Gloucestershire Residual Waste Project

PLANNING APPLICATION FOR THE DEVELOPMENT OF AN ENERGY FROM WASTE FACILITY, BOTTOM ASH PROCESSING FACILITY AND ASSOCIATED INFRASTRUCTURE ON LAND AT JAVELIN PARK, HARESFIELD, GLOUCESTERSHIRE

ENVIRONMENTAL STATEMENT
VOLUME 1: MAIN REPORT

JANUARY 2012

This report has been prepared in support of the planning application for the Gloucestershire Residual Waste Project on behalf of Urbaser Balfour Beatty. The application has been co-ordinated by Axis with technical inputs from:

- AXIS – Planning, Transportation, Landscape & Visual and Socio Economic
- Gifford – Soils, Geology & Hydrogeology, Surface Waters & Flood Risk, Noise, Archaeology & Cultural Heritage, Facility Design
- Fichtner – Air Quality & Human Health Assessment
- Argus – Ecology and Nature Conservation
- Fletcher-Rae Architects – Facility Design and Architecture

Camellia House
Water Lane
Wilmslow
SK9 5BB

CONTENTS

FOREWORD

Figures **(Volume 2 – Bound Separately)**

Technical Appendices (Volume 3 – Bound Separately)

Appendix 2.1	Environmental Scoping Report
Appendix 2.2	GCC Scoping Opinion
Appendix 5.1	Utilities Plan
Appendix 5.1a	Consultation with Severn Trent Water
Appendix 5.2	Lighting Design
Appendix 5.2a	Augean Letter of Support
Appendix 5.3	Grid Connection Study
Appendix 5.4	Construction Programme
Appendix 5.5	Construction Phasing
Appendix 7.1	Predicted changes in Total Traffic Demand on the Adjacent Highway Network Core Assessment Scenario
Appendix 7.2	Predicted changes in Total Traffic Demand on the Adjacent Highway Network Sensitivity Assessment Scenario
Appendix 7.3	Predicted changes in HGV Demand on the Adjacent Highway Network Core Assessment Scenario
Appendix 7.4	Predicted changes in HGV Demand on the Adjacent Highway Network Sensitivity Assessment Scenario
Appendix 8.1	Landscape and Visual Assessment Methodology
Appendix 8.2	Cotswolds Conservation Board Landscape Position Statement
Appendix 8.3a	Gloucestershire Landscape Character Assessment Extract
Appendix 8.3b	Cotswolds AONB Landscape Character Assessment Extract
Appendix 8.4	Viewpoint Locations
Appendix 8.5	Schedule of Visual Effects
Appendix 8.6	Visualisation Methodology
Appendix 8.7	Draft Landscape and Ecological Management Plan
Appendix 9.1	Phase 1 Habitat Survey
Appendix 9.2	Bat Survey Results
Appendix 9.3	Breeding Bird Survey Results
Appendix 9.4	RPS Reptile Survey
Appendix 9.5	RPS Great Crested Newt Survey
Appendix 9.6	Habitat Regulations Screening Assessment
Appendix 10.1	WSP (September 2002) Geo-Environmental Assessment
Appendix 10.2	WSP (April 2005) Asbestos and Hydrocarbon Investigation Report

FOREWORD

This Environmental Statement is submitted in support of a planning application made by Urbaser Balfour Beatty for the development of an Energy from Waste facility, bottom ash processing facility and associated infrastructure, on land at Javelin Park, Haresfield, Gloucestershire. The Environmental Statement comprises the following documents:

- the Environmental Statement (ES) Main Report (Volume 1), which contains the detailed project description; an evaluation of the current environment in the area of the proposed development; the predicted environmental impacts of the scheme; and details of the proposed mitigation measures which would alleviate, compensate for, or remove those impacts identified in the study. Volume 1 also includes a summary of the overall environmental impacts of the proposed development;

- Illustrative Figures (Volume 2) contains all relevant schematics, diagrams and illustrative figures;

- Technical Appendices (Volume 3), which include details of the methodology and information used in the assessment, detailed technical schedules and, where appropriate, raw data. (Volume 3 is printed in black and white. However, a CD is enclosed that includes a colour version of all the technical reports);

- a Non-Technical Summary (Volume 4), containing a brief description of the proposed development and a summary of the ES, expressed in non-technical language.

Copies of the documents, as a four volume set, are available at a cost of £200 from Urbaser Balfour Beatty, Unit F, 2nd Floor, Pate Court, St Margaret's Road, Cheltenham, GL50. Alternatively, the Non-Technical Summary can be purchased on its own from the same point of contact for £15. An electronic copy of the Non-Technical Summary is also available via email (info@ubbgloucestershire.co.uk), free of charge. In addition, all of the planning application documentation, including the ES can be downloaded from www.ubbgloucestershire.org.

1.0 INTRODUCTION AND BACKGROUND

1.1 Introduction

1.1.1 This Environmental Statement (ES) accompanies the planning application for the construction and operation of an Energy from Waste (EfW) facility, bottom ash processing facility and associated infrastructure including access roads, security fencing, weighbridges, lighting and surface water lagoons on land at Javelin Park, Haresfield in Gloucestershire.

1.1.2 The ES describes the proposal and provides an assessment of the likely significant environmental effects that may arise from the construction and operation of the facility.

1.1.3 This introductory chapter provides the general background to the development, an outline description of the proposal, provides details of the applicant and defines the structure of the ES.

1.2 The Proposal

1.2.1 Urbaser Balfour Beatty (UBB) is proposing to meet the residual municipal waste management needs of Gloucestershire County Council through the development of a purpose built EfW facility, on land at Javelin Park, Haresfield, Gloucestershire. The planned opening date for the facility is autumn 2015. The facility would have an installed electricity generating capacity of approximately 17.4 Megawatts (MW). Approximately 14.5MW would be exported to the local electricity grid with the remainder being used in the operation of the facility. It would generate electricity by way of a steam turbine which would be driven through the combustion of 190,000 tonnes per annum (tpa) of non-hazardous residual waste (i.e. waste that is not sent for reuse, recycling or composting) the significant majority of which would be municipal waste. Municipal waste is that waste collected and managed by, or on behalf of, local authorities. A lesser proportion of the waste treated at the facility would be commercial and industrial wastes similar in composition to the municipal waste.

1.2.2 The proposals comprise the construction of the EfW facility (with an integrated education / visitor centre), bottom ash processing facility and associated infrastructure and landscaping designed to help integrate the development into the site and the surrounding area.

1.2.3 The operation of the proposed facility would comply fully with relevant UK Government and European Union (EU) legislation and policies. The principal processes to be carried out at the plant include the receipt, storage and combustion of non-hazardous residual waste, the generation of electricity and heat, the use of emissions abatement equipment and the processing of bottom ash arising from the EfW facility into a recycled aggregate capable of beneficial use. In addition, there would also be the temporary storage of process residues on the site.

1.2.4 On the basis that the planning application is approved, the facility is programmed to open in autumn 2015. The facility would have a design life of around 30 years although in reality many elements of the plant would last beyond this period. For the avoidance of doubt planning permission is being sought for a permanent development and therefore as elements of the facility require repair/refurbishment/replacement this would be carried out.

1.3 The Site and Its Context

1.3.1 The proposed development site (hereafter referred to as 'the site') is located within the Severn Vale, near the village of Haresfield, Gloucestershire. The centre of the site is at Ordnance Survey National Grid Reference 380040E 210430N and it is located within the administrative areas of Gloucestershire County Council (GCC) and Stroud District Council (SDC). The location of the site is shown on Figure 1.1.

1.3.2 The site is approximately 5.1 ha in area (including the site access road) and forms the southern part of Javelin Park, a disused former airfield. The wider Javelin Park site covers a total area of approximately 10.75 ha. Javelin Park has been subject to a number of planning permissions (described in Chapter 4.0), but currently comprises derelict ground, hardstanding and vegetated areas. No buildings or above ground structures associated with the former land use remain at the site. It is understood that these comprise materials arising from the demolition of the buildings and structures that were historically present on the site. The site slopes gently from east to west with a fall of approximately 2.5 m. The site is situated at between 19.5 and 22 meters above ordnance datum (mAOD).

1.3.3 The site is bounded to the north by an undeveloped, derelict area (the northern part of ‘Javelin Park’), beyond which lies Blooms Garden Centre. Further north is Junction 12 of the M5 motorway.

1.3.4 The eastern boundary of the site is formed by the B4008 beyond which are agricultural fields and one residential property, The Lodge, which is approximately 50 m from the boundary of the site.

1.3.5 A small unnamed watercourse flows into the south-east corner of the site and flows along the southern and western boundary. It is understood that watercourse was previously culverted beneath Javelin Park and has since been diverted around the site in an engineered open channel. The corridor of the watercourse has been landscaped with trees and shrubs.

1.3.6 Agricultural fields lie to the south and west of the site. The M5 motorway runs in a north-east / south-west orientation, approximately 70 m from the western boundary of the site. Hiltmead House, a residential property, is located approximately 250 m to the west of the site on the opposite side of the M5 motorway.

1.3.7 Access to the site is from a three-arm roundabout junction, which was purpose built to provide access to Javelin Park from the B4008. A recently constructed private access road within Javelin Park links the site to the B4008 roundabout junction. The private access road runs along the northern boundary of the site and is not currently accessible to traffic. Another access onto the northern half of Javelin Park is provided via a ghost island right turn lane on the B4008 and is combined with the Blooms Garden Centre access.

1.3.8 The area beyond Javelin Park is predominantly semi-rural in nature. However, there are a number of key features and settlements in the surrounding area which include:

- the M5 motorway 70 m to the west of the site and the associated M5 Junction 12 approximately 100 m to the north of the site;

- the settlement of Haresfield located approximately 1km to the east of the site;
- the settlement of Little Haresfield and Standish located approximately 1 km and 1.5 km to the south of the site respectively;
- the settlement of Moreton Valence located approximately 2 km to the south-west of the site;
- Quedgeley East Business Park located approximately 0.75 km to the north-east of the site, the business park is located to the east of the M5; and
- Quedgeley West Business Park and Waterwells Business Park located approximately 1.5 km and 2 km to the north of the site, the business parks are located to the west of the M5.

1.4 The Applicant

1.4.1 Urbaser Balfour Beatty is a consortium formed specifically to deliver the proposed Gloucestershire Residual Waste Project and is a joint venture between Urbaser Ltd and Balfour Beatty Capital Ltd.

1.4.2 Urbaser Ltd is an environmental services company, who work internationally as one of the main operators in the environmental and waste management sector. Part of the accredited ACS Group, Urbaser specialise in providing local councils and industry all types of environmental services. Urbaser owns and runs more than 60 waste management facilities worldwide, processing more than 7 million tonnes of waste every year.

1.4.3 Urbaser currently has more than 32,000 employees trained and specialised in environmental services. The company has a worldwide presence and provides services to more than 50 million people. The company operates seven major waste management facilities and twelve smaller waste sites in the counties of Herefordshire and Worcestershire, serving 500,000 inhabitants. The UK head office of Urbaser is in Cheltenham.

1.4.4 Balfour Beatty is a world class infrastructure services business operating across the infrastructure lifecycle providing: roads, power, renewables, schools and hospitals, and are involved in 41 private finance initiative contracts around the country. Within the waste management sector Balfour Beatty have been involved with the construction of 15 projects.

1.4.5 Balfour Beatty services encompass everything from multidiscipline engineering, through construction, to long term asset management and financing of major projects. Worldwide Balfour Beatty currently employ 500,000 staff with over 50,000 based in the UK.

1.5 Background to the Development

1.5.1 The Gloucestershire Joint Municipal Waste Management Strategy (JMWMS) outlines how the County intends to manage its Municipal Solid Waste (MSW) up to 2020. The JMWMS identifies the need for the County to develop alternative sustainable measures to landfill for the management of its residual waste i.e. waste left after recycling and composting. The JMWMS has set a target to recycle and compost 60% of the County's MSW by 2020 with the remaining residual waste to be diverted from landfill through materials and energy recovery.

1.5.2 In response to the growing need to identify alternative measures to manage the County's residual municipal waste, the County Council has recognised the need to invest in a long term alternative to landfill. In 2008 the GCC Cabinet approved the preparation of a business case to determine the best approach for the delivery of a residual waste contract. In 2009 GCC invited companies to bid for the Gloucestershire Residual Waste Project, a long term contract for the provision of residual waste treatment capacity capable of diverting Gloucestershire's municipal residual waste from landfill.

1.5.3 As part of the procurement process, in accordance with Defra guidance, a model waste management solution was identified by GCC. This included a specific waste treatment technology and a specific development site. This solution is referred to as the Reference Project and provides the benchmark against which the various bids for the contract will be evaluated. The Reference Project was an Energy from Waste (EfW) facility (with an opportunity to develop Combined Heat and Power) based on Javelin Park. Whilst a Reference Project was selected by the Council, bidders for the Gloucestershire Residual Waste Project were encouraged to come forward with a range of potential solutions. The Council stipulated that solutions did not have to consist of any single technology or combination of any particular technologies. In addition, GCC made it clear that the solution could be based on a single site or on more than one site. UBB were one of 10 companies selected to develop proposals for the contract.

1.5.4 The Gloucestershire Residual Waste Project was originally intended to be funded as a Private Finance Initiative (PFI). However, part way through the procurement process, in October 2010 Defra announced the withdrawal of the PFI funding from the project as part of the Government's Spending Review. As a result GCC suspended the procurement exercise and carried out a “strategic reappraisal” of the project. In March 2011 GCC announced that on the basis of the cost benefits to the Authority it would continue with the procurement process albeit not under the PFI umbrella. At the same time UBB was shortlisted as one of the two final bidders for the contract. In December 2011 UBB were awarded preferred bidder status.

1.5.5 At the preferred bidder stage UBB is required to submit its planning application for the consortiums contract solution. As described previously UBB’s proposal mirrors the Reference Project.

1.6 This Document

1.6.1 This document is the Environmental Statement (ES), which has been prepared to accompany the planning application. It describes the potential environmental effects of the proposed scheme, both during its construction and operation. It has been prepared in accordance with European Community (EC) Directives on the assessment of the effects of certain projects upon the environment (85/337/EEC updated by 97/11/EEC). This legislation is now manifest in England through the Town and Country Planning (Environmental Impact Assessment) Regulations 2011 with which this report is fully compliant.

1.6.2 Following on from this introduction the remainder of the ES is structured as follows:

- Chapter 2.0 of the ES outlines the approach to the assessment describing the scope and structure of the ES;

- Chapter 3.0 summarises the need for the proposed development and the alternatives considered;
- Chapter 4.0 provides a summary of the relevant planning history associated with Javelin Park;
- Chapter 5.0 provides a detailed scheme description and provides an outline of the construction methods;
- Chapter 6.0 provides an outline description of the planning policy context relevant to the determination of the planning application.
- Chapters 7.0 to 17.0 assess the potential environmental impacts of the proposal during its construction and operation, including proposed mitigation measures;
- Chapter 18.0 provides an assessment of the impacts of potential options to connect the facility to the local electricity grid, which is a discrete element of the scheme and does not form part of the planning application which this ES supports; and
- Chapter 19.0 summarises the assessment findings.

2.0 SCOPE OF THE ENVIRONMENTAL IMPACT ASSESSMENT

2.1 Scope

2.1.1 Environmental Impact Assessment (EIA) is the process culminating in the production of this report, the Environmental Statement (ES). The objective of the process is to identify and evaluate all significant, direct and indirect environmental effects of the proposed development, during both construction and operation, on the environment.

2.1.2 With regard to the need for an EIA the proposed development is included within Schedule 1 of the Town and Country Planning (Environmental Impact Assessment) Regulations 2011under Part 10 as follows:

"10. Waste disposal installations for the incineration or chemical treatment (as defined in Annex IIA to Council Directive 75/442/EEC under heading D9) of non hazardous waste with a capacity exceeding 100 tonnes per day".

2.1.3 As such the proposed EfW facility at Javelin Park is deemed to be a Schedule 1 development and therefore EIA is mandatory for this project.

2.1.4 The scope, or requirements, of an ES are set out in Schedule 4 of the EIA Regulations. Part 1 of the Schedule details the information that the applicant is reasonably required to provide, whilst Part 2 identifies the information that the applicant must provide, these are set out below. References to chapters in the ES where information relevant to these requirements can be found are also listed below.

PART I

1. Description of the development, including in particular:

a) a description of the physical characteristics of the whole development and the land-use requirements during the construction and operational phases;	*Chapter 5*
b) a description of the main characteristics of the production processes, for instance, nature and	*Chapter 5*

quantity of the materials used;

c) *an estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc.) resulting from the operation of the proposed development.* — *Chapter 5, 10, 11,12, 13 and 14*

2. An outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for his choice, taking into account the environmental effects. — *Chapter 3*

3. A description of the aspects of the environment likely to be significantly affected by the development, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter-relationship between the above factors. — *Chapters 7 to 18*

4. A description of the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the development, resulting from: — *Chapters 7 to 18*

(a) the existence of the development;

(b) the use of natural resources;

(c) the emission of pollutants, the creation of nuisances and the elimination of waste, and the description by the applicant of the forecasting methods used to assess the effects on the environment.

5. A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse — *Chapters 7 to 18* *effects on the environment.*

6. A non-technical summary of the information provided under paragraphs 1 to 5 of this Part.	*Volume 3*
7. An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the applicant in compiling the required information.	*Chapters 7 to 18*

PART II

1. A description of the development comprising information on the site, design and size of the development.	*Chapter 5*
2. A description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects.	*Chapters 7 to 18*
3. The data required to identify and assess the main effects which the development is likely to have on the environment.	*Chapters 7 to 18*
4. An outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for his choice, taking into account the environmental effects.	*Chapter 3*
5. A non-technical summary of the information provided under paragraphs 1 to 4 of this Part.	*Volume 3*

Consultation

2.1.5 Under Regulation 13 of the EIA Regulations, potential applicants may request a Scoping Opinion from the Local Planning Authority. This is a written confirmation as to the information that would need to be provided in the ES.

2.1.6 On 1st October 2011 UBB submitted a formal request for a Scoping Opinion from GCC. The request was accompanied by an Environmental Scoping

Report which provided confirmation of the issues that UBB considered would need to be covered in the ES. The Scoping Report submitted to GCC is contained within Appendix 2.1.

2.1.7 As part of the procurement process for the project GCC had already undertaken a number of environmental surveys and some assessment work of the Javelin Park site. These include the following, which were used to assist in establishing the scope of the EIA:

- Extended Phase 1 Habitat Survey;
- Reptile Survey;
- Great Crested Newt Habitat Suitability Assessment;
- Contaminated Land Desk Study;
- Phase 2 Intrusive Site Investigation Report;
- Air Quality Gap Analysis;
- Preliminary Assessment of Air Quality on Statutory Designated Sites;
- Noise and Vibration Baseline Report;
- Level 2 Flood Risk Assessment; and
- Desk Assessment of Cultural Heritage Resources.

Table 2.1 Summary of Scoping Consultations

Consultee	Key Comments
GCC Highways Department and the Highways Agency	Assessment to include committed developments at Javelin Park (remainder of the development site), Kingsway, Hunts Grove and Gloucester Quays. Key assessment area confined to A38 Cross Keys Roundabout, M5 J12 and Javelin Park roundabout. Transport Assessment should accurately reflect DfT’s Guidance for Transport Assessment. Accident data analysis should be undertaken for a 5year period. A Travel Plan is required in support of the application
Gloucestershire County Council (Landscape)	Additional viewpoint proposed around Haresfield and Moreton Valence.
Forest of Dean District Council (Landscape)	Recommended additional viewpoints from edge of Cinderford and paths along River Severn (near Awre and Purton),

Consultee	Key Comments
Forest of Dean District Council (Landscape)	Recommended general views from Robins Wood Hill and views from within the Country Park, Golf Course and the nearby footpaths should be considered in the assessment
Cotswold Conservation Board and Natural England	Both organisations were satisfied with the scoping information provided.
GCC Ecologist	Satisfied with level of survey conducted at the site. GCC requested that pre-construction surveys should be undertaken to confirm that the baseline at the site had not significantly altered between the assessment undertaken for the EIA and the start of the construction period. GCC also advised that Natural England Standing Advice notes regarding protected species should be reviewed.
Stroud District Council (SDC) Contaminated Land Officer	SDC was satisfied with the approach proposed to the assessment. The only additional comments related to ensuring that 'Model Procedures for the Management of Contaminated Land (CLR11)' (Environment Agency, 2004) are considered when undertaking the assessment.
Environmental Agency (EA)	EA satisfied with the approach to the Flood Risk Assessment.
SDC Environmental Health Officer (Noise)	SDC advised that operational noise from the development should not exceed +3dB above background at any residential receptors. The EHO was satisfied with the level of noise monitoring and the general approach to the assessment.
SDC Environmental Health Officer (Air Quality)	SDC satisfied with the general approach to modelling and assessment of air quality impacts.
Natural England (Ecology and Air Quality)	Natural England requested that a Habitat Regulations Screening Assessment was undertaken for European Sites within 15km of the proposed facility. This should include air quality impacts as well as any other impacts that have the potential to effect the integrity of a European Site.
GCC County Archaeologist	GCC confirmed that on the basis of the evidence presented in the Desk Assessment the overall archaeological potential of the site is considered to be low. As such any further assessment of below ground archaeology can be scoped out of the EIA.

Consultee	Key Comments
English Heritage	English Heritage has requested that the baseline data included within the Desk Assessment is updated to confirm the presence and location of all cultural heritage features surrounding the site. In addition it was also requested that the cultural heritage gazetteer includes all heritage features up to 2km from the site and all Designated Heritage Assets (i.e. World Heritage Sites, Scheduled Monuments, Listed Buildings, Registered Park and Gardens, Registered Battlefields or Conservation Areas) within 5km of the site.

2.1.8 Following the aforementioned screening request, GCC adopted their formal Scoping Opinion on 6th December 2011, a copy of which is contained within Appendix 2.2. The Scoping Opinion provided by GCC confirmed that the majority of the key environmental considerations had been identified by the Environmental Scoping Report and made a number of recommendations for additional information to be considered within the EIA. The ES reflects comments included in the Scoping Opinion on all issues material to the requirements of the EIA Regulations.

2.1.9 The information and knowledge required to produce this ES was acquired from a number of varied sources to ensure that all impacts, whether explicit from the outset, or coming to light during the project's development, were assessed. These sources included:

- discussions with technical consultees;
- review of public files and records;
- review of historical mapping and aerial photography;
- site surveys undertaken both by GCC and the applicant;
- specialist studies, such as computer modelling of potential noise impacts; and
- expert knowledge from the consultancy team.

2.2 Structure of the Environmental Statement

2.2.1 The format of this Environmental Statement is as follows:

2.2.2 Volume 1 (Main Report) provides an introduction to the project and details the technical assessments that have been undertaken to determine the likely impacts of the project. The chapters of the Main Report are as follows:

Chapter 1.0:	Introduction and Background
Chapter 2.0:	Scope of the Environmental Impact Assessment
Chapter 3.0:	The Need for the Scheme and Alternatives Considered
Chapter 4.0:	Planning History
Chapter 5.0:	Detailed Scheme Description and Construction Methods
Chapter 6.0:	Planning Policy Context
Chapter 7.0:	Traffic and Transportation
Chapter 8.0:	Landscape and Visual
Chapter 9.0:	Ecology and Nature Conservation
Chapter 10.0:	Geology, Soils and Groundwater
Chapter 11.0:	Surface Waters and Flood Risk
Chapter 12.0:	Noise and Vibration
Chapter 13.0:	Air Quality
Chapter 14.0:	Human Health
Chapter 15.0:	Archaeology and Cultural Heritage
Chapter 16.0:	Socio Economic
Chapter 17.0:	Cumulative Effects Assessment
Chapter 18.0:	Grid Connection
Chapter 19.0:	Summary of Effects

2.2.3 Bound separately to this document is a series of Technical Appendices (Volume 2). These include details of the methodology and information used in the assessment, detailed technical schedules and, where appropriate, raw data.

2.2.4 The Environmental Statement covers a large number of issues and, in doing so, uses a significant quantity of technical terms. Consequently, all the chapters are summarised in a Non-Technical Summary (bound separately as Volume 3) to provide a review of the development proposals, and the possible environmental implications, in concise lay terms.

3.0 THE NEED FOR THE SCHEME AND ALTERNATIVES CONSIDERED

3.1 The Need for the Scheme

3.1.1 The need for the proposed EfW facility is described in detail within Chapter 2.0 of the Planning Statement (that forms Part 3 of the Planning Application). The conclusions from Chapter 2.0 of the Planning Statement are provided in the following paragraphs.

3.1.2 The need for the Javelin Park EfW facility (and the benefits arising from the scheme) has been considered in the context of a number of strategic waste policy documents and the current waste management position within the South West region and Gloucestershire. In addition, it has also been evaluated in terms of national, regional and sub-regional renewable energy policy and need. The assessment has established the following:

National Waste Policy

- Waste Strategy England 2007 sets a number of targets to reduce the quantities of biodegradable municipal solid waste (MSW) sent to landfill which are focussed on recovering value from MSW through recycling and composting. It is accepted within national guidance that the balance of MSW not recycled will need to be managed further down the hierarchy with a preference for energy recovery over disposal.
- Increases in the Landfill Tax regime, introduced in the March 2010 budget, will rapidly increase the need for alternative facilities for the management of MSW and commercial and industrial (C&I) waste to come forward. This fiscal measure is a driver for the achievement of national sustainable waste management targets.
- From a national (and indeed regional and sub-regional) perspective, all relevant extant and emerging policy and strategy documents support the thermal treatment of waste with energy recovery.
- The biodegradable fraction of waste is acknowledged as being a potential source of renewable energy generation and its contribution to the achievement of renewable energy targets is acknowledged in the Government's Energy White Paper (May 2007), Waste Strategy for England (2007), the UK Renewable Energy Strategy (2009), together

with the Government Review of Waste Policy in England 2011 (June 2011).

Regional Waste Policy and Position

- From a regional perspective, figures in the draft Regional Strategy (RS) identify that the maximum secondary treatment / recovery capacity that needs to be planned for MSW in 2020 is 2,750,000 tpa and for C&I waste in 2020 is 2,930,000 to 3,080,000 tpa. Presently there are no operating residual waste treatment plants in the region and only a single 60,000 tpa EfW facility under construction (in Exeter). Thus, much more residual waste treatment infrastructure is required in the South West.

County Waste Policy and Position

- Gloucestershire has no operating residual waste treatment capacity and is presently sending nearly 500,000 tpa of waste to landfill. The County Council has identified (in its emerging Waste Core Strategy) that for MSW it will require circa 150,000 tpa of residual waste treatment capacity up to 2027. For reasons explained in the Gloucestershire Joint Municipal Waste Management Strategy, and elsewhere, this figure may be much higher (either by this date or beyond). Furthermore, the Council identifies that this level of provision would be consistent with achieving very high levels of MSW recycling.
- Gloucestershire also requires up to 200,000 tpa of new residual waste treatment capacity for C&I waste.
- The Council supports EfW (i.e. thermal treatment with energy recovery) as being an appropriate residual waste management technology.
- In light of the above, Gloucestershire must develop new residual waste management infrastructure. The proposed Javelin Park EfW facility, with a capacity of 190,000 tpa, would move the management of Gloucestershire's residual MSW up the Waste Hierarchy and still allow for very high levels of recycling. It would also make a modest, but nevertheless useful, contribution towards recovering energy from some of the County's residual C&I waste, which is presently sent to landfill. It would provide an essential element of the waste management infrastructure required within Gloucestershire that is currently missing.

National Renewable Energy Policy

- The Energy White Paper includes targets which aim to see renewables grow as a proportion of electricity supply to 10% in 2010, with an aspiration for this to rise to 20% in 2020.
- The UK Renewable Energy Strategy promotes investment in renewable energy technology (including the type proposed), in order to meet the EU set target that renewables will constitute 15% of the UK energy mix by 2020. This figure is explicitly a minimum target.
- The Glossary to the PPS1 Supplement on Climate Change explicitly identifies that renewable and / or low carbon energy supplies include energy from waste. The significance of the Supplement cannot be overstated. In paragraphs 13, 19, 20 and 40 it effectively reconfigures the emphasis in the planning system, such that the approach to proposals like the Javelin Park EfW facility, should be one of facilitation and encouragement.

Regional Renewable Energy Policy and Position

- Detailed evaluation has shown that the South West region is failing in every regard in the deployment of renewables and meeting its obligations to contribute to the national renewables target. It is now the second worst performing region in England and it is actually generating less renewable electricity (compared to demand) in 2010 than it did in 2005.
- With regard to targets, the 13% renewable electricity generation target for 2010 in the extant RS has been missed by a huge margin with only 2.5% renewable electricity generation achieved. With regard to installed renewables generating capacity, less than 40% of the lower end of the regional target in the draft RS was delivered.

County Renewable Energy Policy and Position

- The need assessment has shown that in 2010 renewable electricity generation in Gloucestershire was ~124 GWh. This only accounts for 3.94% of the County's electricity consumption (against the national target of 10% for the same year). In addition, Gloucestershire only has

17MW of installed renewable electricity generation capacity and has significantly missed its target of 40-50 MW by 2010. Finally, of the 124 GWh of renewable electricity generated in Gloucestershire (in 2010), 120GWh (97%) came from waste, highlighting the importance of waste as a renewable resource in the County.

- UBB's Javelin Park EfW facility would generate 17.4 MW of electricity, with 14.5 MW exported to the local electricity grid. Of that exported, 56% would be classed as renewable i.e. 8.1 MW. Based upon 8,000 hours of generation per annum, the facility would generate 64,800 MWh/yr (64.8GWh/yr) of renewable electricity. This would increase the renewable electricity generated in Gloucestershire (in 2010) by over 50%. It would also increase the current installed capacity by 48%. Furthermore, in terms of the South West region as a whole, it would increase 2010 renewable electricity generation levels by over 10%.

Climate Change

- The development proposal has been found to accord with the Government's Key Planning Objectives for combating climate change. It would result in significant greenhouse gas savings per annum amounting to 40,480 tonnes of CO_2 equivalents.

Economic and Other Benefits

- The economic benefits of the scheme include the creation of approximately 40 permanent jobs together with up to 300 temporary jobs during the construction phase of the development. This would include local employment opportunities. There would also be financial benefits to the County Council (and rate payers) in terms of reducing the financial costs and risk associated with increased Landfill Tax. In addition social / community benefits would arise from the new visitor / education facilities which would enable the community and schools to learn about waste management and how they can take more responsibility for their own waste.

3.1.3 In conclusion, there is a demonstrable and overriding need for the Javelin Park EfW development. The benefits it would bring relate to both contributing towards delivering sustainable waste management and combating climate change through low carbon and renewable energy production. Given both the South West region and Gloucestershire sub-region have a paucity of sustainable waste management and renewable energy infrastructure, the opportunity presented by the proposal must not be missed. The scheme offers very significant benefits of regional and sub-regional significance and, in accordance with the identified policy framework, these should be afforded very significant positive weight (in planning terms).

3.2 Alternatives Considered

3.2.1 The issue of alternatives stems primarily from the Town and Country Planning (Environmental Impact Assessment) Regulations 2011. Schedule 4 of the Regulations identifies the information for inclusion in Environmental Statements. Parts 1 (2) and 2 (4) include:

"An outline of the main alternatives studied ………. And an indication of the main reasons for his choice, taking into account the environmental effects".

3.2.2 Paragraph 83 of Circular 2/99 which accompanies the Regulations notes that:

"Although the Directive and the Regulations do not expressly require the developer to study alternatives, the nature of certain developments and their location may make the consideration of alternatives a material consideration…."

3.2.3 In the case of this planning application, and specifically the work undertaken leading up to the application, a number of alternatives have been considered, these are listed below. The following sections provide a summary of each of the alternatives considered.

- Alternative Waste Management Options and Technology Choice.
- Alternative EfW Technologies.
- Alternative Locations / Sites.
- Alternative Design Solutions.

Alternative Waste Management Options and Technology Choice

3.2.4 In 2008 Gloucestershire Waste Partnership (GWP) published its Joint Municipal Waste Management Strategy (JMWMS). This document recognised the need for the County to provide an alternative to landfill for the management of its residual waste.

3.2.5 As part of the development of a residual waste strategy a technology appraisal was conducted to examine the various options that could be implemented to manage the County's residual waste.

3.2.6 The process began with evaluating a 'long-list' of 34 potential waste technology solutions that included permutations of the following:

- landfill;
- autoclave;
- advanced thermal treatment (e.g. pyrolysis, gasification);
- mechanical biological treatment;
- in-vessel composting;
- windrow composting;
- modern thermal treatment (also referred to as EfW);
- anaerobic digestion; and
- plasma arc.

3.2.7 These technologies were considered against the following high level criteria and the most feasible options were taken forward further appraisal:

- national policy / legislation;
- product marketability;
- efficacy: proven technology;
- the Landfill Allowance Trading Scheme; and
- excessive cost.

3.2.8 This resulted in the long list being reduced to 19 technology solutions. A second evaluation exercise was then undertaken examining planning, environmental and deliverability risks associated with each of the technology options. The criteria used in this second options appraisal exercise were:

- planning risks associated with technology;
- track record of the technology;
- flexibility and adaptability of the technology to changes in waste composition / volume;
- climate change implications of the technology option;
- health effects of emissions from technology;
- contribution of the technology to recycling/composting and demand the technology makes on primary materials extraction; and
- net energy generation / use of the technology.

3.2.9 The outcome of the this analysis produced a shortlist of technology options as follows:

- modern thermal treatment EfW with combined heat and power (CHP);
- mechanical biological treatment (MBT) producing a fuel to power a dedicated CHP plant/s;
- MBT producing a biologically stabilised material that is sent to landfill;
- autoclave producing an active fibre fuel that is sent to power a dedicated CHP plant/s; and
- advanced thermal treatment with syngas used for electricity production and recovery of heat energy.

3.2.10 Following this GCC undertook further assessments on the shortlist of technology options to select a reference project (that included a reference technology) for the Gloucestershire Residual Waste Project, the following is an extract from the April 2008 GCC Cabinet Report:

"In accordance with Defra guidance, GCC is required to develop a hypothetical residual waste solution referred to as a Reference Project as part of GCC's OBC [Outline Business Case] and application for PFI [Private Finance Initiative] credits. It should be stressed that the Reference Project does not represent GCC's preferred solution. A Reference Project must however represent a credible and proven solution that is capable of being delivered both financially and technically by the private sector."

3.2.11 and the following was concluded within the April 2008 GCC Cabinet Report:

"Based on technical and financial modelling, the two best performing scenarios were MBT producing a Solid Recovered Fuel to feed a dedicated CHP and Energy from Waste (EfW) with Combined Heat & Power (CHP). These technology scenarios were identified as having the potential to represent GCC's Reference Project. Further climate change impact modelling was undertaken on the two scenarios, and the stand alone CHP option was the best performing technology scenario. It was therefore decided that stand alone CHP would be the most appropriate option to take forward as GCC's Reference Project."

3.2.12 Despite the County having selected a reference technology for the purposes of the procurement process it was made clear to the selected bidders for the Gloucestershire Residual Waste Project contract that none of the five shortlisted technologies were deemed to be superior to the others.

3.2.13 On this basis UBB has reviewed the suitability of the short-listed technologies identified by GCC, keeping in mind the key requirements of the contract i.e. GCC require a deliverable, flexible, environmentally sustainable and value for money solution to manage the County's residual waste stream.

3.2.14 With regard to Advanced Thermal Treatment (e.g. pyrolysis and gasification) there is relatively limited experience of successfully using these technologies for the processing of MSW at the scale required for the Gloucestershire Residual Waste Project. In addition, both technologies are sensitive to the nature and composition of waste being treated. In order to operate efficiently these technologies require both a consistent feed stock and a certain proportion of different waste types. Such limitations are especially relevant given the high recycling rates anticipated by GCC and therefore the likely composition of the waste following extraction of recyclable materials. As such, these technologies are limited in their flexibility to deal with the potential variation in the composition of the residual MSW that may arise during the contract period. Pyrolysis and gasification processes are more complex than other more widely deployed technologies and more prone to operational problems. As a consequence they are difficult to fund and were rejected by UBB.

3.2.15 Autoclaves are not in themselves a residual waste treatment solution and only offer an interim process which results in the production of a fuel (generally referred to as a solid recovered fuel (SRF) or refuse derived fuel (RDF)) or a compost like output (CLO). The SRF/RDF then requires a separate facility/process in order for energy to be recovered. An autoclave facility on its own is a significant net user of energy. CLO produced by autoclaves from mixed residual waste has very little application and the Environment Agency has complex and stringent rules on it being spread on land. At best it can be mixed with soils and used in landfill (or occasionally contaminated land) restoration. However, in reality the demand for CLO is extremely limited and it often ends up being landfilled. UBB found no benefits in a multi-stage solution nor in autoclaving as a technology when compared to other options. As a consequence it was dismissed.

3.2.16 With respect to Mechanical Biological Treatment (MBT) this technology is usually adopted where there is a large proportion of an authority's mixed municipal waste to be managed and a significant opportunity to recover more recycled material. As stated previously the JMWMS sets a target to recycle and compost 60% of MSW by 2020. The JMWMS states that this target will be achieved through source segregation of recyclable and compostable materials at the kerbside, and through bring sites and Household Recycling Centres.

3.2.17 The composition of the residual waste that would remain should the 60% recycling target be achieved would be such that MBT technologies would be inefficient in terms of extracting further recyclable material. The majority of recyclable material will already have been removed from the waste stream and any remaining recyclables are likely to be of low grade and would be inefficient to sort and extract. Furthermore, like autoclaves they are only an interim solution and the non-recycled-fraction of the waste is processed into either a CLO or more commonly an RDF/SRF. In the Gloucestershire situation the composition of the residual waste remaining after source segregation would mean that any RDF/SRF would be a low grade fuel. For this reason, and reasons similar to the consortium's conclusions on autoclaving. UBB dismissed MBT options.

3.2.18 Direct waste combustion in a modern thermal treatment EfW facility with CHP is a proven technology capable of delivering a flexible and sustainable waste management solution. EfW is used throughout the UK and Europe for the management of MSW (and similar commercial and industrial wastes) and is established as an efficient way to recover energy, especially where CHP can also be delivered from the plant. The technology is, by a very significant margin, the most widely deployed waste recovery solution in Europe (with circa 400 operating plants). An EfW facility would be capable of managing the predicted waste volumes and would effectively treat the likely composition of the waste predicted to remain after achieving the 60% recycling and composting target. Given, the technology is well proved it is also significantly less complex to fund. On this basis the use of a modern EfW facility was considered by UBB to be the most appropriate waste management option for the Gloucestershire Residual Waste Project.

Alternative EfW Technologies

3.2.19 Direct waste combustion EfW facilities can be delivered through a variety of sub-technologies. UBB has given consideration to these technologies and a synopsis of this assessment is set out below.

Fixed Hearth

3.2.20 This type of furnace is generally not considered to be suitable for the management of large volumes of mixed waste and is best suited to low volumes of consistent waste. As a consequence, they have not been used for the combustion of municipal waste in the UK.

Pulsed Hearth

3.2.21 Pulsed hearth technology has been used for municipal waste in the past, as well as other solid wastes. However, there have been difficulties in achieving reliable and effective burnout of waste and it is considered that the burnout criteria required by the Waste Incineration Directive (WID) would be difficult to achieve.

Rotary Kiln

3.2.22 Rotary Kilns have achieved good results with clinical waste, but they are not commonly used in the UK for MSW (or similar wastes). There is a rotary kiln in use on municipal waste at Grimsby, which has a design throughput of 56,000 tonnes per annum. In general this technology is suitable only in the throughput range of 40,000 to 80,000 tonnes per annum and thus would not be appropriate for the GCC residual waste facility. The energy conversion efficiency of a rotary kiln is lower than that of a moving grate (see below) due to the large areas of refractory lined combustion chamber.

Fluidised Bed

3.2.23 Fluidised bed technology has been used for municipal waste at a very few sites in Europe. In the UK, there are only two operating facilities which are located in Dundee and at Allington in Kent. The former has a long history of significant operational difficulties.

3.2.24 Fluidised bed technology has a number of advantages over moving grate technology, including lower nitrogen oxide (NOx) formation, slightly higher thermal efficiency and the lack of moving parts within the combustion chamber. However, there are also a number of disadvantages:

- the waste stream needs to be homogenised and therefore would need to be pre-treated before feeding to the fluidised bed. This would lead to additional energy consumption and a larger building. The additional energy consumption tends to outweigh the combustion efficiency advantage;
- high fluidisation velocities can lead to the carryover of fine particulate material. This can lead to a higher particulate loading in the flue gases, so leading to higher quantities of flue gas treatment residues, which need to be disposed of as waste. However, the bottom ash tends to be of better quality;
- although less NOx would be formed, additional NOx abatement equipment would still be required to meet the limits imposed by the WID. Therefore, there would be very little difference in NOx levels overall;
- the operational and capital costs of a fluidised bed are higher than the equivalent costs for a moving grate incinerator.; and

- reliability in UK fluidised bed plants is lower than for other EfW options.

Moving Grate

3.2.25 This is the leading technology in the UK and Europe for the combustion of municipal and other similar wastes, being installed on circa 90% of UK incinerators and some 98% of European incinerators. It is a proven and developed design, with a number of suppliers available. The various designs are proven to achieve the burnout requirements for WID compliance. For these reasons UBB selected this particular EfW technology.

Alternative Sites / Locations

3.2.26 The Planning Statement undertakes a critical review of the approach that Gloucestershire County Council (GCC), as both the Waste Planning Authority (WPA) and the Waste Disposal Authority (WDA), has taken to consider alternative sites and identify the most suitable sites for a strategic waste management facility to serve the County. UBB's critical review of the two GCC site identification and assessment documents found both to be based on sound methodologies and their conclusions to be robust. Both documents rank Javelin Park as the best performing site against the assessment criteria used.

3.2.27 In addition, in order to reaffirm that Javelin Park is a suitable site for a strategic waste management facility such as an EfW plant, UBB has undertaken an assessment of the four sites identified in Core Policy WCS4 - 'Other Recovery (including energy recovery)' in the emerging Waste Core Strategy. This assessment has used relevant planning criteria for assessing the suitability of sites for strategic waste management development. The conclusions of the assessment are set out as follows::

- **Javelin Park –** This has been assessed as the least constrained site due to:
  - It lying outside of the Green Belt;
  - It having a suitable shape, size and topography;
  - It comprising a brownfield site with permission for B8 use;
  - Its excellent standard of access to the strategic highway network;

- It being relatively free from obvious environmental constraints and where the site does have any identified constraints these are all minor with the exception of one moderate constraint (ostensibly associated with a single residential property);
- It offering the best potential for heat off-take;
- It being available and deliverable.

- **Moreton Valence –** This site does not perform significantly worse than Javelin Park, although it has been identified as having more constraints. The principle reasons for this are:
  - A large part of the identified site (the area not occupied by existing development) is greenfield;
  - The site's access and accessibility from the strategic highway network is slightly constrained, whereas the Javelin Park site has no such constraints;
  - It has lower potential for heat off-take.

- **Wingmoor Farm East and Wingmoor Farm West -** These two sites are considered to be the most constrained of the four. The principal reasons for this being that:
  - They are located within the Green Belt and could not secure planning permission for an EfW facility use without very special circumstances being demonstrated. In light of there being other alternative, suitable / available sites (Javelin Park and Moreton Valance) that lie outside of the Green Belt, this would prove very complex until such time as the alternatives have been built out (i.e. have no available land);
  - They have a relatively constrained and convoluted access which requires vehicles to past through settlements before reaching strategic road network and, a lesser point, both sites are within the Gloucester Airfield safeguarding area.

Of the two it may also well be the case that there is no available or readily deliverable land of the requisite size at Wingmoor Farm West. The Eastern site has no such constraint.

3.2.28 As a consequence UBB conclude that the Javelin Park site is the most suitable for the proposed use.

Alternative Design Solutions

3.2.29 With regard to alternative design solutions, prior to selecting the current proposals a number of design options were developed. The alternative design options considered can be categorised under alternative site layout and alternative building design. This work is set out in detail within the Design and Access Statement which accompanies the planning application and is summarised below.

Site Layout

3.2.30 As a result of the shape of the site the principle of a linear building arrangement on the site was established at an early stage of the design process. In addition the layout of the individual building elements i.e. waste bunker, tipping hall, boiler hall and flue gas treatment facility was dictated by process requirements. As such no significant alternative layout options were considered.

3.2.31 The tallest elements of the process have been located at the west end of the site adjacent to the M5 with the logic that the building form would cascade down towards the east, reducing visual impacts from elevated positions within the AONB.

3.2.32 One of the alternative building configurations considered included an elevated tipping hall. This would have eliminated the requirement for ground excavation to facilitate the waste bunker but would have required a considerable two-way vehicular ramp leading to the tipping hall. An elevated tipping hall would have resulted in an increased building height compared to the proposed design and the movement of HGVs above the existing ground level.

3.2.33 The building position on the site was partially driven by the presence of the watercourse along the southern perimeter of the site. A variety of alternative positions were considered but the building was moved to its current position to ensure that major impacts on the stream corridor were avoided. Sufficient space was also required along the northern boundary to enable a high quality landscape scheme to be developed at the entrance of the facility and also to provide an attractive frontage to the potential future developments on the northern half of Javelin Park. Another factor that dictated the building position was the location of The Lodge, a residential receptor approximately 50 m to the east of the site. In order to reduce noise impacts on this property the facility was located away from the eastern boundary of the site.

Building Design

3.2.34 In parallel to the development of the site layout a review of alternative architectural design solutions were explored. From the outset the design team were conscious of the site's sensitive setting and the challenge of having to develop an architectural approach which would most appropriately mitigate the visual impact of the facility. In order to test the alternative design ideas draft photomontage images were developed for key views around the site.

3.2.35 A number of design options were considered including a variety of curved forms and rectilinear structures. Initially the curved roof solution appeared to present a greater opportunity for further design development by providing a structure that would be perceived to fit in with the rolling hills of the Cotswold Escarpment. However, through the use of photomontages produced for key receptor locations, it was apparent that the curved solution would appear incongruous to the form of the surrounding landscape. A curved design would also result in a building with considerable excess volume and with structures higher than necessary to house the internal plant.

3.2.36 Angular design options were developed further. The final preferred design option was that of a deconstructed angular form, the key reasons for the selection were as follows:

- reduced volume and height of the buildings;
- resolution of the buildings into four principle zones of function;
- low level buildings presented to views from the east and the B4008;
- fragmentation of the roofscape into field pattern rectangles when appreciated from elevated positions in the Cotswold ANOB e.g. Haresfield Beacon.
- presenting simple building forms of minimal mass on the north-west / south east axis e.g. the elevations facing the Cotswolds AONB.

3.2.37 A series of colour studies were undertaken to review a range of alternative approaches, these were tested in draft photomontages and against the site's visual context before selecting the colour scheme detailed within the current building design proposal. A colour scheme of grey and green was selected. The final colour scheme helped retain the deconstructivist architectural approach that helps breakdown the mass of the building whilst also providing colours that assist reducing visual impacts from nearby and distant viewpoints.

4.0 PLANNING HISTORY

4.1.1 The planning history of the proposed development site has been established from a review of the planning application records that are held by Stroud District Council on both the Council's website and following a visit to the Council's offices at Ebley Mill on 8 June 2011. In addition it was augmented with information provided by Gloucestershire County Council. The full planning history is contained within Chapter 4.0 of the Planning Statement (which forms Part 3 of the Planning Application document).

4.1.2 The purpose of understanding the planning history in the context of the EIA process is to establish whether development consents have historically existed or remain at the site. If this is the case those consents help inform the assessment of the sensitivity of the site to future development. However, for the avoidance of doubt, the presence of any extant consents do not change the current baseline, as the site is quite clearly not built out and remains a brownfield development plot. The only exception to this is the Transportation Assessment (TA) the findings of which inform Chapter 7.0 (Traffic and Transportation). This is in accordance with Guidelines on Transportation Assessments (DCLG and DTP – March 2007) where the standard methodology allows for the consideration of extant planning permissions, and associated trip generation to form the baseline for assessment.

4.1.3 The site was understood to have first been developed in 1939 as part of Haresfield aerodrome and was used as a landing ground and occasional training base for various military units. In 1941 the site was upgraded to a permanent training base when it became known as RAF Moreton Valance. In 1943 the main runway was lengthened and additional hangers constructed to accommodate the Gloster Aircraft Company for developing, building and test flying aircraft. At the end of World War II the RAF withdrew from the site leaving it to the Gloster Aircraft Company with the site ceasing all aviation operations and closing in 1962. The former assembly hangers were converted to a trading estate (known as the Bilton Cargo Centre), with other buildings and runways left to deteriorate.

4.1.4 Outline planning permission was granted in 1992 for the demolition of the old aerodrome hangars and storage buildings, which had come to the end of their useful life, and replacement with modern warehouse buildings (B8 use class). The replacement buildings comprised approximately 34,480m^2 in floor area (Ref: S.10827/1/W). The application also provided consent for the construction of a new access road from the site onto the B4008. This permission was subsequently renewed four times between 1995 and 2000 in order to extend the time period for submitting the details for the reserved matters of appearance, landscaping, layout and scale.

4.1.5 On 21 November 2002 outline planning permission was granted for new distribution warehouses and a new means of access onto the B4008 (Ref: S.01/1191). This consent allowed for 45,150m^2 of floor area with buildings up to 15.7m in height compared to existing ground levels. A subsequent reserved matters application for external appearance, siting, design and landscaping was approved in April 2003 (Ref: S.02/2178).

4.1.6 Planning application S.05/2138/VAR was submitted to Stroud District Council in November 2005 and sought to vary Condition 2 of Outline Permission S.01/1191 to increase the prescribed period in which reserved matters could be submitted from three years to five years. This was ultimately granted following a 'call-in' Inquiry in March 2007.

4.1.7 Five reserved matters applications have subsequently been granted permission (refs: S.07/2468/REM, S.07/2471/REM, S.07/2472/REM, S.07/2473/REM and S.07/2474/REM). These are all variations of proposed warehouse scheme submitted pursuant to permission S.05/2138/VAR. These applications were intended to offer a number of options for the future development at the site. The reserved matters applications also provided the opportunity for the site to be developed in phases with a number of smaller buildings rather than one large single building. All five reserved matters applications were approved in April 2008.

4.1.8 Graftongate Developments and Consi Investments Limited submitted a planning application in March 2010 to extend the time period for the implementation of outline permission S.05/2138/VAR (the '2007 permission') for a further three years (ref: S.10/0590/VAR). This application was subsequently approved.

4.1.9 In July 2010 a full retrospective application for the construction of an estate road was submitted to Stroud District Council. This was granted permission on 24 September 2010 (S.10/1451/FUL).

4.1.10 In conclusion, the planning history identifies that:

- the site has been developed since 1939;
- the site has had a long history of planning consents for B8 Storage or Distribution use dating back to 1992; and
- there is an extant planning consent (S.10/0590/VAR) for the development of 45,150m^2 of B8 distribution warehousing at Javelin Park. This consent remains extant until 16th April 2013.

5.0 SCHEME DESCRIPTION AND CONSTRUCTION METHODS

5.1 Introduction

5.1.1 This chapter provides a description of the layout and design of the proposed development, together with details regarding its construction. It also outlines the processes that would take place at the proposed facility.

5.2 Layout and Design of the Proposed Development

5.2.1 The proposed development would be based around a main building which would contain the following areas:

- waste reception hall;
- waste bunker;
- boiler hall and demineralisation plant;
- turbine hall;
- flue gas treatment (FGT) facility;
- Air Pollution Control (APC) reagent silos and APC residue silos;
- bottom ash processing facility; and
- education/visitor centre and staff facilities.

5.2.2 The main building would be 236 m in length, the width of the building would vary from 55 m to 25.6 m. The building is divided into the various process areas with the height of the structure varying depending on the process that it houses. The highest section of the building, towards the western end, would house the FGT facility and the APC reagent and residue silos. In this area the building roof would slope from 40.65 m in height to a peak of 48 m. The section of the building housing the boiler and turbine hall would be at a height of 42 m, the waste bunker at a height of 31.5 m and the tipping hall at a height of 21 m. The lowest part of the building, at a height of 14.65 m, would house the bottom ash processing facility, which would be located at the eastern end of the building.

5.2.3 The stack (chimney) would be located adjacent to the western elevation of the building and would be 70m in height and 2.5m in diameter.

5.2.4 In order to reflect the shape of the site, with the added advantage of helping to reduce the visual mass of the building from views from the east, which includes views from the Cotswolds Area of Outstanding Natural Beauty (AONB), the building would be orientated along an east-west axis. In order to further reduce visual impacts the tallest elements of the facility, including the stack, have been located in the western half of the site. This helps to fragment the mass of the building when viewed from the east with further visual mitigation provided by the design and colour of the roof materials that would be finished in shades of matt green.

5.2.5 The air cooled condenser (ACC) would comprise a separate structure immediately to the south of the turbine hall. The ACC is separated from the main building in order to allow sufficient air flow into the condenser unit. The ACC would be 41 m in length and 14 m in width and would be 21 m high.

5.2.6 The visitor centre and office space would form an integrated element of the main building and would be located on the northern facade of the building. This area would include offices, staff welfare facilities, control room and a number of visitor facilities including interactive exhibition space and a visual presentation suite. The visitor experience area would allow the ability to view the primary activities of the tipping hall, crane grab, boiler hall and control room from a secure space via protected corridors and glazed screens.

5.2.7 The visitor centre would provide a facility for use by local schools, further and higher education institutes, local community groups, local businesses related to waste and renewable energy industries and the local council.

5.2.8 The development would also include the following ancillary / infrastructure elements:

- vehicle weighbridges and office;
- substation;
- site fencing and gates;
- service connections;
- surface water drainage and attenuation features;
- cycle / motorbike store;
- external hardstanding areas for vehicle manoeuvring;
- internal access roads and car parking;

- ammonia and diesel tanks;
- fire sprinkler system pump house; and
- new areas of hard and soft landscaping.

5.2.9 The layout of these elements is shown on Figure 5.1 (the Site Layout) and Figures 5.2, 5.2b and 5.3 (Site Cross Sections). Building elevations are shown on Figures 5.4 to 5.7 and 3D representations of the buildings are shown on Figure 5.9.

5.2.10 The facility would have an installed electricity generating capacity of 17.4 MW and would generate electricity by way of a steam turbine driven by the combustion of 190,000 tonnes per annum (tpa) of residual waste. The facility would also be designed to enable residual heat to be extracted from the generation process for use by local heat users.

5.2.11 The EfW facility would have a design life of around 30 years although in reality many elements of the plant would last beyond this period. Planning permission is being sought for a permanent development and therefore as elements of the facility require repair/refurbishment/replacement this would be carried out.

5.2.12 The forthcoming sections describe the intended layout and design of the proposed development under the following headings:

- Design Philosophy;
- Landscaping;
- Employment;
- Access;
- Drainage;
- Utilities;
- Lighting;
- Security Fencing and Gates; and
- Car Parking Provision.

5.2.13 Thereafter, a number of sections provide a detailed description of the main operational facilities, including an explanation of the process that would be undertaken at each facility. Descriptions are also provided for:

- proposed site operations;
- energy recovery operations;
- the proposed electricity grid connection;
- operational environmental management;
- proposed contingency plans;
- proposed waste types, sources and quantities; and
- construction methods.

Design Philosophy

5.2.14 The Applicant has appointed Fletcher-Rae Architects, an award winning practice with specific experience in the design of waste management facilities, to design the proposed EfW facility. Their experience covers the design and construction of a wide range of energy and waste related projects and they are noted for the design quality of their work which stems from their contextual and sustainable approach.

5.2.15 The rationale behind the chosen design / architectural solution is described in detail within the Design and Access Statement which accompanies the planning application and is summarised below under the following headings:

- Layout;
- Scale; and
- Appearance.

Layout

5.2.16 The layout of the buildings and access to them has been designed to take into account various operational constraints in relation to the functional requirements of the facility. In addition the site also presents a number of constraints which have ultimately been key drivers in establishing the proposed site layout. These include:

- establishing vehicular access to the site from the existing access road from the B4008;
- minimising impacts on the existing watercourse corridor and associated planting;

- recognising the visual impact the scheme would have from elevated views from the Cotswolds AONB;
- recognising impacts on the closest residential receptor, The Lodge, approximately 50 m from the site boundary; and
- recognising the open aspect of the site from local roads.

5.2.17 There have also been a number of other requirements which have also been key drivers in the development of the layout. These include:

- the desire to minimise the overall height of the main process building;
- minimising the footprint of the facility;
- establishing a civic forecourt within a landscaped setting;
- the need to accommodate within the site all anticipated queuing requirements for vehicles;
- reducing noise impacts on The Lodge;
- establishing efficient and safe traffic management for all vehicles accessing and circulating within the site;
- segregating of pedestrian, cycle, car and process vehicles;
- establishing an efficient and logical process layout for the building;
- incorporating ecological enhancement; and
- establishing a coherent ‘family’ of buildings within the site.

5.2.18 As described in Chapter 3.0 a series of alternative site arrangement studies were undertaken and tested against these key drivers before selecting the preferred site layout.

5.2.19 The layout of the site has been optimised to ensure safe and efficient access and routing of delivery, service, staff and visitor vehicles, as well as cyclist and pedestrian routes within the site. The arrangement of the buildings ensure that the surrounding vehicular access roads take into account the manoeuvring space for a range of delivery and service vehicles.

5.2.20 The waste bunker and boiler have been sunk into the ground in order to reduce the height of the building. Over half of the excavated material would be re-used on site to provide soil bunds that serve to screen low level views into the site, provide noise attenuation to The Lodge and provide relief within the landscaped areas surrounding the building.

5.2.21 The process buildings have been oriented along a north-west/south-east axis with the tallest elements of the facility at the west end of the site adjacent to the M5. The logic for this arrangement is that the building form would cascade down towards the east, reducing visual impacts from elevated positions within the AONB.

Scale

5.2.22 The design of the facility has been developed in a manner which minimises its visual scale and footprint as far as possible in order to mitigate its impact, where introduced, upon key visual receptors as far as possible.

5.2.23 In principle, the volumes and heights of the individual buildings have been determined to be sufficient to satisfy the spatial requirements of the process equipment. However, it has been recognised from the outset that the overall height of the building should be minimised in order to mitigate as far as possible the facility's visual impact upon sensitive receptors. The process design has been interrogated in order to ensure that the building height is minimised whilst providing sufficient room for safe operation and maintenance. As mentioned previously the waste bunker and boiler have been sunk into the ground to reduce the building height. Both of these measures have been successful in making a significant contribution to minimising the overall visual height of the facility within its setting.

Appearance

5.2.24 Having mitigated as far as possible the visual impact of the facility through careful site planning an architectural approach has been developed which further minimises the overall height and massing of the facility. This has been achieved by ensuring that the architectural envelope is volumetrically efficient, and as such is a tight fit to the internal process technology that it contains.

5.2.25 This approach has led to the development of a design which avoids the use of a sculpted form such as a curved roof as this approach inevitably generates additional volume and building height and in so doing unnecessarily increases the visual impact of the building.

5.2.26 The building form has also been further developed to break up its visual mass by architecturally expressing the steps in height between different process areas by using varying colours on different process sections of the building. The roofscape of the facility also consists of simple, rectangular plates that would be coloured in carefully selected shades of tonal green. This design approach has been adopted to partially assimilate the facility into the local landscape of fields and hedgerows when viewed from elevated positions.

Landscaping

5.2.27 The landscape proposals for the facility have been developed in order to provide a high quality external environment to the facility as well as mitigating potential visual effects of the proposal.

5.2.28 The landscaping scheme would include a series of earth bunds created from material excavated during the construction of the facility. The bunds would serve to minimise the requirement to export material offsite, introduce relief within the soft landscaped areas and also provide screening both in terms of visual impact and noise.

5.2.29 The largest earth bund would be located along the eastern boundary of the site and would be up to approximately 7 m in height, a cross section through this bund is shown on Figure 5.2b. The bund would be constructed to sympathetic gradients (maximum 1:3 on the outer face) and would be planted with a mix of native woodland species. The bund would screen low level views into the site of ground operations, including HGV movements.

5.2.30 The watercourse that runs along the southern and western boundary of the site would be retained along with much of the associated planting. Additional native species planting would be carried out to reinforce the existing tree and scrub present along the stream corridor. The additional planting would help to further screen low level views from the south and south-east of the facility and would also enhance the quality of this wildlife corridor.

5.2.31 The landscaping scheme on the northern side of the facility at the entrance to the visitor centre and offices would be more formal in design. In addition to accommodating staff and visitor car parking and providing an attractive arrival experience for users, there would be a significant external component to the visitor centre facility. This would comprise a garden space that showcases sustainability through demonstrating the use of recycled products and low water usage. This would be an area that could be enjoyed by the visitors to the site and also could form an interesting component of school visits.

5.2.32 A footpath would lead from the building entrance into a landscaped visitor experience area where interpretation and educational material would be included in the landscaping scheme. This would include an area devoted to demonstrating local benefits to nature conservation. Again this would provide a valuable opportunity for school visits and interest groups.

5.2.33 The site would be drained, via a sustainable drainage system, to a series of detention basins. In the main these would be dry features (outside of storm conditions). However, elements of permanent open water have been incorporated in order to add biodiversity value to the site. The detention basins would be located to the south-east and north-west of the facility and would be planted with appropriate wetland species. The landscape masterplan is shown on Figure 5.10.

Employment

5.2.34 The plant would provide employment for approximately 40 people with a peak day-time staffing level of 25, supplemented by shift workers to maintain 24 hour plant operation. The majority of the employees would be skilled operatives (electricians/fitters/crane operatives) or technical engineers (control and plant). It is anticipated that shifts would operate on a typical 6am, 4pm, midnight shift pattern, with 4 staff members per shift (with two shifts effectively ‘off’ each day).

5.2.35 The construction of the EfW facility would also provide temporary employment. The number of site operatives employed would vary throughout the construction period with peak construction staff numbers occurring during the plant installation and fit out.

5.2.36 Subject to obtaining the necessary planning permission, permits and licenses, it is currently anticipated that construction work would commence in January 2013 and last around 33 months.

5.2.37 The construction staffing profile would vary depending on the approach of the main contractor. However, typically the staffing profile for a project of this type would be as follows:

- Month 0 - 3: approximate staffing levels 60
- Month 3 - 6: approximate staffing levels 100
- Month 6 - 9: approximate staffing levels 150
- Month 9 - 12: approximate staffing levels 200
- Month 12 - 15: approximate staffing levels 300
- Month 15 - 18: approximate staffing levels 300
- Month 18 - 21: approximate staffing levels 250
- Month 21 - 24: approximate staffing levels 220
- Month 24 - 27: approximate staffing levels 200
- Month 27 - 30: approximate staffing levels 120
- Month 30 - 33: approximate staffing levels 100

Access

5.2.38 A road has been constructed within Javelin Park to provide access from the B4008 to the proposed development site and to the vacant development plot on the northern half of Javelin Park. The access road links to the B4008 via a three arm roundabout. It is understood that the roundabout was constructed specifically to provide access into Javelin Park for the consented distribution warehousing proposal and as such has been designed to cater for HGV movements.

5.2.39 The aforementioned B4008 connects Stonehouse to the south-east with Gloucester to the north-west. The B4008 to the south of Javelin Park lies within the Lorry Management Area as defined on the Advisory Freight Route Network produced by GCC. The Lorry Management Area has been implemented to reduce the environmental impacts of freight on roads within the Cotswolds AONB. As such the B4008 is subject to a weight restriction of 7.5 tonnes to the immediate south of the Javelin Park roundabout junction.

It is also understood that the B4008 through Stonehouse is the subject of pending environmental improvement works.

5.2.40 To the north of Javelin Park the B4008 forms a grade separated 'dumb-bell' junction (Junction 12) arrangement with the M5. The junction was upgraded in 2010 by the Highways Agency to improve queue length and delay times on the north and south bound off slips. The junction was originally laid out as two free flow roundabouts, the junction improvements have included partial signalisation and modifications to the motorway slip roads. These improvements are considered to be working well by the Highways Agency and were developed with due regard to committed development in the area, including Javelin Park.

5.2.41 To the north of the M5 the B4008 continues and joins the A38 at a 5-arm roundabout, referred to as the Cross Keys roundabout. This roundabout junction provides a route connection to Gloucester in the north and the GCC administrative boundary in the south.

Drainage

5.2.42 A preliminary drainage design for the proposed development has been developed for surface and foul water. The conceptual drainage strategy for the scheme is shown on Figure 11.1.

5.2.43 The proposed development would give rise to surface water run-off from roads, vehicle parking areas, roofs of buildings, other hard standings and landscaped areas. Most surface water would flow into the four surface water detention basins described previously. However, some roof water would be diverted to a rainwater harvesting tank located within the main building. Surface water flows from areas susceptible to pollution e.g. roads and parking areas, would pass through petrol/oil interceptors prior to being discharged into the detention basins. Penstocks would also be fitted to the discharge points to enable the detention basins to be isolated in the event of a pollution event.

5.2.44 The detention basins would be designed to cater for the 1 in 100 year storm event with an additional allowance to cater for climatic change with final discharge being restricted to a 'Greenfield' run off rate of 9.5 litres per second per hectare. The surface water from the detention basins would discharge into the adjacent watercourse.

5.2.45 Domestic foul flows e.g. toilets, kitchens and showers would be discharged to the adjacent private sewage treatment works that serves Javelin Park.

5.2.46 Other sources of wastewater from the plant include water from flushing of the de-mineralisation plant, plant maintenance, drainage from the ash quenching process and drainage from within the bottom ash processing facility. This water would be collected and routed via a settlement tank for re-use in the ash quenching process. As such there would be no requirement for the disposal of these wastewaters into the sewer system.

5.2.47 The plant would be a net user of water and it is estimated that the plant would use approximately 6m^3/hr. Water would be sourced from the local mains piped water system and from rainwater harvesting off building roofs.

Utilities

5.2.48 The facility would require connection into a number of utilities. Connections include sewer, water, telecommunications and electricity. In addition there may be a requirement for a gas connection. These are described below, a utilities plan is provided as Appendix 5.1.

Sewer

5.2.49 A foul water pumping station has been constructed in the north-eastern corner of Javelin Park. Foul water flows from the site would be directed to this pumping station which then connects to the foul sewerage network. The operator of the works has confirmed that there is sufficient capacity to deal with the anticipated flows from the development, details of consultation with Severn Trent Water is provided within Appendix 5.1a.

Water

5.2.50 A 150mm distribution main runs along the B4008 with an extension of this main providing supply into Javelin Park which would be capable of serving the proposed development.

Telecommunications

5.2.51 Underground telecommunication lines run along the B4008. Connection into these lines is considered feasible.

Electricity

5.2.52 There is an existing connection from the local electricity supply network into Javelin Park. However, the proposed development would generate electricity, a proportion of which would be used to power the facility. A new connection to the local electricity distribution network would be required to export electricity offsite. This is described in further detail below.

Gas

5.2.53 A gas main runs along the B4008 with a branch from the gas main into the Javelin Park site. A connection directly into the site from this main is considered feasible if required.

Lighting

5.2.54 Once commissioned the EfW facility would operate on a continuous basis. During hours of darkness there would be a need for lighting commensurate with Health and Safety requirements to ensure a safe working environment for operatives on site, Appendix 5.2 presents indicative details of the lighting design including lighting specifications and lighting levels. The report demonstrates compliance with lighting standards and guidance, namely EN 13201 and Institute of Lighting Engineers (ILE) Guidance Notes for the Reduction of Obtrusive Light. The lighting design also takes into account guidance set out in 'Lighting in the countryside: Towards good practice' (Countryside Commission, 1997). The lighting proposals would be as follows:

- there would be no building mounted lights and no lighting of external façades;
- lighting of external yard and parking areas would use modern flat glass high pressure sodium (or similar) lanterns which achieve full 'cut-off', meaning that all of the light shines down with minimal upwards or

sideways spill. The lit surfacing would not materially extend beyond the operational boundary of the site;

- the full external lighting system would only operate during hours of darkness when vehicle deliveries are occurring, this being during the normal working day. After this time the main lighting would automatically be switched off. In order to cater for the health and safety needs of night shift workers at the plant, a reduced, low level lighting system would remain in operation after dark, utilising low level lanterns and restricted to required walking routes and staff parking areas;
- similarly, internal building lighting to the upper floors of the proposed office and visitor/education centre, which would be vacant outside of the normal working day, would incorporate intelligent lighting control systems and as such would switch off after operational hours;
- the internal operational areas of the facility would be lit to provide a safe working environment according to task in specific working areas, rather than to provide a consistent light level. This approach would ensure that light spillage from within the plant would be kept to a minimum; and
- lighting within the APC silo storage area i.e. the area that would be located adjacent to the glazed areas on the western elevation of the building, would be designed to reduce light spill from the building. There would be no requirement to light the internal APC silo area outside delivery hours other than low level health and safety lighting. As such light spill would be minimal from this elevation of the building. The lux levels shown in Appendix 5.2 include for light emissions from the western elevation of the building.

5.2.55 It should be noted that any potential impact of the proposed lighting scheme beyond the site boundaries would be further mitigated by the peripheral landscaping. It is suggested that the detailed lighting design is subject to a planning condition.

Security Fencing and Gates

5.2.56 The southern and western perimeter of the site would be secured by the existing 2.4 metre high metal chain-link fence. The northern and eastern perimeter of the site would be secured by a 2.4 metre high welded mesh boundary fence (e.g. Paladin security fencing or similar) with matching lockable steel gates to provide means of access. The new welded mesh fence would be green in colour.

5.2.57 The existing timber post and rail fence that runs along the eastern boundary of the site would be retained.

5.2.58 On the northern boundary of the site, facing the remaining development land on Javelin Park, the welded mesh fence would be fitted with a light weight fabric screen (Enviro Knit or similar) to obscure views through the fence. The reason for the use of screening on the site's northern boundary is to comply with a restrictive covenant on the application site.

5.2.59 Further security would be provided by virtue of an infrared CCTV monitoring system.

Car Parking Provision

5.2.60 45 car parking spaces would be provided on site, including 4 to disabled standard provision. This level of car parking has been provided to accommodate the proposed staffing level, taking into account shift change requirements. A shelter would be provided for bicycles and motorcycles. A parking area for one coach would also be provided adjacent to the main car park.

5.3 Proposed Site Operations

5.3.1 The following text describes the operations and process that would be undertaken at the site. Figure 5.11 provides a simplified process diagram of the site operations.

Operating Hours and Vehicle Numbers

5.3.2 It is proposed that the plant would process waste and generate electricity on a 24-hour basis. Waste would be brought onto the site between the hours of 07.00 and 19.00 seven days a week. However, approximately 95% of this waste would be brought in Monday to Friday. It should also be noted that deliveries would actually occur within a shorter daytime time span as described within Chapter 7.0 and within the Transport Assessment which accompanies the planning application.

5.3.3 On the basis of the predicted annual tonnage figures for this facility it is anticipated that daily site waste input demand to the EfW facility would likely be in the region of 95 HGV two way movements. In addition to these, there would be an additional 1-2 HGV two way movements per day as a result of the delivery of APC materials and a further 8 HGV two way movements per day associated with the export of APC residues, waste rejects and aggregates, metal and residuals from the bottom ash processing facility.

Waste Reception and Handling

5.3.4 Incoming refuse collection and bulk transport vehicles would enter the site from the internal Javelin Park access road that provides access from the B4008. Having entered the site the vehicles would proceed to the weighbridge, where the quantity of incoming waste would be checked and recorded. Vehicle loads would be inspected periodically at the weighbridge to confirm the nature of the incoming wastes.

5.3.5 After weighing, the vehicles would continue along the internal site road that leads around the southern side of the main building in a clockwise direction. Vehicles delivering waste would proceed to the southern side of the main building to the enclosed waste reception / tipping hall. When ready to tip, the lorries would be directed to a vacant tipping bay to discharge into a refuse bunker. On completion of the tipping operation, the vehicles would leave the waste reception / tipping hall via a dedicated exit tunnel located along the northern side of the main building. The vehicles would exit via a door in the eastern elevation and proceed to the weighbridge to record the weight of the vehicle prior to leaving the site.

5.3.6 The tipping hall would be approximately 45 m wide and 30 m in length and incorporate 7 tipping bays, each about 4 m wide. The entry and exit doors would be equipped with manually operated ‘rapid closing’ vertical folding doors, which would be kept closed when delivery of waste is not taking place.

5.3.7 The refuse bunker would be of a concrete construction and housed within the bunker hall in the main building. The refuse bunker would measure approximately 45 m by 20 m and extend approximately 13 m below ground level. The bunker would be capable of accommodating 15,200 m^3 or approximately 5,700 tonnes of waste. The bunker includes a unit for certain waste streams that require shredding e.g. large and bulky items from household waste recycling centres. This waste would be fed into the shredder by the cranes described below, the shredded waste would then be discharged into the waste bunker.

5.3.8 Above the storage bunkers would be two overhead travelling cranes equipped with petal grabs, each with a capacity of approximately 6 tonnes (including the weight of the hoist and grab). These are used to mix, stack and load the refuse into the feed chutes of the furnaces. Under normal operations only one crane would be required to feed the plant. The cranes would be operated by dedicated crane operators, who are located in an operations room overlooking the bunkers. CCTV cameras would be installed above the furnace charging chute to ensure maximum visibility. The crane operators would inspect the waste during mixing and loading operations to identify and unsuitable or unauthorised wastes e.g. tyres. Such waste would be removed for disposal at an appropriate facility.

5.3.9 Odour and dust in the tipping hall would be controlled by forced draught fans located above the bunker. These would draw air from the bunker hall and boiler hall into the furnace to feed the combustion process creating a slight negative pressure which would prevent odours, dust or litter from escaping from the building. Anaerobic conditions within the refuse bunkers, which could cause odour, would be prevented by regular mixing of the waste by the crane operators.

5.3.10 Following loading into the feeding chute by the petal grabs, the waste would be transferred onto the grate by hydraulically powered feeding units. The backward flow of combustion gases or the premature ignition of waste would be prevented by keeping the chute full of waste and by keeping the furnace under negative pressure. A level detector would monitor the amount of waste in the feed chute and an alarm sounded if the waste falls below the safe minimum level. Secondary air would be injected from nozzles in the walls of the furnace to control flame height and the directions of air and flame flow. The feed rate to the furnace would be controlled by a combustion control system.

Combustion Process

5.3.11 The proposed facility would use a moving grate which comprises inclined fixed and moving bars that move the waste from the feed inlet to the residue discharge. The grate movement turns and mixes the waste along the surface of the grate to ensure that all waste is exposed to the combustion process. The start up burners (which typically operate for up to 16 hours during a start up event) would be gas fuelled, fuelled by low sulphur gas oil. There should be only two start-ups per year after planned maintenance activities.

5.3.12 Primary air for combustion is fed to the underside of the grate by a single inverter-driven fan. Secondary air is also admitted above the grate to create turbulence and ensure complete combustion with minimum levels of oxides of nitrogen (NOx). The volume of both primary and secondary air is regulated by a combustion control system.

5.3.13 The combustion control system regulates combustion conditions (and thereby minimises the levels of pollutants and particulates in the flue gas before flue treatment) and controls the boiler. The furnace is also fitted with auxiliary burners, fuelled by low sulphur gas oil, which would automatically maintain the temperature above 850^{o}C, if temperatures start to fall below this. However, this rarely occurs. Combustion chambers, casings and ducts, and ancillary equipment are maintained under slight negative pressure to prevent the release of gases. The plant would meet the requirements set down in the WID, which would be reflected in the Environmental Permit for the facility.

5.3.14 During operation the temperature in the combustion chamber would be continuously monitored and recorded to demonstrate compliance with the requirements of the WID. The combustion control system would be an automated system, including the monitoring of combustion and temperature conditions of the grate, modification of the waste feed rates, and the control of primary and secondary air.

Boiler Water Treatment

5.3.15 A demineralisation plant would be provided as part of the facility, this would be located under the boiler within the building basement. Various chemicals, including hydrochloric acid and caustic soda would be required for the demineralisation process and for boiler water dosing to prevent corrosion.

5.3.16 The chemicals for demineralisation would be stored within a bunded area within the demineralisation plant. Caustic soda would be delivered by bulk tanker and offloaded into a 5 m^3 tank in a bund. Hydrochloric acid would also be delivered by tanker and stored in a 5 m^3 bunded tank after it is vented through a scrubber.

Flue Gas Treatment

5.3.17 Gases generated during the combustion process would be cleaned before being released into the atmosphere. The EfW facility would be served by a flue gas treatment system and associated reagent storage silos. The treatment plant comprises a dry absorption system that includes activated carbon injection, dry lime scrubbing, and fabric filters. This would be designed to ensure that the plant operates within the emission limits set out in the WID.

5.3.18 Vehicles would be required to access the FGT plant in order to deliver APC reagents and export APC residues. The silos containing the APC reagents and residues would be housed in the western end of the main building adjacent to the FGT plant. Vehicles would access the silo storage area via the roadway that runs to the south of the main building. Vehicles would drive in a clockwise direction around the western elevation and would access silo storage area via a door on the northern elevation. APC reagents and residues would be transferred by sealed pumps into and out of the storage silos within the building. Vehicles would then exit via a door on the southern elevation of the building and proceed to the exit via the weighbridge.

NOx Reduction

5.3.19 NOx[1] levels would be managed through careful control of combustion air and selective non-catalytic reduction. This involves the injection of ammonium hydroxide solution into the combustion chamber of the boiler. The ammonium hydroxide reacts with both nitrogen oxide (NO) and nitrogen dioxide (NO_2) to form nitrogen and water.

Gas Scrubbing

5.3.20 Acid gases produced during the combustion process would be removed by a dry scrubbing system, using hydrated lime as a reagent. Neutralisation of the acid gases would take place as they react with the lime. The residual material would be recovered at the outlet of the flue gas scrubbing system.

5.3.21 Activated carbon would also be injected into the flue gas duct to minimise the flue gas emissions of dioxins, mercury and other heavy metals.

Fabric Filtering

5.3.22 After flowing through the gas scrubber, the gases would be drawn through a fabric bag filter to remove particulates, including lime and activated carbon particles. The fabric filter would be divided into at least four separate compartments allowing for maintenance as described below. The treated flue gas passes through an induced draught fan into the stack for release to the atmosphere.

5.3.23 Regular bag filter cleaning would be performed on-line by pulsing compressed air through the filter bags. The residues are known as APC residues and would be collected in fully enclosed hoppers beneath the filters.

5.3.24 Bag failure, albeit it an infrequent occurrence, would be identified by a sudden increase in particulate concentration at particulate meters installed immediately downstream of the bag filter. The compartment containing the failed bag would be isolated and then replaced. The plant would be capable of operating at full capacity with one compartment off-line whilst

[1] NO_x is the generic term which refers to NO and NO_2 gases formed during the combustion process.

maintenance was being undertaken. Spare bags would be held on site and installed immediately after a failure occurs.

Stack

5.3.25 Following cleaning, the combustion gases would be released into the atmosphere via the stack. Emission from the stack would be monitored continuously by an automatic computerised system and reported in accordance with the Environment Agency's requirements for the operation of the facility. The proposed stack is 70m high from ground level. Details of the stack height and air quality modelling are provided in the air quality assessment in Chapter 13.0 and Appendix 13.1.

By-Product Handling and Disposal

5.3.26 Two types of solid by-products would be produced from the operation of the EfW facility, bottom ash and APC residues, each of which would have separate handling and disposal arrangements as described below.

Bottom Ash

5.3.27 Bottom ash is the inert burnt-out residue from the combustion process and approximately 6 tonnes per hour of bottom ash would be produced at full load. The volume of bottom ash generated equates to approximately 25% of the overall volume of the waste managed at the site. Bottom ash typically comprises a mixture of glass, brick, rubble, sand, grit and metal as well as ash from combusted waste. As described below would be processed onsite to extract metals for recycling and for use as a secondary aggregate.

5.3.28 Bottom ash would be quenched as it leaves the combustion chamber to both cool the ash and also reduce potential for emissions of ash (dust) into the air. Any water not vaporised in the quenching process would be collected and recycled for continued use in the quenching process. The bottom ash would be deposited into a bunker where it would be fed onto a conveyor that would transport the bottom ash to the bottom ash processing facility at the eastern end of the main building. The enclosed conveyor would exit the building approximately 1.5 m above ground level. The conveyor would be fixed to the outside of the building and would rise to a height of approximately 8 m where it would re-enter the structure of the building into the bottom ash processing facility.

Bottom Ash Processing

5.3.29 The bottom ash would be processed into a recycled aggregate capable of beneficial use within the onsite bottom ash processing facility. The processing activities would be undertaken in an enclosed building in order to avoid any release of fugitive dust. Fast acting roller shutter doors would provide vehicular access to the building. Doors would only be opened to allow entry / exit of vehicles and would be closed at all other times. In addition there would be a bag filter system (or similar) installed as part of the ventilation system to avoid the release of fugitive dust from the processing facility.

5.3.30 Bottom ash would be discharged from the aforementioned conveyor into one of five storage bunkers located at the western end of the bottom ash processing facility. The bunkers would comprise concrete push walls up to 6 m in height. The bottom ash material would be wet on leaving the EfW facility and would be left to dry for approximately 2 weeks before being processed for use as an aggregate.

5.3.31 After approximately 2 weeks the bottom ash would be transferred from the stockpiles into a hopper using a front end loader. Bottom ash from the hopper would then be transferred via conveyor along a process line were ferrous metals would be removed using magnetic separators and non-ferrous metals would be removed using eddy current separators. The remaining material would then be passed through a series of screens to remove any oversize or reject materials and would finally be crushed to produce aggregate of various sizes. The recycled aggregates would be stored in stockpiles for between 4 to 6 weeks. This is referred to as the ‘maturation period’ during which time the aggregate undergoes changes in its chemical composition enabling the material to be of sufficient quality for use as a commercial aggregate. The aggregate would be stored at the eastern end of the building prior to export from the site.

5.3.32 The facility would have a processing capacity of 20 tonnes per hour. Any oversize or reject materials (typically 10% of volume by weight) from the processing plant would be categorised and then sent for reuse, recycling or disposal. The facility would process bottom ash between 07.00 hours and 19.00 hours, seven days a week.

5.3.33 The recycled aggregate, recovered metals and reject material would be exported from site via HGV. Vehicles would enter and exit from the southern side of the facility and would be loaded within the building by a front end loader. It is anticipated that there would be approximately 6 HVG movements per day associated with the export of materials from the facility.

5.3.34 The recycled aggregate would act as a direct replacement for virgin aggregate and would have a wide range of engineering and construction applications. It would be used by Balfour Beatty Civil Engineering (a sister company to Balfour Beatty Capital who are one half of the UBB consortium) or other major civil engineering contractors.

Air Pollution Control (APC) Residues

5.3.35 APC residues comprise fine particles of ash and residue from the flue gas treatment process, which are collected in the bag filters. It is estimated that the operations would generate approximately 1 tonne of APC residues per hour which equates to approximately 4% of the overall volume of the waste managed at the site. APC residues would be stored in a silo adjacent to the flue gas treatment facility. The residue APC silo has a capacity of 250 tonnes, which is sufficient for approximately 10 days storage, although at normal operating conditions only 10% of this capacity is generally used prior to export off site.

5.3.36 Due to the alkaline nature of the APC residues, they are classified as hazardous waste (in much the same way as cement). The APC residues would be transported offsite to a Permitted Hazardous disposal facility, alternatively the residues may be taken to an appropriate treatment facility where, for example, they could be re-used in the stabilisation of acid wastes or used in cement manufacture.

5.3.37 At the time of submission, UBB were in consultation with Augean Plc, a specialist waste management company suitably licensed to accept APC residues. This company has been identified as the preferred operator to accept the APC residues from the site. A letter of support from Augean Plc is provided at Appendix 5.2a that demonstrates this company would have the capacity to accept the material from the proposed development.

5.3.38 UBB would continue to explore alternative options for the disposal and treatment of the APC residues throughout the operational lifetime of the facility. This would be based upon a regular review of the market taking full account of social, environmental and economic factors and also potential emerging technologies.

Raw Materials Handling and Storage

5.3.39 Apart from treating non-hazardous waste, the plant would use various raw materials during processing. Primarily, these would include hydrated lime, ammonium hydroxide, activated carbon and gas oil. Table 5.1 indicates the processes in which they would be used. The table also provides estimates of the rates of use and the quantities in which they would be stored on site, these estimates are based on another EfW plant and are considered an overestimate i.e. worst case scenario, of the likely consumption rate and storage volumes. The materials would be stored within appropriately designed silos adjacent to the FGT facility.

Table 5.1: Proposed Raw Material Usage and Storage

Raw material (if required)	**Process**	**Typical rate of use**	**On-site storage capacity**	**Storage details**
Hydrated Lime $(CA(OH)_2$	Flue gas treatment – acid gas scrubbing	Approx 2,368 tonnes/ annum	200m^3	Storage capacity for 20 days
Ammonium Hydroxide (NH_4OH)	Flue gas treatment – NO_x reduction	Approx 778 tonnes/ annum	46m^3	Storage capacity for 20 days (normal usage)
Activated carbon	Flue gas treatment – dioxins/ heavy metal	Approx 67.7 tonnes/ annum	65m^3	Storage capacity for 230 days (normal usage)
Low sulphur	System firing	Approx 198	50m^3	Capacity

Raw material (if required)	Process	Typical rate of use	On-site storage capacity	Storage details
gas oil		tonnes/annum		dependent upon number of start-up operations

5.3.40 In addition, various other materials would be used for the operation and maintenance of the plant including:

- hydraulic oils and silicone based oils;
- electrical switchgear;
- gas emptying and filling equipment;
- refrigerant gases for air conditioning plant;
- glycol/anti-freeze for cooling;
- oxyacetylene, TIG, MIG welding gases; and
- CO_2 / fire-fighting foam agents.

5.3.41 In order to minimise the risks of contamination to process and surface water, all liquid chemicals stored on site would be kept in bunded controlled areas with a volume of 110% of stored capacity.

5.3.42 In addition to the raw materials described above, the facility would require materials necessary to maintain the boiler water demineralisation plant, these include:

- hydrochloric acid (35% solution);
- caustic soda (30% solution); and
- boiler water dosing chemicals.

5.3.43 These materials would be used both in the demineralisation process and for boiler water dosing to prevent boiler tube corrosion and would be stored in an appropriately bunded area within the demineralisation plant, in the main building.

5.4 Energy Recovery

5.4.1 One of the major benefits of the EfW facility would be the ability to recover energy from the combustion of the waste by way of electricity and heat production. For the avoidance of doubt, the development proposal includes for electricity generation and export to the grid. The electricity generation component forms part of the planning application, but the connection (i.e. transmission lines) to the local electricity distribution network is not included within the formal application itself. This would be delivered through a separate consenting process as described subsequently. However, this ES does consider the potential environmental effects of grid connection.

5.4.2 Similarly the planning application includes for the generation of heat, but again distribution of heat to potential users is not included. However, unlike electricity export there are no current fixed proposals to export heat and thus consideration of the environmental effects of heat transmission are not assessed in the ES. Notwithstanding, the application makes provision for future heat export to take place and suggests planning conditions to facilitate this.

5.4.3 The Glossary to the Planning and Climate Change Supplement to Planning Policy Statement 1 (PPS1 Supplement) identifies that renewable and / or low carbon energy supplies include energy from waste. It is also explicit in paragraph 208 of the Government Review of Waste Policy in England 2011 that only the combustion of the biogenic fraction of the waste, and the energy derived there from, is classified as renewable energy.

5.4.4 The EU Directive 2009/28/EC on the promotion of the use of energy from renewable sources defines 'energy from renewable sources' as meaning "… *energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower,* ***biomass*** [our emphasis]*, landfill gas, sewage treatment plant gas and biogases*" (2). 'Biomass' is defined as meaning "… *the biodegradable fraction of products, waste and residues from biological origin from agriculture (including vegetal and animal substances), forestry and related industries including fisheries and aquaculture, as well as the*

(2) EU Directive 2009/28/EC Article 2, page L140/27 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32009L0028:EN:NOT Appendix H

biodegradable fraction of industrial and municipal waste [our emphasis]” [3].

5.4.5 The Renewable Heat Incentive (RHI) states [4]:“Energy from waste combustion (the biomass proportion of municipal waste) Rather than being sent to landfill the waste we produce can be reused, recycled or burned to produce heat. More than half of the rubbish households throw away is organic, renewable matter, such as food or paper products. Although it is usually better from an environmental perspective to reuse, recycle or produce biogas from these materials, this is not always possible and combustion can offer a better option than disposal to landfill, which generates harmful greenhouse gas emissions. Due to its renewable biomass proportion, currently around half the heat produced by burning municipal waste is renewable heat.”

5.4.6 The RHI goes on to state: “Participants who burn MSW will receive the biomass tariff, adjusted pro-rata for the solid biomass content of their waste. Unless participants prove a higher percentage of biomass content, the pro-rata content will be deemed at 50 per cent.” This indicates that 50% is considered to be the minimum proportion of the waste which is considered biomass, and therefore the minimum proportion that is renewable.

5.4.7 In reality, the 50% figure would be exceeded, but the actual figure would depend upon the precise composition of the waste to be treated. For the purposes of this scheme, based upon predicted waste compositional analysis within Gloucestershire and projects elsewhere in the UK, a conservative figure of 56% renewable energy has been adopted.

5.4.8 The energy generation process is founded upon hot gases from the combustion chamber passing to a boiler which converts the energy from the gases into steam. The boiler would be located above the grate and the plant would generate approximately 76 tonnes of steam per hour.

(3) EU Directive 2009/28/EC Article 2, page L140/27 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32009L0028:EN:NOT Appendix H
(4)
http://www.decc.gov.uk/assets/decc/What%20we%20do/UK%20energy%20supply/Energy%20mix/Renewable%20energy/policy/renewableheat/1387-renewable-heat-incentive.pdf (page 35)

5.4.9 The proposed facility includes a steam turbine that would have a generation capacity of 17.4 MW of electricity 14.5 MW of this would be exported to the local supply grid (the grid connection is discussed subsequently) with the remainder used in the operation of the facility. The facility would also have the capability to export heat to local heat users. To facilitate this, the turbine would be equipped with steam extraction points to allow low pressure steam to be supplied directly to consumers, or to be condensed in heat exchangers in order to provide hot water. A series of air-cooled condensers, located to the south of the main building, would then be used to condense the residual steam from the steam turbine to water that would then be reused in the boiler.

5.4.10 The turbine would be able to generate an estimated 139,200 megawatt hours per year (MWh/yr) of electricity (based upon 91% availability i.e. operating for 8,000 hours in a year). Approximately 116,000 MWh/yr would be exported to the local grid and the balance would be used to provide power within the facility itself.

5.4.11 Of that exported 56% would be classed as renewable i.e. 8.1 MW. Based upon 8,000 hours of generation per annum, the facility would generate 64,800 MWh/yr (64GWh/yr) of renewable electricity.

5.4.12 The Waste Framework Directive (2008/98/EC), enacted in the UK in the Waste (England and Wales) Regulations 2011, includes specific definitions of “disposal operations” and “recovery operations”. Of particular relevance to the proposed EfW facility is recovery operation R1, which is “use principally as a fuel or other means to generate energy”. A footnote to this definition states that “this includes incineration facilities dedicated to the processing of municipal waste only where their energy efficiency is equal to or above 0.65”, and defines energy efficiency using a formula which take into account the differing benefits of electricity generation and heat generation. Applying this formula gives an energy efficiency factor of 0.72 for the proposed EfW facility when only exporting electricity (as opposed to heat, or heat and electricity in combination). This confirms that the operation of the plant would be defined as a recovery operation.

5.4.13 The plant has the capability of producing as much as 80,000 MWh/yr (80 GWh/yr) of heat in the form of steam. Depending upon the level of electricity generation for which the plant is configured, a proportion of this would be available for export, either as steam or hot water.

5.4.14 GCC and UBB have undertaken assessments of potential heat off-take options from the proposed facility. The GCC assessment was conducted by Entec on behalf of GCC in 2008. The assessment concluded that the potential for directly supplying high grade heat to large heat consumers is generally low. The study identified the closest existing major heat user to the Javelin Park as Dairy Crest, a chilled foods manufacturer. This business is located approximately 4.5 km from Javelin Park, at these distances and on the basis of current economic drivers this is a distance currently considered too far to feasibly transport high grade heat for industrial purposes.

5.4.15 The Entec assessment also examined the potential for heat from the facility to be used in district heating schemes. Whilst a number of existing business and residential areas exist within a feasible distance for heat offtake retrofitting a CHP network into existing infrastructure is not considered economically feasible at the current time. However, the assessment did identify a new housing development proposed approximately 1.5 km to the north of Javelin Park. This development known as Hunts Grove is for 1,750 homes and as such the study recognised that the development could potentially utilise CHP opportunities if it was integrated into the development proposals.

5.4.16 The Entec assessment also recognised the potential for the use of heat by a number of existing office based business at Quedgeley and by warehousing currently consented on the remainder of Javelin Park. On the basis of Hunts Grove, some limited supply to existing local businesses and supply of heat to distribution warehousing at Javelin Park the assessment identified the potential for an annual heat demand total 17GWh per year within the local area. The UBB study broadly supported these findings.

5.4.17 In addition to the development proposed housing at Hunts Grove, and not discussed in the Entec report, is an extant planning permission for the development of Kingsway Residential Development approximately 2.5 km to the north of Javelin Park. This development comprises 2,650 houses, employment development, open space and community facilities.

5.4.18 Whilst the delivery of a CHP scheme at Hunts Grove and Kingsway offers a potential opportunity for heat use it would require the development of a strategic CHP network that may not be financially viable at the present time. However, the final detail of implementation of the Renewable Heat Incentive and ongoing discussions around the ability to treat electricity generated by CHP which is "offsite" but connected by DH mains as an "Allowable Solution" for Building Regulations and Code for Sustainable Homes requirements could change the economics of such a scheme positively. Further potential fiscal and policy drivers that could influence the viability of delivering a CHP scheme are discussed below.

5.4.19 With regard to potential development at Javelin Park the development of a distribution warehousing scheme provides a realistic opportunity to provide CHP from the facility. Whilst traditional warehousing developments have a relatively low heat demand the presence of a significant heat source at Javelin Park could attract energy intensive distribution businesses e.g. chilled warehousing, to the site. Such businesses demand over four times the energy required by traditional warehousing units. As such the future development of Javelin Park does present a realistic and valuable opportunity to deliver CHP from the proposed facility.

5.4.20 Notwithstanding the potential for a CHP scheme at Javelin Park there is at present limited potential to supply heat to off-site users. However, this may alter in the future not least due to the fact that the fiscal drivers for heat supply are undergoing wholesale change. Economic factors with regard to energy are likely to alter in the short to medium term, supporting the potential for heat off-take schemes, factors to be considered include:

- high and volatile energy prices;
- the increasing adoption of planning policies requiring new development over a certain scale to source a proportion of its energy from renewable sources;
- the Climate Change Levy;

- Part L of the Building Regulations;
- the Carbon Reduction Commitment Energy Efficiency Scheme;
- the Renewable Heat Incentive (described subsequently);
- increased environmental awareness and associated development of corporate social responsibility policies; and
- increased focus on the delivery of sustainable development to meet national and international renewable energy targets.

5.4.21 It is evident from the above that the proposed EfW facility represents a real opportunity for future Combined Heat and Power (CHP) development i.e. the plant would be 'CHP ready' and in addition to the guaranteed electricity generation there is a prospect of heat off-take in respect of future development at Javelin Park.

5.4.22 The matter of the identification of potential heat users and the feasibility / viability of heat off-take is complex and not adequately supported by current legislative and fiscal policy. This is evidenced by the fact that the UK only has three EfWs that presently distribute material quantities of heat and two of these (Nottingham and Sheffield) were reconstructed on former incinerator sites specifically to serve existing district heating schemes that had been installed many years previously. The problems in delivering heat off-take have been recognised by central government who are in the process of developing new policies, most notably:

- In March 2011 the Department for Energy and Climate Change (DECC) published its Renewable Heat Incentive (RHI) policy document and the Renewable Heat Incentive Scheme Regulations 2011 were made legislation in November 2011. The Regulations set out the detailed arrangements for the RHI scheme which will provide long-term financial support to renewable heat installations to encourage the uptake of renewable heat. The Renewable Heat Incentive Scheme Regulations 2011 have the potential to have a large impact on future renewable energy projects delivering CHP. The policy document and associated legislation confirms that heat produced from renewable combined heat and power plants will be eligible for the RHI and CHP installations will not need to meet the CHPQA standard in order to claim the RHI. The initiative is based around a tariff system, providing a fixed rate financial incentive per unit of renewable heat generated (and utilised).The legislation lays out ground rules for the interaction of the Renewable Obligation for electricity and renewable heat, and attempts to remove some of the inconsistencies introduced in the Renewables Obligation regarding CHP. The RHI will sit alongside the existing Renewables Obligation for power generation and Feed-In-Tariffs for small scale generation.

- In March 2010 the Department for Communities and Local Government (DCLG) published, for consultation, a new Planning Policy Statement: Planning for a Low Carbon Future in a Changing Climate. This draft policy document sets out a planning framework for securing enduring progress against the UK's targets to cut greenhouse emissions and use more renewable and low carbon energy, and to plan for the climate change which is now inevitable. The purpose of the consultation is to get stakeholder views and comments on the new draft planning policy which combines and updates the existing Planning Policy Statements on climate change (PPS1 supplement) and renewable energy (PPS22). It identifies the benefits of CHP and reconfirms that EfW is renewable and / or low carbon energy supply infrastructure. Draft Policy LCF 1.4 places an obligation on Local Planning Authorities to: *look for opportunities to secure:*

    i) decentralised energy to meet the needs of new development;

    ii) greater integration of waste management with the provision of decentralised energy;

    iii) co-location of potential heat suppliers and users; and,

    iv) district heating networks based on renewable energy from waste, surplus heat and biomass, or which could be economically converted to such sources in the future.

5.4.23 It also advises, at draft Policy LCF14.1, that: Local planning authorities should ensure their development management does not prevent, delay or inhibit proposals for renewable and low carbon energy, and associated infrastructure, which could be permitted having regard to the objectives and policies in this PPS.

5.4.24 In summary, the proposed EfW facility:

- would generate electricity of which the majority would be renewable;
- is designed with the potential to generate heat for export and use by local heat users;
- has the opportunity to provide heat-off take to future development at Javelin Park; and
- has clear potential to export heat when the emerging government policies on planning and fiscal measures for facilitating heat use come into force / are implemented.

5.4.25 Off-site heat off-take, whilst not a part of the current planning application, is nevertheless an important consideration that would be pursued during the ongoing development of the project. At this time as no committed heat off-take opportunities have been identified the matter is not considered further within this ES.

5.4.26 UBB is committed to ongoing investigation into potential heat off-take. To highlight their commitment to this process, the company is prepared to accept a planning condition requiring the submission of an annual report setting out the measures that have been undertaken to secure further heat off-take from the facility. This approach is entirely consistent with that adopted by a number of other Planning Authorities / the Planning Inspectorate when approving other EfW developments. Examples of such conditions are set out below.

5.4.27 On 30th September 2008 Lincolnshire County Council approved an EfW facility (planning permission reference N43/1186/08). The relevant condition is as follows:

(14) Prior to the EfW Plant becoming operational a study detailing the feasibility and commercial viability of exporting heat from the EfW Plant for use by local domestic, commercial and/or industrial users (together with the demand for such heat) shall be submitted to and approved in writing by the WPA. If at the time the EfW Plant becomes operational the study concludes

that exporting heat from the EfW Plant is not feasible or commercially viable then a timetable for the review of the study shall be agreed in writing with the WPA.

5.4.28 On 24th November 2009 Peterborough City Council resolved to approve an EfW facility (application reference 09/00078/MMFUL) subject to Section 106 agreement (unrelated to heat off-take). The relevant draft approved condition is as follows:

(C 24) Prior to the Energy from Waste Plant becoming operational a study detailing the feasibility and commercial viability of exporting heat from the Energy from Waste plant for use by domestic, commercial and/or industrial users (together with the demand for such heat) and a timetable/strategy for expanding this network to distribute residual heat shall be submitted to and approved in writing by the Local Planning Authority. If at the time the Energy from Waste Plant becomes operational the study concludes that exporting heat from the Energy from Waste Plant is not feasible or commercially viable then a timetable for the review of the study shall be agreed in writing with the Local Planning authority.

5.5 Electricity Grid Connection

5.5.1 As outlined above the EfW facility would recover energy from the combustion of waste by way of electricity and heat production. Electricity would be generated by a steam turbine, the generation capacity of which would be 17.4 MW.

5.5.2 As described in Section 5.4 a proportion of the electricity generated would be reused in the operation of the facility with the majority of the electricity, 14.5 MW, being exported to the local grid. The grid connection works required to export electricity from the facility do not form part of the planning application and fall either under Section 37 of the Electricity Act 1989 or under permitted development rights of statutory undertakers. However, on the basis that export of electricity is an integral part of the scheme it is considered appropriate that the potential environmental impacts associated with the connection to the local electricity grid are assessed within the ES.

5.5.3 UBB have undertaken a Grid Connection Feasibility Study (Appendix 5.3) and have consulted with the local District Network Operator (DNO), E.ON Central Networks, to identify potential grid connection options. The DNO has confirmed that connection is feasible. Whilst currently the grid connection route has not been confirmed, there are two options presently under consideration. One is derived from the UBB study the other from E.ON Central Networks. For the purposes of this ES, both options have been assessed. They can be described as follows:

- Option 1: a connection to Tuffey substation c.6km to the north-west of the site, this connection would be via underground cabling for the majority of the distance buried within existing highways carriageway or verge. The route would follow the B4008, the A38 and Cole Avenue. This grid connection route was identified within the UBB Grid Connection Study.
- Option 2: a tee connection off the existing 33kV Ryeford – Nethrills – Coaley circuit, this connection would comprise an overhead line suspended on newly erected wooden poles. This connection route was identified by the DNO.

5.5.4 An assessment of the potential environmental impacts of these two connection options is presented in Chapter 17.0, the routes of the two options are shown on Figure 5.12.

5.6 Operational Environmental Management

5.6.1 The potential effects of waste management developments can be the subject of public concern with regard to environmental nuisance e.g. generation of litter and odour or through attraction of vermin or other pests to the site. However, a modern, well run facility should not give rise to such issues.

5.6.2 In order to ensure that the site would be run in an acceptable manor UBB shall implement an Environmental Management System (EMS), certified to ISO 14001, for the facility. The EMS would form an integral part of the facility Integrated Management System (IMS) that will draw together all the policies and procedures for the facility that would include a site Environmental Management Plan (EMP).

5.6.3 The facility general manager would be responsible for the day to day management and compliance of the site with the EMS and the control of these issues would be monitored and enforced by the Environment Agency through the Environmental Permit for the site.

5.6.4 The potential impacts of the development in respect of landscape and visual impacts, noise and air quality are assessed in detail within Chapters 8.0, 12.0 and 13.0 respectively. This section considers the methods employed to manage and monitor the following potential public amenity issues at the site:

- vermin and other pests;
- dust and odour;
- fire; and
- litter.

Rodents and Other Pests

5.6.5 All waste would be delivered within the enclosed waste reception hall and deposited within the sealed concrete waste bunker. As described below regular inspections of the site would ensure litter within and adjacent to the site, that could attract vermin, would be collected and disposed of. In addition the waste reception hall would be cleaned daily to ensure that material that could attract rodents or other pests does not accumulate.

5.6.6 There is the possibility of fly infestation particularly in periods of warm weather (when insect breeding cycles speed up) and when aged waste is transported to the site e.g. where waste collection frequencies are in the order of two weeks and/or there is further storage time at waste transfer stations prior to delivery to the facility. This could potentially allow any fly eggs within the waste to mature and hatch within the waste bunker prior to combustion. In such instances insecticides would be used to ensure that fly issues are not experienced at the facility.

5.6.7 Inspections of the site by pest control specialists would be undertaken if any rodent or other pest issues are identified.

Dust and Odour

5.6.8 Whilst odour sources do occur at EfW facilities, odour complaints and escape of odours at EfW facilities beyond the site boundary are unlikely on the basis that all operations occur within an enclosed building. Odours would be prevented from escaping the tipping hall and waste bunker, where most odour issues are likely to arise, as the air within the building is retained under negative pressure. This is achieved through the extraction of air from the tipping hall by forced draught fans which feed the combustion process.

5.6.9 The handling operators would be trained to operate a FIFO (first in first out) system, so that waste is not routinely kept in the waste bunker for longer than two to three days. In addition anaerobic conditions within the refuse bunkers, which could cause odour, would be prevented by regular mixing of the waste by the crane operators. An activated carbon filter unit would be installed to prevent odour issues during any shutdown period.

5.6.10 No odours would be emitted from the stack as all odorous compounds would be destroyed due to the high temperatures achieved (850^{o}C) within the furnace. Deliveries of biodegradable waste, which could give rise to odour, would be within enclosed or sheeted delivery vehicles. All delivery vehicles entering the site would be inspected by the gatehouse operator to ensure that vehicles are appropriately enclosed. Any drivers failing to comply with site regulations would be warned and breaches reported in the site EMP. If repeated offences occur then drivers would be banned from accessing the site.

5.6.11 Odour surveys would be undertaken if any complaint from neighbours in relation to odours is received. If necessary, operating procedures would be amended to deal with any issues identified at the site.

5.6.12 Dust emissions from the site are unlikely to occur as all process operations are undertaken within enclosed buildings. Dust arising from vehicle movements are unlikely as all trafficked areas would be hard surfaced. During prolonged periods of dry weather the site roads would be washed if the potential for fugitive dust impacts resulting from traffic movements are identified by the facility general manager.

5.6.13 Bottom ash processing and handling would occur within an enclosed building. The doors of the bottom ash processing facility would remain closed other than for access of vehicles collecting material for transport off site. Air vented from the bottom ash processing building would be filtered before being released to the atmosphere by means of a bag filter system (or any other system with at least same performance levels, such as air cyclones, jet system or multi-venturi), again further mitigating the potential for dust release from the facility.

Fire

5.6.14 Whist considered extremely unlikely it is possible that waste loads being received at the site may comprise elements of smouldering waste. The site management plan would have procedures in place to deal with such events and records of any smouldering load incidents would be made within the EMP and monthly facility service reports. A dedicated area would be provided within the facility that would be equipped to receive and extinguish smouldering loads delivered to the facility.

5.6.15 Once deposited in the waste bunker the waste would be inspected by the crane operator and as described above the waste would be mixed regularly to avoid anaerobic conditions developing within the waste mass. Inspections and regular mixing of the waste would help identify and prevent hot spots forming within the waste mass which could cause a fire.

5.6.16 Fire prevention and suppressions systems would operate at the facility. This may include the use of a specific water deluge system within the waste bunker and a fire water sprinkler system.

Litter

5.6.17 UBB would maintain the site in a clean and tidy condition and measures would be defined within the EMP to prevent the release of litter from the facility buildings and from the site boundary.

5.6.18 All vehicles carrying waste to the site would be required to be adequately covered thus avoiding problems associated with litter escaping onto the public highway or other areas outside the boundary of the site. Drivers would only be allowed to un-sheet vehicles upon entering the waste reception hall. As described above any drivers failing to comply with site regulations would be warned and breaches reported in the site EMP. If repeated offences occur then drivers would be banned from accessing the site.

5.6.19 All unloading of waste would be undertaken within the enclosed waste reception hall, which, as described above would be controlled under negative air pressure. This would assist in preventing any litter from escaping the building.

5.6.20 The boundary of the site would be fenced by a 2.4m high fence as described in Section 5.2, this would help prevent litter from being blown beyond the site boundary. The internal and external boundaries of the site would be inspected daily and any litter would be collected and disposed of.

Conclusions

5.6.21 The site would be operated under an Environmental Permit, which would ensure that any potential effects upon public amenity are minimised. Management measures adopted at the facility would help to prevent unacceptable environmental effects in respect of rodents and other pests, odour, dust, fires and litter.

5.7 Proposed Contingency Plans

5.7.1 Extensive operating procedures and contingency plans would be put in place to ensure the safe and efficient running of the plant. These would cover situations such as plant failure, unacceptable waste and traffic problems.

5.7.2 Procedures would be put in place in the event that waste cannot be delivered to the facility for processing. For example, the plant would require essential annual planned maintenance over a period of 2-3 weeks. Waste which cannot be processed at the plant during this period would be diverted to an alternative treatment or disposal facility.

5.7.3 In the event of unexpected shut-down, similar procedures apply, with waste vehicles being diverted directly to alternative treatment facilities or landfill sites.

5.7.4 The site does not lie in a flood plain and is not at risk of flooding. However, in the event of public roads becoming impassable due to flooding or other exceptional weather conditions once the proposed EfW facility is operational, the same procedures would apply as at present with waste diverted to landfill.

5.8 Waste Inputs

Waste Types, Sources and Quantities

5.8.1 The proposed EfW facility has been developed for the thermal treatment of 190,000 tpa of residual non-hazardous waste arising within Gloucestershire. As set out in Chapter 3.0 of the ES (and Chapter 2.0 of the Planning Statement) there is a demonstrable need for such treatment capacity within the County.

5.8.2 The proposed EfW facility would cater primarily for residual MSW delivered under contract by Gloucestershire County Council (GCC), but capacity has also been allowed for the treatment of lesser quantities of residual non-hazardous commercial and industrial (C&I) waste arising within Gloucestershire.

5.8.3 It is not possible to accurately predict the future spit between Gloucestershire's MSW and C&I waste that would be treated at the EfW facility. This would be influenced by a number of variables including waste growth and future recycling rates. With regard to MSW, if high levels of recycling are achieved, it is projected (in the emerging Gloucestershire Waste Core Strategy) that circa 150,000 tonnes per annum of residual waste treatment capacity (i.e. 'other recovery') would be required in the period up to 2027. Beyond this date this figure may well increase. In terms of C&I waste, in 2008, 314,000 tonnes of this waste stream was landfilled within the County. Even with significant increases in recycling there is predicted to be circa 200,000 tpa of residual C&I waste produced in Gloucestershire.

5.8.4 Based on the foregoing it is likely that in the first 5-10 years of operation (2015-2025) approximately three quarters of the waste treated at the facility would be residual MSW (although this figure could be as low as two thirds) and the remainder C&I waste. Thereafter the proportion of residual MSW treated is likely to slowly increase.

5.8.5 Regardless of what the precise residual MSW / C&I waste split transpires to be, the aforementioned need assessment demonstrates that there is far more residual waste requiring treatment within Gloucestershire than could be accommodated at the plant.

Understanding Waste Throughput

5.8.6 The EfW facility has been designed with the capacity to thermally treat 190,000 tpa of residual waste. However, it is important to understand thermal treatment plants such as EfW facilities are actually sized on thermal capacity, not mass throughput, and that once a plant has been constructed its thermal capacity is fixed for life. The relationship between mass throughput and thermal size is dictated by the Calorific Value (CV) of the Waste. The CV depends upon the mix of materials that is in the waste and when this is applied to residual waste this is also related to the materials removed from the waste by recycling. Removal of low CV materials such as glass and metals would increase the CV of the residual waste. Removal of high CV materials such as paper and plastics would reduce the CV of the residual waste. The higher the CV of the waste, the lower the tonnage throughput of any given thermal treatment plant and vice versa (this relationship is independent of the thermal treatment technology selected).

5.8.7 Plant availability is the number of hours per year the plant is running and processing waste; this affects annual tonnage throughputs. Over the life of an EfW plant there would be years of high availability and years of low availability. Typically a well run and reliable plant would average 91% availability. There are 8,760 hours available in a year, for a plant averaging 91% availability over a 25 year life this means that on average it would operate for 7,972 hours in a year. However, some years may have more hours and some less. For example: a plant processing 25 tonnes per hour for 8,000 hours has an annual throughput of 200,000 tonnes, but if the same plant only operates for 7,500 hours (maybe due to increased maintenance needs that year) then the throughput would reduce to 187,500 tonnes.

5.8.8 In light of the above, it should be understood that the plant throughput in any year is a combination of three factors:

- thermal capacity;
- waste CV; and
- plant availability.

5.8.9 Given that once a plant has been constructed its thermal capacity is fixed, it is the other two variables that determine the waste throughput profile over the life of the plant, albeit the likely change in throughput would be very modest even if the variables shift.

5.8.10 This is a common issue faced in planning applications for thermal treatment plants where the applicant must use the best available information to fix a throughput figure which accurately reflects current waste data and is supported by a need argument. It is inappropriate to assess the effects of the scheme based upon theoretical outcomes (not reflecting the best available data) which could modestly either reduce or increase the actual throughput capacity. However, for the reasons identified above, whilst the EfW facility capacity is designed to have 190,000 tpa capacity, the volume of waste treated at the facility could, dependent upon the aforementioned variables, be slightly different. For this reason, an absolute tonnage throughput restriction should not be placed on the facility and it is suggested, as is commonly the case, that if a tonnage restriction is placed on the permission, it provides for the planning authority to control and agree minor variations in throughput depending upon the prevailing circumstances.

5.9 Construction Methods

5.9.1 The following chapter provides a summary of the key elements of the construction of the EfW facility, this description is not intended to be prescriptive and the exact construction methods, phasing and programme would be determined by the appointed contractor. However, the following description enables the key environmental effects of the development to be assessed.

Programme

5.9.2 The timing of the construction period would be dependent on the grant of planning permission for the proposed development and subsequent contract negotiations. The current programme of works is based on the assumption of a construction start date in early 2013.

5.9.3 The construction period is anticipated to take approximately 33 months, this includes internal fit-out and commissioning of mechanical and electrical plant. The programmed date for the opening of the plant is in Autumn 2015. An outline programme of works is provided in Appendix 5.4.

5.9.4 The core ground works including site clearance, earthworks, foundations, drainage are likely to occur within the first eight months. The erection of building frames and the main structural works would be staggered throughout the construction period. The first major structure to be erected would be the boiler hall and FGT building, this would begin immediately following the main ground works. The final building structures to be completed would be the bottom ash processing facility and the air cooled condensers. These structures would be erected between months 21 and 26, towards the end of the construction period. Following completion of the structural building works, external hardstandings including roads and car parks would be completed along with lighting, signage and landscaping.

5.9.5 A series of indicative construction phasing drawings are included in Appendix 5.5. These drawings illustrate the main operations being undertaken within the site and indicate the areas of the site that would be used for staff compounds, materials storage, car parking and plant assembly. All of the construction works would be managed within the site with the exception of an area of staff parking that would be required from month 13 to 28. The temporary parking is described in further detail below.

Construction Hours

5.9.6 Construction operations would generally be limited to 07.00 to 19.00hrs Monday to Friday and 07.00 to 12.00hrs Saturday. It is possible that some construction activities would be undertaken outside these hours e.g. during the internal fit out of buildings, delivery of abnormal loads. HGV movements would not be permitted outside the hours outlined above without prior agreement from the Waste Planning Authority and operations would not exceed any noise limits imposed as part of the permission.

Site Access

5.9.7 Site access would be from the internal access road within Javelin Park that leads onto the B4008. It is anticipated that a number of abnormal loads would be required during the construction period. The local roads leading to the construction site have been assessed as being suitable for the transport of abnormal loads and widening and strengthening of highways is not considered necessary.

5.9.8 If there is a requirement for abnormal loads to be delivered outside the normal working hours described above then permission shall be sought from the Waste Planning Authority. The traffic impact of the construction phase is described in Chapter 7.0.

Main Construction Activities

5.9.9 The key construction phases of the project are described below. The construction activities are set out in the likely construction sequence. However, it is expected that a number of the operations would overlap and as described above the construction of various elements of the main building would be staged throughout the construction period.

Site Preparation

5.9.10 The perimeter of the site would be secured for the duration of the construction works by either timber hoardings or Heras (or similar) fencing. The fencing would run along the northern and eastern edge of the stream corridor in order to protect the watercourse corridor from damage by vehicles or other site operations. A geotextile silt fence would be erected along the boundary of watercourse corridor to prevent heavily silt laden runoff from entering the watercourse. Further surface water pollution protection measures would include the use of temporary settlement / storage lagoons prior to the discharge of surface water from the site.

5.9.11 A one way traffic system would be set up on site with a separate entrance and exit providing access to/from the internal Javelin Park site access road. The site entrance and exit would be gated and 24 hour manned security would operate throughout the construction period.

5.9.12 Vegetation clearance on the site would involve the removal of a number of immature trees and areas of scrubby grassland. Vegetation clearance would be undertaken outside the bird breeding period (April – September) and would take into account any other ecological constraints identified at the site.

Earthworks, Foundations and Piling

5.9.13 The construction would involve the excavation of approximately 36,000 m^3 of materials at the site. The excavations would include creation of the void for the waste bunker, turbine condenser room and bottom ash bunker. Other excavated material would be generated from the piling and foundation works, development of external hard standing areas and utilities and drainage runs.

5.9.14 As described previously the landscaping scheme includes a number of earth bunds. The creation of these bunds, along with the use of the arisings in road construction and development of building platforms, would utilise over half of the excavated material on site with the remainder being exported offsite.

5.9.15 It is estimated that approximately 16,475m^3 of material would need to be exported offsite. This would result in approximately 1,600 HVG loads. The export of the material would be undertaken in the first four months of the construction and would equate to approximately 25 HGV loads per day. As described above the traffic impact of the construction period has been considered in the Transport Assessment and is summarised in Chapter 7.0 of the ES. Vehicle weight restriction to the south of the site would require HGVs to transport the material north along the B4008 and most likely onto the M5 for further onward transport.

5.9.16 Provisional site investigations indicate that the excavated material would be suitable for reuse as engineering fill or for landscaping operations. As such it is likely that the material would be exported for re-use at another construction site. Alternatively the material could be transported to nearby landfill sites for re-use in engineering and capping operations.

Building Foundations

5.9.17 Foundations for the frame of the main building are likely to be founded using a piled solution. Piling methods would be determined by the piling contractor but could be hammer driven or rotary auger. Noise impacts from the hammer driven option has been assessed in Chapter 12.0 as this is likely to result in the most significant noise impacts.

5.9.18 Foundations for the ancillary buildings including the weighbridge, ACC, water pump house and substation are likely to be strip or pad footings.

5.9.19 Building slabs would be cast insitu and concrete would either be delivered directly to the site via concrete mix lorry or concrete would be made from an on-site concrete batching plant with aggregates being supplied to site by HGV.

Erection and Cladding of Building Frames

5.9.20 The buildings are likely to be of steel frame construction with the external envelope formed from a combination of masonry blocks, cold rolled sheeting rails, metal cladding and glazing. The roofs of the buildings would be constructed of composite cladding panel.

5.9.21 Steel work would be delivered to the site by HGV. The construction is likely to be undertaken using a series of mobile truck mounted cranes and a fixed tower crane. Typically a tower crane with a 55 metre boom and a span of 65 meters to the hook would be used in such a construction. The height of the tower crane would typically be 40m. The greatest lifting capacity is likely to be provided by a large crawler (500 tonne capacity) for boiler erection.

Installation of Plant and Equipment

5.9.22 The installation of the main plant and equipment would be undertaken following the completion of the boiler hall and FGT facility. The installation would begin approximately 13 months after the start of construction and would take approximately 13 months.

5.9.23 Commissioning of the plant would take a period of 6 months and would commence following installation of the main plant. The initial commissioning referred to as ‘cold testing’ would involve a series of tests prior to the burning of any waste at the site. The cold testing would ensure that all systems are in full working order prior to the thermal treatment of waste. Waste would then begin to be imported to the site to allow ‘hot testing’ of the plant to commence. Hot testing, optimisation of the plant and performance testing would take a period of 4 months after which the plant would be fully operational.

External Civil Engineering and Infrastructure (Roads, Car Parking Areas, Drainage and Utilities)

5.9.24 Much of the external civil engineering works are likely to be undertaken towards the end of the main construction works in parallel with the installation of plant and the commissioning period. The works would comprise the laying of access roads, the car park, external hard standing areas to the buildings and earthworks associated with the final landscape scheme. The laying and installation of drainage and utilities would be phased with much of the work being undertaken in the early phases of the project. Connections and finishing of service runs are likely to be undertaken towards the end of the construction phase. It is likely that the external grid connection works i.e. the construction of the cable route, cabling and any ancillary works e.g. reinforcement of substations would be undertaken by the DNO. This work would be undertaken in parallel with the plant installation and commissioning operations.

Site Compound and Operative Facilities

5.9.25 The site compound would be located in the northern area of the site close to the site entrance. Parking for site operatives would be provided between the entrance and exit, part of this area would also be used for the temporary storage and laydown of materials and plant. Further material storage and laydown areas would be provided along the northern boundary of the site.

5.9.26 The site of the bottom ash processing facility would be used as the boiler and FGT plant assembly and storage area. The foundations and slab of the processing building would be developed to provide a working platform and storage area. Once the boiler and FGT equipment has been installed the superstructure of the bottom ash processing facility would be constructed.

5.9.27 As described above a temporary car parking area would be required adjacent to the northern boundary of the site. It should be noted that construction compounds are covered under Part 4 Class A: Temporary Buildings and Uses of the General Permitted Development Order (GPDO) 1995 (as amended) and as a consequence do not require planning permission in their own right. For this reason, the off-site car parking space does not form part of the planning application. However, for the purposes of the EIA the likely offsite car parking location has been identified. The temporary car parking area is shown in Appendix 5.5.

5.9.28 The temporary car parking is approximately 120 m in length and 17 m in width. The identified area comprises a section of the Javelin Park access road, derelict ground, hardstanding and sparse ruderal vegetation. The temporary car parking area would be formed by laying stone either directly on the current ground surface or if necessary on a geotextile, Terram or similar, to provide a suitable parking surface. The Javelin Park access road would be used to access the temporary car park.

5.9.29 At the time of submission a formal agreement between UBB and the owner of the development plot to the north of the site has yet to be finalised. However, preliminary discussions have been undertaken and the site owner has indicated that the area to the north of the site could be available for use as a temporary car parking area. In order to minimise the requirement for operative car parking busses would be provided from Gloucester and Cheltenham and a car sharing scheme would form part of the Construction Travel Management Plan (CTMP).

5.9.30 Appropriate bunding and environmental protection measures would be implemented within the fuel and material storage areas situated within the construction site. The protection measures would be defined in the Construction Environmental Management Plan (CEMP) described in further detail below and would be in line with Environment Agency Pollution Protection Guidelines.

5.9.31 A wheel wash facility would be located at the site exit. The wheel washing facility would be self contained with an integral pump house and internal settlement collection tank. The wheel wash would comprise high-pressure water hoses and a power washer hand lance.

Plant

5.9.32 The following items would be the principal elements used during the construction period:

- tracked excavators (excavation and loading);
- articulated dump trucks;
- wheeled backhoe loaders;
- HVG wagons;
- piling rigs;
- mobile cranes and telescopic handlers;
- tower cranes;
- rollers and vibratory compactors;
- generators and water pumps;
- concrete batching plant and pump; and
- cement mixer trucks.

Construction Environmental Management Plan (CEMP)

5.9.33 A CEMP would be developed for the construction period, the purpose of which would be to manage and report environmental effects of the project during construction. The CEMP would set out how environmental issues would be managed in accordance with relevant legislation, regulations and best practice guidance. It would be the responsibility of the main contractor to develop and enforce the CEMP. It is suggested that the requirement for a CEMP is subject to a planning condition.

5.9.34 The objectives of the CEMP would be to:

- highlight environmental impacts resulting from the development and identify sensitive receptors within the development site to the construction team;
- reduce and manage environmental impacts through appropriate construction methods;
- reduce and manage environmental impacts through implementing environmental best practice during the construction period;
- undertake ongoing monitoring and assessment during construction to ensure environmental objectives are achieved;
- provide emergency procedures to protect against environmental damage;
- provide an environmental management structure for the construction stage;
- recommend mechanisms to reduce risks of environmental damage occurring; and
- consult and liaise with EA, Natural England, Local Authority Officers and other stakeholders throughout the works if necessary.

5.9.35 A CEMP for a project of this nature would typically cover the following key elements:

- drainage, water quality and hydrology;
- dust, emissions and odours;
- health and safety/site management;
- waste management;
- traffic management;
- wildlife and natural features;
- cultural heritage; and
- contaminated material.

5.9.36 Prior to the commencement of construction an environmental walkover ecological survey would be undertaken to establish any changes in the environmental baseline since the surveys undertaken as part of the EIA and update any of the defined construction procedures as necessary.

5.9.37 Detailed construction method statements would be included within the CEMP. Method statements would be developed for the key construction phases e.g. site preparation and development of site compound, site excavation and foundations and piling activities. The method statements would outline the key construction processes, identify potential environmental and health and safety risks and define appropriate mitigation measures. In parallel to these method statements a number of environmental management plans would be developed, these include but are not limited to the following:

- Waste and Resource Management Plan, including a Site Waste Management Plan (SWMP);
- Pollution Control and Contingency Plan – emergency procedures;
- Noise and Vibration Management Plan;
- Air Quality Plan; and a
- Construction Traffic Management Plan (CTMP).

5.9.38 The main contractor would take regard of the following guidelines in preparation of the CEMP and during the operation of the site:

- Environment Agency. Pollution Prevention Guidelines 1: General Guide to the Prevention of Pollution (PPG1);
- Environment Agency. Pollution Prevention Guidelines 2: Above Ground Oil Storage Tanks (PPG2);
- Environment Agency. Pollution Prevention Guidelines 4: Disposal of Sewage where no Mains Drainage is Available (PPG4);
- Environment Agency. Pollution Prevention Guidelines 5: Works in, near or liable to affect water sources (PPG5);
- Environment Agency. Pollution Prevention Guidelines 6: Working at Construction and Demolition Sites (PPG6);
- Environment Agency. Pollution Prevention Guidelines 7: Refuelling Facilities (PPG7);
- Environment Agency. Pollution Prevention Guidelines 8: Storage and Disposal of Used Oils (PPG8);
- Environment Agency. Pollution Prevention Guidelines 21: Pollution Incident Response Planning (PPG21);

- CIRIA. Culvert Design Guide C168 (1997);
- CIRIA. Control of water pollution from construction sites C532 (2001); and
- CIRIA. Environmental Good Practice on Site C692 (2010).

6.0 PLANNING POLICY CONTEXT

6.1 Introduction

6.1.1 This section of the Environmental Statement (ES) briefly identifies the planning policy context for the proposed EfW development. The Scoping Report outlines that a planning policy assessment will not be included in the ES but provided by way of a separate Planning Statement. As a consequence, the planning assessment is included as Part 3 of the Planning Application Document and only the relevant policy context is summarised below.

6.2 Policy Context

The Development Plan

6.2.1 In the case of Javelin Park, the relevant statutory Development Plan comprises:

- Regional Planning Guidance (RPG10) for the South West (September 2001);
- The Adopted Second Review Gloucestershire Structure Plan (November 1999);
- Gloucestershire Waste Local Plan 2002-2012 - Saved Policies (October 2004)
- The Stroud District Local Plan - Saved Policies (November 2005).

Material Considerations

6.2.2 Many of the policies contained within statutory Development Plan were adopted some time ago. As a consequence, whilst they carry statutory weight, many have been superseded or are supplemented, in part, by elements of subsequent national policy, guidance and other new evidence. This information is contained within a number of documents which are considered to be material planning considerations in the determination of this planning application. The key documents are judged to comprise the following:

- Revised Waste Framework Directive 2008/98/EC (December 2008);

- Renewable Energy Directive 2009/28/EC (April 2009);
- Waste Strategy England 2007 (May 2007);
- Waste (England and Wales) Regulations 2011 (March 2011);
- Government Review of Waste Policy in England 2011 (June 2011);
- Planning Policy Statement 10 (PPS10): Planning for Sustainable Waste Management (March 2011);
- Companion Guide to PPS10: Planning for Sustainable Waste Management (June 2006);
- Energy White Paper 'Meeting the Energy Challenge' (May 2007);
- UK Renewable Energy Strategy (July 2009);
- UK Low Carbon Transition Plan (July 2009);
- Planning Policy Statement 22 (PPS22): Renewable Energy (August 2004);
- Draft Planning Policy Statement: Planning for a Low Carbon Future in a Changing Climate (March 2010);
- Planning Policy Statement 1 (PPS1): Delivering Sustainable Development (January 2005);
- PPS1 Supplement: Planning and Climate Change (December 2007);
- Planning Policy Statement 4 (PPS4): Planning for Sustainable Economic Growth (December 2009);
- Planning Policy Statement 5 (PPS5): Planning for the Historic Environment (March 2010);
- Planning Policy Statement 7 (PPS7): Sustainable Development in Rural Areas (August 2004);
- Planning Policy Statement 9 (PPS9): Biodiversity and Geological Conservation (August 2005);
- EN-1 Overarching National Policy Statement for Energy (July 2011);
- EN-3 National Policy Statement for Renewable Energy Infrastructure (July 2011);
- Draft National Planning Policy Framework 2011 (July 2011);
- Draft RSS for the South West (Secretary of State's Proposed Changes version) (July 2008);
- Gloucestershire Waste Partnership Joint Municipal Waste Management Strategy 2007-2020 (April 2008);

- Emerging Gloucestershire Waste Core Strategy - Focused Changes (June 2011);
- Emerging Stroud District Core Strategy - draft 'Preferred Strategy' due to be published in autumn 2011.

6.2.3 A further material planning consideration is the overriding and demonstrable 'need' for the development which is set out in Chapter 2.0 of the Planning Statement and is summarised in Chapter 3.0 of the ES.

6.2.4 In combination, the Statutory Development Plan and the identified material considerations contain policies and guidance which seek to:

- Control the use of land;
- Protect the environment;
- Give locational guidance for new development;
- Facilitate sustainable development including sustainable waste management; and
- Encourage renewable energy development.

6.2.5 As such, they provide a framework against which development proposals should be considered. In addition, in many instances, they provide the planning basis for the scope of this EIA. Accordingly, the EIA findings have been used to inform the assessment of the facility against the identified planning context as set out in the Planning Statement.

7.0 TRAFFIC AND TRANSPORTATION

7.1 Introduction

7.1.1 This chapter of the ES has been prepared to consider the highways and transport related environmental impact of the proposed EfW facility at Javelin Park.

7.1.2 Detailed highways and transport operational analysis work, including the identification of development trip generation and assignment, review of network safety, link capacity and general site accessibility has been considered in a formal Transport Assessment (TA) document. This TA report has been submitted separately as part of the Planning Application.

7.1.3 The TA report considered a baseline traffic assessment position as set out below:

- Observed background traffic demand + general traffic growth + future predicted development traffic flows associated with key committed local development sites (including the appropriate development of the Javelin Park site for its permitted B8 commercial warehousing land use).

7.1.4 This assessment approach was agreed with officers of the relevant highway authorities operating roads within the immediate vicinity of the proposal site (Gloucestershire County Council – Local Highway Network and the Highways Agency – Strategic Highway Network). Such an approach ensures the assessment of maximum network operational impact, as it considers maximum potential future levels of overall traffic demand.

7.1.5 Traffic estimates associated with this agreed assessment approach are set out in full within the supporting Transport Assessment report.

7.1.6 In addition to the core assessment approach based on the TA methodology, this ES chapter also includes for a further ‘sensitivity test’, which considers the environmental impact of changes in traffic levels including for a sensitivity baseline traffic assessment position as follows:

- Observed background traffic + general traffic growth + committed development traffic not including the development of the Javelin Park site, i.e. the Javelin Park site remains un-developed over the study period, except for the proposed EfW purposes.

7.1.7 In practice, this ‘sensitivity’ scenario is considered highly unlikely to take place, given that the Javelin Park site enjoys extant planning permission for B8 commercial warehousing development and has already been progressed towards implementation via the delivery of a new site access roundabout junction and supporting on-line improvements on the B4008 link road to M5 J12. Notwithstanding this, the consideration of this additional sensitivity test scenario within this ES chapter will ensure for an extremely robust assessment of potential development site impact.

Potential Impacts

7.1.8 The scope and nature of this ES chapter reflects the extent of matters which are understood to be of material interest to local highways and planning officers (Gloucestershire County Council) and officers of the Highways Agency (Strategic Highway Authority). Scoping consultation with officers identified that the assessment of key highways and transport issues should be concentrated on understanding future predicted development HGV and car traffic demand levels over the immediate highway network and anticipated future changes in traffic demand levels following the development of the proposed EfW facility.

7.1.9 Transport related environmental impacts are typically associated with changes in local traffic demand, both in terms of total number of development vehicles and the type of vehicles generated (i.e. the proportion of larger HGV service vehicles). Key impact types to be considered in traffic related environmental assessment are as follows:

- changes in development traffic demand impacting on prevailing highway safety conditions, accident risk and network congestion and delay on key links in the immediate vicinity of the proposal site and further a-field;
- changes in development traffic demand impacting on other local road network users and the immediate community, resulting in a reduced amenity (e.g. community severance, pedestrian delay / intimidation, etc.);

- changes in development traffic demand resulting in noise and vibration effects at surrounding / frontage properties to key access road corridors (see also Chapter 12.0 of this ES); and
- changes in development traffic demand and congestion resulting in local air quality effects at key local network links and junctions (see also Chapter 13.0 of this ES).

7.1.10 Transport related environmental impacts also vary over the different stages of the development lifetime. Typically a full assessment of transport environmental impact considers both:

- *Operational Traffic Impact* – i.e. the day to day transport impact of the operation of the proposal site - associated with typical staff, visitor and operational HGV demand. In the case of the proposed EfW plant, the scheme would be developed on a site which already enjoys planning permission for B8 commercial distribution warehousing. The 'net' impact of the proposal scheme is therefore the difference between the predicted total trip demand for the operation of the waste scheme and those traffic demand levels associated with the use of the site under the extant B8 planning permissions.

- *Construction Traffic Impact* – i.e. the extent of additional vehicle movements that would take place to / from the site during the construction phase. It should be noted that any environmental impacts associated with construction related traffic demand are generally only temporary in nature (occurring for the extent of the project build period only) and are rarely constant over the full construction period. Typically construction traffic impact can vary greatly in scale depending on the main activities taking place on site on any particular day.

7.2 Methodology

Scope of Methodology

7.2.1 The assessment of transport impacts has been carried out through the consideration of both core network operational factors (link capacity, congestion and delay) and the potential for transport environmental impact (noise, air quality, severance, effects on vulnerable users, etc). The detailed assessment of noise and air quality effects relating to traffic are included in Chapter 12.0 and 13.0 respectively.

Assessment Modelling

7.2.2 The following network traffic demand situations have been considered as part of this Environmental Assessment:

Core Assessment (Consistent with TA operational analysis)

- ***'Do-nothing' Scenario***: Operation of the local highway network in 2016 and 2026 assuming that the proposed EfW facility at Javelin Park does not take place (see Figures 7.1 & 7.2 to this ES). Under such circumstances it is assumed that the proposal site land area would instead be developed for B8 commercial warehousing land use, in line with current planning approval for the site. Full B8 development could be delivered at the Javelin Park site by the 2016 opening year.
- ***'Do-something' Scenario***: Operation of the local highway network in 2016 and 2026 including for traffic demand associated with the proposed EfW facility (see Figures 7.5 & 7.6).

Sensitivity Assessment ('Worst case' environmental impact)

- ***Sensitivity 'Do-nothing' Scenario***: Operation of the local highway network in 2016 and 2026 assuming that the proposed EfW facility at Javelin Park does not take place. Under this sensitivity scenario it is assumed that the full Javelin Park development area would remain un-developed for the full duration of the study period assessed (see Figures 7.3 & 7.4).
- ***Sensitivity 'Do-something' Scenario***: Operation of the local highway network in 2016 and 2026 including for traffic demand associated with the proposed EfW facility (see Figures 7.7 & 7.8). Under this sensitivity scenario it is assumed that no other development would take place at Javelin Park on the residual land parcels not utilised for the EfW scheme.

7.2.3 The assessment of the development environmental traffic impact for the proposed EfW development in both assessment cases is therefore based on the review of the anticipated change in network traffic conditions between the relevant 'Do-nothing' and 'Do-something' scenarios.

Network Operational Assessment

7.2.4 The detailed assessment of local highway network operation is set out within the formal TA document that supports the Planning Application. The TA has been prepared to accord with the guidance set out in March 2007 Department for Transport (DfT) document "Guidance on Transport Assessment". The TA considers the assessment of development traffic impact via a link flow assessment of immediate local network links and a review of link capacity when compared to relevant DfT thresholds. As noted above, the scope and nature of assessment matters included in the TA document reflects the extent of highways and transport issues identified as being of interest to GCC highways department and the Highways Agency during scoping discussions and includes for the consideration of maximum network operational demand conditions.

Transport Related Environmental Assessment

7.2.5 The potential highways and transport related environmental impact of the operation of the proposed EfW development has been assessed via reference to the methodology set out in the Institute of Environmental Assessment (IEA) document "Guidelines for the Environmental Assessment of Road Traffic". The IEA guidelines have been prepared to inform the environmental assessment of road traffic associated with major new developments and are designed to be applied to off-site traffic impacts. Alternative guidelines and established procedures exist for the environmental assessment of new road / highway infrastructure (as set out in Design Manual for Roads and Bridges), however, such procedures are not directly relevant to the case of the proposed development at Javelin Park which does not involve any off-site road construction.

7.2.6 IEA guidelines suggest the following general 'rules of thumb' when considering the initial appraisal or 'screening' of environmental impact and the identification of where more detailed analysis of specific environmental effects might be required:

> ***"Rule 1: Include highway links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%)***
>
> ***Rule 2: Include any other specifically sensitive areas where traffic flows have increased by 10% or more"***

7.2.7 With respect to Rule 1 (30% threshold), IEA guidance notes that traffic forecasting is not an exact science and that it is generally accepted that accuracies of greater than 10% are not achievable. Day-to-day variation of traffic on a route corridor is frequently at least + or – 10% of data recorded on a single survey date. The IEA guidelines therefore suggest that, at a basic level, projected changes in traffic of less than 10% would create no discernable environmental impact.

7.2.8 IEA guidance further notes that the most discernable environmental impacts of road traffic are considered to be noise / vibration, severance and pedestrian delay and intimidation. In terms of these potential impacts, IEA guidance states the following:

- In general, people are unable to perceive a change in noise nuisance for changes in noise levels of less than 3dB(A), such changes requires a "<u>doubling or halving in the level of traffic</u>".
- At low flows, <u>increases in traffic of around 30%</u> can double the delay experienced by pedestrians attempting to cross a road.
- Severance (community disruption) and intimidation are much more sensitive to traffic flow and DfT suggest <u>30%, 60% and 90%</u> changes in traffic levels should be considered as <u>'sight', 'moderate' and 'substantial' impacts</u> respectively.

7.2.9 Other environmental impacts (e.g. pollution, ecology, etc) are considered to be less sensitive to traffic flow changes, and IEA guidelines recommend that, as a starting point, a 30% change in traffic would represent a reasonable threshold for the consideration of the need to undertake a more detailed assessment of environmental conditions. Where there are major changes in the composition of the traffic flow, say a much greater flow of HGV's, the IEA guidance identifies that a lower percentage change threshold might be appropriate and the assessor should use their professional judgement as to whether additional detailed assessment is required.

7.2.10 Guidance with respect to IEA Rule 2 (10% threshold) identifies that the assessor should consider the inclusion of any other locations or network links where a 10% change in traffic demand is predicted in specific environmentally 'sensitive' areas. Suggested locations highlighted in the IEA guidelines which could be considered to represent a 'sensitive' receptor include accident blackspot locations, conservation areas, hospitals, links with high pedestrian flows, etc. IEA guidance notes that it would not normally be appropriate to consider links where traffic flows have changes of less than 10% unless there are significant changes in the composition of traffic, e.g. a large increase in the number of heavy goods vehicles. Again the assessor is charged with utilising their professional judgement to determine whether further assessment is necessary in such cases. It is not considered that the immediate study area to the Javelin Park proposal site (B4008, M5 and A38 Cross Keys roundabout) includes links that reflect conditions that accord to such 'sensitive' link criteria.

Significance Criteria

7.2.11 The assessment of potential impacts as a result of the proposed EfW development has taken into account the site preparation and construction tasks, as well as operational phases. The significance level attributed to each impact identified has been assessed based on the magnitude of change expected due to the delivery of the development proposals, and the sensitivity of the affected receptor / receiving environment to any change.

Impact Significance

7.2.12 The following terms have been used to define the significance of the impacts identified:

- **Major impact**: where the Proposed Development could be expected to have a very significant impact (either positive or negative) on transport;

- **Moderate impact**: where the Proposed Development could be expected to have a noticeable impact (either positive or negative) on transport;
- **Slight impact**: where the Proposed Development could be expected to result in a small, barely noticeable impact (either positive or negative) on transport; and,
- **Negligible**: where no discernible impact is expected as a result of the Proposed Development on traffic and transportation.

7.2.13 Impacts classified as Major are considered 'Significant' in EIA terms. Typically changes in baseline traffic demand of less than 30% due to development are not anticipated to result in readily perceived traffic related environmental effects.

7.3 Baseline

Site Location and Existing Planning Position

7.3.1 The proposal site comprises approximately 4.5 hectares of land and forms the southern part of the Javelin Park development area, a disused former airfield. The Javelin Park development area is subject to a number of extant development consents as described in Chapter 4.0 to this ES, but is currently comprised of derelict ground, hardstanding and vegetated areas. A private access road has recently been constructed into Javelin Park to provide a dedicated connection to the B4008 at a roundabout junction. The access road runs along the northern boundary of the proposal site, but is not currently accessible to general traffic, being gated at its access point to the B4008 roundabout.

7.3.2 On 21 November 2002 outline planning permission was granted for the Javelin Park development area (including the proposal site area) for B8 distribution warehouses and a new means of access on to the B4008 (Ref: S.01/1191).

7.3.3 Subsequent to the 2002 outline approval five reserved matters applications have been submitted to cover variations of proposed B8 warehouse development schemes with associated landscaping, internal access and car parking. The reserved matters applications provide the opportunity for the site to be developed in phases, associated with a number of smaller buildings rather than one large single building. Review of the reserved matters applications identifies three main land parcels that would make up the maximum development use of the Javelin Park area. The proposed EfW development is effectively located on the land parcels identified for the approved reserved matters plots ‘Unit 2’ and ‘Unit 3’ (a total of 19,968sqms GIA of B8 development area).

Immediate Local Highway Network And Observed Background Operating Conditions

7.3.4 The Javelin Park site is served via a single main development spine road access connection direct to the B4008 at a dedicated roundabout junction. The proposed development would be served from two new accesses to this spine road route.

7.3.5 The layout of the B4008 / Javelin Park roundabout junction provides adequate entry deflection and visibility and is of a suitable standard to accommodate maximum legal HGV movements. The B4008 operates under national speed limit control through the roundabout and with street lighting at the roundabout and to the north.

7.3.6 To the north of the Javelin Park development area the B4008 is typically of 7.3-7.5m width, with signed footway / cycleways to both sides. Approximately 550m to the north of the Javelin Park roundabout, the B4008 connects to the M5 motorway at junction 12. The M5 provides strategic connections to Gloucester, Cheltenham and Tewkesbury to the North-east, and links to Stroud, Bristol and South Wales to the South-west. M5 Junction 12 was recently the subject of junction capacity improvements which were completed and fully opened to traffic in Spring 2011.

7.3.7 To the south of Javelin Park, the B4008 is typically more rural in nature with no dedicated footway / cycleway provision. The B4008 to the south of the roundabout is also signed as being subject to a 7.5t weight restriction (access for loading only) reflecting that this section of route is included within the GCC Cotswold Lorry Management Zone. The prevailing weight restriction therefore protects the southern section of B4008 route from use by HGV’s for through movements between Gloucester / M5 J12 and Stroud.

This section of route would therefore not be used for regular HGV trip demand associated with the EfW scheme at Javelin Park,

7.3.8 Site observations and local experience of existing traffic conditions suggest that the immediate local network operates with busy, generally free flow conditions during weekday peak hour periods, and that since completion of the M5 J12 capacity works, the frequency of substantial traffic queuing and congestion events is limited. A review of off-peak and weekend conditions identified no real traffic congestion issues.

7.3.9 Review of personal injury accident data demonstrates that just 14 accident incidents have been recorded within the search area including the B4008 / site access junction, M5 J12 and the A38 / B4008 Cross Keys roundabout. Thirteen of these incidents are of slight injury classification, with just one incident being classified as a serious injury incident. Only two of the recorded incidents involved HGV movements. Given the generally good accident record of the immediate local highway network to the Javelin Park site, which demonstrates a generally low HGV accident frequency and few common accident causation factors, it is concluded that there are no material prevailing road safety issues that would call into question the development of the proposed EfW. It is therefore not considered necessary for any off-site highway safety mitigation works to be pursued to accommodate the scheme.

7.3.10 Baseline 'Do-nothing' traffic flow information utilised in this assessment has been established through the undertaking of detailed background classified traffic surveys in July 2011, the modelling of future network traffic growth and the specific inclusion of 'committed' traffic associated with large local permitted development schemes. As noted above, two assessment scenarios have been considered in this ES. The calculation of the underlying 'baseline' assessment flows for each scenario have been undertaken as follows:

- **Core Baseline Assessment:** Background traffic + general traffic growth + committed developments at Hunts Grove, Kingsway & Javelin Park. Details of the calculation of these baseline flows are set out in section

5.3 to the supporting TA report and summarised in Figures 7.1(a-d) & 7.2(a-d) to this chapter for 2016 and 2026 scenarios.

- **Sensitivity Baseline Assessment**: Background traffic + general traffic growth + committed developments at Hunts Grove & Kingsway. No development is assumed to take place at Javelin Park as part of the sensitivity baseline scenario. Details of these sensitivity baseline flows are summarised in Figures 7.3(a-d) & 7.4(a-d) to this chapter for 2016 and 2026 scenarios respectively.

Site Accessibility

7.3.11 Whilst spatially well related to the main areas of waste arisings within the County, the proposal site itself is located away from major centres of population. Given this locational characteristic, opportunities for staff / visitor access via sustainable travel modes such as walking, cycling and public transport are likely to be more limited than for a comparative typical employment site located within a major urban area. Notwithstanding this point, it is recognised that some staff journeys could be made to the site by alternative travel options to car driving. The Javelin Park site provides opportunities for access by both cycle and public transport and would be supported by the operation of a Travel Plan to encourage sustainable transport use, where practical.

7.3.12 The site was selected following a lengthy and comprehensive site selection exercise. Key advantages of the Javelin Park site in highways and transport terms include the site's proximity to the M5 and A38 routes and good accessibility to the main sources of waste arisings in the County.

7.4 Anticipated Levels of Development Traffic Demand

Typical Operating Practice

7.4.1 It is proposed that the EfW facility would operate on a 24 hour, 7 days a week basis. However, the plant could be expected to shut down for occasional short term periods to allow the carrying out of essential programmed maintenance work. The planning submissions for the proposal scheme seek the potential for waste input and ash export vehicle movements to / from the site to take place within a 12hr (07:00-19:00) delivery window. Typically the vast majority of waste input movements could be expected to take place during weekday daytime hours 08:00-16:00, with the remainder of the identified delivery periods allowing for operational flexibility and the receipt of bulked waste from more distant WTS / HRC facilities.

Operational HGV Routing

7.4.2 In order to support the operation of the proposed EfW development, HGV traffic movements to / from the site would be encouraged to observe appropriate route corridors. This routing strategy would seek to restrict operational traffic to those roads suitable to accommodate regular HGV movements and would ensure that no operational vehicle movements take place within designated GCC Lorry Management Zones (except for those kerbside collection trips directly serving properties located within the zone).

Measures to Encourage Sustainable Travel

7.4.3 UBB are committed to encouraging staff and visitor journeys to the site by alternative travel modes to the private car where practical. The scheme design includes for covered and secure cycle / motorcycle parking, staff shower, changing and locker facilities and a staff food preparation area to encourage staff to remain on-site during working hours. A range of additional operational initiatives would be promoted at the site as part of a Travel Plan.

Predicted Development Traffic Demand

7.4.4 Anticipated vehicle demand estimates for movements to / from the proposed development have been calculated using a 'first principles' approach, based upon main site operating assumptions such as anticipated site processing capacity, site operating / delivery hours and anticipated input / export vehicle load tonnages.

Operational HGV Traffic Demand

7.4.5 For the purposes of the highway impact assessments, daily traffic demand levels associated with the operation of the proposed development have been calculated on the basis of a 5-day delivery week (250 delivery days per year) rather than the proposed 7 day delivery window available (350 delivery days per year). This reflects the fact that only relatively limited municipal waste input to the scheme would take place during weekend periods (typically less than 5% of total weekly input). Such a methodology ensures a conservative / over-estimate of likely HGV operational traffic demand to / from the site on a weekday and thus ensures a robust assessment of highway network impact.

7.4.6 On the basis of predicted annual future waste tonnage figures it is anticipated that daily waste input demand (including import of APC re-agents) to the facility would be of the order of 751 tonnes or 96 HGV arrival movements (see Table 7.1 below).

Table 7.1 - Total Average Weekday Operational HGV Traffic Demand 2016 / 2017 Opening Year

Waste Stream	Weekday Delivered Waste Tonnage 2016 (Opening Year)	Total annual weekday vehicle demand	Average weekday vehicle demand (arrivals)	Average weekday vehicle demand (departures)
WASTE INPUTS				
Kerbside	116,148	15,216	67	67
HRC Transfer	10,595	1,424	6	6
C&I	57,611	5,761	23	23
PROCESS INPUTS				
APCR	3,300	165	1	1
TOTAL INPUTS	187,655	22,566	96	96
PROCESS OUTPUTS				
Rejects	1,304	65	0	0
Process Exports	36,946	1,848	8	8
TOTAL EXPORTS	38,250	1,913	8	8
TOTAL	226,905	24,479	104	104

(Vehicles per day)
(Values rounded for presentation)

7.4.7 The waste treatment process at the proposed EfW facility would generate a range of waste products that would require export from the site for final treatment / disposal / recycling. These waste outputs include aggregates and metals for recycling, reject materials, bottom ash residuals and APCR. Such materials would typically be exported from the site in large payload vehicles. Total daily export material demand could therefore be expected to be of the order of 153 tonnes, with an associated HGV trip demand of 8 movements per day.

7.4.8 Assuming no 'backloading' of operational movements (i.e. HGVs would only operate loaded in one direction), the proposed EfW facility could be anticipated to generate a typical daily HGV demand of 208 HGV trips per day (in+out) see Table 7.2 below.

Table 7.2 - Predicted 2016 Average Weekday Operational HGV Traffic Demand Profile

	INPUTS			EXPORTS	TOTAL
Time (Hour Start)	Kerbside Inputs and Other Inputs (inc. rejects)	HRC Transfer and APCR	C & I Inputs	Rejects, Recyclables + Other Exports	Total
07:00	2	0	1	0	3
08:00	3	1	1	0	5
09:00	9	1	3	0	12
10:00	21	1	7	2	31
11:00	20	1	7	2	30
12:00	22	2	8	2	33
13:00	26	2	10	2	40
14:00	23	1	8	2	34
15:00	8	2	3	2	14
16:00	1	1	0	2	4
17:00	0	0	0	2	2
18:00	0	0	0	0	0
TOTAL	134	13	46	15	208

Vehicle trips: in + out
(Values rounded for presentation)

7.4.9 Experience of the operation of UK municipal waste plants is that such facilities do not experience substantive levels of operational HGV demand during the traditional weekday AM and PM rush hour periods (08:00-09:00 and 17:00-18:00), reflecting municipal waste collection patterns operated by the local waste collection authorities. Hourly operational HGV municipal waste delivery traffic demand has been estimated via reference to a review of the demand profile trends inherent within 2010 / 2011 GCC WDA weighbridge data for waste collection / waste disposal movements. These profiles have been adjusted to reflect the re-assignment of such trips to Javelin Park from existing origins / destinations. Trip demand associated with third party commercial & industrial waste imports and waste materials exports have been estimated via reference to operational experience at other similar residual waste processing sites.

7.4.10 Applying predicted total daily operational HGV demand to relevant hourly demand profiles identifies the following hourly development operational HGV demand for 2016 / 2017 opening year conditions:

- 08:00 – 09:00: Inputs 5, Exports 0, Two-way 5;
- 13:00 – 14:00: Inputs 36, Exports 2, Two-way 38;
- 17:00 – 18:00: Inputs 0, Exports 2, Two-way 2;
- 07:00 – 19:00: Inputs 193, Exports 15 Two-way 208.

Predicted Staff / Visitor Traffic Demand

7.4.11 The EfW facility is anticipated to employ a total of up to 40 staff members on a daily basis. Given the 24 hour nature of facility operation, however, it is anticipated that the site would be operated on a shift system. 80 staff vehicle movements (in + out) have therefore been modelled as taking place across the 24hr period, with 62 of these movements within the core 12hr period 07:00-19:00.

7.4.12 It is proposed that the EfW scheme would include a visitor centre for education related visits. In addition, it can be expected that the site would also generate some additional technical / professional visitor movements. At this preliminary stage it is difficult to accurately predict the frequency of visitor events, however, in order to ensure a robust traffic demand assessment an additional 3 vehicle arrival movements & 3 vehicle departure movements per hour have been modelled over the weekday period 09:00-17:00. This represents a total of 48 visitor movements (in+out) over the core weekday daytime period.

7.4.13 Combined maximum hourly staff / visitor trip demand is anticipated to take place between 16:00-17:00, when of the order of 23 trip movements are predicted (see Table 7.3).

Table 7.3 - Predicted Average Weekday Staff and Visitor Traffic Demand

Time (Hour Start)	Arrivals	Departures	Total(2-way)
00:00	**1**	**1**	2
01:00	**0**	**0**	0
02:00	**0**	**0**	0
03:00	**0**	**0**	0
04:00	**0**	**0**	0
05:00	**4**	**4**	8
06:00	**1**	**0**	1
07:00	**13**	**1**	14
08:00	**0**	**0**	0
09:00	**10**	**3**	13
10:00	**3**	**3**	6
11:00	**7**	**8**	15
12:00	**4**	**3**	7
13:00	**3**	**3**	6
14:00	**3**	**3**	6
15:00	**3**	**3**	6
16:00	**3**	**20**	23
17:00	**5**	**8**	13
18:00	**0**	**0**	0
19:00	**0**	**0**	0
20:00	**0**	**0**	0
21:00	**0**	**0**	0
22:00	**0**	**0**	0
23:00	**4**	**4**	8
07:00-19:00	**54**	**55**	**109**
24hr	**64**	**64**	**128**

(Car / LGV trips)

Total EfW Facility Trip Demand

7.4.14 Overall a total of 317 vehicle trip movements are predicted to be generated by the proposed EfW development over the core weekday 12hr period, 07:00-19:00 (see Table 7.4 below). Maximum hourly demand (the 'Development Peak') would take place for the hour 13:00-14:00, during which up to 46 vehicle movements are predicted, representing, on average, less than one development vehicle movement per minute.

Table 7.4 – Average Weekday Development Traffic Demand (07:00-19:00)

Time (Hour Start)	Car / LGV Trip Demand	HGV Demand	Total Vehicles
07:00	14	3	17
08:00	0	5	5
09:00	13	12	25
10:00	6	31	37
11:00	15	30	45
12:00	7	33	40
13:00	6	40	46
14:00	6	34	40
15:00	6	14	20
16:00	23	4	27
17:00	13	2	15
18:00	0	0	0
TOTAL	109	208	317

Vehicle trips: in + out
(Values rounded for presentation)

Trip Distribution / Trip Assignment

7.4.15 Total EfW development traffic assignment has been calculated by the summation of all of the different predicted waste vehicle trip movement distributions, as follows:

Waste Input Movements (see Table 7.5)

- kerbside residual waste (direct delivery by local District Council's via RCV);
- kerbside residual waste (bulk haulage from more distant District Councils via WTS);
- HRC Transfer Waste – from County HRC locations;
- commercial & industrial waste; and
- APC Re-agent.

Table 7.5 – Predicted 2016 Average Weekday Operational HGV Waste Import Movements (By Route)

Waste Stream	B4008 (S)	M5 North	M5 South	A38 (N)
KERBSIDE RESIDUAL				
Cheltenham	0% / 0	100% / 28	0% / 0	0% / 0
Cotswold	0% / 0	50% / 2	50% / 2	0% / 0
Forest of Dean	0% / 0	0% / 0	0% / 0	100% / 6
Gloucester City	0% / 0	29% 9	0% / 0	71% / 22
Stroud	0% / 0	0% / 0	100% / 23	0% / 0
Tewkesbury	0% / 0	100% / 29	0% / 0	0% / 0
Other (inc rejects)	0% / 0	49% / 6	21% / 2	30% / 4
Kerbside Residual Total	0% / 0	***56% / 68***	***21% / 25***	***23% / 28***
COUNTY HRC'S				
Fosse Cross	0% / 0	100% / 1	0% / 0	0% / 0
Gloucester	0% / 0	0% / 0	0% / 0	100% / 3
Oak Quarry	0% / 0	0% / 0	0% / 0	100% / 2
Pyke Quarry	0% / 0	0% / 0	100% / 3	0% / 0
Wigmoor	0% / 0	100% / 2	0% / 0	0% / 0
HRC Residual	0% / 0	***31% / 4***	***25% / 3***	***44% / 5***
C&I				
C&I Differential (inc rejects)	0% / 0	***49% / 22***	***21% / 10***	***30% / 14***
APCR				
APCR Re-agent input	0% / 0	***100% / 1***	0% / 0	0% / 0
TOTAL	**0% / 0**	**53% / 101**	**21% / 40**	**26% / 51**

(Route percentage / 2016 Opening Year Daily 2-way Flow)
(Percentage demand via B4008(S) reflects existing weight limit on this route)
(Values rounded for presentation)

Waste Export Movements (see Table 7.6)

- rejects to landfill;
- metals to Recycling Centres;
- recycled bottom ash aggregates to market;
- IBA residuals to landfill; and
- APCR to suitably permitted disposal or treatment facility.

Table 7.6 – Predicted 2016 Average Weekday Operational HGV Waste Export Movements (By Route)

Waste Stream	B4008 (S)	M5 North	M5 South	A38 (N)
INPUT REJECTS				
Rejects	0% / 0	100% / 1	0% / 0	0% / 0
PROCESS OUTPUTS				
IBA Aggregates	0% / 0	50% / 5	50% / 5	0% / 0
IBA Residuals	0% / 0	50% / 1	50% / 1	0% / 0
Metals to Recycling	0% / 0	0% / 0	1000% / 1	0% / 0
APCR & Fly Ash	0% / 0	100% / 2	0% / 0	0% / 0
TOTAL	**0% / 0**	**55% / 8**	**44% / 7**	**0% / 0**

(Route percentage / 2016 Opening Year Daily 2-way Flow)
(Percentage demand via B4008(S) reflects existing weight limit on this route)
(Values rounded for presentation)

7.4.16 Car traffic movements associated with predicted staff / visitor traffic have been assigned to the immediate local network, based on population distribution within a 20 minute drivetime catchment of the site. Given the excellent local highway access of the site (adjacent to the M5 motorway corridor and the main A38 route), such a catchment area provides good coverage of Gloucestershire, including the main settlements of Gloucester, Cheltenham, Tewkesbury and Stroud. Reference to the population distribution within this catchment would suggest the following route assignment proportions:

- B4008 (S): 7%
- M5 (S): 26%;
- M5 (N): 46%
- A38 (N): 21%

7.4.17 Review of the results of the combined operational HGV & staff / visitor assignment exercises suggests that the majority of traffic movements generated by the proposed EfW development would likely utilise the strategic motorway network, with of the order of 50% of total daily 2016 opening year traffic predicted to utilise the M5 corridor to the north and 24% to the south (see Table 7.7 below).

Table 7.7 – Predicted 2016 Average Weekday (07:00-19:00) Development Traffic Movements (By Route)

	B4008 (S)	M5 North	M5 South	A38 (N)
INPUT WASTES	0% / 0	53% / 101	21% / 40	26% / 51
MATERIAL OUTPUTS	0% / 0	55% / 8	44% / 7	0% / 0
STAFF AND VISITORS	7% / 8	46% / 50	26% 28	21% / 23
TOTAL	3% / 8	50% / 159	24% / 75	23% / 74

(Route percentage / 2016 Opening Year Daily 2-way Flow)
(Values rounded for presentation)

7.4.18 Review of the hourly assignment exercise set out in section 4.2 of the Transport Assessment demonstrates that even during maximum development traffic hours, impact on the M5 corridor is not anticipated to exceed 25 vehicles per hour (on M5 north of J12), representing, on average, less than one vehicle every 2 minutes. Maximum development traffic demand on the local highway network to the north of M5 J12 is predicted to be less than 10 vehicles per hour. Such predicted development traffic demand levels are not anticipated to result in material changes to immediate highway network operating conditions.

7.4.19 Baseline + EfW traffic flow estimates are over the immediate highway network to the proposal site are set out in Figures 7.5(a-d) & 7.6(a-d) for the core TA assessment scenario and Figures 7.7(a-d) & 7.8(a-d) for sensitivity assessment conditions.

7.5 Assessment of Effects

Development Operation: Highway Capacity and Network Operational Assessments

7.5.1 The extent of the network operational impact assessments included in the ES and TA reflects the scope of work requested by GCC and HA officers during formal scoping discussions.

7.5.2 Detailed junction assessments were not requested by the Highway Authorities during assessment scoping due to the relatively low level of hourly development traffic demand predicted, particularly when viewed in the light of the high capacity nature of the immediate network and recently completed junction capacity improvements. Furthermore, officers recognised the clear 'net impact' position – i.e. that the operation of the EfW scheme would result in a net reduction in overall traffic demand to be generated from the proposal site, when compared to the permitted B8 commercial warehouse development (see also paragraphs 7.5.10-7.5.13 below).

7.5.3 Assessments have been carried out for a proposed EfW scheme opening year of 2016 and additional future assessment year of 2026. Link capacity assessments have been carried out for both the core TA assessment scenario and the sensitivity test scenario (assuming for no non-EfW development at Javelin Park).

Core Assessment Scenario

7.5.4 Link capacity assessments including for the effects of all agreed additional committed development traffic associated with local major development schemes (including development of Javelin Park for B8 commercial warehousing) are set out in Tables 7.8 & 7.9 below. Such an assessment scenario ensures for the consideration of maximum network demand conditions and therefore ensures for the most robust appraisal of operating capacity / impact.

Table 7.8 – 2016 Baseline + EfW Link Capacity Assessments (Core Assessment Scenario, i.e. including for B8 development at Javelin Park).

B4008 Corridor

	B4008 (South of Javelin Park)			B4008 (Between Javelin Park & M5 J12)		
	Back + Devel	Link Capacity Threshold	%age of Capacity	Back + Devel	Link Capacity Threshold	%age of Capacity
(08:00-09:00)	828	1768	46.83%	871	1965	44.33%
(13:00-14:00)	702	1762	39.84%	784	1909	41.07%
(17:00-18:00)	876	1758	49.83%	917	1969	46.57%

M5 Junction 12 (Motorway Exit Slips)

	B4008 S'bound exit slip M5 to J12			B4008 N'bound exit slip M5 to J12		
	Back + Devel	Link Capacity Threshold	%age of Capacity	Back + Devel	Link Capacity Threshold	%age of Capacity
(08:00-09:00)	700	2118	33.05%	542	2088	25.96%
(13:00-14:00)	367	2240	16.38%	432	2003	21.57%
(17:00-18:00)	852	2290	37.21%	606	2118	28.61%

M5 Junction 12 (Motorway Entry Slips)

	B4008 S'bound entry slip from J12 to M5			B4008 N'bound entry slip from J12 to M5		
	Back + Devel	Link Capacity Threshold	%age of Capacity	Back + Devel	Link Capacity Threshold	%age of Capacity
(08:00-09:00)	587	2020	29.06%	783	2180	35.92%
(13:00-14:00)	399	1958	20.38%	336	1998	16.82%
(17:00-18:00)	546	2215	24.65%	748	2210	33.85%

Cross Keys Roundabout

	B4008 (South of Cross Keys R'bout)			A38 (North East of Cross Keys R'bout)		
	Back + Devel	Link Capacity Threshold	%age of Capacity	Back + Devel	Link Capacity Threshold	%age of Capacity
(08:00-09:00)	2874	6796	42.29%	3368	6735	50.01%
(13:00-14:00)	1831	6564	27.89%	2198	6480	33.92%
(17:00-18:00)	3245	6904	47.00%	3861	6829	56.54%

2 way flow totals (Total vehicles)
(Values rounded for presentation)

Table 7.9 – 2026 Baseline + EfW Link Capacity Assessments (Core Assessment Scenario, i.e. including for B8 development at Javelin Park).

B4008 Corridor

	B4008 (South of Javelin Park)			B4008 (Between Javelin Park & M5 J12)		
	Back + Devel	Link Capacity Threshold	%age of Capacity	Back + Devel	Link Capacity Threshold	%age of Capacity
(08:00-09:00)	1246	1784	69.84%	1290	2008	64.24%
(13:00-14:00)	1044	1748	59.73%	1128	1960	57.55%
(17:00-18:00)	1324	1776	74.55%	1364	2011	67.83%

M5 Junction 12 (Motorway Exit Slips)

	B4008 S'bound exit slip M5 to J12			B4008 N'bound exit slip M5 to J12		
	Back + Devel	Link Capacity Threshold	%age of Capacity	Back + Devel	Link Capacity Threshold	%age of Capacity
(08:00-09:00)	984	2158	45.60%	626	2100	29.81%
(13:00-14:00)	586	2055	28.52%	530	2023	26.20%
(17:00-18:00)	1205	2197	54.85%	721	2130	33.85%

M5 Junction 12 (Motorway Entry Slips)

	B4008 S'bound entry slip from J12 to M5			B4008 N'bound entry slip from J12 to M5		
	Back + Devel	Link Capacity Threshold	%age of Capacity	Back + Devel	Link Capacity Threshold	%age of Capacity
(08:00-09:00)	783	2068	37.86%	1131	2210	51.18%
(13:00-14:00)	532	2005	26.53%	543	2083	26.07%
(17:00-18:00)	696	2228	31.24%	1239	2240	55.31%

Cross Keys Roundabout

	B4008 (South of Cross Keys R'bout)			A38 (North East of Cross Keys R'bout)		
	Back + Devel	Link Capacity Threshold	%age of Capacity	Back + Devel	Link Capacity Threshold	%age of Capacity
(08:00-09:00)	4150	6877	60.35%	4863	6802	71.49%
(13:00-14:00)	2823	6680	42.26%	3379	6615	51.08%
(17:00-18:00)	4761	6966	68.35%	5683	6876	82.65%

2 way flow totals (Total vehicles)
(Values rounded for presentation)

7.5.5 Analysis of link flow capacity for local links within the immediate study area demonstrates that all routes are predicted to operate well below calculated DfT link congestion thresholds for all core 'Do-something' assessment scenarios.

Sensitivity Assessment Scenario

7.5.6 A similar link capacity assessment exercise has been undertaken for the sensitivity scenario of no future non-EfW development at the Javelin Park site. The results of this assessment are set out in Tables 7.10 & 7.11 and demonstrate slightly improved capacity conditions than for the core assessment scenario. This reflects the reduced baseline level of overall vehicle trips considered on the network as part of the sensitivity scenario (reflecting non residual B8 development at Javelin Park).

Table 7.10 – 2016 Baseline + EfW Link Capacity Assessments (Sensitivity Assessment Scenario, i.e. no B8 development at Javelin Park).

B4008 Corridor

	B4008 (South of Javelin Park)			B4008 (Between Javelin Park & M5 J12)		
	Back + Devel	Link Capacity Threshold	%age of Capacity	Back + Devel	Link Capacity Threshold	%age of Capacity
(08:00-09:00)	824	1768	46.61%	829	1965	42.19%
(13:00-14:00)	698	1762	39.61%	744	1909	38.97%
(17:00-18:00)	874	1758	49.72%	888	1969	45.10%

M5 Junction 12 (Motorway Exit Slips)

	B4008 S'bound exit slip M5 to J12			B4008 N'bound exit slip M5 to J12		
	Back + Devel	Link Capacity Threshold	%age of Capacity	Back + Devel	Link Capacity Threshold	%age of Capacity
(08:00-09:00)	692	2118	32.67%	537	2088	25.72%
(13:00-14:00)	359	2240	16.03%	426	2003	21.27%
(17:00-18:00)	848	2290	37.03%	603	2118	28.47%

M5 Junction 12 (Motorway Entry Slips)

	B4008 S'bound entry slip from J12 to M5			B4008 N'bound entry slip from J12 to M5		
	Back + Devel	Link Capacity Threshold	%age of Capacity	Back + Devel	Link Capacity Threshold	%age of Capacity
(08:00-09:00)	582	2020	28.81%	778	2180	35.69%
(13:00-14:00)	395	1958	20.17%	332	1998	16.62%
(17:00-18:00)	542	2215	24.47%	743	2210	33.62%

Cross Keys Roundabout

	B4008 (South of Cross Keys R'bout)			A38 (North East of Cross Keys R'bout)		
	Back + Devel	Link Capacity Threshold	%age of Capacity	Back + Devel	Link Capacity Threshold	%age of Capacity
(08:00-09:00)	2854	6796	42.00%	3352	6735	49.77%
(13:00-14:00)	1811	6564	27.58%	2182	6480	33.67%
(17:00-18:00)	3232	6904	46.81%	3850	6829	56.38%

2 way flow totals (Total vehicles)
(Values rounded for presentation)

Table 7.11 – 2026 Baseline + EfW Link Capacity Assessments (Sensitivity Assessment Scenario, i.e. no B8 development at Javelin Park).

B4008 Corridor

	B4008 (South of Javelin Park)			B4008 (Between Javelin Park & M5 J12)		
	Back + Devel	Link Capacity Threshold	%age of Capacity	Back + Devel	Link Capacity Threshold	%age of Capacity
(08:00-09:00)	1243	1784	69.57%	1249	2008	62.20%
(13:00-14:00)	1041	1748	59.55%	1087	1960	55.46%
(17:00-18:00)	1322	1776	74.44%	1333	2011	66.29%

M5 Junction 12 (Motorway Exit Slips)

	B4008 S'bound exit slip M5 to J12			B4008 N'bound exit slip M5 to J12		
	Back + Devel	Link Capacity Threshold	%age of Capacity	Back + Devel	Link Capacity Threshold	%age of Capacity
(08:00-09:00)	977	2158	45.27%	621	2100	29.57%
(13:00-14:00)	578	2055	28.13%	524	2023	25.90%
(17:00-18:00)	1202	2197	54.71%	717	2130	33.66%

M5 Junction 12 (Motorway Entry Slips)

	B4008 S'bound entry slip from J12 to M5			B4008 N'bound entry slip from J12 to M5		
	Back + Devel	Link Capacity Threshold	%age of Capacity	Back + Devel	Link Capacity Threshold	%age of Capacity
(08:00-09:00)	778	2068	37.62%	1126	2210	50.95%
(13:00-14:00)	529	2005	26.38%	539	2083	25.88%
(17:00-18:00)	692	2228	31.06%	1234	2240	55.09%

Cross Keys Roundabout

	B4008 (South of Cross Keys R'bout)			A38 (North East of Cross Keys R'bout)		
	Back + Devel	Link Capacity Threshold	%age of Capacity	Back + Devel	Link Capacity Threshold	%age of Capacity
(08:00-09:00)	4131	6877	60.07%	4847	6802	71.26%
(13:00-14:00)	2804	6680	41.98%	3362	6615	50.82%
(17:00-18:00)	4747	6966	68.15%	5672	6876	82.49%

2 way flow totals (Total vehicles)
(Values rounded for presentation)

Development Operation: Traffic Related Environmental Issues

7.5.7 Section 7.2 notes that IEA guidelines identify two general 'rule of thumb' tests when considering the initial appraisal or 'screening' of traffic related environmental impact, with detailed environmental appraisal only likely to be considered necessary when traffic exceeds the following thresholds:

- Rule 1: Highway links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%);
- Rule 2: Include any other specifically sensitive areas where traffic flows have increased by 10% or more.

7.5.8 Given that it has been established that none of the routes within the immediate ES study area (B4008 links, M5 & A38) represent environmentally 'sensitive' links, the Rule 1, 30% test is considered to represent the most appropriate guideline threshold for the identification of potential impact. Proportional traffic changes below this threshold can be considered to give rise to negligible environmental impact. The following paragraphs set out the results of the screening appraisal exercise, including for both changes in overall traffic levels and HGV movements. The screening exercise has been undertaken for both the core assessment scenario (matching the agreed TA methodology) along with the additional sensitivity assessment of no additional non EfW development at Javelin Park.

Review of Changes in Overall Network Traffic Demand Levels Associated with the Proposed EfW Development

Core Assessment Scenario

7.5.9 Under the core assessment scenario considered in the TA, the likely ‘net’ traffic impact of the development of the proposed EfW scheme at Javelin Park is effectively the difference between the predicted total trip demand anticipated to be generated by the proposed EfW development and the comparative traffic demand levels associated with the operation of the EfW proposal site area under extant B8 warehouse distribution land use permissions. As noted previously, this is considered the most realistic future assessment approach, as the Javelin Park development area already enjoys extant development permissions, with development already progressed (in highway terms) via the delivery of the roundabout access scheme and the improvements to the immediate section of the B4008 connecting to M5 J12.

7.5.10 Results of a comparison exercise of predicted traffic demand between the proposed EfW scheme and permitted B8 commercial land use demonstrate that the anticipated overall ‘net’ traffic impact of the proposed EfW facility during the majority of weekday daytime periods would be a general reduction in total vehicle volumes when compared to development of the site area for extant B8 commercial warehousing land use (see Table 7.12). Across the course of the core 12hr (07:00-19:00) delivery period, for example, total traffic demand associated with the proposed EfW development could be expected to be of the order of 75 vehicle movements per day less than operation of current permitted B8 development on the site.

7.5.11 A parallel HGV demand comparison exercise demonstrates that anticipated daily HGV traffic levels for the proposed EfW development during weekday periods are anticipated to be only slightly higher than those associated with the permitted B8 land use. Over the core 12hr day-time period 07:00-19:00, it is anticipated that the proposed EfW facility would generate of the order of 50 additional HGV movements, when compared to the currently permitted B8 land use.

7.5.12 It is anticipated, however, that the majority of these additional HGV movements would take place during core day time hours, outside of the traditional AM and PM 'rush hour' periods. Indeed, during such background traditional AM / PM rush hour network operating periods, deliveries to the EfW facility are anticipated to be at typically low levels, resulting in a net-reduction in trips from the Javelin Park site when compared to the consented B8 land use. During such rush hour time periods, the proposed EfW development is predicted to generate of the order of 10 HGV vehicle movements per hour less than permitted B8 scheme options.

Table 7.12 – Hourly Net Traffic Demand Comparison: Proposed EfW Development v Permitted B8 Land Use

	Permitted B8 Development		Proposed EfW Facility		Net Change Waste v B8	
Time	Car / LGV	HGVs	Car / LGV	HGVs	Car / LGV	HGVs
06:00	38	15	1	0	-37	-15
07:00	32	13	14	3	-18	-10
08:00	22	14	0	5	-22	-9
09:00	16	12	13	12	-3	0
10:00	14	13	6	31	-8	18
11:00	12	15	15	30	3	16
12:00	18	10	7	32	-11	22
13:00	22	14	6	41	-16	27
14:00	38	16	6	34	-32	18
15:00	22	16	6	14	-16	-2
16:00	18	11	23	4	5	-7
17:00	14	12	13	2	-1	-10
18:00	12	10	0	0	-12	-10
19:00	9	8	0	0	-9	-8
20:00	8	9	0	0	-8	-9
21:00	7	8	0	0	-7	-8
22:00	12	13	0	0	-12	-13

	Permitted B8 Development		Proposed EfW Facility		Net Change Waste v B8	
Time	Car / LGV	HGVs	Car / LGV	HGVs	Car / LGV	HGVs
23:00	8	9	8	0	0	-9
12hr (7-19)	238	156	109	208	-129	52
18hr (6-24)	319	218	118	208	-201	-10

(Two-way vehicle movements)
(Values rounded for presentation)

7.5.13 In addition to the above, it must also be born in mind that the current B8 permissions at the Javelin Park site would operate over the course of the day without restrictions on staff and HGV movements. Indeed, typically B8 warehouse distribution sites are characterised by 24 / 7 operation and can remain quite busy during early morning / late evening periods. Review of 18 hour trip demand for B8 warehousing facilities demonstrates that hourly HGV demand levels of the order of 8-15 vehicles could be expected to take place during early morning / late evening hours. In comparison, no such evening / night time HGV movements are proposed to serve the EfW facility, with HGV movements during such times anticipated to be subject to planning conditions controlling the times of waste deliveries / exports.

7.5.14 Table 7.13 below sets out the predicted changes in 12hr (07:00-19:00) overall traffic levels on key links within the study area, calculated via a comparison of the relevant 2016 and 2026 'Do-Nothing' and 'Do-Something' traffic conditions under the core TA assessment scenario. Further information on predicted hourly changes are set out in Appendix 7.1.

Table 7.13 – Predicted Changes in Total Traffic Demand on the Immediate Local Network to the Proposal Site (12 hour period 07:00-19:00) – Core Assessment Scenario

	2016		
	Base + Dev Flow	**Base Flow**	**%'tage Change**
B4008 (S of Javelin Park)	8332	8356	-0.29%
B4008 (N of Javelin Park)	9053	9105	-0.57%
S'bound exit slip from M5 to J12	6065	6040	0.41%

	2016		
	Base + Dev Flow	**Base Flow**	**%'tage Change**
N'bound exit slip from M5 to J12	6006	6012	-0.12%
S'bound entry slip from J12 to M5	5358	5365	-0.13%
N'bound entry slip from J12 to M5	6226	6195	0.50%
B4008 (S of Cross Keys r'bout)	26449	26595	-0.36%
A38 (NE of Cross Keys r'bout)	31622	31691	-0.22%

Flow totals (All vehicles)
(Values rounded for presentation)

	2026		
	Base + Dev Flow	**Base Flow**	**%'tage Change**
B4008 (S of Javelin Park)	12581	12603	-0.17%
B4008 (N of Javelin Park)	13300	13353	-0.40%
S'bound exit slip from M5 to J12	8935	8911	0.27%
N'bound exit slip from M5 to J12	7164	7170	-0.08%
S'bound entry slip from J12 to M5	7033	7040	-0.10%
N'bound entry slip from J12 to M5	9929	9900	0.29%
B4008 (S of Cross Keys r'bout)	39449	39543	-0.24%
A38 (NE of Cross Keys r'bout)	46986	47054	-0.14%

Flow totals (All vehicles)
(Values rounded for presentation)

7.5.15 Review of the results of these core scenario ‘Do-nothing’ v ‘Do-something’ link impact assessments demonstrates that total traffic demand over the immediate local highway network would shows a slight net reduction in traffic demand on most links over the core 12hr period 07:00-19:00. Maximum waste traffic impact is predicted to occur in the ‘development peak hour’ period of 13:00-14:00. During this time period, small flow increases of between 0% – 3% of baseline ‘Do-Nothing’ traffic flows are predicted on immediate links as a result of the proposed EfW facility.

7.5.16 Given that such maximum predicted increases in link flow demand are well below traditional guideline impact threshold levels and that all links are predicted to be operating with some level of spare capacity, it is considered that the proposed EfW development is unlikely to result in a material detrimental operational impact on the local highway network. Indeed, in most cases, the proposed EfW development would actually result in a slight net improvement in traffic conditions when compared to the 'do-nothing' position of consented B8 warehouse development at Javelin Park.

Sensitivity Assessment Scenario

7.5.17 A similar 'Do-nothing' v 'Do-something' comparison exercise has also been undertaken for total traffic demand levels predicted under the sensitivity scenario (i.e. no non-EfW development at Javelin Park). The predicted changes in 12 hour (07:00-19:00) link flow demand are summarised in Table 7.14 below, with information on hourly changes in traffic demand for key assessment periods included in Appendix 7.2.

Table 7.14 – Predicted Changes in Total Traffic Demand on the Immediate Local Network to the Proposal Site (12 hour period 07:00-19:00) – Sensitivity Assessment Scenario

	2016		
	Base + Dev Flow	**Base Flow**	**%'tage Change**
B4008 (S of Javelin Park)	8293	8286	0.08%
B4008 (N of Javelin Park)	8596	8286	3.74%
S'bound exit slip from M5 to J12	5997	5917	1.35%
N'bound exit slip from M5 to J12	5951	5914	0.63%
S'bound entry slip from J12 to M5	5301	5236	1.24%
N'bound entry slip from J12 to M5	6163	6083	1.32%
B4008 (S of Cross Keys r'bout)	26285	26210	0.29%
A38 (NE of Cross Keys r'bout)	31411	31366	0.14%

Flow totals (All vehicles)
(Values rounded for presentation)

	2026		
	Base + Dev Flow	**Base Flow**	**%'tage Change**
B4008 (S of Javelin Park)	12541	12534	0.06%
B4008 (N of Javelin Park)	12843	12534	2.47%

	2026		
	Base + Dev Flow	**Base Flow**	**%'tage Change**
S'bound exit slip from M5 to J12	8867	8788	0.90%
N'bound exit slip from M5 to J12	7110	7072	0.54%
S'bound entry slip from J12 to M5	6976	6938	0.55%
N'bound entry slip from J12 to M5	9876	9787	0.82%
B4008 (S of Cross Keys r'bout)	39235	39159	0.19%
A38 (NE of Cross Keys r'bout)	46805	46729	0.16%

Flow totals (All vehicles)
(Values rounded for presentation

7.5.18 Review of the results of the sensitivity scenario 'Do-nothing' v 'Do-something' link impact assessment again demonstrates that changes in total traffic demand associated with the EfW scheme would generally be limited. Maximum waste traffic impact is predicted to occur in the 'development peak hour' period of 13:00-14:00 on the B4008 link between the Javelin Park access roundabout and M5 J12. During this time period, a flow increase of approximately 6.5% of total baseline traffic could be anticipated. Such levels of predicted overall traffic change are still well below the IEA Rule 1 traffic related environmental impact assessment threshold for the consideration of further detailed assessment.

Review of Changes in HGV Traffic Demand Levels Associated with the Proposed EfW Development

7.5.19 In order to ensure the most robust assessment of potential development traffic environmental impact, this ES has also considered predicted changes in HGV demand on key network links within the agreed study area. Such an approach is fully in accordance with IEA guidance.

7.5.20 The results of this HGV screening assessment for both the core TA assessment scenario and sensitivity conditions are set out below:

Core Assessment Scenario

7.5.21 Review of the predicted changes in HGV traffic demand on the immediate network to the Javelin Park site for the core TA assessment scenario demonstrates that for the core 12hr weekday period 07:00-19:00, the proposed development is predicted to result in only generally small increases in HGV movements (see Table 7.15 below). The maximum predicted 12hr change in HGV movements (6.5%) is predicted to occur on the section of the B4008 immediately to the north of Javelin Park, with smaller percentage change levels over links more distant from the site - as development traffic dissipates across the wider network.

7.5.22 Maximum HGV impact over the core 12 hour period on sections of the trunk road network is predicted to be less than 6%, with the maximum level of predicted impact occurring on the northbound entry slip road from J12 to the M5 mainline.

Table 7.15 – Predicted Changes in HGV Demand on the Immediate Local Network to the Proposal Site (12 hour period 07:00-19:00) Core Assessment Scenario

	2016		
	Base + Dev Flow	**Base Flow**	**%'tage Change**
B4008 (S of Javelin Park)	456	456	0.00%
B4008 (N of Javelin Park)	861	809	6.43%
S'bound exit slip from M5 to J12	594	573	3.66%
N'bound exit slip from M5 to J12	608	622	-2.25%
S'bound entry slip from J12 to M5	550	565	-2.65%
N'bound entry slip from J12 to M5	450	425	5.88%
B4008 (S of Cross Keys r'bout)	1768	1733	2.02%
A38 (NE of Cross Keys r'bout)	1993	1955	1.94%

Flow totals (HGVs)
(Values rounded for presentation)

	2026		
	Base + Dev Flow	**Base Flow**	**%'tage Change**
B4008 (S of Javelin Park)	516	516	0.00%
B4008 (N of Javelin Park)	920	869	5.87%
S'bound exit slip from M5 to J12	659	639	3.13%
N'bound exit slip from M5 to J12	673	687	-2.04%
S'bound entry slip from J12 to M5	610	626	-2.56%
N'bound entry slip from J12 to M5	506	481	5.20%

	2026		
	Base + Dev Flow	**Base Flow**	**%'tage Change**
B4008 (S of Cross Keys r'bout)	2002	1965	1.88%
A38 (NE of Cross Keys r'bout)	2259	2219	1.80%

Flow totals (HGVs)
(Values rounded for presentation)

7.5.23 Such predicted 12hr changes in network HGV volumes as a result of the proposed EfW facility are well below the IEA rule 1 (30%) threshold. It can therefore be reasonably concluded that the proposals are unlikely to result in a material HGV traffic related environmental impact during core day time periods.

7.5.24 Detailed review of specific hourly predicted changes in HGV traffic flow demonstrates generally similar results to the trends identified for the core 12 hour assessment period, with the majority of study links experiencing only a small net change in HGV demand (see Appendix 7.3) well below IEA Rule 1 thresholds. Indeed, some study links illustrate an overall net reduction in hourly HGV demand levels between the do-something and do-nothing scenarios.

7.5.25 The greatest levels of hourly change in HGV demand are predicted to be experienced on the B4008 immediately to the north of the Javelin Park site (the main connecting link to the wider highway network). Review of predicted changes in HGV levels on this link demonstrate that during the development peak hour of 13:00-14:00 an increase of HGV movements of almost 40% of baseline ‘do-nothing’ demand could be experienced. All other time periods are well below the 30% IEA threshold.

Sensitivity Assessment Scenario

7.5.26 A similar ‘Do-Nothing’ v ‘Do-Something’ comparison exercise has also been undertaken to identify changes in network HGV traffic demand levels under the sensitivity scenario (i.e. no non-EfW development at Javelin Park). The predicted changes in 12 hour (07:00-19:00) link flow demand are summarised in Table 7.16 below, with information on hourly changes in traffic demand for key assessment periods included in Appendix 7.4.

Table 7.16 – Predicted Changes in HGV Demand on the Immediate Local Network to the Proposal Site (12 hour period 07:00-19:00) Sensitivity Assessment Scenario

	2016		
	Base + Dev Flow	**Base Flow**	**%'tage Change**
B4008 (S of Javelin Park)	457	457	-
B4008 (N of Javelin Park)	664	457	45.30%
S'bound exit slip from M5 to J12	550	495	11.11%
N'bound exit slip from M5 to J12	561	537	4.47%
S'bound entry slip from J12 to M5	501	477	5.03%
N'bound entry slip from J12 to M5	413	358	15.36
B4008 (S of Cross Keys r'bout)	1748	1697	3.01%
A38 (NE of Cross Keys r'bout)	1977	1927	2.59%

Flow totals (HGVs)
(Values rounded for presentation)

	2026		
	Base + Dev Flow	**Base Flow**	**%'tage Change**
B4008 (S of Javelin Park)	517	517	-
B4008 (N of Javelin Park)	724	517	40.04%
S'bound exit slip from M5 to J12	615	561	9.63%
N'bound exit slip from M5 to J12	626	602	3.99%
S'bound entry slip from J12 to M5	561	537	4.47%
N'bound entry slip from J12 to M5	469	415	13.01%
B4008 (S of Cross Keys r'bout)	1982	1930	2.69%
A38 (NE of Cross Keys r'bout)	2243	2190	2.42%

Flow totals (HGVs)
(Values rounded for presentation)

7.5.27 Review of the predicted changes in HGV traffic demand on the immediate network to the Javelin Park site demonstrates that even including for sensitivity test traffic conditions, the proposed development is predicted to result in only generally small increases in 12hr (07:00-19:00) HGV movements - typically less than 15% of baseline flows. Such levels are well below the IEA rule 1 threshold of 30% change.

7.5.28 Maximum HGV impact under the sensitivity scenario is predicted to take place on the immediate B4008 link between the Javelin Park roundabout access and M5 J12. Twelve hour HGV flow increases of between 40% and 45% are predicted on this section of link road, with hourly impact in the EfW 'development peak' (13:00-14:00) of the order of 100% of baseline traffic levels (assuming no other development at Javelin Park). Given the guidance set out in IEA best practice, it is considered that such levels of HGV increase are worthy of more detailed consideration / assessment.

Conclusions of the Screening Assessment.

7.5.29 The results of the above environmental impact screening exercise identify the following:

Changes in overall network traffic levels associated with the EfW proposals:

- Review of changes in overall flow demand over the immediate highway network has demonstrated that, in general traffic terms, development of the proposed EfW scheme would not be expected to result in substantive increases in overall traffic volumes - under either the core TA or sensitivity assessment scenarios. Any changes in flow demand are well below IEA Rule 1 screening thresholds and would therefore indicate that the potential for general traffic related environmental impact is likely to be negligible.

Changes in network HGV traffic levels associated with the EfW proposals:

- Analysis of daily HGV link flow demand over the immediate highway network has demonstrated that the proposed EfW scheme would not be expected to result in substantive increases in HGV traffic volumes over the majority of the immediate study area (for either the core TA or sensitivity assessment scenarios). Development related changes in HGV levels on the A38, M5 and B4008 north of M5 J12 have all been demonstrated to be at levels substantially less than IEA Rule 1 screening thresholds. This would therefore indicate that the potential for general traffic related environmental impact on such links is likely to be limited. Substantive changes in HGV demand levels above the IEA 30% threshold have been identified for the immediate section of the B4008 between the Javelin Park access roundabout and M5 J12 under sensitivity scenario conditions. Such results would suggest the need for further consideration of HGV related environmental conditions specifically on this link.

Further Review of HGV Impact on the B4008 corridor between Javelin Park & M5 J12

7.5.30 As noted above, the only section of the surrounding highway network to the proposal site that is identified as likely to experience a material increase in HGV volumes as a result of the EfW proposals is the immediate section of the B4008 between the Javelin Park. Critical impact levels are identified under the 'worst case' no Javelin Park sensitivity scenarios. Under the more realistic core TA scenario, changes in HGV traffic levels are only predicted to exceed the IEA threshold during the EfW development peak hour of 13:00-14:00, and would to some degree, be offset by reductions in HGV demand during other more sensitive time periods.

7.5.31 It should also be noted that the identified section of the B4008 represents a high quality access route that has been the subject of recent capacity and environmental improvements associated with the delivery of the adjacent Blooms Garden Centre and preparation for the development of the Javelin Park Development Area. The critical section of route under review also forms part of the GCC Advisory Heavy Goods Network.

7.5.32 Notwithstanding the above, a detailed assessment of traffic related environmental disturbance impact for the identified section of the B4008 has been undertaken. IEA guidance identifies that noise, severance and pedestrian delay & intimidation represent the most discernable environmental effects of road traffic associated with new development. Other impacts are typically less sensitive to traffic flow changes. The full list of potential traffic effects and the core impacts and assessment criteria set out in the IEA Guidelines are set out below:

- **Pedestrian Delay:** Delay occurring to pedestrians as a result of traffic demand impacting upon their ability to cross the carriageway. The provision of crossing facilities, the geometric characteristics of the road and the traffic volume, speed and composition are all factors that can determine delay. The IEA Guidelines advise that quantitative thresholds should be avoided, with professional judgment to be used in its place;
- **Pedestrian Amenity:** The term pedestrian amenity is described broadly as the relative pleasantness of a journey. It is considered to be affected by traffic flow, speed and composition as well as footway width and the separation/protection from traffic. It encompasses the overall relationship between pedestrians and traffic. There are no commonly agreed thresholds for quantifying the significance of changes, although the IEA Guidelines tentatively suggest that where the traffic flow (or its HGV component) doubles, a significant effect is likely to arise;
- **Severance:** The perceived division that can occur within a community when it becomes separated by a major traffic artery. Severance is difficult to measure and by its subjective nature is likely to vary between different groups within a single community. In addition to the volume, composition and speed of traffic, severance is also likely to be influenced by the geometric characteristics of a road, the demand for movement across a road and the variety of land uses on either side. In general terms, according to the IEA Guidelines, changes in traffic flow of 30, 60 and 90% are regarded as producing ‘slight’, ‘moderate’ and ‘substantial’ changes in severance respectively;
- **Driver Delay:** Delay generally occurs at junctions where there are opposing movements and where vehicles are required to either give or receive priority. Delay is only likely to be significant when demand exceeds or is approaching capacity, (i.e. the Ratio of Flow to Capacity (RFC) exceeds 0.85);
- **Road Safety:** Assessments have incorporated a review of collision data and the local circumstances prevailing, in particular traffic speed, flow and composition as well as vehicle conflict and pedestrian activity. Professional judgment is used to determine the significance of the effect;

- **Noise and Vibration:** The environmental implications of noise and vibration arising from changes in traffic flow; and
- **Air Pollution & Dust and Dirt:** The air quality effects of the development proposals arising from traffic flow and the environmental implications of dust and dirt being generated by the traffic movements.

7.5.33 The conclusions of the detailed analysis of the above identified common traffic related environmental effects for the B4008 study corridor are as summarised below:

- **Pedestrian Delay:** Weekday EfW development traffic demand on the B4008 corridor is predicted to be of the order of between 5 - 35 HGV movements per hour, with the potential for a maximum of 40 HGV movements during the 'Development peak' hour of 13.00-14.00. As baseline traffic conditions on the B4008 corridor are generally free flowing, the practical impact on potential pedestrian crossing movements associated with such maximum HGV demand levels would be of the order of just 5 seconds potential delay every 1 - 2 minutes. Furthermore, it is important to note that current pedestrian flow demand on this section of the B4008 is generally very low, reflecting limited immediate frontage development and or local settlements. Indeed, it is anticipated that the majority of walking movements likely to take place in future over the B4008 corridor would be trips to / from the Javelin Park site itself. Given the above, it can only be concluded that the impact of the proposed development on baseline pedestrian delay conditions would only be of a '<u>slight</u>' nature and would not require any improvement to existing pedestrian crossing opportunities.
- **Severance:** The B4008 in the vicinity of the development is an existing local distributor road route corridor, providing through traffic access to surrounding local towns and villages. The route already experiences traffic flows of the order of 700-900 vehicle movements per hour. The addition of appeal site development traffic is not predicted to result in total traffic increases of in excess of 5% . Such small increases in traffic volumes, in combination with low existing pedestrian crossing demand and lack of frontage development is considered to result in only <u>negligible</u> severance impact.

- **Pedestrian Amenity (Fear & Intimidation):** As noted above, the section of the B4008 corridor under review is generally characterised by a wide single carriageway route of minimum 7.1m – 7.3m width, with parallel sections of high quality segregated footway / cycleway provision of minimum 3m width to at least one side of the route. It is considered that such a layout assists in reducing pedestrian exposure to vehicle movements. Furthermore IEA guidance (Core Doc CD6.1, para 4.41) cites research by Crompton & Gilbert, which seeks to classify factors which can impact on the level of fear and intimidation associated with traffic movements as experienced by pedestrians. These criteria are summarised below.

Degree of hazard	Ave. traffic flow over 18-hr day (veh/hr)	Total 18-hr HGV (vehs)	Ave. speed over 18-hr day (mph)
Extreme	1800+	3000+	20+
Great	1200-1800	2000-3000	15-20
Moderate	600-1200	1000-2000	10-15

- Review of this table demonstrates that baseline + development traffic predicted for the B4008 corridor would generally fall either within or below the 'moderate' threshold criteria for total traffic demand and HGV level factors. Only the traffic speed criteria would lie above 'moderate' impact classification levels, although such effects must be balanced against the existing 60mph speed limit already in operation over the route and the layout of existing footpath / verge provision. Given this review of issues Axis conclude that the effects of EfW related traffic on pedestrian amenity over the critical sections of the B4008 corridor would only be of slight / moderate impact and would not require additional improvement in local pedestrian facilities.
- **Driver Delay:** Predicted increases in total traffic demand on the B4008 corridor resulting from development of the EfW proposals are predicted to be less than 5% of existing traffic levels. In practice, such a level of increase would likely be subsumed into daily variations in traffic flow (typically of the order of +/- 10%) and therefore unlikely to result in a material impact on driver delay. Furthermore the EfW scheme is also not anticipated to generate substantive traffic levels during the traditional AM & PM peak rush hour periods.

- **Road Safety:** Section 2.4 to the supporting formal TA report provides a detailed review of road safety over the B4008 study corridor and demonstrates that there is no evidence of existing material local road safety hazards associated with HGV operation that would call the development of the EfW scheme into question. Road safety issues associated with the EfW development are therefore anticipated to be only slight in nature.
- **Noise and Vibration:** Noise and vibration issues are considered in detail in the Chapter 12.0 to this ES report. This review of issues identifies no material impact on local highway noise conditions associated with predicted traffic movements to / from the proposed EfW scheme.
- **Air pollution dust & dirt:** The transport related air quality effects associated with EfW scheme are considered in detail in Chapter 13.0 of this ES report. This assessment identifies that development related traffic emission effects would be slight in nature and would not lead to any breaches of air quality standard thresholds.

7.5.34 On the basis of the above detailed review of general IEA assessment criteria, it is concluded that the proposed EfW scheme would not result in a material change to operational capacity or traffic related environmental conditions on the immediate section of the B4008. Any environmental effects of the increases in HGV traffic demand could be expected to typically be of only a ‘slight’ nature and would not require any physical mitigation measures.

7.5.35 In addition to the conclusions of the above detailed review of impact, it is considered that substantial weight should also be given to the positive ‘net impact’ traffic position established under the core assessment scenario and set out in the supporting TA report. The TA analysis identifies that over the core 12hr (07:00-19:00) delivery period operation of the proposed EfW development at Javelin Park could be expected to result in only a strictly marginal increase in HGV movements over the immediate highway network to the site when compared to the permitted B8 commercial warehousing development land use. Any such ‘net’ increases in HGV demand would be well below recognised thresholds for traffic related environmental impact.

Furthermore, it is important to recognise that outside of this core 12 hour period the proposed EfW development would not generate any additional HGV movements, due to proposed HGV delivery restrictions, and therefore such operating practice would likely lead to an improvement in traffic related environmental conditions during late night / early morning periods compared to the do-nothing scenario of B8 distribution warehousing. As noted in paragraph 7.5.13 to this ES, B8 land use typically operates on a 24hr 7day a week basis, with regular night-time and weekend deliveries, whereas the proposed waste scheme would not generate significant HGV movements during these sensitive periods.

7.5.36 Table 7.12, for example, demonstrates the anticipated differences in HGV traffic demand during the weekday early morning hour of 06:00-07:00 and late evening hours of 19:00-24:00. Review of this data clearly demonstrates that the development of the proposed EfW development would actually result in a net reduction of HGV trip movements of between 10 and 50 HGV movements per hour on the B4008 to the immediate north of the Javelin Park site when compared with typical operating practice for a B8 commercial warehousing scheme.

7.5.37 On balance it is therefore concluded that the development of the proposed EfW scheme would likely result in some overall ‘net benefits’ in traffic related environmental effects, when compared to those previously accepted environmental conditions associated with current development permissions at the Javelin Park proposal site. Furthermore, even if considered in isolation (i.e. the sensitivity test scenario), predicted EfW traffic levels would not result in material traffic effects over the surrounding network - with the main focus of development traffic demand (the B4008), being a high standard route, which has recently been specifically upgraded to accommodate traffic levels to / from Javelin Park in excess of the demand now anticipated to be generated by the EfW scheme.

Construction Traffic Issues

7.5.38 All construction HGV related traffic on the local network would be routed via the B4008 to the north of the site, to provide connections to the M5 and A38 strategic routes. No HGV construction traffic would be permitted to utilise the B4008 to the south of the site. The use of this northern haulage route would minimise impact on key local settlements and sensitive receptors.

7.5.39 Development construction would likely be phased in order to minimise development construction demand and limit hourly increases in traffic demand. Maximum construction traffic HGV demand is anticipated to take place during the initial earthworks phase of construction (50-75 HGV movements per day (in+out)), with a secondary peak in demand during final ‘hot testing’ of the facility prior to opening. Even at such peak levels, construction traffic HGV demand is not anticipated to exceed those levels associated with the ultimate operation of the site (204 HGV movements (in+out) per day)

7.5.40 It is anticipated that up to 250 – 300 operatives per day could be based on site during peak construction periods. Such staffing levels would likely be experienced during the central 12 month period of the core three year construction process, with reduced staffing levels of between 60-150 staff members during site establishment, earthworks and project completion stages. During initial low staff demand phases, parking for site operatives would be provided on-site between the vehicle entrance and exit. This temporary on-site staff parking area should provide the opportunity for the provision of the order of 80-100 parking spaces.

7.5.41 During the main building construction, fit out and process installation phases, it is proposed that the majority of the initial on-site operative car parking area would be replaced by temporary off-site car parking on an adjacent part of the Javelin Park site. This strategy would provide up to 120-150 spaces. Based on typical observed staff car occupancy at major construction projects, it is expected that such parking levels would be sufficient to cater for predicted construction operative parking demand, particularly when supported by parallel staff travel management initiatives such as car sharing and shuttle bus transfer to other off site parking areas.

7.5.42 Typically intensive staff demand periods coincide with generally low levels of HGV construction traffic (just 20-30 HGV movements per day). It is therefore ultimately concluded that there would be no requirement for local highway network operational or environmental improvements over and above existing provision to accommodate predicted levels of construction traffic demand.

7.6 Mitigation

Mitigation of Day to Day Operational Issues Post Opening of Proposal Scheme

7.6.1 On the basis of the above review of network capacity and reference to IEA guidelines, it has been concluded that the proposed EfW development would not result in a material change in day to day operational or environmental conditions over the immediate highway network. Maximum impact would be experienced on the immediate section of the B4008, however, this section of route has recently been upgraded to a standard suitable to accommodate the predicted levels of HGV traffic and includes high quality walking / cycling and public transport infrastructure. It is therefore concluded that there is no requirement for off-site supporting highway mitigation works to support the proposals.

7.6.2 Notwithstanding the above, in order to assist in managing day to day EfW development transport related effects on key sections of the local network, it is proposed that the following measures be put in place and strictly managed:

- restrictions on operational HGV delivery movements serving the EfW facility to limit the time periods of transport related effects, i.e. no delivery traffic outside of proposed delivery windows of 07:00 – 19:00 (Monday – Sunday); and
- operation of a large vehicle routing strategy to ensure all HGV traffic is limited to the preferred local haulage route of B4008 (N). No operational HGV traffic would be permitted to access the site via the B4008 and other local routes to the immediate south of the site, in line with the principles of the Cotswold Lorry Management Zone.

Mitigation of Construction Traffic Impacts

7.6.3 Despite construction traffic being effectively temporary in nature and likely to vary over the course of the construction period (dependent upon the activities on site on any given day), it is recognised that the proposed development would represent a major construction project in the local area and that it is essential that any disturbance to neighbours and the local community be minimised during the construction period. To this end it is suggested that a Construction Traffic Management Plan (CTMP) is prepared (under the control of a planning condition), to ensure that the best available techniques necessary to minimise / mitigate adverse effects would be adopted. It is anticipated that the CTMP would form part of the CEMP described in Chapter 5.0 and would encompass:

- agreed construction operating hours and vehicle delivery hours;
- on-site construction vehicle parking and manoeuvring;
- off-site construction vehicle routing;
- Staff parking arrangements and details of supporting staff / operative travel management initiatives, including encouraging staff travel outside of the traditional AM & PM ‘rush hour’ periods.;
- management and procedures for access by abnormal loads;
- local signage strategy;
- storage of materials;
- construction noise management; and
- construction dust management.

7.6.4 Development construction should be phased in order to minimise development construction demand and limit hourly increases in traffic. Vehicle deliveries to / from the site during the construction phase should be managed, where at all practical, to avoid impact on traditional AM / PM rush hour periods. In addition, further on-site vehicle management practices should seek to limit typical construction highway network impacts such as dirt, dust, noise and vehicle related vibration.

7.7 Residual Impacts and Conclusions

7.7.1 This chapter of the ES has been prepared to consider the highways and transport related environmental impact of the proposed EfW development at Javelin Park. Further detail relating to transport operational effects of the proposal can be read in the formal TA document also submitted in support of the Planning Application. The TA sets out the detailed appraisal of highway network operational impact in terms of link capacity and percentage link flow change.

Day to Day Operational Impact

7.7.2 Link capacity assessments for the surrounding local network indicate that all existing links would operate with some level of spare capacity when compared to relevant DfT TA46/97 capacity thresholds.

7.7.3 There is no evidence of any material local road safety hazards that would call the development into question. No additional local network safety or capacity improvements are considered necessary to accommodate the proposed development traffic demand.

Traffic Related Environmental Impact

7.7.4 Reference to IEA screening guidelines would suggest that overall changes in traffic flow over the immediate local network as a result of the proposed EfW scheme would not give rise to a material change in traffic related environmental conditions.

7.7.5 During the proposed core weekday waste site delivery period (07:00 – 19:00), the proposed EfW development could be expected to generate an increase in HGV traffic volumes, however, over the majority of the network such volumes would be of a level well below IEA 30% screening thresholds for perceptible impact. Such thresholds would only be exceeded on the immediate section of the B4008 between the Javelin Park access roundabout and M5 J12 and typically are only identified under worst case sensitivity scenario.

7.7.6 The B4008 section of network has recently been improved to a high standard and has little sensitive frontage development. It is considered that the predicted increases in HGV traffic in this location can therefore be accommodated without any unacceptable traffic related environmental impact. Furthermore it must also be recognised that any daily increases in EfW traffic movements would be less than for operation of the Javelin Park proposal site under currently permitted B8 commercial warehousing land use. Such B8 development could be delivered without the need for further environmental appraisal.

Construction Impacts

7.7.7 Traffic impacts associated with the construction of the site would be temporary in nature and would likely vary over the course of the construction period dependent upon the nature of activities taking place.

7.7.8 Notwithstanding the above, it is proposed that a Construction Traffic Management Plan should be prepared (under the control of a planning condition), to ensure that the best available techniques necessary to minimise / mitigate adverse effects would be adopted. Vehicle deliveries to / from the site during the construction phase would be managed to avoid impact on traditional AM / PM rush hour periods where at all practical. In addition, further on-site vehicle management practices could seek to limit typical construction traffic impacts such as dirt, dust, noise and vehicle related vibration.

7.7.9 Appropriate levels of staff parking would be provided on site to avoid any potential issues of overspill off-site parking on local routes, with the levels of staff vehicle demand to be controlled by travel management initiatives such as car sharing and off-site bus transfer where practical.

Residual Effects and Conclusions

7.7.10 Given the review of anticipated future operational highway conditions and reference to appropriate guideline standards, it is concluded that the development of the proposed EfW scheme would not result in a material impact on operational or environmental conditions over the local highway network. There is no requirement for off-site highway improvement / mitigation works, however, a number of operational measures are proposed to manage development traffic demand to appropriate levels.

8.0 LANDSCAPE AND VISUAL

8.1 Introduction

8.1.1 This Landscape and Visual Impact Assessment (LVIA) forms part of the Environmental Statement (ES) for the proposed EfW facility, Javelin Park, Gloucestershire. The landscape and visual effects of the proposed grid connection are assessed separately in Chapter 17.0 of the ES.

8.1.2 Landscape and visual effects are separate, although closely related and interlinked issues. As such, assessments of the effects of the proposed development upon the landscape and upon visual amenity have been carried out under separate headings below.

8.1.3 Landscape effects derive from changes in the physical landscape, which may give rise to changes in its character and how this is experienced. This may in turn affect the perceived value ascribed to the landscape.

8.1.4 Visual effects relate to the changes that arise in the composition of views experienced as a result of changes to the landscape, to people's response to such changes, and to the overall effects with respect to visual amenity.

8.1.5 The assessment was undertaken by a Chartered Member of the Landscape Institute (CMLI). The site and the surrounding area were visited over three days in June 2011.

8.1.6 Consultation regarding the assessment was undertaken with Gloucestershire County Council, Stroud District Council, Gloucester City Council, Forest of Dean District Council, Natural England and the Cotswolds Conservation Board. Opinions were sought regarding the methodologies for the LVIA and for the production of visualisations, and also for the selection of viewpoint locations.

8.1.7 In summary, the consultation responses received suggested several additional viewpoint locations (refer to Appendix 8.4 for full details of viewpoint selection). No comments were received in respect of the LVIA methodology. Minor comments were received in respect of the visualisation methodology.

8.2 Summary of Proposed Development

8.2.1 A detailed description of the proposed development is set out in Chapter 5.0 of the ES.

8.2.2 The general arrangement of the facility is indicated on Figure 5.1. The maximum roof height of the facility would peak at 48m above ground level (approximately 69m AOD), although the main body of the building would stand at 42m (approximately 63m AOD). The proposed chimney stack would be 70m above ground level (approximately 90m AOD).

8.2.3 It is proposed that the plant would process waste and generate electricity on a 24-hour basis. Waste would be brought onto the site between the hours of 07.00 and 19.00 seven days a week.

8.2.4 During hours of darkness there would be a need for lighting commensurate with Health and Safety requirements to ensure a safe working environment for operatives on site.

8.2.5 The proposed lighting of the facility has been developed to have regard with the guidance set out in *Guidance for the Reduction of Obtrusive Light* (Institute of Lighting Engineers 2005) and *Lighting in the countryside: Towards good practice* (Countryside Commission 1997). The lighting of the scheme is also described in Chapter 5.0 and illustrated in Appendix 5.2.

8.2.6 The design of the facility has been developed via an iterative process within which landscape and visual factors have been a significant influence. Refer to Chapter 3.0 for further details of the design process and alternative designs that have been considered. The final design includes a number of features and architectural methods designed to mitigate visual impact of the facility. As such the assessment presented in this chapter is considered to represent an assessment post mitigation. The landscape scheme has also been designed in part to mitigate visual impacts, although the nature of the development is such that mitigation is provided primarily by landform and planting plays a relatively minor role in this.

8.2.7 An important factor in the development of the design has been the proximity of the proposed development to the Cotswolds Area of Outstanding Natural Beauty (AONB). In particular, the relationship of the facility to the distinctive landmark skyline defined by the top of the Cotswold Escarpment was a key consideration.

8.2.8 In recognition of the importance of views towards this feature of the AONB from areas west of the designation, great effort has been taken to achieve a design which is sympathetic within such views. The roof profile of the building has been designed to comprise a series of 'steps' at different elevations and different angles of pitch which echo the natural profile of the landform at the top of the Escarpment.

8.2.9 Views from the AONB are also important. The design of the facility has been developed with this in mind and in particular consideration has been given to the arrangement of the different processes within the building (which necessitate differing roof heights). The higher parts of the building are located toward the west of the site, furthest from the AONB boundary. By arranging the building perpendicular to the escarpment along an east-west axis, the elevation presented towards the AONB is minimised. Further to this, by breaking up the mass of the building according to processes, and using carefully selected cladding variants for each element, adverse visual effects are reduced, and to a degree the built form is assimilated with the surrounding mosaic of fields and hedgerows when seen from elevated vantage points.

8.2.10 The landscape proposals for the facility (described in Chapter 5.0) have been developed in order to provide a high quality external environment as well as mitigating against potential effects that could arise, notably the visual effects upon the immediate locality. The proposals include:

- material generated from the construction of the facility would be used to create a bund along the eastern boundary up to approximately 7 m in height, constructed to sympathetic gradients (maximum 1:3 on the outer face) and would be planted with a mix of native woodland species.
- the retention and enhancement of the existing tree cover and watercourse that runs along the southern boundary of the site would be retained;
- a more formal landscape area on the northern side of the facility, at the entrance to the visitor centre and offices;

- a series of landscaped surface water detention basins.

8.2.11 The long-term management of the landscape proposals would be carried out in accordance with the Landscape and Ecology Management Plan (refer to Appendix 8.7 for details). Management would be carried out for a period of twenty-five years, with the Management Plan reviewed in detail every five years and updated as necessary.

8.3 Planning Policy Background

8.3.1 The planning policy background of relevance to the proposed development, including details of the statutory development plan, is set out in Chapter 6.0 of the ES and within the Planning Statement. Key policies of relevance to this LVIA include:

8.3.2 Policy WM.2 of the *Adopted 2nd Review Gloucestershire Structure Plan 1991-2001* (adopted 1999), which states that considerations in determining planning applications will include:

"…(e) There is no adverse impact on internationally, nationally, regionally and locally important areas of landscape, nature conservation, and archaeological interest…"

8.3.3 Policy EN.3 of the same document, stating that renewable energy developments will be granted planning permission providing that the development would not:

"Proposals for the development of renewable sources of energy will be encouraged, particularly where there are benefits to the local community. Renewable energy proposals will be permitted provided that the proposed development:

a) Would not adversely affect the special character of the Areas of Outstanding Natural Beauty or sites of nature conservation or heritage conservation interest; and

b) Would not cause demonstrable harm to:

i. Special Landscape Areas or sites of special nature conservation or heritage interest as defined in local plans; or *ii. areas or facilities of special importance for tourism and recreation; or*

iii. the amenity of nearby dwellings or residential areas; and would not dominate any prominent skyline or vista as defined in local plans; and would not result in an unacceptable level of visual impact; particular regard will be had to the cumulative impact of existing, planned or proposed renewable energy developments; and is justified, where necessary, in terms of national energy policies of local and regional requirements; and is accompanied by adequate information to indicate the extent of possible environmental effects and how they can be satisfactorily mitigated"

8.3.4 Policy 37 of the *Gloucestershire Waste Local Plan 2002-2012* (adopted 2004), stating that:

"Proposals for waste development will be determined taking into account such matters as the effect on... the traditional landscape character of Gloucestershire…"

8.3.5 Policy NE8 of the *Stroud District Local Plan* (adopted 2005), stating that:

"…development within or affecting the setting of the Cotswolds AONB will only be permitted if all the following criteria are met:

"The nature, siting and scale are sympathetic to the landscape;

The design and materials complement the character of the area; and

Important landscape features and trees are retained and appropriate landscaping measures are undertaken..."

8.3.6 Policy NE10 of the same document, stating that:

"*Development proposals should conserve or enhance the special features and diversity of the different landscape types found within the District as identified in the Stroud District Landscape Assessment. Priority will be given to the protection of the quality and diversity of the landscape character.*

Development will only be permitted if all of the following criteria are met:

1. *natural features and water features that contribute to the landscape setting are retained and managed;*

2. *there is no unacceptable impact on long distance views; and*

3. *the benefits of the proposed development outweigh any harmful effects on the landscape*".

8.4 Methodology

8.4.1 The methodology used to carry out the landscape and visual assessment is based upon that set out in *Guidelines for Landscape and Visual Impact Assessment* (The Landscape Institute and Institute of Environmental Assessment, 1st Edition, 1995 & 2nd Edition, 2002). Full details of the methodology followed can be found in Appendix 8.1.

8.5 Baseline

The Site and the Surrounding Area

8.5.1 The proposed development would be situated within Javelin Park, a disused former airfield located just south of Junction 12 of the M5 and approximately 2.5km from the southern edge of Gloucester.

8.5.2 Javelin Park is a broadly triangular-shaped piece of land (with the apex to the north). It is subject to a number of extant development consents but currently comprises areas of derelict ground, hardstanding and vegetation. Javelin Park is bounded by the M5 to the north and west and the B4008 to the east. The base of the triangle to the south borders onto agricultural land, with a belt of trees defining the boundary. The site of the proposed development lies along the southern boundary of Javelin Park.

8.5.3 To the north of the proposed development site, the remainder of the wider Javelin Park extends for approximately 0.5km. A garden centre development abuts the northern boundary of Javelin Park. Junction 12 of the M5 lies immediately north of this. North of the motorway, a mixture of agricultural and industrial land uses extends as far as the edge of Gloucester.

8.5.4 East of the site, land use is largely agricultural. Set within the farmland is an area of former parkland between the site and the village of Haresfield. Haresfield itself lies approximately 1km east of the site and straddles a north-south railway line. Field size is smaller east of the railway and tree cover is more widespread.

8.5.5 The site lies within the Vale of Berkeley, part of the valley of the River Severn. Topography is defined by the very flat, low-lying valley bottom landform, with few obvious landmark features. Vegetation cover along field boundaries and roads acts to constrain views of features within the valley, although the higher ground to both the east and the west is often visible above this.

8.5.6 Further east, approximately 1.6km from the site, the landform rises appreciably in elevation up the steep slopes of the Cotswolds Escarpment. The Cotswolds landscape is protected by the AONB designation and is a popular destination for tourists and other recreational users. The Cotswolds Way runs through the area, and links several notable beauty spots with panoramic views north and west across the Severn Vale.

8.5.7 To the south is a landscape of large agricultural fields with small settlements. The closest village, Little Haresfield, lies approximately 1km south of the site. The small town of Stonehouse lies approximately 4.25km south of the site. A large industrial development is present at the edge of Stonehouse.

8.5.8 West of the site, beyond the M5, a ribbon of development follows the A38 south of Gloucester. Small villages and scattered housing is interspersed with industrial development, all set within the wider agricultural landscape. Development is not continuous, but consists of scattered clusters. An EfW facility associated with the industrial estate at Old Airfield Farm (c. 1.25km from the site) has recently been granted planning permission.

8.5.9 The Gloucester and Sharpness Canal runs from south-west to north-east through this area, approximately 2km from the site at the closest point. A line of electricity pylons follows to the canal. Further west, the River Severn flows through the flat low-lying landscape, approximately 3.75km from the site at the closes point.

8.5.10 To the west of the River Severn, landform rises notably in elevation to the edge of the higher ground occupied by the Forest of Dean. Long views east from the edge of this area are available across the valley bottom towards the Cotswolds Escarpment.

8.5.11 The area surrounding the site is already illuminated at night-time. Lighting columns on the adjacent B4008 extend southwards from M5 J12 as far as the site entrance. The motorway junction is also lit by lighting columns (and is elevated above the surrounding ground level by virtue of its function). The lights of vehicles on the motorway provide a further element of visible light in the night-time landscape.

Landscape Designations

8.5.12 The site is not covered by any specific statutory or non-statutory designations intended to protect the landscape.

8.5.13 The Cotswolds Area of Outstanding Natural Beauty (AONB) lies approximately 1.3km east of the site at the closest point. The Cotswolds is the largest AONB in England and Wales and is also larger than all but one National Park (the Lake District). Refer to Figures 8.1 and 8.3 for location.

8.5.14 The primary purpose of AONBs is, as set out in the Countryside and Rights of Way Act 2000, "*to conserve and enhance natural beauty*".

8.5.15 The document *Cotswolds Conservation Board Position Statement. Development in the setting of the Cotswolds AONB* (Cotswolds Conservation Board 2010) gives a definition of the setting of the AONB as follows:

"The Board considers the setting of the Cotswolds AONB to be the area within which development and land management proposals, by virtue of their nature, size, scale, siting materials or design can be considered to have an impact, positive or negative, on the natural beauty or special qualities of the Cotswolds AONB".

8.5.16 The position paper goes on to identify that (paragraphs 11 and 12 of the position paper):

"The setting of the Cotswolds AONB does not have a geographical border. The location, scale, materials or design of a proposed development or land management activity will determine whether it affects the natural beauty and special qualities of the AONB. A very large development may have an impact even if some considerable distance from the AONB boundary.

Examples of adverse impacts will include:

- *Blocking or interference of views out of the AONB particularly from public viewpoints;*
- *Blocking or interference of views of the AONB from public viewpoints outside the AONB…*"

8.5.17 The position paper goes on to define the special qualities of the AONB as follows:

- "*The unifying character of the limestone geology – its visible presence as natural outcrops, through its use as a building material and through the plant and animal communities it supports;*
- *The Cotswold escarpment;*
- *The high wolds – an elevated landscape with large open landscapes, commons, 'big' skies and long distance views;*
- *River valleys, the majority forming the headwaters of the Thames;*
- *Dry stone walls, which give the AONB its essential character in many areas;*
- *Internationally important flower-rich limestone grasslands;*
- *Internationally important ancient broadleaved woodland, particularly along the top of the escarpment;*
- *Variations in the colour of the stone from one part of the AONB to another which add a vital element of local distinctiveness;*
- *Tranquillity; and*
- *Arable and livestock farms managed with consideration for biodiversity*".

8.5.18 A copy of the full position paper is included as Appendix 8.2.

Landscape/Townscape Character

National

8.5.19 At an England-wide level, 159 National Character Areas (NCA) have been identified by the former Countryside Commission (now Natural England). These are detailed in *The Character of England* (Countryside Commission 1996), which is published in eight parts, each covering one region of England. The study area lies within the South-west region.

8.5.20 These NCAs provide background and context to more detailed landscape character assessments produced at county and district levels. Their broad geographic reach means that the key characteristics identified as typical of a particular character area may not necessarily apply to a specific location within that character area.

8.5.21 The site of the proposed development lies within NCA 106: Severn and Avon Vales, approximately 2km west of the boundary with NCA 107: Cotswolds. Refer to Figure 8.1 for location.

8.5.22 Key relevant characteristics of NCA 106 include:

- Variety of land uses, from pastures and commons in the west to intensive agriculture in the east; and
- Prominent views of hills – such as the Cotswolds, Bredon and Malverns – at the edges of the character area.

County

8.5.23 The *Gloucestershire Landscape Character Assessment* (LDA Design 2006) covers the County outside the boundaries of the Cotswolds AONB and the Forest of Dean District. A series of twenty-two broad landscape character types and forty-four geographically distinct landscape character areas were identified.

8.5.24 The site of the proposed development lies within the Settled Unwooded Vale landscape character type, and within the SV6A: Vale of Berkeley landscape character area. Refer to Figure 8.1 for location.

8.5.25 Key characteristics of the Settled Unwooded Vale include:

- soft, gently undulating to flat landscape, but with intermittent locally elevated areas that project above the otherwise flatter landform;
- area drained by a series of east-west aligned tributaries of the Severn, in the Cam, Frome and Chelt, and the Stratford Avon flowing into the Severn from the north;
- mixed arable and pastoral land use enclosed by hedgerow network, in places forming a strong landscape pattern;
- limited woodland cover with mature hedgerow trees and occasional orchards;
- rural areas bordered by large urban and suburban areas and interspersed with commercial and industrial premises;
- varied mix of building materials including brick, timber and stone, and slate and thatch roofing;
- proliferation of modern 'suburban' building styles and materials;
- major transport corridors pass through the Vale, frequently aligned north-south, beyond which is a network of local roads and lanes linking villages and hamlets; and
- widespread network of pylons and transmission lines.

8.5.26 An extract from the Gloucestershire LCA containing a description of the Settled Unwooded Vale landscape character type and the Vale of Berkeley landscape character area is included in Appendix 8.3a.

District

8.5.27 The *Stroud Landscape Assessment* (Stroud District Council 2000) covers those parts of the District lying outside the boundary of the Cotswolds AONB. This study area is subdivided into a series of landscape character types. The site of the proposed development lies within the 5B: Lowland Plain sub-division of the 5: Rolling Agricultural Plain landscape character type.

8.5.28 The District study was undertaken prior to the publication of the current recognised best practice guidance for landscape character assessment (*Landscape Character Assessment: Guidance for England and Scotland* Scottish Natural Heritage and The Countryside Agency 2002). As such, and given that the more recent County study covers the same area, no further consideration is given to the District Assessment.

8.5.29 The *Forest of Dean District: Landscape Character Assessment* (Landscape Design Associates 2002) subdivides the district into fifteen landscape character types, themselves further subdivided into distinct character areas. Refer to Figure 8.1 for location.

AONB

8.5.30 The *Cotswolds Area of Outstanding Natural Beauty Landscape Character Assessment* (Cotswolds AONB Partnership 2004) subdivides the AONB are into a series of nineteen broad landscape character types and sixty-eight geographically distinct landscape character areas.

8.5.31 The closest of these landscape character areas to the site of the proposed development is 18A: Vale of Gloucester Fringe, which represents the low lying areas along the AONB boundary. Key features of this character area identified as part of the AONB LCA include:

- a proliferation of modern ‘suburban’ building styles and materials indicating proximity of large urban centres; and
- rural areas bordered by large urban and suburban areas and interspersed with commercial and industrial uses indicating the proximity of large urban centres and major transportation links.

8.5.32 The escarpment slopes to the east are covered by landscape character area 2C: Escarpment: Uley to Cooper’s Hill. Key features of this character area include:

- a number of large towns and cities located at, or in the vicinity of the foot of the escarpment. The scarp forms a rural backdrop to urban development and limits eastwards expansion.

8.5.33 An extract from the AONB LCA containing a description of the character areas 18A and 2C is included in Appendix 8.3b. Refer to Figure 8.1 for location.

Visual Receptors

8.5.34 Visual receptors can include, but are not necessarily limited to, residents in surrounding properties, users of routes and land with public access, and travellers on public roads, railways and waterways.

8.5.35 A series of representative viewpoints (VPs) have been chosen from which to provide a detailed assessment of the visual effects of the proposed development.

8.5.36 The viewpoints have been chosen to provide coverage of views from the more sensitive visual receptors within the study area and to provide coverage of potential views of the proposed development from a range of directions.

8.5.37 Viewpoint selection has been subject to a process of consultation with a series of local authorities, with Natural England and with the Cotswolds Conservation Board (in relation to effects on the AONB). Appendix 8.4 describes details of the viewpoints included in the assessment, together with those considered for inclusion and subsequently rejected. Figures 8.2a-b indicate the location of some of the receptors mentioned below. Figure 8.3 illustrates the viewpoint locations.

8.5.38 The viewpoint receptors are representative of the types of view available within the study area from a range of visual receptors. They are not exhaustive, nor do they seek to represent views of the proposed development from every location or visual receptor.

8.5.39 As such, a summary of the key visual receptors that may experience views of the proposed development is set out below. Where distances to the site are stated, these are to the nearest site boundary.

Residential Properties and Settlements Closer to the Site

8.5.40 The closest residential property to the site is The Lodge, a building set within dense tree cover just off the B4008, c.50m to the east. Further east, a number of scattered properties lie at the edge of Haresfield, close to the village church. The closest of these to the site is Royston, approximately 0.7km away. Other properties in this area include Mount Farm, The Old

Vicarage, The Thatched Cottage, Chestnut Farm, The Hollies and Round House. Views are typically well screened by the tree cover along the roadside and within property gardens. However, Royston is not screened and has unimpeded oblique views towards the site.

8.5.41 The majority of properties within Haresfield lie east of the railway (1.25km from the site) and benefit from the tree screen that runs along the railway corridor. A mixture of single, two and three-storey properties are present. At the southern edge of the village, Haresfield Court (a country house, now subdivided into apartments, and associated outbuildings, also residential) lies west of the railway (1.2km from the site), within heavily wooded grounds. Adjacent properties on the roadside at Lower Green Farm have views towards the site through a gap in the roadside vegetation.

8.5.42 Further east, the small village of Colethrop lies c.2km from the site at the edge of the AONB. Ground level views towards the site are well screened by intervening trees and hedges. Some properties have views towards the site from upper windows filtered through the intervening tree cover.

8.5.43 Properties at Little Haresfield (1km south of the site) are strung out along the roadside which runs from east to west. Those on the northern side typically have unencumbered views towards the site. Properties on the southern side of the road benefit from the screening provided by both buildings and vegetation cover.

8.5.44 Further south, the village of Standish (c.1.8km from the site) has a distinctive nucleated form. The majority of properties face east-west. Tree cover at the edge of the village screens views northward from most properties.

8.5.45 Standish Lane runs west of the village towards Putloe and Moreton Valance. Scattered farm properties lie along this road, with associated dwellings, some of which have views northwards towards the development site c.1.75km away.

8.5.46 Putloe and Moreton Valence lie along the A38 in close proximity to one another approximately 1.75km south-west of the site. The villages include industrial developments, notably a distribution depot at the north-eastern edge of the villages. To the north, along the A38, a series of properties and industrial sites are located along the road. The industrial estate at Old Airfield Farm acts to screen views towards the site from the south-west. A residential property associated with this site has unimpeded views eastwards across the M5 towards the site at a distance of c.630m.

8.5.47 North of this, development comprises chiefly industrial/commercial uses. However, recently built single-storey properties are evident on Hiltmead Lane, associated with the adjacent funfair site. Hiltmead Farm lies east of this, close to the motorway and has unimpeded views toward the site from a distance of c.250m.

8.5.48 To the west of the A38, there are few properties. A small group of houses lie close to Parkend Bridge, where Castle Lane crosses the canal. Some have unimpeded views east towards the site, with others better screened by intervening features. These properties are c.1.9-2.2km from the site.

8.5.49 Hardwicke Court is an early-nineteenth century house (Grade II* listed) set within associated parkland with mature trees, which screens views eastwards from the property. The Court is situated to the west of the A38. Residential properties lie on the A38 close to the Court entrance and have unimpeded views towards the development site at a distance of c.1km.

8.5.50 North of the site, there is a row of properties along Pound Lane, immediately south of the Quedgeley Trading Estate, comprising two-storey detached properties facing south-west approximately 1.35km from the site. Views towards the site are heavily screened by the adjacent roadside hedge with mature trees. Another row of predominantly detached properties lies to the east of Quedgeley Trading Estate on Bath Road c.1.4km from the site. Properties in this second row face east-west. Views south towards the site are screened by a dense tree belt.

8.5.51 The village of Hardwicke lies approximately 2km north-west of the site. Most properties have views south-east well screened by tree cover. However, three properties located at the south-eastern edge of the village do have clearer views towards the site.

8.5.52 Housing at the southern edge of Gloucester is unlikely to experience any views towards the development site. The intervening industrial/commercial development screens southwards views.

Routes and Land with Public Access

8.5.53 Public rights of way in the immediate vicinity of the site are restricted to a small number of footpaths east of the site which converge on the village church at Haresfield.

8.5.54 Elsewhere, PRoWs are concentrated to the south of Standish (where the network is particularly dense), to the west of Moreton Valance/Putloe and in the vicinity of Hardwicke.

8.5.55 The Cotswolds Way National Trail runs along the Cotswolds Escarpment, intermittently dropping into the adjacent valleys. The route was formally approved as a National Trail in 2007. The route links several beauty spots along the top of the Escarpment and is approximately 2.3km from the site at the closest point.

8.5.56 Notable beauty spots/viewpoints within the Cotswolds include Painswick Beacon, approximately 6.9km east of the site and Haresfield Beacon, approximately 2.5km south-east of the site.

8.5.57 National Cycle Route 45 runs along the minor road through Whitminster before joining National Cycle Route 41 just north of Frampton-on-Severn. NCR41 then runs northwards towards Gloucester along minor roads close to the Severn.

8.5.58 The Gloucester and Sharpness Canal runs in a north to south alignment to the east of the River Severn (approximately 2km from the site at the closest point). The canal itself is used for recreation. Sections of the adjacent towpaths are accessible to the public, although some are private. Views from the canal vary depending upon the level of vegetation cover present. Long views eastwards are available where vegetation is sparse or absent.

8.5.59 The Severn Way is a promoted recreational route that follows the course of the river from source to sea. The route runs along the eastern bank of the river in the vicinity of the site (3.8km away at the closest point). A footpath (not part of the Severn Way) follows the western bank.

8.5.60 The Wysis Way (approximately 5.9km from the site at the closest) is a promoted recreational route which provides a link between two National Trails (Offa's Dyke Path and Thames Path). From Gloucester, the route runs up to Robins Wood Hill, crosses the M5 and then travels up the Cotswolds Escarpment, before descending into the valleys beyond. The two National Trails are themselves both over 20km from the site and would not be affected by the proposed development.

8.5.61 Robins Wood Hill lies at the south-eastern edge of Gloucester. It is managed as a Country Park and affords long-distance views out in all directions. The distinctive landform of the hill is a notable landmark feature clearly recognisable in views from the surrounding area.

Roads and Railways

8.5.62 The M5 runs north-north-east to south-south-west close to the western boundary of the site. The road is a typical six-lane motorway. Junction 12 lies to the north of the site and comprises a 'dumbbell' layout of two roundabouts linked by an overbridge across the motorway. North of the junction the route of the road veers eastwards, effectively bypassing Gloucester on the eastern side of the city.

8.5.63 The A38 runs west of and parallel to the motorway in a similar alignment. It lies approximately 800m from the site at the closest point. Numerous minor roads, private driveways and access roads lead off the A38.

8.5.64 The A4173 runs south out of Gloucester approximately 4-4.5km north-east of the site. It crosses the M5 via an overbridge and then travels up the Cotswolds Escarpment as far as the village of Edge, before descending into the valleys further south and east.

8.5.65 The B4008 runs south from the A38 just outside Gloucester. It links with the M5 at Junction 12, before continuing immediately past the eastern boundary of the site and then heading south through Little Haresfield and Standish toward Stonehouse.

8.5.66 The minor road network in the vicinity of the site provides access to the smaller villages and individual farmsteads. The closest of these to the site runs east-west from Haresfield to the B4008.

8.5.67 The railway from Gloucester to Bristol runs north-north-east to south-south-west approximately 1.2km from the site at the closest point. For much of its length it lies within tree-lined cuttings, although occasional more open or elevated areas are present (such as the overbridge across the motorway).

8.6 Assessment of Effects

Construction Effects

8.6.1 A description of the key elements of the construction process for the proposed development is set out in Chapter 5.0 of the ES. A summary of landscape and visual effects that may result from aspects of this process is set out below.

8.6.2 It is anticipated that the construction period would last for approximately thirty-three months commencing in early 2013. It is anticipated that the facility would open in autumn 2015.

8.6.3 The main initial works include clearance, earthworks, foundations and drainage and would be likely to take place within the first eight months of the project. Construction of building frames and main structural works would be staggered throughout the construction period. Landscaping and other external works would follow.

8.6.4 The construction process would be managed in accordance with a project-specific Construction Environmental Management Plan (CEMP) which would set out how environmental issues would be managed in accordance with relevant legislation, regulations and best practice guidance. The CEMP would include detailed method statements where necessary.

8.6.5 Inherent in the construction of the proposal would be the use of cranes, which by their nature would be visible for some distance. Both fixed and mobile cranes would be used and would be up to 40m in height. Appendix 5.4 indicates that tower cranes would be present on site for a period of sixty-one weeks (c. 13-14 months), representing less than half of the construction and commissioning period. Whilst short term visual effects would result from the presence of cranes, these would only be temporary in duration and as such are not considered to be significant.

8.6.6 Short-term visual effects would also result from the presence of the concrete batching plant, likely to be on-site chiefly during the first eight months of the construction period.

8.6.7 Construction operations would generally be limited to 07.00 to 19.00hrs Monday to Friday and 07.00 to 12.00hrs Saturday and as such the main construction lighting would be limited to this period. Low level lighting of security compounds may be required throughout the night but the effects of this would be limited and are not considered significant. Construction lighting would be detailed within the CEMP which would include suitable control measures. It should be noted that external lighting is used on the plot adjacent to the site, this area has been identified as a potential temporary car parking area during the construction periods and the lighting would be suitable for use during the construction period.

8.6.8 In overall terms, whilst there would undoubtedly be short term visual effects during the construction phase, their temporary nature would not result in any significant effect given the context of existing vehicle movements along the B4008 immediately east of the site and along the M5 to the west.

8.6.9 Effects upon landscape character would be set in the context of the corridor of existing development that extends southwards from Gloucester along the M5 and A38. Current construction activity is evidenced at several sites within this broad area including a number of housing developments to the north of the M5. As such, it is concluded that construction activity is not unusual in the wider area and that in this context, the temporary and localised effects of the proposed development would not be significant.

Landscape Effects

Landscape Fabric

8.6.10 The site was formerly part of Moreton Valence Airfield and has subsequently been cleared to create a prepared development plot. As such it principally comprises made ground, some of which has become vegetated with grassland and scrub. A new access road has recently been constructed which runs into the site from the B4008 to the east. The perimeter of Javelin Park has been landscaped and includes a trimmed hedge, with dense tree cover along the eastern boundary and tree belts along other boundaries. A small watercourse runs close to the southern edge of the site. The watercourse was previously culverted and now runs in a newly engineered channel created as part of the works to prepare the development plot.

8.6.11 The sensitivity of the majority of the site is considered to be **low**. The large areas of hardstanding and associated scrub and grass vegetation do not contribute positively to the surrounding character, nor do they represent any distinctive or scarce elements which it is desirable to preserve or re-establish.

8.6.12 The perimeter features are considered to be of **moderate to high** sensitivity. They are the result of comparatively recent landscape works and appear attractive and well maintained. They define the edge of the wider Javelin Park site and present a soft boundary which screens ground level views.

8.6.13 The proposed development would result in the introduction of a large building, associated ancillary structures and external hard surfaces and areas of landscaping. Existing perimeter landscaping would be retained, and enhanced where appropriate with new planting. All planting would be managed in accordance with the Landscape and Ecology Management Plan (refer to Appendix 8.7).

8.6.14 A **large** magnitude of change in the landscape fabric would occur, resulting in an effect of **minor to moderate** significance. There would be a permanent change in the fabric of the site, with a removal of the existing detracting features. The proposed EfW facility may be considered a detractor by some, due to its size. Others may consider it as enabling the regeneration of a derelict site. As such, the effects of the proposed development on landscape fabric are considered **neutral** in nature.

8.6.15 With regards to the existing perimeter vegetation, a **small** magnitude of change in fabric would occur, resulting in an effect of **moderate** significance. Existing features would be retained, with new planting carried out to reinforce and enhance these. As such, it is considered that the effects of the proposed development on landscape fabric would be **beneficial**.

Landscape Character

8.6.16 Locally (up to c.2.5km from the proposed development), the landscape of the area surrounding the site is of a medium to small scale. Enclosure is provided by vegetation cover around properties and along field boundaries and roads, which limits views. A pattern of regular shaped, medium and large sized fields predominates, with patches of development and the corridor of the M5 superimposed upon this, to result in a rather haphazard and incoherent overall mosaic.

8.6.17 The built environment includes a mix of traditional and contemporary styles. Limestone and half-timbered buildings evidence the local vernacular style and are more common east of the site and within the AONB. Functional industrial/commercial buildings are more common along the A38 corridor and in the vicinity of the M5 junction. The M5 motorway is a large scale transport infrastructure development with associated bridges, gantries and signage.

8.6.18 Skylines are typically defined by tree cover which is prominent in the flat low-lying landscape. Longer views east towards the Cotswolds and west towards the Forest of Dean are also available and Robins Wood Hill is a notable landmark feature from many locations. The contrast with neighbouring areas is marked to the east due to the rapid change in elevation, and to the north due to the transition into the industrial and suburban environment of Gloucester. Elsewhere the landscape is of a very similar character, with no marked transition. Views out of the area are limited by the flat topography and extensive vegetation cover. Views in are available from the higher ground beyond the wider Severn valley.

8.6.19 A more tranquil feel is more notable towards the Cotswolds in the east. Elsewhere the presence of the M5 and A38 corridors, plus the development associated with these give a busier feel where movement is commonplace.

8.6.20 Settlement is concentrated in a series of small villages, although isolated individual properties are also present and a ribbon of development runs along the A38. Tree cover is often significant around properties, though some have views out above or through gaps in this vegetation.

8.6.21 Value is evidenced by the presence of the Cotswolds AONB to the east of the site and also by traditional style buildings, some of which are listed. The Gloucester to Sharpness Canal is an important recreational feature.

8.6.22 The sensitivity of the local landscape character, within approximately 2.5km of the site, is considered to be **moderate**. The landscape has some distinctive features and sense of place but the coherence of the landscape is degraded by the interspersal of industrial and commercial uses and by the presence of major infrastructure. The typical urban fringe mixture of land uses has little overall coherence or unity, although patches of higher quality do exist within this wider mosaic.

8.6.23 The proposed development would comprise a new structure, large in scale within the flat landscape and would be prominent by virtue of this. The established landscape pattern would not change. The influence that development exerts upon the surrounding character would increase due to the size of the facility, which would be more widely visible than existing structures due to its height. A **medium** magnitude of change in character would occur, resulting in an effect of **moderate** significance.

8.6.24 To the south-east of the site, within approximately 2.5km, lies an area of the Cotswolds AONB. This area is considered to have a **high** sensitivity. The scenic quality is recognised by designation. The landform rises in elevation up the Cotswolds Escarpment, affording long views out across the Severn valley and the diverse land uses therein. Building styles are distinctive and attractive and vegetation is typically well maintained. A strongly positive character is evidenced, with a strong sense of place which is well-known and valued nationally. As such, the introduction of uncharacteristic new elements has potential to result in adverse change.

8.6.25 The proposed development would lie outside this area and therefore the balance of vegetation and building styles that contribute strongly to local character would be unaffected. The only change would be in the visual context, with the facility visible to the north-west. However, this would be in the context of existing views of development in this area and tangible change in character would be difficult to perceive. Change would be **negligible**, as would the resultant effect.

8.6.26 In reference to the wider landscape character, a similar pattern emerges. In the low-lying Severn valley, development is not unusual, particularly in the area to the south of Gloucester, and its presence is an acknowledged influence which indicates the presence of and proximity to major transportation links and urban centres. The flat topography of the area means that medium and long-range views tend to be restricted by the presence of vegetation and structures. As such the proposed development would appear incongruous from some areas due to its height and mass, but would not be apparent from others. Change in character would be localised, with a perceptible increase in the influence of development along the M5/A38 corridor, but little appreciable change elsewhere.

8.6.27 In contrast, from more elevated landscapes, such as within the Cotswolds, or at the edge of the Forest of Dean, expansive out across the lowlands are characteristic. Such views contain a variety of different land uses and features, including extensive developed areas. In this context, the introduction of the proposed development would not result in any appreciable change in character.

Visual Effects

Zone of Theoretical Visibility

8.6.28 A Zone of Theoretical Visibility (ZTV) map has been generated to identify areas from which any part of the proposed development could theoretically be seen. Refer to Figure 8.3 for the ZTV and to Appendix 8.6 for details of the methodology followed in its generation.

8.6.29 The ZTV is generated based upon the maximum height of the roof of the proposed development (48m above ground level) and the maximum height of the proposed chimney stack (70m above ground level), using an Ordnance Survey bare earth digital terrain model (DTM) which takes no account of other elements in the landscape such as vegetation, buildings or built up areas. As such they represent very much a worst case scenario of potential visibility.

8.6.30 One limitation of this technique is that actual visibility is not determined by topography alone. Other elements in the landscape can act as screens, such as buildings, hedgerows and woodlands. In the vicinity of the proposed development, the screening offered by vegetation in the flat landscape is very significant.

8.6.31 In addition, a simple ZTV takes no account of the scale of the development in the view due to distance or truncation of views, it simply illustrates that a part of the structure would be visible. Thus the ZTV makes no qualitative distinction between areas where the whole development can be seen and where only the tip of the chimney stack or facility roof might be visible.

8.6.32 The ZTV presented on Figure 8.3 indicates that the theoretical visibility of the proposed development would be widespread within the valley of the River Severn, but would be sharply curtailed by the Cotswolds Escarpment to the east.

Representative Viewpoints

8.6.33 A detailed assessment of the visual effects that would occur from each of the thirty-four representative viewpoints included in the assessment is set out in Appendix 8.5. Photographs of the view available from each viewpoint are shown on Figures 8.4a-y.

8.6.34 Photomontages have been prepared illustrating the change in view that would occur from selected viewpoints. Additionally in further selected viewpoints, an outline of the proposed development has been superimposed onto the existing view. Where proposed planting is visible on the photomontages, trees have been shown at a height of approximately 5m, which would reflect their estimated stature at between ten to fifteen years following planting.

8.6.35 Appendix 8.6 sets out the methodology followed in the taking of viewpoint photographs and the production of photomontages.

8.6.36 To summarise the findings of the assessment, of the thirty-four viewpoints assessed, twelve would experience effects considered to be potentially significant in EIA terms (significance of effect moderate to major or greater).

8.6.37 A single viewpoint (29: Hiltmead Farm) would experience effects of major to substantial significance.

8.6.38 Four of the viewpoints would experience effects of major significance, namely: 3: Footpath to the east of the site; 16: Lower Green Farm; 27: Gloucester and Sharpness Canal, near Parkend Bridge; and 31: Sheep House.

8.6.39 Eight of the viewpoints would experience effects of moderate to major significance, namely: 2: B4008 south of the site; 4: St Peter’s Church, Haresfield; 9: Robins Wood Hill; 12: Painswick Beacon; 13: Edge; 24: Old Airfield Farm; 30: Field View; and 34: Haresfield Beacon.

8.6.40 It should be noted that significance of effect is related to both the magnitude of change in view and also to the sensitivity of the receptor in question. In some cases, where significant effects (in EIA terms) have been assessed for a given viewpoint, the actual change in view would be small (refer to Appendix 8.5 for further details).

8.6.41 From twenty of the viewpoints assessed, visual effects would not be significant in EIA terms (significance of effect moderate or lower).

8.6.42 Two of the viewpoints assessed would experience no visual effects resulting from the proposed development, which would not be visible (viewpoints 10 and 11).

8.6.43 The nature of visual effects (whether adverse, neutral or beneficial) relates closely to the relationship between the proposed development and the balance and composition of existing features present within the view. An effect that is considered significant (in EIA terms) is not necessarily adverse. This depends upon the context of the change in view.

8.6.44 A notable deterioration in view would occur from viewpoints 2, 3, 7, 16, 17, 24, 27 and 29 and as such, in these cases, visual effects are considered adverse. This relates to the introduction of the proposed development into a flat and undeveloped skyline, to the marked increase in the influence of built features upon the view resulting from the proposed development, and to the scale of the proposed development in relation to existing features. Refer to Appendix 8.5 for further details.

8.6.45 Therefore, visual effects from six viewpoints, namely viewpoints 2, 3, 16, 24, 27 and 29, are considered both significant and adverse.

Pattern of Visual Effects

8.6.46 By virtue of its scale, the proposed development would be very evident from locations in close proximity to the site. However, the presence of considerable vegetation cover around properties and along road corridors would limit the extent of actual visibility. It is likely that there would be an appreciable seasonal difference in the visibility of the development from some locations, due to the screening provided by foliage during the summer months. Refer to Figure 8.2b for the location of the key receptors mentioned below.

Haresfield and Colethrop

8.6.47 From the nearest property to the site, The Lodge, the extensive vegetation cover which surrounds the property would continue to restrict views. From a single ground floor window, filtered views of the facility would be available in summer looking along the driveway to the property. In winter, the lack of foliage would allow filtered views from other windows, including from the first floor. The proposed development would be visible at close range. The lower sections of the development, including vehicle movements would be screened by the proposed planted earth bund.

8.6.48 To the east, properties at the edge of Haresfield would be well screened by vegetation during the summer months. Clearer views would be available from Royston, which does not benefit from such screening.

8.6.49 Upper storey views from Chestnut Farm towards the facility would be available, filtered by intervening tree cover. In winter, the lack of foliage may allow filtered views from other properties west of the railway.

8.6.50 Properties at Lower Green Farm to the south of the village would have views north-west towards the proposed development through the gaps in the adjacent roadside vegetation. The facility would be visible above the intervening field hedges. The facility would be similarly visible from the properties at Haresfield Court, although views from some windows would be filtered by tree cover, particularly during the summer months.

8.6.51 Properties east of the railway in Haresfield would not have views of the proposed development in either summer or winter due to the intervening vegetation cover along the rail corridor.

8.6.52 From Colethrop, ground level views towards the site are well screened both by the localised rise in topography to the south-west of the village and also by the dense vegetation cover present along roadsides. From upper windows of some properties, notably the farmhouse at Cross Farm, The Bakehouse and Colethrop Villas, the local topography would not completely screen views and filtered views of the proposed stack and building roof may be available, particularly in winter.

Little Haresfield and Standish

8.6.53 From Little Haresfield, the proposed development would be visible from the farmhouse and adjacent property at Warren Farm at the western edge of the village. Within the group of properties at Little Haresfield Farm there would be views from those situated on the northern edge only, with other properties screened by the intervening buildings. The development would also be visible from the properties at Haresfield Farm. Views from the Vicarage would be part screened by the adjacent tree cover at the property boundary. Views north would be available from the garden. Other properties in the village would be screened by vegetation cover along the roadside, possibly with some glimpses of the development available, especially in winter. In the case of Bridge Farm, screening would be provided by the barns immediately north and north-west of the farmhouse.

8.6.54 The proposed development would be visible from a single two-storey property at the edge of Standish. The remaining properties within the village would have no views of the proposed development due to intervening vegetation and structures (including the church/village hall).

8.6.55 West of Standish, the isolated farms along the minor road running westwards would have views of the proposed development to the north. Intervening tree cover to the north of the road (on both sides of the motorway) would provide some screening of views particularly in summer, but the upper parts of the facility would remain visible. The clearest views would be available from Standish Moreton Farm, where tree cover is less effective as a screen.

West of the M5

8.6.56 Views from Moreton Valence and Putloe would be restricted by both tree cover and industry. Few properties would have clear views of the proposed development. Further screening would be provided when the EfW development at the Smiths site, north of the village is constructed as this structure (which benefits from planning consent) would lie between the edge of the village and the Javelin Park site.

8.6.57 From the area along the A38, to the north of Moreton Valance, the visibility of the proposed development would be defined by the presence/absence of intervening features. In some instances, roadside development, or industry (such as Old Airfield Farm industrial estate) would screen views. Properties with relatively unimpeded views of the facility include Field View and Road Farm. Other properties are better screened.

8.6.58 To the east of the A38, single properties at Old Airfield Farm and Hiltmead Farm would have unimpeded views of the proposed development across the M5 at close range. Motorway traffic is already prominent in views from these dwellings. Similar views would be available from some of the new properties and temporary buildings towards the eastern edge of the funfair site, with other properties further west better screened by the intervening buildings.

8.6.59 From Hardwicke, three properties at the southern edge of the village would have views of the upper sections of the proposed development above the intervening vegetation cover. It is considered that the remaining properties would not have views due to the presence of screening vegetation (both in gardens and around the intervening fields) in both winter and summer, and to the orientation of properties.

Public Rights of Way (and other routes)

8.6.60 Views from public rights of way and other non-vehicular routes in the vicinity of the proposed development site would vary depending upon vegetation cover. Relatively unimpeded views would be available from the footpath that runs between the site and St Peter's Church, Haresfield. The facility would become increasingly prominent within views as users travel west along the path.

8.6.61 The proposed development would also be clearly visible from the footpath running north-west from the church and from the footpath to the west of Haresfield Court. Views from other footpaths in proximity to the church would be better screened by intervening tree cover as well as buildings and other structures, and the facility would not typically be visible from these paths.

8.6.62 From the public footpath running south-west from Lower Green Farm towards Little Haresfield, views of the proposed development would be available, intermittently screened by vegetation cover at field boundaries, particularly during the summer months. Similar visual effects would be experienced from the network of footpaths to the south-west of Little Haresfield and from the single footpath to the north of Haresfield.

8.6.63 From east of the railway line at Haresfield, views from the network of public footpaths in the area would be screened by the intervening buildings and vegetation. Intermittent views of the proposed development may be available from the footpath north of the village, which runs towards Colethrop.

8.6.64 West of the A38, views of the proposed development would be available from the network of paths to the south of Hardwicke. Some screening would be provided by vegetation cover along the road corridor and in field boundaries, particularly during the summer months.

8.6.65 From the Gloucester and Sharpness Canal, views would be intermittent. Screening vegetation along the canalside would block views from much of the canal, particularly during the summer months. Where visible, the proposed development would be evident in views eastwards.

8.6.66 From Haresfield Beacon, views would generally be screened by the vegetation cover on the adjacent hillsides. However, gaps in this vegetation are present and the proposed development would be visible through these, particularly during the winter months. Where visible the development would be set in the context of the diverse land uses at the edge of Gloucester, including considerable existing development and the corridor of the M5.

Wider Visual Effects

8.6.67 From further afield, the visibility of the proposed development would be defined by a combination of landform and screening features. To the east and south-east, where gaps in vegetation allow, views would be available from vantage points along the top of the Cotswolds Escarpment, including from the Cotswolds Way. A variety of different features are already present in such views, including extensive industrial/commercial development at the edge of Gloucester and the edge of Stonehouse. The introduction of the proposed development would not change this.

8.6.68 Further east the proposed development would be screened from view by the intervening landform.

8.6.69 From within the Severn Valley to the south and west, views of the proposed development would be intermittent and would frequently be screened by intervening vegetation and structures. Long views across the very flat and low-lying topography are few and far between, with tree and hedge cover at field boundaries and agricultural and industrial buildings acting to break up views at short- and middle-range. Screening attributable to vegetation would be more effective in summer, but would continue to break up and filter views during the winter months.

8.6.70 To the north, the extent of visibility would be limited by the proximity of the Gloucester urban edge. The considerable industrial/commercial development at the southern edge of the city would screen the majority of views from this direction. From elevated vantage points, notably from Robins Wood Hill, the proposed development would be visible as a new feature in the expansive panoramic views available.

8.6.71 On the elevated valley sides west of the Severn, at the edge of the Forest of Dean, much of the land is well wooded. From unwooded vantage points, such as the belt of land between the river and the edge of Cinderford, the proposed development would be visible as a minor new feature in the long panoramic views available.

Plume Visibility

8.6.72 The combustion process that would take place as part of the proposed development produces an emissions plume, composed primarily of water vapour, which is emitted via the chimney stack. The degree to which this plume is visible is determined by the air temperature and humidity of the plume in relation to that of the surrounding air environment.

8.6.73 When visible, emission plumes vary greatly in their visual characteristics in response to weather conditions. Such plumes often have characteristics in common with the surrounding air environment, i.e. on a cloudy day they would often blend in with the background as they comprise primarily of water vapour.

8.6.74 Plume visibility has been modelled as part of air quality assessment for this Environmental Statement (Appendix 13.1). The modelling was based on weather conditions recorded over the five year period 2006-2010. To summarise the results of this modelling, the plume would be visible for an average of approximately one-fifth of daylight hours (between 18% and 22% varying from year to year).

8.6.75 The visible plume would generally run horizontally from the stack and would exceed 70m (the height of the proposed stack) for between 2.8% and 5.3% of the time, with average length of visible plume varying between 40m and 50m. The visible plumes would pass outside the site boundary between 5.2% and 7% of the time.

8.6.76 The presence of the emissions plume would have potential to accentuate the height of the proposed stack, but as is demonstrated above this would occur very infrequently, even when the plume is actually visible, which itself would occur only a small proportion of the time.

8.6.77 As such, it is concluded that the emissions plume would not lead to any significant adverse visual effects.

Night-time Effects

8.6.78 Once commissioned the EfW facility would operate on a continuous basis. As such, there would be a need for lighting to ensure a safe working environment for operatives on site during hours of darkness.

8.6.79 The lighting design for the facility has been developed to accord with current standards and guidance, including *BS EN 13201:2003 Road lighting: Performance requirements* and *Guidance Notes for the Reduction of Obtrusive Light* Institute of Lighting Engineers 2005). The lighting design also takes into account guidance set out in *Lighting in the countryside: Towards good practice* (Countryside Commission, 1997). Notable features of the lighting scheme include:

- avoidance of building mounted lights and lighting of external façades;
- use of modern lanterns which achieve full 'cut-off', meaning that all of the light is directed downwards with minimal upwards or sideways spill;
- the main lighting system would operate in normal working hours during hours of darkness only, to allow for deliveries;
- after dark outside normal working hours, a reduced, system would operate, utilising low level lanterns and restricted to required walking routes and staff parking areas;
- within office areas, the internal building lighting would incorporate intelligent lighting control systems and as such would switch off automatically after operational hours; and
- within operational areas of the facility lighting is designed to provide a safe working environment according to task, rather than to provide a consistent light level throughout.

8.6.80 It should be noted that any potential impact of the proposed lighting scheme beyond the site boundaries would be further mitigated by the peripheral landscaping, including the perimeter bunding. It is suggested that the detailed lighting design is subject to a planning condition

8.6.81 It is not anticipated that the lighting of the proposed development would give rise to adverse night-time effects. Some lighting is necessary to ensure the safety of staff and operational areas. Use of full cut-off lighting would minimise spillage of light beyond the facility boundary, with further mitigation of light spillage provided by the landscape proposals and earthworks. Existing lighting columns on the B4008 and at M5 J12 would continue to illuminate the area and the lighting proposed at the facility would not add materially to the effects of this lighting.

Effects on the Cotswolds AONB

8.6.82 The proposed development would be located c1.3km outside the boundary of the Cotswolds AONB at the closest. As such, any effects upon the designation would relate to the setting of the AONB and effects on special qualities that relate to views into and/or out of the designation.

8.6.83 Eight of the special qualities of the AONB (refer to sub-heading *Landscape Designations* above and to Appendix 8.2 for a list of the special qualities) relate to the land cover, land use and distinctive landscape features and elements within the AONB boundary. These would not be affected by the proposed development.

8.6.84 Two of the special qualities of the AONB have some reliance on views beyond the designation boundary and as such could potentially be affected by the proposed development. These special qualities are the High Wolds and the Cotswolds Escarpment.

High Wolds

8.6.85 The special qualities of the High Wolds that could conceivably be affected by the proposed development are the long-distance views available from these areas.

8.6.86 Views out towards the site would be experienced from some vantage points at the western edge of the High Wolds (along the top of the Escarpment), such as in the vicinity of Painswick Beacon (refer to viewpoint 12), Edge (refer to viewpoint 13) and Haresfield Beacon (refer to viewpoint 34). From these locations, broad expansive views are typically available which contain a multitude of different features, including prominent transport infrastructure, urban and industrial development, and a diverse mosaic of trees, woodlands, hedgerows and fields.

8.6.87 It is not necessarily the scenic quality of the views that are of value as the pattern of land uses in the valley below is not intrinsically beautiful or attractive. Rather it is the fact that a viewer can look down from an elevated point and see a wide range of features with the ability to pick out various different 'landmarks' that may be familiar to different individuals. This would not be affected by the presence of the proposed development.

8.6.88 In views from the escarpment, the design of the building as a series of stepped structures with different cladding colours and styles would assist in its assimilation with the backdrop of fields and hedgerows. This approach was recognised by the Commission for Architecture and the Built Environment (CABE), following their Design Council review of the proposed development, as follows (letter from Thomas Bender of CABE to Bob Fletcher of Fletcher-Rae Architects dated 10th August 2011):

"…*The green wall is an intelligent way to establish a connection between the building and the ground. While we find the composition of the free standing stack against an array of differentiated boxes convincing, the material and detailing of the large façade panels will decide on the success of the scheme…*"

8.6.89 As such, and by reference to the fact the none of the visual effects from the viewpoints within the High Wolds (refer to sub-heading *Visual Effects* above and to Appendix 8.5) would be significant, it is considered that this special quality of the AONB would not be affected materially by the proposed development.

Cotswolds Escarpment

8.6.90 The special qualities of the Cotswolds Escarpment relate to its distinctive landform, which defines the eastern edge of the Severn valley and marks an obvious transition between the Cotswolds and the land to the west. As such, the visual relationship between development and the landform (and the skyline defined by the landform) may affect these special qualities; in particular as experienced by people approaching the AONB from the west, or travelling past the AONB on one of the north-south transport routes.

8.6.91 Views towards the AONB and the distinctive skyline landform defined by the top of the Escarpment are available from much of the Severn valley, from areas of higher ground to the west and from isolated high points such as Robins Wood Hill.

8.6.92 The direction of view is important. It is from locations where the proposed development and Escarpment are viewed in the same field of view, i.e. the facility is 'in front' of the Escarpment, that effects upon the special qualities of the AONB may result.

8.6.93 The further the viewer is from the proposed development, the smaller it would appear in relation to other features within the view and in relation to the skyline as defined by the Escarpment.

8.6.94 By reference to the viewpoints considered in the visual assessment (refer to sub-heading *Visual Effects* above, to Appendix 8.5, and to Figures 8.4a-y) it can be seen that (where visible) the proposed development would break the Escarpment skyline from locations west of the site up to a distance of c.2-2.5km. At greater distances, views of the Escarpment skyline would be unbroken, with the roof of the facility appearing lower than the landform to the rear. The proposed chimney stack would continue to break the skyline by virtue of its height where visible.

8.6.95 The development of the design of the facility consciously recognised the juxtaposition of the proposal against the Escarpment skyline. The solution proposed has a stepped roof profile with varied pitch angles, which seek to echo the natural profile variations seen along the Escarpment. The result is a building silhouette that would be sympathetic to the natural changes in elevation along the top of the Escarpment and that does not appear discordant in this context.

8.6.96 As such, it is considered that the existing visual relationship between the Escarpment and the viewer from areas west of the proposed development site would generally be maintained. Some localised adverse change would occur, but this would be restricted to a narrow belt of land of approximately

1km width west of the M5, extending westwards towards, but not reaching the Gloucester to Sharpness Canal. It is not considered that this would translate into a wider material effect upon the setting or special qualities of the AONB.

8.7 Planning Policy Interpretation

8.7.1 A full and detailed analysis of the planning policy context to the proposed development, and the implications and acceptability of the development in relation to this context is set out in the Planning Statement for the proposal.

8.7.2 This section of the LVIA provides interpretation as to the effects of the proposed development and their likely acceptability in relation to landscape-relevant policies (as referenced under to heading *Planning Policy Background* above), in order to guide the more detailed analysis set out in the Planning Statement.

8.7.3 The proposed development would not result in any material effect upon the setting or special qualities of the Cotswolds AONB. As such, there is no conflict with either Policy WM.2 of the Structure Plan or Policy NE8 of the Stroud Local Plan.

8.7.4 With regards to Policy 37 of the Waste Local Plan, the LVIA identifies that changes in landscape character resulting from the proposed development would be localised and not significant (in EIA terms). Change would occur in an area already characterised by the presence of the M5 motorway and considerable existing development of functional and contemporary style along the corridor of the A38 south of Gloucester, and at the garden centre immediately north of the site. There is little evidence of traditional character in this area, although older farmhouses do exhibit a local vernacular style. As such, the proposed development would not have any material adverse effect upon the traditional character of the county and there is no conflict with this policy.

8.7.5 Policy EN.3 of the Structure Plan comprises a series of bullets, which are addressed in turn below. Whilst not stated explicitly it is considered likely that this policy was written with the development of wind turbines in mind especially with regard to the comments relating to cumulative impacts, an issue particularly relevant to wind farm development. Nonetheless, as the proposed development would be a source of renewable energy the policy implications are considered below.

8.7.6 In respect of bullet a) of Policy EN.3, the proposed development would not result in any materially adverse effect upon the setting and special qualities of the Cotswolds AONB. As such, there is no conflict with this part of the policy.

8.7.7 Bullet b)i of Policy EN.3 is not relevant as there are no Special Landscape Areas that would be affected by the proposed development.

8.7.8 Bullet b)ii of Policy EN.3 refers to tourism and recreational interests. Landscape and visual impacts are of only limited relevance to this policy. However, some of the viewpoints included in the LVIA illustrate visual effects from areas likely to be well used for recreational amenity, such as the Cotswolds Way, Robins Wood Hill Country Park and the Gloucester to Sharpness Canal. Localised significant adverse visual effects on Gloucester to Sharpness Canal have been identified within the assessment. This relates to a specific short length of canal near to Parkend Bridge. Views of the site from the canal as a whole would vary depending on the level of vegetation cover present and also depending upon distance from the site. From much of the canal, the proposed development would not be visible or would appear so small within the view as to exert little influence upon the visual experience. In addition, views of the proposed development would often be seen in conjunction with other built infrastructure present in the landscape. As such, and on the basis that only a limited stretch of the canal would experience intervisibility with the proposed facility, there is not considered to be a detrimental effect on the tourism or recreational benefit of Gloucester to Sharpness Canal in respect of landscape and visual effects.

8.7.9 In respect of bullet b)iii of Policy EN.3, it is considered that there may be some tension between this part of the policy and the proposed development as significant adverse visual effects have been identified from three residential viewpoints close to the site. These adverse effects are considered to be localised and would only impact a very limited number of properties. It should be noted that not all significant effects are considered adverse. This relates to the composition of the existing view available and how the proposed development would relate to this, as well as the simple visibility of the proposed development. More generalised effects upon residential areas would not occur due to the presence of considerable screening vegetation and existing industrial/commercial structures and transport infrastructure, which restrict the wider visibility, from villages such as Haresfield, Standish, Colethrop, Moreton Valence/Putloe and Hardwicke.

8.7.10 By the very nature of the type of development it would be a prominent feature in the landscape. However, through sensitive design the visual impacts of the development have been minimised. As such whilst the development would result in some adverse visual impacts these are limited to a small number of nearby properties.

8.7.11 Policy NE10 of the Stroud District Local Plan makes reference to the *Stroud District Landscape Assessment*. As referenced above (sub-heading *Landscape/Townscape Character*) the LVIA does not give consideration to this document as it was prepared prior to the current best practice guidance being published. The LVIA instead considers the more recent *Gloucestershire Landscape Character Assessment*. Notwithstanding this, the three criteria set out in bullets as part of Policy NE10 are relevant to the proposed development.

8.7.12 The first bullet of Policy NE10 requires that natural features and water features that contribute to the landscape setting are retained. It is not clear whether this is in reference to the setting of the site or of the wider countryside. In either case, the proposed development would retain the existing perimeter tree planting and watercourse that are present on the site and incorporate these features into the landscape design for the facility.

8.7.13 The second bullet of Policy NE10 requires that there are no unacceptable effects upon long-distance views. The LVIA does not identify any unacceptable effects on long-distance views. The proposed development would be a minor feature in such views and would be experienced in the context of existing built development to the south of Gloucester, which already influences such views.

8.7.14 The third bullet of Policy NE10 requires that the benefits of the proposed development outweigh any harmful effects upon the landscape. The LVIA identifies that neither the physical fabric, nor the wider character of the landscape would undergo any significant effect which could be considered harmful.

8.8 Residual Effects and Conclusions

8.8.1 The landscape and visual effects of the proposed EfW facility at Javelin Park, Gloucestershire have been assessed.

8.8.2 Effects upon the landscape fabric would not be significant in EIA terms. The proposed development would redevelop what is currently a vacant derelict site. Existing perimeter planting would be retained and additional new planting provided.

8.8.3 Effects upon landscape character would not be significant in EIA terms. Localised change would occur in the area around the site and along the corridor of the M5 and A38. Elsewhere, the existing character would be largely unaffected by the presence of the facility.

8.8.4 Significant visual effects (in EIA terms) would be experienced from twelve of the thirty-four viewpoints assessed. However, from only six of these viewpoints would effects be considered adverse in nature, with the remainder experiencing neutral effects. Three of the significant adverse effects relate to views from individual residential properties with the remainder being views from stretches of road, footpath and canal towpath. All viewpoints experiencing significant visual effects are within 2.5km of the site.

8.8.5 The proposed development would be prominent from locations closer to the site by virtue of its scale. From further afield, views would be better screened by both vegetation cover and buildings and other structures within the Severn valley. From the higher ground east and west of the valley, the proposed development would be visible set in an expansive context of diverse land uses. This would include a mosaic of agriculture crossed by major transport infrastructure and interspersed with commercial and industrial activity, including areas of extensive development at the edge of Gloucester and the edge of Stonehouse.

8.8.6 The special qualities and setting of the Cotswolds AONB would not be materially affected by the proposed development. The design of the facility has been developed to have regard to the distinctive skyline formed by the Cotswolds Escarpment and views towards this from the west.

8.8.7 The proposed development would be set within a landscape where a variety of land uses are present without any strong unifying character. Local change resulting from the development would be set in the context of existing industrial/commercial development and the corridor of the M5 and A38. The facility would, by virtue of its function, be of greater height and mass than existing features, but would not lead to wide-ranging or fundamental change in existing character or of visual amenity. Wider effects would be limited by the surrounding pattern of vegetation cover which provides considerable visual screening from low-lying areas. From more elevated locations, expansive views are available which contain a variety of different features and can accommodate the proposed development without significant change. The relationship between the proposed development and the skyline of the Cotswolds Escarpment when viewed from the west has been an important design consideration and the facility has been designed to respect this distinctive landform, both in terms of views towards the Escarpment and from elevated vantage points along it.

9.0 ECOLOGY AND NATURE CONSERVATION

9.1 Introduction

9.1.1 This chapter considers the impacts of the proposed development on flora and fauna. The scope and methodology of the study are first described, followed by a description of habitats and fauna, including the occurrence of legally protected species. The nature conservation interest of the site and its surroundings is then evaluated through identifying ecological interest features and assessing their geographical scale of importance.

9.1.2 Mitigation design measures have been identified to avoid, reduce or compensate for any potentially significant ecological impacts on identified interest features on the site and features in the surrounding landscape. Measures incorporated into scheme design are described in Chapter 5.0 and the ecological rationale for these measures is explained more fully below. Ecological impacts of the construction and operation phases of the development are outlined, with an assessment of impact significance based on the conservation status of identified interest features. Further proposed mitigation and ecological enhancement measures are outlined, with a summary of residual impacts following the implementation of these measures.

9.2 Methodology

Scope of Investigation

9.2.1 The scope of ecological surveys was defined by a review of existing data, taking into account the results of recent surveys undertaken on the site by RPS, and consultation with Gloucestershire County Council's ecologist. Particular consideration was given to the published LPA Requirements for Biodiversity and Geodiversity (Gloucestershire County Council, 2008), which form part of the County Council's local requirements for validation of planning applications. Survey scope was further refined by the results of initial surveys, and by consideration of ecological data obtained from the local biological records centre and other sources.

9.2.2 The scope of survey and ecological impact assessment is informed by the following documents:

- RPS (2010). *Extended Phase 1 Habitat Survey. Javelin Park*. On behalf of Gloucestershire County Council;
- RPS (2010). *Reptile Survey. Javelin Park.* On behalf of Gloucestershire County Council (Appendix 9.4);
- RPS (2010). *Preliminary Assessment of Air Quality on Statutory Designated* Sites;
- Gloucestershire County Council (2009). *Habitat Regulations Assessment (HRA) Screening Report for WCS Site* Options. October 2009;
- Gloucestershire County Council (2011). *Gloucestershire Waste Core Strategy (WCS).* Revised version, June 2011;
- Atkins Water & Environment (2007). *Javelin Park, Quedgeley, Gloucestershire. Ecological Constraints Report.* Final Issue; and
- RPS letter to Gary Kennison, Gloucestershire County Council, 14th April 2010, incorporating great crested newt habitat suitability assessment (Appendix 9.5).

9.2.3 The following data searches, consultations and ecological studies were carried out in 2011 as part of the EIA:

- data search of European conservation sites within 10km of the development using the MAGIC (multi-agency geographic information for the countryside) website;
- data search on air quality and European conservation sites using the APIS (air pollution information system) website;
- data search of other statutory sites within 2km of the development using the MAGIC database;
- data search by Gloucestershire Environmental Records Centre (GERC) of locally designated sites, protected and priority species within 2km of the development, and of greater horseshoe bat and barbastelle records within 4km of the development;
- consultation with Gloucestershire Bat Group to request additional records;
- search of Gloucestershire Biodiversity Partnership website for data on local priority species and Special Landscape Areas;
- extended Phase 1 Habitat Survey;

- breeding bird survey;
- precautionary badger / protected species survey;
- bat activity survey; and
- survey of Pope's Wood, Cotswold Beechwoods SAC and assessment of vulnerability to nitrogen deposition .

9.2.4 The scope and methodology of the ecological impact assessment was further checked against the Scoping Opinion on Content of an Environmental Statement (Ecological Impact Assessment) produced by Gloucestershire County Council in November 2011, and Scoping Opinions supplied to the County Council by Natural England and the Environment Agency.

9.2.5 Full details of survey methods for the 2011 survey programme are given in Appendices 9.1 – 9.3, and summarised below. All surveys were undertaken by appropriately qualified, experienced and licensed ecologists, in accordance with current standard methodological guidelines.

Phase 1 Habitat Survey Methods

9.2.6 An extended Phase 1 Habitat Survey was carried out in accordance with the methodology set out by Institute of Environmental Management and Assessment (IEA, 1995). This utilises standard Phase 1 Habitat Survey methods (JNCC, 2010), with an additional consideration of habitat quality for fauna, including protected species.

9.2.7 The whole of the site was walked and habitats mapped according to standard Phase 1 categories. A vascular plant species list was derived from each habitat compartment, with relative abundance assessed on the qualitative Dafor scale (Dominant / Abundant / Frequent / Occasional / Rare). Habitat boundaries were plotted in the field using a differential GPS, or taken from existing boundaries mapped on the topographic survey base. Notes were made of sightings and signs of fauna recorded in the course of the habitat survey, as well as faunal habitat quality and potential occurrence of protected and notable species.

9.2.8 The geographical scope of survey included the Planning Application boundary, covering an area of approximately 5.1 ha. The survey was carried out on 27th April 2011, with supplemental recording carried out during subsequent site visits.

Breeding Bird Survey Methods

9.2.9 The breeding bird survey was based on Common Bird Census (CBC) methodology (Bibby et al., 2000; Gilbert et al., 1998; Marchant, 1983). This involves the production of bird species maps that can be used to indicate the density and distribution of territorial breeding birds. It is based on a British Trust for Ornithology (BTO) survey method known as 'territory mapping' which identifies the number and distribution of breeding territories in a specified census area. These can be determined by noting breeding behaviour in accordance with standard BTO breeding evidence assessment.

9.2.10 Visits were made commencing in the early morning (within 1 hour of sunrise), as birds are generally most active at this time of day, and most inactive in the early afternoon. The survey area was walked at a slow walking pace with frequent pauses, so that all birds detected could be identified. Days of inclement weather (persistent rain, high winds, poor visibility) were avoided. The route was organised such that any point within 50m of the survey route was visible. Birds occupying adjacent habitats outside the site were also recorded.

9.2.11 Three surveys were carried out on 28th April, 18th May and 24th June 2011.

Badger / Protected Species Survey Methods

9.2.12 A protected species survey was carried out on the 11th May 2011. This involved a careful walkover of the whole site, paying particular attention to the southern boundary of the site where badger had been previously recorded. Evidence of setts, tracks, trails, dung-pits and feeding signs were searched for. Other mammal signs were also recorded.

Bat Activity Survey Methodology

9.2.13 The survey methodology conformed to the Bat Conservation Trust *Bat Surveys Good Practice Guidelines* (BCT, 2007) for manual and automated bat activity surveys.

9.2.14 Three overnight recordings were carried out using automated monitoring at three points along the stream corridor which had been assessed as the habitat feature with greatest potential to support bats. Two transect surveys were also undertaken to monitor bat activity across the whole of the site. The second of these also incorporated a fixed-point survey to detect the direction and location of bat movement onto the site.

9.2.15 Automated recordings were carried out using an EcoObs Batcorder broadband ultrasonic recorder. Manual recordings used a Pettersson D-240x time expansion detector linked to a Roland Edirol mp3 recorder. Batbox IIID heterodyne recorders were employed. In addition to two observers, the evening fixed point survey used a Sony Handycam video recorder, with an attached Batbox providing audio.

9.2.16 Surveys were carried out on 17th May (Batcorder only), 23rd June and 13th July 2011. Batcorder recordings were analysed using bcAdmin, bcIdent and bcAnalyze software to identify species and plot nocturnal activity. Pettersson recordings were analyzed using Audacity and BatSound software to produce sonagrams enabling identification to be confirmed.

Assessment of Significance / Assessment Criteria

9.2.17 In order to assess the impacts of the development on flora and fauna, it is first necessary to identify the nature and geographical extent of likely impacts and identify the component ecological interest features of the receiving environment. The valuation of ecological features utilises current guidance produced by Institute for Ecology & Environmental Management (IEEM, 2006). This process assesses the geographical scale of importance of habitats and species that may be impacted by the development proposals. It also identifies legal issues, including habitats and species with legal protection, or with a specific requirement for control (e.g. invasive alien species).

9.2.18 The evaluation first considers species and habitats subject to legal protection, before considering other ecological features. These include locally designated sites, species and habitats listed under Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006), Priority

Species and Habitats in the Gloucestershire Biodiversity Action Plan, and other features of local importance for nature conservation.

9.2.19 The impact assessment methodology follows current Institute of Ecology and Environmental Management guidelines (IEEM, 2006). This is based on:

- the identification of valued ecological resources described above;
- the characterisation of potential impacts as a consequence of the development;
- an assessment of the likelihood of occurrence, duration, extent, magnitude, frequency and reversibility; and
- an assessment of impact significance.

9.2.20 The assessment of impact significance follows the guidance set out in *Environmental Impact Assessment: a guide to good practice and procedures* (Department for Communities and Local Government, 2006).

Table 9.1: Impact significance criteria

Significance	**Criteria**
Extreme	These effects represent key factors in the decision-making process. They are generally, but not exclusively associated with sites and features of national importance and resources/features which are unique and which, if lost, cannot be replaced or relocated.
Major	These effects are likely to be important considerations at a regional or district scale but, if adverse, are potential concerns to the project, depending upon the relative importance attached to the issue during the decision making process.
Moderate	These effects, if adverse, while important at a local scale, are not likely to be key decision making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource.
Minor	These effects may be raised as local issues but are unlikely to be of importance in the decision making process. Nevertheless, they are of relevance in the detailed design of the project.
Negligible	Effects which are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

9.2.21 Impact significance has also been defined more specifically in relation to potential impacts on European conservation sites, through the concept of site integrity. Government Circular 06/2005 gives the following definition of site integrity to be applied in the assessment of development impacts on European sites:

'The integrity of the site is the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and / or the levels of populations of species for which it was classified.' (para. 20, p9).

9.2.22 It should be noted that all surveys were carried out within acceptable seasonal and weather parameters, and conformed to current guidelines with respect to duration and frequency. The assessment relies on reptile survey data collected by RPS in 2010. This also utilised standard methods at an appropriate season, and remains valid for planning applications submitted within a minimum 2 year time period.

9.3 Baseline

Ecological Context

European and Internationally Designated Sites

9.3.1 A Site Check on the Multi-Agency Geographic Information for the Countryside (MAGIC) website for a 10km radius around OS grid reference SO 800 104 showed the following European and internationally designated conservation sites.

Table 9.2: European and internationally designated conservation sites

Site	Status	Interest features	Location (Centroid)	Distance from site
Severn Estuary	Ramsar SPA SAC	Waterfowl; Estuaries; Mudflats & sandbanks not covered by water at high tide; Atlantic salt meadows; Sandbanks slightly covered by water at all times;	ST 321 748	6.5km, SW

Site	Status	Interest features	Location (Centroid)	Distance from site
		Reefs; Sea lamprey; River lamprey; Twaite shad.		
Walmore Common	Ramsar SPA	Tundra swan (Bewick's swan)	SO 745 150	6.6km, NW
Cotswold Beechwoods	SAC	*Asperulo – Fagetum* beech forests Calcareous grassland	SO 898 134	7.1km, E
Rodborough Common	SAC	Calcareous grassland	SO 849 036	8.0km, SE

9.3.2 Ramsar sites are wetlands of international importance, designated under the Ramsar Convention. Special Protection Areas (SPAs) are internationally important sites, designated under the European Union Birds Directive (79/409/EEC, consolidated by 2009/147/EC). Special Areas of Conservation (SAC) are designated under Article 3 of the European Union Habitats Directive (92/43/EC).

Other Statutory Designated Sites

9.3.3 The 10km radius Site Check report produced the following statutory designated conservation sites, including National Nature Reserves (NNR), Sites of Special Scientific Interest (SSSI) and Local Nature Reserves (LNR). Note that some of these are contiguous with the European designated sites listed above.

Table 9.3: UK designated conservation sites within 10km

Site	Status	Interest features	Location	Distance from site boundary
Cotswold Commons and Beechwoods	NNR	Beech woodland Calcareous grassland	Various (10 component sites)	7.1km E
Haresfield Beacon	SSSI	Geological	SO 819 088	2.3km SE
Edge Common	SSSI	Calcareous grassland; lepidoptera	SO 847 092	4.5km SE
Range Farm Fields	SSSI	Neutral grassland	SO 850 130	5.3km NE

Site	Status	Interest features	Location	Distance from site boundary
Frampton Pools	SSSI	Open water	SO 753 073	5.3km SW
Robins Wood Hill Quarry	SSSI	Geological	SO 836 148	5.5km NE
Walmore Common	SSSI	Seasonally flooded grassland; Waterfowl	SO 740 162 & SO 745 150	6.6km NW
Bull Cross, The Frith & Juniper Hill	SSSI	Beech woodland, calcareous grassland; geological	SO 872 083	6.7km SE
Cotswold Commons and Beechwoods	SSSI	Beech woodland Calcareous grassland	SP 900 130	7.1km E
Selsley Common	SSSI	Calc. grassland; geology	SO 829 030	7.3km SE
Rodborough Common	SSSI	Calcareous grassland; geological	SO 851 035	8.0km SE
Upper Severn Estuary	SSSI	Estuarine habitats; ornithological	SO 720 060	8.0km SW
Swift’s Hill	SSSI	Calcareous grassland; geological	SO 878 067	8.2km SE
Garden Cliff	SSSI	Geological	SO 718 128	8.4km NW
Woodchester Park	SSSI	Greater horseshoe bat	SO 820 014	8.6km S
Hucclecote Meadows	SSSI LNR	Lowland meadows	SO 872 163	8.9km NE
Easter Park Farm Quarry	SSSI	Geological	SO 810 009	9.4km S
Minchinhampton Common	SSSI	Calcareous grassland; geological	SO 855 010	10.0km SE
Quedgeley Arboretum	LNR	Grassland; scrub; specimen trees	SO 802 142	3.7km N
Green Farm Orchard	LNR	Grassland; orchard	SO 810 153	4.8km N
Robinswood Hill	LNR	Grassland; woodland;	SO 840 152	5.5km NE

Site	Status	Interest features	Location	Distance from site boundary
		scrub; geological		
Saintