and demolition forecasts and construction wastes for each element of the development are limited, with no supply/demand assessment for recycling/composting waste management capacity supplied as evidence of what facilities will be required on and off-site.

The environmental impacts of waste management on place are not identified in the submission (Section 8 of the Attachment 5-1 or the Updated Scheme Design). There is a proposed Construction Environmental Plan where the environmental impact of construction wastes on water quality is acknowledged. Given there is no WMP currently and the Construction Environmental Plan is limited to water impacts of waste management, it is not possible to conclude if the WMP will successfully

mitigate the environmental impacts. A further notable absence is presence of a WMP for operational waste.

The broad approach described to managing waste on the scheme is consistent with the waste hierarchy and there are examples of good practice for reducing and recycling waste. However, the absence of site-specific information has resulted in a submission that is generic and limited in detail, resulting in the impacts of waste on Place being undefined. Should the HH scheme progress is suggested that geo-technical investigations are undertaken and a MMP and WMP (supported by detailed waste forecasts, a facility capacity review and the identification/mitigation of environmental impacts of waste management) are prepared, to enable the impact of waste management on place to be more meaningfully assessed.

Glossary

This Glossary provides a definition for the key technical terms used in each of the appraisal reports.

Land take	
Term	**Definition**
Core Strategy	A core strategy document is the key compulsory local development document specified in United Kingdom planning law. Every other local development document is built on the principles it sets out, regarding the development and use of land in a local planning authority's area.
Green Belt	Green belt land designated by local authorities with the main purpose to protect the land around larger urban centres from urban sprawl.
Heathrow Opportunity Area	An area identified in the current London Plan (2011) capable of accommodating a proportion of 12,000 new jobs and over 9,000 new homes.
Local Plan	The plan for the future development of the local area, drawn up by the local planning authority in consultation with the community. In law this is described as the development plan documents adopted under the Planning and Compulsory Purchase Act 2004. Current core strategies or other planning policies, which under the regulations would be considered to be development plan documents, form part of the Local Plan. The term includes old policies which have been saved under the 2004 Act.
Local Planning Authority (LPA)	A local planning authority (LPA) is the local authority or council that is empowered by law to exercise statutory town planning functions for a particular area of the United Kingdom.
National Planning Policy Framework (NPPF)	The National Planning Policy Framework sets out government's planning policies for England and how these are expected to be applied

Landscape, townscape and seascape	
Term	**Definition**
Ancient Woodland	Land that has had continuous woodland cover since at least 1600AD.
Area of Great Landscape Value (AGLV)	An area perceived to have particular scenic value and as such is locally designated. New terminology is 'locally designated landscape'.
Area of Outstanding Natural Beauty (AONB)	National landscape designation for areas with high scenic quality, which has statutory protection to conserve and enhance the natural beauty of the landscape.
Dark skies	Skies which are the least influenced by light pollution from street

Landscape, townscape and seascape	
Term	**Definition**
	lights and other sources of lighting.
Effect (negligible / minor / moderate / major)	The level to which a proposed scheme changes landscape quality or visual amenity, taking into account the value and sensitivity of landscape and visual receptors.
Elements (of a landscape / townscape)	Individual parts which make up the landscape, such as, trees, hedges and buildings.
Hydrological features	Streams, rivers, lakes, ponds, ditches.
Hydrology	Overarching topic description for looking at the nature of streams, rivers, lakes, ponds, ditches.
Landscape and Visual Impact Assessment (LVIA)	The study of how a proposed scheme is likely to change landscape quality and visual amenity.
Landscape character	A distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse
Landscape character areas	Single unique areas that are the discrete geographical areas of a particular landscape type
Landscape character assessment	The process of identifying and describing variation in the character of the landscape
Landscape features	Individual parts which make up the landscape, such as, trees, hedges and buildings.
Quality (condition) (of a landscape / townscape)	A measure of the physical state of the landscape. It may include the extent to which typical character is represented in individual areas, the intactness of the landscape and the condition of individual elements.
Sensitivity (low / moderate / high)	A term applied to specific receptors, combining judgements of the susceptibility of the receptor to the specific type of change or development proposed and the value related to that receptor.
Significant	'Large' or 'moderate' significance of effect scores.
Topography	The shape of the landscape and whether it is made up of hills, valleys, escarpments.
Townscape	Built up areas such as towns and cities comprising of housing, offices, retail.
Townscape character	The character and composition of the built environment including the buildings and the relationships between them, the different types of urban open space, including green spaces, and the relationship between buildings and open space
Townscape	The study of the character and composition of the built

Landscape, townscape and seascape	
Term	**Definition**
character assessment	environment.
Value (of a landscape / townscape)	The relative value that is attached to different landscapes/ townscapes by society. A landscape/ townscape may be valued by different stakeholders for a whole variety of reasons.
Visual amenity	The overall pleasantness of the views people enjoy of their surroundings
Waterscape	Landscapes with views of the coast or seas, and coasts and adjacent marine environments with cultural, historical and archaeological links with each other.
Zone of Theoretical Visibility (ZTV)	A map, usually digitally produced, showing areas of land within which a development is theoretically visible

Heritage	
Term	**Definition**
Almshouse	A house devoted to the shelter of the poor and endowed by a benefactor for this use.
Causewayed Enclosure	A Neolithic (4000 – 2200 BC) monument comprising an irregularly circular enclosing ditch, interrupted by frequent causeways, and often accompanied by an internal bank, also causewayed.
Chest Tomb	A tomb designed in the form of a cist or stone box placed over a burial. Its outward form often reproduces the features of the classical sarcophagus or medieval effigy base.
Crop / Soil Mark	Crop marks are traces of buried archaeological remains, caused by the different rates of growth and ripening of crops where they are affected by changes in soil density or the presence of concentrations of stone. Soil marks are created when ploughing reveals patterns of differently coloured or stonier soil. Both types are usually detected by aerial photography.
Crown Post Barn	A barn with timber roof construction including crown post trusses, commonly dated to between the 13th and 14th centuries AD.
Designated Heritage Assets	Assets protected by statutory designation such as Scheduled Monuments, Listed Buildings, Conservation Areas.
Hall House	A house consisting of a public hall with private living accommodation attached. Built from the medieval period onwards.
Listed Building	A listed building, in the United Kingdom, is a building that has been placed on the Statutory List of Buildings of Special Architectural or Historic Interest.
Manor House	The principal house of a manor or village.

Heritage	
Term	**Definition**
Medieval Period	Historical period spanning AD 1066 - 1540
Moated Site	A house, garden or other feature surrounded by a wide ditch, usually filled with water. These types of features are usually moated for status rather than defensive reasons.
Registered Parks and Gardens	A site included on the Register of Historic Parks and Gardens in England. Most sites registered are, or were, the grounds of private houses. The Register, however, encompasses designed landscapes of many types including public parks, town squares and cemeteries.
Scheduled Monument	a scheduled monument is a 'nationally important' archaeological site or historic building, given protection against unauthorised change.
Timber Framed Building	A building constructed with a basic timber framework; between the members are panels which can be infilled with timber, wattle and daub, plaster, brick or other materials.

Waste	
Term	**Definition**
Anaerobic Digestion (AD) plant	A process where biodegradable material is placed in an enclosed vessel and broken down in controlled conditions in the absence of oxygen. Outputs are typically a digestate and biogas
Biomass boiler	Biological material from plant matter e.g. wood is used as a fuel to heat a boiler
Circular economy	A process for keeping resources in use for as long as possible, extracting the maximum value from resources whilst in use, then recovering and regenerating products and materials at the end of their service life.
Energy from Waste (EfW) plant	Processing facilities, primarily incineration, whereby energy may be recovered from waste. The resultant energy can be used to create power, heat or combined heat and power.
Energy recovery	Recovery of useful energy in the form of heat and/or power from burning waste or other combustible materials. Generally applied to incineration, but can also include the combustion of landfill gas and gas produced during anaerobic digestion.
Feedstock (of waste)	Supply of suitable waste material for a waste facility.
Hazardous waste	Waste (or the substances it contains) that is considered harmful to humans or the environment. Examples of hazardous waste include solvents, asbestos.
Historic landfills	Landfill sites that are no longer accepting waste.
Key Performance Indicators	A set of defined indicators used to measure performance against.

Waste	
Term	**Definition**
(KPIs)	
Materials Management Plan (MMP)	Describes the quantities of different material which will be generated on site, methods of management and potential end use of the material
Materials Recycling Facility (MRF)	A facility for the sorting of mixed recyclable materials into separate material streams
Nitrate Vulnerable Zone (NVZ)	A NVZ is designated where land drains and contributes to the nitrate found in polluted waters
Organic waste	Waste derived from animal or plant matter
Perched water	Downward percolating water may be intercepted, resulting in a saturated zone of limited areal extent formed
Residual waste	Waste that is not separated out for recycling or composting or sent for reprocessing.
Site Waste Management Plan (SWMP)	Sets out how different waste generated through construction activity will be effectively managed at all stages of a project - from design through to completion
Source Protection Zone (SPZ)	Show the risk of contamination from any activities that might cause groundwater pollution in the area
Waste arisings	The amount of waste generated either historically, now or projected in the future
Waste hierarchy	The preferred order in which waste should be managed with prevention the most preferable, followed by reuse and recycling and disposal with no energy recovery the least preferable option for managing waste
Waste management permit	Required for the operation of waste management facilities/activities as set out in The Environmental Permitting (England and Wales) Regulations 2010 as amended.
Waste treatment facilities	Involves the physical, chemical or biological processing of waste to reduce the volume or harmfulness of the waste.

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Appendix A Methodology and Land Use Categories

Land Use Categorisation

The National Land Use Database (NLUD) land use categories have been used to identify the land uses within the land take areas. The most comprehensive land use data was held by a company called The GeoInformation Group (GIG). Table A summarises how the two sets of land use categories have been rationalised. Table B compares the definitions of the respective categories. It should be noted that there are many more categories for the GIG data than for NLUD and therefore several categories were sometimes applicable for each NLUD category.

The list below provides a summarised explanation of this rationalisation:

- Agriculture and Fisheries - Grouped all agricultural categories i.e. Crops, Agriculture, Mixed Use, Glasshouses, Orchards and Farms;
- Forestry - Grouped all woodland categories (Deciduous Woodland & Coniferous & undifferentiated woodland);
- Mineral – Grouped all mining and spoil areas;
- Recreation and Leisure - Included inland water where used for recreational activities (water sports etc.), and was determined from aerial imagery.
- Transport - Principal transport (all road & rail);
- Utilities and infrastructure – E.g. reservoirs;
- Residential - Grouped all residential categories, apart from high density (retail), as one, as they lacked sufficient other land use detail to use them for another category;
- Retail - Retail Parks and High density residential with retail and commercial sites were used. Large Complex Buildings were investigated individually to check whether they related to retail or any other use. Edits were made to the data to exclude complexes where hotels and offices predominate;
- Industry and business - Grouped all Industrial areas and business parks;
- Unused land - Inland Water and Coastal Dunes are listed only in cases where inland water had no specific usage.

Table A1- Regularisation of the Land Use Categories

		NLUD Categories												
		Agriculture & Fisheries	Forestry	Minerals	Recreation & Leisure	Transport	Utilities & Infra-structure	Residential	Communit y Services	Retail	Industry & Business	Vacant & Derelict	Defence	Unused Land
Land Use - Geoinformation Group	Inland Water				X - Water Sports Use		X – Reser-voir Use							X – 'Unused water body'
	Costal Dunes													X
	Agriculture - mainly crops	X												
	Agriculture - Mixed Use	X												
	Glasshouses	X												
	Orchards	X												
	Farms	X												
	Deciduous Woodland		X											
	Coniferous & undifferentiated woodland		X											
	Principal transport - road & rail					X								
	Mining and spoil areas			X										
	Recreational Land				X									
	Large complex buildings various use								X	X				
	Low density residential with amenities							X						
	Medium density residential with high streets and amenities							X						
	High density residential with retail and commercial sites									X				
	Industrial Areas										X			
	Business Parks										X			
	Retail Parks									X				

Table A2 - Comparison of Category Definitions

	NLUD Category	NLUD Definitions	GIG Category	GIG Definition
1	**Agriculture and Fisheries**	**U010 AGRICULTURE AND FISHERIES** *Agriculture includes horticulture, fruit growing, seed growing, dairy farming, the breeding and keeping of livestock (including any creature kept for the production of food, wool, skins or fur), the use of land as grazing land, meadow land, osier land, market gardens and nursery grounds, and the use of woodlands where that use is ancillary to the farming of land for other agricultural purposes.* **U011 Agriculture** *+ Land under agricultural rotation whether for crops or grassland or left fallow.* + Land under permanent crops, including orchards and other cultivated trees and flowering shrubs. + Land used for horticulture e.g. glass houses, nurseries, hop fields and market gardens. + Enclosed intensively managed improved pastures used for grazing and/or fodder production. + Enclosed unimproved or little-improved grasslands with little or no management used for grazing. + Set-aside and fallow land. + Low-intensity *agricultural use (e.g. land used for intermittent grazing and foraging by livestock).* *+ All ancillary land, e.g. uncultivated patches, banks, footpaths, ditches, headlands and shoulders.* *+ All associated buildings and hard surface areas on farm holdings e.g. places for crop conditioning, grading and storage, and places for livestock (as defined above) servicing, breeding, rearing and animal product processing.* *– Excludes farm dwellings (U071) and farm shops (U091).* **U012 Fisheries** *+ Places devoted to the operation of fish hatcheries and fish farms in inshore and fresh water areas.* *+ Other fishing activities e.g. inshore or estuarial fishing using nets and pots (where these are the primary use of land and associated waters and can be clearly delineated).*	**Agriculture - mainly crops**	Farm land and agricultural areas, essentially devoid of trees, used for arable fields, pastures and any other type of low crops (< about 2m). Vineyards, hop yards, orchards and woods are excluded from this category.

	NLUD Category	NLUD Definitions	GIG Category	GIG Definition
			Agriculture - Mixed Use	Areas of generally open fields, but with some sparsely distributed single mature trees or very small groups of tress. It may include small groups of trees on open land, garden and parklands with trees. Tree cover density should not exceed about 30%.
			Glasshouses	Large buildings consisting mainly of glass used for growing plants.
			Orchards	Continuous areas with fruit trees.
			Farms	Buildings used for farming activities in rural areas, including one or two dwellings. Distinguished from small settlements and hamlets with multiple dwellings which are classified in the 'Low density residential with amenities (suburbs and small villages / hamlets)' category.
2	**Forestry**	**UO21 Managed forest** + Forest and other wooded land managed (either wholly or in combination) for timber production, recreation and amenity, conservation and environmental uses e.g. Forestry Commission and Forest Enterprise plantations, woodland in official grant schemes, woodland certified to UK Woodland Assurance Scheme (UKWASS) standards. + Woodland used for seasonal grazing and foraging by livestock, and where timber is used on-farm, e.g. as a source of fencing material, or as a short-term crop in its own right (e.g. coppiced woodland for energy crops purposes). + Felled woodland and land cultivated for afforestation. – Excludes woodland managed principally for agricultural purposes (U011).	**Deciduous Woodland**	Beech, oak, birch, maple, and any other type of deciduous tree species making up forests, or gallery forests along roads, rivers, canals, etc.

	NLUD Category	NLUD Definitions	GIG Category	GIG Definition
		U022 Un-managed forest + Un-managed forest and other wooded land.		
			Coniferous & undifferentiated woodland	Areas of mixed coniferous and broadleaved trees where both comprise of approximately >20% of the tree canopy, Pines, firs, spruces and other coniferous trees making up forests, or gallery forests within 100m of major roads.
3	**Minerals**	**U031 Mineral workings and quarries** *+ Surface mineral workings and quarries including waste disposal areas together with all buildings and installations for surface and underground mineral extraction and handling.*	**Mining and spoil areas**	Areas of mine workings and excavations, sand and clay pits, coal and stone spoil tips, other excavations and spoil tips.
4	**Recreation & Leisure**	**U041 Outdoor amenity and open spaces** *+ Outdoor amenity and open spaces e.g. gardens, parks, zoos, picnic areas and play areas.* *+ Civic spaces e.g. civic squares, plazas, sea fronts (including promenade).* *+ Heritage sites and monuments.* *– Excludes sports facilities (U044)* **U042 Amusement and show places** *+ Places for amusement and entertainment e.g. cinemas, theatres, concert halls and arenas, broadcast studios, dance halls, bingo halls, night-clubs, gaming and gambling clubs and premises.* *+ Amusement arcades, fun fairs and circuses.* *+ Visitor centres and interpretation centres.* **U043 Libraries, museums and galleries** *+ Buildings, places, or institutions devoted to the acquisition, conservation, study, exhibition, and educational interpretation of objects having scientific, historical, or artistic value e.g. museums, libraries, art galleries, public and exhibition halls.* **U044 Sports facilities and grounds** *+ Facilities for land and water sports e.g. football or rugby*	**Inland Water**	*Water Sports Uses* on open (natural or man-made) body of fresh water, lakes, ponds, major rivers (above the tidal limit), canals. Small rivers (generally < 25m wide) not recorded, in particular not when overtopped by trees or shrubs.

	NLUD Category	NLUD Definitions	GIG Category	GIG Definition
		stadiums, sports centres, gymnasia, swimming pools, skating rinks, indoor shooting ranges, vehicle race tracks. *+ Sports grounds, including those in schools and industrial sites, and areas for outdoor sports e.g. football and rugby pitches, greens and courts for ball games, golf courses, athletics grounds, ski fields, hunting and shooting, boating and sailing lakes.* **U045 Holiday parks and camps** *+ Holiday park with chalets, hotels, entertainments for holidaymakers.* *+ Camp site for tents, touring caravans and camper vans.* *– Excludes caravan sites and mobile homes used as permanent dwellings (U071).* **U046 Allotments and city farms** *+ Allotments and city farms.*		
			Recreational Land	Recreational parks, sport fields, golf courses, camping and caravan sites, cemeteries, zoological and botanical gardens, typified by large areas of manicured grass land (not used for growing crops), with and without stands of trees.
5	**Transport**	**U051 Transport tracks and ways** *+ Roads, railway lines, cycle tracks, footpaths and bridleways.* **U052 Transport terminals and interchanges** *+ Terminals and transport interchanges for people e.g. airport, ship passenger terminal, railway station, bus station, coach station.* *– Excludes car parks (U053).* **U053 Car parks** *+ Long and short stay car parks and 'Park and Ride' terminals.* **U054 Vehicle storage** *+ Storage places for vehicles (other than cars) e.g. lorry parks, bus and coach depots, railway sidings, aircraft hangars.* **U055 Goods and freight terminals** *+ Terminals and transhipment places for goods e.g. air freight*	**Principal transport - road & rail**	Man-made concrete or tar based sealings of the plain ground, such as roads, parking areas, airport runways, etc. 2014 update will replace the minimum width criteria of 25m with variable road widths based on grade of road, e.g. Motorway, A Road, local street etc. Large parking areas around business parks and retail sites fall in this category. Rail corridor areas including track and embankments (> 25m wide),

	NLUD Category	NLUD Definitions	GIG Category	GIG Definition
		terminals, rail freight terminals, container depots, docks, railway yards and depots, and customs depots. *+ Mechanised handling of goods and raw materials e.g. aerial ropeway, conveyor, lift.* **U056 Waterways** *+ Canals and navigable rivers.* *+ Moorings, marinas, boat yards and anchorage for water craft.* *– Excludes marine engineering and shipbuilding yards (U101).*		railway depots and sidings. 2014 update standardises rail corridors to a minimum 22m total width.
6	**Utilities & Infrastructure**	**U061 Energy production and distribution** *+ Power stations, using thermal, nuclear, hydroelectric, gas turbine, diesel or renewable sources, for electricity production and generation.* *+ Cableways and transformer stations for the distribution of electricity.* *+ Gas manufacture and storage facilities.* *+ Pipelines and pumping stations for oil and gas.* **U062 Water supply and treatment** *+ Water treatment and purification facilities, including extraction from springs, rivers or aquifers.* *+ Water storage and distribution places e.g. reservoirs, water towers and pumping stations.* *+ Sewage disposal and treatment works, including drains, pumping stations and sewage farms.* **U063 Refuse disposal** *+ Refuse disposal facilities, including tips, landfill sites and disposal plants.* **U064 Cemeteries and crematoria** *+ Places for storage and disposal of human remains e.g. mortuaries, chapels of rest, crematoria, cemeteries and church yards.* **U065 Post and telecommunications** *+ Postal service places, including depots and sorting and delivery offices.* *+ Telecommunication facilities for transmitting and receiving messages by telephone, radio, radar, cable, television, microwave*	**Inland Water**	In this case just ‘reservoir use’

	NLUD Category	NLUD Definitions	GIG Category	GIG Definition
		and satellite.		
7	**Residential**	**U071 Dwellings** *+ Houses and flats for individuals and families living as a single household, including adjoining garages, gardens, non-thoroughfare service and distribution roads and pathways.* *+ Caravan sites and mobile homes used as permanent dwellings.* *+ Sheltered residential accommodation with separate front entrances.* **U072 Hotels, boarding and guest houses** *+ Hotels, B&B's, boarding houses, and residential clubs (where no significant element of care is provided).* **U073 Residential institutions** *+ Residential accommodation for provision of care e.g. old peoples' homes, children's homes and other non-medical homes.* *+ Residential schools and colleges and training centres, including university and hospital residences.* *+ Communal residences e.g. barracks, monasteries and convents.*	**Low density residential with amenities**	Smaller single or continuous buildings (typically family homes), typically of 1 or 2 storey height and with high percentage of vegetation (gardens). Areas made up of either small blocks of terraced house or semi-detached houses with gardens, normally situated outside the city centre are included in this category.
			Medium density residential with high streets and amenities	Larger single or continuous buildings – between 3 and 5 storeys (approx.. 10m to 18m), with some vegetation in between (e.g.. apartment buildings). Usually included in this category would be post war local authority estates, usually at the edge of city centres and rows of terraced houses not more than 3 storeys high, usually with small gardens.
8	**Community Services**	**U081 Medical and health care services** *+ Medical and health care services e.g. medical diagnosis and treatment centres, auxiliary medical centres, clinics, day centres, health farms.* *+ Hospitals and convalescent homes.* *+ Other medical and health services e.g. dentist, doctor,*	**Large complex buildings various use**	Multi-functional large (generally greater the 60 x 100m) single or agglomerated building of multiple use and irregular shape and height, e.g. Airport terminals. Hospitals, Rail terminals,

	NLUD Category	NLUD Definitions	GIG Category	GIG Definition
		chiropodist, and optician. *– Excludes associated residential accommodation (U073).* **U082 Places of worship** *+ Churches, mosques and synagogues.* **U083 Education** *+ Educational establishments e.g. schools, colleges, higher and further education centres, universities and other specialised learning places.* *– Excludes associated residential accommodation (U073).* **U084 Community services** *+ Community protection and justice administration services e.g. police stations, fire stations, coastguard and life boat stations, and law courts.* *+ Community protection and detention centres e.g. borstals, prisons, remand homes.* *+ Community meeting places e.g. community centre, public hall, church hall, youth club.* *+ Public sanitation facilities e.g. public baths and conveniences.* *+ Animal welfare facilities e.g. animal treatment, veterinary surgery, animal quarantining, cattery, kennels*		exhibition halls and sports stadia.
9	**Retail**	**U091 Shops** *+ Premises for the retail sale and display of goods to visiting members of the public e.g. shops, boutiques, department stores, retail warehouses and markets, supermarkets.* *+ Shops where the primary use is the sale of food and drink for consumption off the premises e.g. sandwich bar, hot-food take-aways.* *+ Other retail uses including hairdressers, travel and ticket agencies, post offices, pet shops, showrooms, hire of domestic or personal goods, launderettes and dry cleaners, undertakers and funeral directors, places for the reception of goods to be washed, cleaned or repaired.* *+ Showrooms for retail sale and display of motor vehicles, car hire businesses, petrol filling stations and taxi businesses.* 40 *+ Internet shops/cafes, where primary purpose is sale of access*	**High density residential with retail and commercial sites**	Continuous building rows, little vegetation, buildings having 3 or more storeys, typically found in city centres in big and mid-range cities can include dense residential areas with courtyard style gardens.

	NLUD Category	NLUD Definitions	GIG Category	GIG Definition
		to internet services. *– Excludes financial and professional services (U092).* **U092 Financial and professional services** *+ Financial and professional services e.g. banks, building societies, estate and employment agencies and insurance brokers.* *+ Betting offices.* *– Excludes health and medical services (U081).* **U093 Restaurants and cafes** *+ Places for the sale of food and drink primarily for consumption on the premises.* **U094 Public houses and bars** *+ Places for the sale of food and drink for consumption on the premises where the primary purpose is the sale of alcoholic drink e.g. pubs, wine bars, private clubs, other drinking establishments.*		
			Retail Parks	Large retail areas often on the edge of towns typically of warehouse-style construction or purpose built shopping centres. The class describes only the buildings and not parking areas which are assigned to 'Principle Transport Road' classes above.
10	**Industry and Business**	**U101 Manufacturing** *+ Factories and refineries for processing of coal, petroleum, metals and other raw materials.* *+ Manufacturing of food, drink, tobacco.* *+ Manufacturing of chemical and allied products.* *+ Mechanical, instrument and electrical engineering.* *+ Marine engineering and shipbuilding yards.* *+ Manufacturing of vehicles and other metal goods.* *+ Textile and clothing manufacturing.* *+ Brick, pottery, glass and cement manufacture.* *+ Timber, furniture, paper and printing works.* *+ Factory construction and demolition sites.* *+ Places for packing agricultural and food products (separate from*	**Industrial Areas**	General industrial and utility sites and Industrial estates, including combinations of smaller business industrial units, distribution warehouses (approximately less than 100m dimensions), factory units (works and depots) and other similar buildings and the space between them. Also includes smaller sewerage works and other infrastructure sites.

	NLUD Category	NLUD Definitions	GIG Category	GIG Definition
		farm holding) *– Excludes utilities and infrastructure (U061 – U065).* – Excludes primary extractive industries e.g. coal mine*s, stone quarry, and gravel pits (U031).* **U102 Offices** *+ Offices of central and local government, company offices, and other general offices.* *+ Offices for research and development and testing of products or processes.* *+ Offices hosting scientific facilities and laboratories.* *+ Business meeting places and centres.* *+ Art studios, music recording and film studios.* *– Excludes offices providing financial, professional and other services for the public (U092).* **U103 Storage** *+ Storage places and facilities for onward distribution (not sale) of equipment, bulk materials and goods e.g. warehouses, repositories, open storage land.* **U104 Wholesale distribution** *+ Places for bulk dealing of raw materials, industrial supplies and machinery and livestock.* *+ Wholesale distribution places for food and drink, petroleum and other non-food products.*		
			Business Parks	Large areas of office accommodation often on the edge of towns or away from it, usually of modern construction. The class describes only the buildings and not parking areas which are assigned to Principle Transport Road classes above.
11	**Vacant and derelict**	**U111 Vacant** *+ Land which is now vacant and could be redeveloped without treatment, where treatment includes any of the following: demolition, clearing of fixed structures or foundations and levelling.*	**NOT SPECIFIED**	NA

	NLUD Category	NLUD Definitions	GIG Category	GIG Definition
		+ Vacant buildings that are structurally sound and in a reasonable state of repair (i.e. capable of being occupied in their present state) where re-letting for their former use is not expected or that have been declared redundant. *– Excludes land previously used for mineral extraction or waste disposal which has been or is being restored for agriculture, forestry, woodland or other open countryside use.* **U112 Derelict** *+ Land so damaged by previous industrial or other development that it is incapable of beneficial use without treatment, where treatment includes any of the following: demolition, clearing of fixed structures or foundations and levelling.* *+ Abandoned and unoccupied buildings in an advanced state of disrepair i.e. with unsound roof(s).* *– Excludes land damaged by development which has been or is being restored for agriculture, forestry, woodland or other open countryside use.* *– Excludes land damaged by a previous development where the remains of any structure or activity have blended into the landscape in the process of time (to the extent that it can reasonably be considered as part of the natural surroundings), and where there is a clear reason that could outweigh the re-use of the site - such as its contribution to nature conservation - or it has subsequently been put to an amenity use and cannot be regarded as requiring redevelopment.*		
12	**Defence**	**U121 Defence** *+ Defence establishments, including camps, airfields, live firing training areas and other defence facilities and places.* *– Excludes residences for defence personnel (U071) and barracks (U073).*	**NOT SPECIFIED**	NA
13	**Unused Land**	**U131 Unused Land** *+ Semi-natural areas of land which are not part of routine cultivations or being grazed and which have never been used for development, including scree, cliff, dunes, marsh and beach and reclaimed land*	**Inland Water**	In this case water bodies 'with no specific use'.

	NLUD Category	NLUD Definitions	GIG Category	GIG Definition
		which has not been grazed or developed. *+ Land or water bodies for which no specific primary use can be determined.* *– Excludes vacant land (U111).* *– Excludes low-intensity agricultural use (U011).*		
			Coastal Dunes	Sand dunes, including those with some marram grass covering, and un-washed beaches.

Appendix B Local Planning Authority GIS Information Received

	Allocations	Designations	Historical Environment and Record	Local Listed Buildings	Historic Landscape Characterisation	Statutory nature Sites	Non Statutory Nature Sites	Public Rights of Way	Minerals	Planning Permission Details	Submission
Crawley	x	x	x	x	OUTSTANDING	x	x	From CC	From CC	Outstanding	GAT
Horsham	x	x	x	x	x	Magic	x	From CC	x	1 Industrual	GAT
Mole Valley	x	x	x	x	x	x	x	From CC	From CC	None	GAT
Tandridge	x	x	x	NA		x	x	From CC	From CC	No Developme nt within criteria	GAT
Hillingdon	x5	x5	Awaiting Conf	x5	Awaiting Conf	x	x5	x	x	x	HAL AND HUB
Hounslow	?	?	?	?	?	?	x	?		Outstanding	HAL AND HUB
Spelthorne	x	x	x	x	Not available	x	x	From CC	From CC	x4 Other	HAL AND HUB
Slough	x	x	6	x	Not Available	Magic	x	x7	x	Outstanding	HAL AND HUB
West Sussex CC								x	x2	NA	NA
Surrey CC								x	x1	NA	NA
Reigate and Banstead	x	x	x	x	x	x	x	Not Included	Not Included	x3	GAT
Winsdsor and Maidenhead	x	x	x	x	x	x	x	x	x	None	HAL AND HUB
South Bucks											HAL AND HUB
Runnymede	x	x	x	x	x	x and onM	x	Surrey CC	x	None	HAL
All data											
Part Data											
Check Data											
No Data but communicating											
No Data Limited Commununcation											

Appendix C Landscape and Visual Impact Assessment Methodology

The process of Landscape and Visual Impact Assessment (LVIA) takes account of potential changes to physical elements within the landscape as well as the way in which people visually perceive the landscape. The landscape takes its character from a combination of elements, including landforms, land-use, vegetation cover, field patterns and boundaries, settlement patterns and types of buildings, roads, railways and rights of way. Landscapes vary considerably in both character and quality, and they are key components of the distinctiveness of any local area or region. The assessment of effects on landscape therefore addresses changes in any of these components that would be caused by a proposed development.

Townscape can be described as *"…areas where the built environment is dominant. Villages, towns and cities often make important contributions as elements in wider-open landscapes, but townscape means the landscape within the built-up area, including the buildings, the relationships between them, the different types of urban open spaces, including green spaces, and the relationship between buildings and open spaces,"* (Landscape Institute and Institute of Environmental Management and Assessment, 2013)

Waterscape is broadly understood as a landscape in which an expanse of water is a dominant feature, but is not a recognised technical term in landscape guidance. In referring to an expanse of water, waterscape covers lakes and rivers which are addressed for landscape purposes under 'hydrological features' and coastal aspects are addressed under 'seascapes'. The latter is defined as *"landscapes with views of the coast or seas, and coasts and adjacent marine environments with cultural, historical and archaeological links with each other,"* (Landscape Institute and Institute of Environmental Management and Assessment, 2013)

People also experience landscape and townscape as a visual phenomenon, and the quality of views in any given area can make a significant contribution to 'quality of life'. In some areas, views can also be important to the local economy. Visual Impact Assessment therefore seeks to identify where existing views would be altered by any proposed changes in the landscape, and to assess the significance of those changes, taking into account the quality and extent of existing views, the number of people affected and the nature of the change.

The high level, desk based assessment has been undertaken in line with Guidelines for Landscape and Visual Impact Assessment Third Edition (GLVIA3), (Landscape Institute and Institute of Environmental Management and Assessment, 2013) and Chapter 10 of the Airports Commission Appraisal Framework (Chapter 10), (Airports Commission, 2014a). This methodological summary is intended to identify the underlying principles and terminology that underpin assessment.

Visual effects on individual receptors have been addressed as well as in terms of the perceptual qualities of the landscape. The effects of flight paths on landscape character, visual amenity, tranquillity and dark skies have been assessed from the area affected by N70 (N=20) noise contours, supplemented by information regarding flight paths , related to the published CPRE tranquillity maps.

Tranquillity mapping has been obtained from the CPRE (Campaign for the Protection of Rural England). The rational for tranquillity mapping is described in the CPRE publication 'Developing an Intrusion Map of England', 2007. The

resulting tranquillity mapping takes account of Civil Aviation Authority information on airports and the '57Leq contour and a 1km radius'. For the purposes of this report, CPRE's Tranquillity mapping is overlain by noise mapping of the predicted noise levels at 2030 and 2050 for both the existing airport configurations without further development, as well as for the promoters' schemes. These provide an illustration of the likely areas where there may be changes in noise levels due to air traffic movements. These changes may be either positive or negative, depending upon location of receptors. No attempt is made within this report to quantify these changes in terms of acceptability or nuisance, or indeed the level at which a landscape character area may be significantly affected, as this is beyond the technical expertise of the author.

In 2003, the CPRE acquired satellite imagery (source unknown) and translated the data into mapping to represent 'Dark Skies' maps. These maps were created from pixels representing a square kilometre, and are therefore the level of detail is relatively course grained when dealing with individual developments. They are a colour representation of satellite measurements of artificial light at night. The light is measured on a range from 0 to 255; 0 means the satellite is detecting no light in that pixel and 255 means the satellite's detector is saturated with light. The measure is therefore of light detected from above, and is not a representation of the visibility of air traffic lights in the sky, when viewed from the ground. The presence of ground lighting has been considered with the report as a whole when dealing with visual impacts. The noise contours have been superimposed onto the CPRE Dark Sky data for illustrative purposes only.

Individual topics listed in Chapter 10 of the Appraisal Document have been addressed as part of the assessment of effects on landscape character, townscape character and visual amenity as follows:

- *Effects on topography, hydrology and land cover on landscape and townscape character areas directly affected by the scheme;*
- *Effects on the layout, density and mix of buildings on townscape character areas directly affected by the scheme;*
- *Tranquillity effects are assessed within the area bounded by the N70 (N=20) noise contour, and dark skies effects within the study area as defined;*
- *Effects on cultural spaces and human interaction and visual effects on recreational areas and on townscape character areas directly affected by the scheme; and,*
- *Effects on beauty have been addressed in the effects on landscapes designated for their natural beauty.*

A study area for the assessment of effects has been defined as a 5km offset from the scheme. It was anticipated that the most significant effects on landscape character and views from the proposed ground based elements of the scheme (such as buildings and runways), would only occur within an area of approximately 5km. Beyond 5km, even though some elements might be visible, they would be barely perceptible due to the distance away from the airport and the filtering effect of intervening vegetation.

The study area for tranquillity has been defined by the N70 contour as a proxy for the area with aircraft at 7000ft or below[39] . Whilst this will not result in a definitive area where aircraft are below 7000ft above mean sea level (AMSL), the largest

39 https://www.gov.uk/government/publications/air-navigation-guidance

aircraft at 70dB Lmax identified within the NATS London Airspace Consultation Standard Noise Tables appendix[40] (Airbus 380) is at 7000ft with this noise level. It is therefore considered a valid proxy for the 7000ft contour pending the airspace change programme that would be available from detailed design activity.

Areas of Outstanding Natural Beauty (AONBs) and Areas of Great Landscape Value (or locally designated landscapes) have been assessed within a 15km study area as they are of significant importance to the landscape surrounding the airports.

Timescales for the assessment have been determined as during construction (when the majority of the site is under construction) and operation. Although temporary, construction effects are usually the most significant for landscape character and visual amenity so both construction and operation effects have been assessed. In the report, construction is discussed first as it would occur first temporally. Operation effects have then been discussed afterwards.

Baseline information has been gathered through a desk study of the existing documents listed below and review of aerial photography, Ordnance Survey mapping and Google Street View. Landscape and townscape effects have been broadly assessed by determining the effects on the county or district level character areas. A high level visual assessment has also been undertaken by identifying key visual receptors to the scheme and the potential effects on them. Landscape and townscape character areas and visual receptors have been assessed for their sensitivity, and quality and value have been considered. Below are descriptions and criteria used for these assessments.

Landscape quality is defined as follows: “Landscape quality (or condition) is based on judgements about the physical state of the landscape, and about its intactness, from visual, functional, and ecological perspectives. It also reflects the state of repair of individual features and elements which make up the character in any one place.” The description of landscape quality for each character area is based on descriptions within existing Landscape Character Assessments. Landscape quality has been described using the following criteria:

- *Highest Quality – areas that exhibit a strong landscape structure with valued features that contribute to the wider landscape character and may be considered to be of particular importance to conserve. Includes the most aesthetically attractive landscapes, which are often designated for their natural beauty;*
- *Very Attractive – areas that exhibit a recognisable landscape structure, such as diverse, semi-natural or farmed landscape with natural features. Normally abundant woodland cover together with a high distribution of trees, hedgerows, streams and other naturalised unpolluted water corridors. May be designated for their natural beauty;*
- *Good – countryside with some variety in farmland cover. Settlements and villages with pockets of open space and public recreation areas. There is a reasonable distribution of semi-natural vegetation, trees and shrub cover and the overall view of the area is pleasant. May be designated for their natural beauty;*

40 http://www.londonairspaceconsultation.co.uk/wp-content/uploads/2013/09/LAC_Appendix_J_StandardNoiseTables.pdf

- *Ordinary – typical open agricultural land where attractive features are offset by detractors. Some strategic planning is evident but development is primarily functional including housing estates, business parks or urban fringe land uses. Not particularly aesthetically attractive, but with more value than a poor quality landscape. Land may be within a Green Belt or have a local landscape designation; and,*
- *Poor – includes detractors such as power lines, industrial derelict or inappropriate built forms with no aesthetic value or evidence of strategic planning. There is lack of mature vegetation cover and no landscape designations apply. Intensively farmed landscape, which has lost most of its features.*

GLVIA 3rd edition describes townscape as "…areas where the built environment is dominant. Villages, towns and cities often make important contributions as elements in wider-open landscapes, but townscape means the landscape within the built-up area, including the buildings, the relationships between them, the different types of urban open spaces, including green spaces, and the relationship between buildings and open spaces." Townscape quality has been described using the following criteria:

- *Highest Quality – townscape with highly valued, rare or unusual features with a high level of human interaction. Area or feature designations or important arrangement of Listed Buildings or cultural features. High quality buildings with a well maintained appearance with attractive details and materials. Few or no visual detractors;*
- *Very Attractive – locally distinctive development form with cultural associations and good quality appearance and locally characteristic materials. Harmonious relationship between public spaces and buildings with a well maintained appearance. Several designated or valued features. No significant visual detractors. Promotes human interaction and pedestrian movement with few conflicts with vehicular use;*
- *Good – locally distinctive appearance with planned layout and well maintained ornamental features. Possible degradation of modern development mix but with potential for enhancement. Some human interaction and pedestrian movement with few conflicts;*
- *Ordinary – functional, incoherent development form with minimal use of design criteria for modern contemporary buildings. Little distinctiveness locally with remnant distinctive features out of context within the townscape. Little human interaction limited to social / community locations. Vehicular traffic dominates movement; and,*
- *Poor – poorly designed development form with inappropriate materials and quality. Unsympathetic scale and lacking in structure, variety, coherence or clear communication links. Poor boundary definition and large amount of vandalised rarely used un-owned space. Lack of maintenance and showing decline in appearance with little or no evidence of human interaction. Pedestrian movement severed and inhibited by transport systems.*

Landscape value is defined as follows: "The relative importance attached to a landscape (often as a basis for designation or recognition), which expresses national or local consensus, because of its quality, special qualities including perceptual aspects such as scenic beauty, tranquillity or wildness, cultural associations or other conservation issues." The description of landscape and townscape value for each character area takes account of:
International, national and local landscape designations;
Policies in local planning documents;

Areas of local community interest such as local green spaces, village greens or allotments;
Status of cultural heritage or ecological features;
Recreation value; and,
Scenic quality and perceptual aspects.

Landscape and townscape value has been described using the following criteria:

Table C1 - Value Criteria

Landscape/ Townscape Value	Criteria	Typical Scale
Exceptional	High importance and rarity; very attractive; no or limited potential for substitution	International or National
High	High importance and rarity; very attractive as a whole or in part; limited potential for substitution	National, Regional or Local
Medium	Medium importance and rarity; typical or pleasant; potential for substitution	Regional or Local
Low	Low importance or rarity; poor quality and condition, easily substituted	Local

Sensitivity reflects the vulnerability of the landscape/ townscape to accommodate the proposed change. It is also based on its importance in relation to national and local designations, its perceived value to local users and consultees, and any intrinsic aesthetic characteristics such as its contribution to local landscape quality or sense of place.

In some instances a landscape or townscape with important elements may be of lower sensitivity as a result of its potential tolerance to change, for example, a variable landform or high levels of tree cover. Conversely, a landscape or townscape with few features of interest may be of a higher sensitivity because it is vulnerable to the introduction of a development, for example, a flat landscape with an open character where screen planting would be inappropriate. The assessment has relied upon professional judgement and subjective opinion based on professional experience.

The sensitivity of a visual receptor is based on the viewer's familiarity with the scene, the activity or occupation that brings them into contact with the view and the nature of the view, whether full or glimpsed, near or distant. It is also determined by the importance of the receptor, the importance of the view, the perceived quality of the view and its ability to accommodate change. The following tables contain the criteria used as a basis for the assessment of sensitivity:

Table C2 – Landscape/Townscape Sensitivity Criteria

Landscape/ Townscape Sensitivity	Criteria
High	Highly important and rare components, often including international or national designations. Of particularly high quality and distinctive character. Susceptible to relatively small changes with limited potential for substitution. Good condition. Strong recreational value is demonstrated through extensive recreational features such as public rights of way/public open space and/or widely distributed promotional (tourist) material and/or local interest groups. There are strong conservation interests, such as the presence of features of nationally recognised historical, cultural or ecological interest.
Moderate	Medium importance and rare components, often including regional or local designations. Of good to ordinary quality and character. Reasonably tolerant of change with limited potential for substitution. Moderate physical condition. Moderate recreational value is demonstrated through some recreational features such as public rights of way/public open space and/or the existence of some locally distributed promotional (tourist) material and/or some local interest groups. There is a presence of locally unique buildings or structures and/or landscape features. There are moderate conservation interests, such as the presence of features of locally recognised historical, cultural or ecological interest.
Low	Components of low importance and rarity and unlikely to contain any designations. Poor/derelict condition with little scenic merit. Potentially tolerant of substantial change and substitutability. There is little recreational value with very few recreational features such as public rights of way/public open space, and no formal expression of specific local interest in the area. Not remarkable in any way and does not contain rare elements or features. There are no or very weak conservation interests.

Table C3 – Visual Sensitivity Criteria

Visual Sensitivity	Criteria
High	Viewers with high interest in their everyday visual environment, with prolonged and regular viewing opportunities and/or within highly valued landscapes, such as: Views within, from or towards internationally/nationally designated and highly valued landscapes/features, such as World Heritage Sites, National Parks and Areas of Outstanding Natural Beauty. Visitors to heritage assets, or to other attractions, where views of the surroundings are an important contributor to the experience. People engaged in outdoor recreation, including users of public rights of way/public open space, whose attention is likely to be focused on the landscape and would have open views. Views within areas recognised as having strong recreational value, such as Open Access Land or on rivers. These areas may be the subject of widely distributed promotional (tourist) material and/or local interest groups. Views with cultural value, such as where referenced within famous literature or artwork. Open views from residential properties. The Scheme would readily harm the character of the view in a way that cannot be easily mitigated.
Moderate	Viewers with moderate interest in their environment, with discontinuous irregular viewing periods and/or within moderate to highly valued landscapes, such as: Views within, from or towards local designations, such as local landscape designations within the Local Plan. Views within areas recognised as having moderate or high recreational value but where the users focus is engaged in outdoor sport and recreation rather than the appreciation of the landscape e.g. golf, hunting, water based activities. Public rights of way with more restricted views.

Visual Sensitivity	Criteria
	Views experienced by drivers/travellers/passengers of moving vehicles along routes recognised for their scenic value. Views from residential properties with restricted views. Views from workers (outdoors) where views and the setting contribute towards the quality of working life. The Scheme could be accommodated within the view with only moderate change, and some effective mitigation would be possible.
Low	Viewers with a passing interest in their surroundings and momentary viewing periods, and/or within landscapes of low value such as:- Views experienced by drivers/travellers/passengers of moving vehicles along routes unrecognised for their scenic value. Views experienced by people at their place of work (indoors), whose attention may be focused on their work or activity and not on the view. The Scheme could be readily accommodated within the view with only minor change, and effective mitigation could be easily accommodated within the proposals.

The **magnitude of impact** is the degree of change that would occur during the construction and operation of the proposed scheme. Magnitude is determined by the perceived contrast or integration with existing features and aesthetic character in terms of form, line, colour, texture, density and scale. It also considers the geographical extent and duration of the impacts. Landscape, townscape and visual magnitude of impact have been described as Adverse or Beneficial. The following tables contain the criteria used as a basis for the assessment of magnitude of impact:

Table C4 - Magnitude of Landscape/ Townscape Impact Criteria

Magnitude of Landscape/ Townscape Impact	Criteria
Major Adverse	Complete or long term loss of, or significant damage to, key components and elements or the integrity of character over a wide area.
Moderate Adverse	Partial loss of, or damage to, key components and elements but not adversely affecting the overall integrity of character. Noticeable change in terms of key components and elements and character over a moderate area.
Minor Adverse	Some measurable loss of, or damage to, one or more key components and elements over a limited area.
Negligible	No discernible impact on the character, features or elements.
Minor Beneficial	Some measurable contribution towards, or benefit to, one or more key components and elements over a limited area.
Moderate Beneficial	Partial contribution towards, or benefit to, key components and elements but not significantly improving the overall integrity of character. Noticeable change in terms of key components and elements and character over a moderate area.
Major Beneficial	Complete or long term significant improvement to key components and elements and the integrity of character over a wide area.

Table C5 - Magnitude of Visual Impact Criteria

Magnitude of Visual Impact	Criteria
Major Adverse	The proposals would dominate or form a significant and immediately apparent part of the view that would permanently affect and change its overall character. The proposals would cause a very significant deterioration in the existing view.
Moderate Adverse	The proposals would form a visible and recognisable new element of the view within the overall character. The proposals would cause a noticeable deterioration in the existing view over a moderate area.
Minor Adverse	The proposals would constitute only a minor component of the wider view. The proposals would cause a barely perceptible deterioration in the existing

Magnitude of Visual Impact	Criteria
	view over a limited area.
Negligible	Only a very small part or no part of the proposals would be visible. No discernible deterioration or improvement in the existing view.
Minor Beneficial	The proposals would constitute only a minor component of the wider view. The proposals would cause minor improvements to the existing view over a limited area.
Moderate Beneficial	The proposals would form a visible and recognisable new element of the view within the overall character. The proposals would cause a noticeable improvement in the existing view over a moderate area.
Major Beneficial	The proposals would dominate or form a significant and immediately apparent part of the view that affects and changes its overall character. The proposals would cause a very significant improvement in the existing view.

An assessment has been made of the sensitivity of each individual landscape and townscape character area and visual receptor using a scale of 'High', 'Moderate' or 'Low' sensitivity. The magnitude of impact on each receptor has also been assessed using a scale of 'Major', 'Moderate', 'Minor' and 'Negligible' and 'Beneficial' or 'Adverse'. These sensitivity and impact assessments have been fed into the matrix provided below to determine the significance of effect on each receptor. These levels of significance can either be Beneficial or Adverse and typical descriptions of these categories are also provided.

This matrix forms only a guide to the way that sensitivity and magnitude of impact give rise to a prediction of effects. The assessment of significance of effect relies upon common sense, experience and professional judgement, supported by substantiated reasoning. The predicted effect may not always fit with the matrix. For example, in assessing the significance of an effect, an assessor may consider changes of a relatively low magnitude to be highly significant if they relate to a highly sensitive (or 'important' or 'vulnerable') landscape or visual resource, whilst high magnitudes of impact on less sensitive receptors may be deemed to be relatively less significant. The relationship between sensitivity and magnitude of impact is not always linear.

Table C6 - Effect Matrix

		Sensitivity		
		Low	Moderate	High
Impact Magnitude	Major Adverse	Moderate or Minor Adverse	Major or Moderate Adverse	Major Adverse
	Moderate Adverse	Minor Adverse	Moderate Adverse	Major or Moderate Adverse
	Minor Adverse	Minor Adverse or Negligible	Minor Adverse	Moderate or Minor Adverse
	Negligible	Negligible	Negligible	Negligible
	Minor Beneficial	Minor Beneficial or Negligible	Minor Beneficial	Moderate or Minor Beneficial
	Moderate Beneficial	Minor Beneficial	Moderate Beneficial	Major or Moderate Beneficial
	Major Beneficial	Moderate or Minor Beneficial	Major or Moderate Beneficial	Major Beneficial

Table C7 – Landscape/Townscape Impact Descriptors

Landscape/ Townscape Impact	Descriptor
Major Adverse/ Beneficial	A permanent, large scale, long term deterioration/improvement in the landscape/ townscape resource.
Moderate Adverse/ Beneficial	Noticeable deterioration/improvement in the existing landscape/ townscape resource
Minor Adverse/ Beneficial	Barely noticeable deterioration/improvement in the existing landscape/ townscape resource.
Negligible	No noticeable deterioration/improvement in the existing landscape/ townscape resource.

Table C8 – Visual Impact Descriptors

Visual Impact	Descriptor
Major Adverse/ Beneficial	Where the Scheme would cause a permanent, large scale, long term deterioration/improvement in the existing view.
Moderate Adverse/ Beneficial	Where the Scheme would cause a noticeable deterioration/improvement in the existing view.
Minor Adverse/ Beneficial	Where the Scheme would cause a barely perceptible deterioration/improvement in the existing view.
Negligible	Where the Scheme would cause no discernible deterioration/improvement in the existing view.

Appendix D Heritage Impact Assessment Methodology

Assessment of Value

An assessment of the value of each identified designated asset was undertaken on a six-point scale of Very High, High, Medium, Low, Negligible and Unknown. The assessment of value was based on professional judgement informed by consideration of the heritage values identified in the National Planning Policy Framework, and the criteria for the assessment of value provided in HA 208/07, as presented in Tables D1 and D2.

Table D1 - Criteria to Assess the Value of Archaeological Remains

Value	Criteria
Very High	• World Heritage Sites (including nominated sites). • Assets of acknowledged international importance. • Assets that can contribute significantly to acknowledged international research objectives.
High	• Scheduled Monuments (including proposed sites). • Undesignated assets of schedulable quality and importance. • Assets that can contribute significantly to acknowledged national research objectives.
Medium	• Designated or undesignated assets that contribute to regional research objectives.
Low	• Designated and undesignated assets of local importance. • Assets compromised by poor preservation and/or poor survival of contextual associations. • Assets of limited value, but with potential to contribute to local research objectives
Negligible	• Assets with very little or no surviving archaeological interest.
Unknown	• The value of the site has not been ascertained.

Table D2 - Criteria to Assess the Value of Historic Buildings

Value	Criteria
Very High	• Structures inscribed as of universal importance as World Heritage Sites. • Other buildings of recognised international importance.
High	• Scheduled Monuments with standing remains. • Grade I and Grade II* Listed Buildings. • Other listed buildings that can be shown to have exceptional qualities in their fabric or historical associations not adequately reflected in the listing grade. • Conservation Areas containing very important buildings. • Undesignated structures of clear national importance.
Medium	• Grade II Listed Buildings. • Historic (unlisted) buildings that can be shown to have exceptional qualities in their fabric or historical associations. • Conservation Areas containing buildings which contribute significantly to its historic character. • Historic Townscape or built-up areas with important historic integrity in their buildings, or built settings (e.g. including street furniture and other structures).

Value	Criteria
Low	• 'Locally Listed' buildings. • Historic (unlisted) buildings of modest quality in their fabric or historical association. • Historic Townscape or built-up areas of limited historic integrity in their buildings, or built settings (e.g. including street furniture and other structures).
Negligible	• Buildings of no architectural or historical note; buildings of an intrusive character.
Unknown	• Buildings with some hidden (i.e. inaccessible) potential for historic significance.

Assessment of Magnitude and Significance of Impact

Magnitude of impact is assessed without reference to the assessment of value of the receptor, and may include physical impacts upon the asset, or impacts upon its setting or amenity value. Assessment of magnitude and significance of impact were assessed using professional judgement guided by the methodology and criteria provided by HA208/07 set out in Tables D3 to D4.

Table D3 - Magnitude of Impact: summary of factors for archaeological remains

Magnitude	Factors in the assessment of magnitude of change
Major	Change to most or all key archaeological materials, such that the resource is totally altered. Comprehensive changes to setting.
Moderate	Changes to many key archaeological materials, such that the resource is clearly modified. Considerable changes to setting that affect the character of the asset.
Minor	Changes to key archaeological materials, such that the asset is slightly altered. Slight changes to setting.
Negligible	Very minor changes to archaeological materials, or setting.
No Change	No Change.

Table D4 - Magnitude of Impact: summary of factors for the built heritage

Magnitude	Factors in the assessment of magnitude of change
Major	Change to key historic building elements, such that the resource is totally altered. Comprehensive changes to the setting.
Moderate	Change to many key historic building elements, such that the resource is significantly modified. Changes to the setting of an historic building, such that it is significantly modified.
Minor	Change to key historic building elements, such that the asset is slightly different. Change to the setting of an historic building, such that it is noticeably changed.
Negligible	Slight changes to historic building elements or setting that hardly affect it.
No Change	No Change. No change to fabric or setting.

For both sub-topics, the significance of impact is determined as a combination of the assessment of the value of the asset and the magnitude of the impact. This is achieved using professional judgment informed by the matrix illustrated below in Table D5. Five levels of significance of impact are defined which apply equally to Adverse and Beneficial impacts. Within this report, all impacts are assumed to be

Adverse unless otherwise stated, and residual impacts of Moderate level or above are considered to be significant.

Table D5 - Matrix to Assess the Significance of Impacts on Cultural Heritage Assets

	Magnitude of Impact				
Value	**No Change**	**Negligible**	**Minor**	**Moderate**	**Major**
Very High	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight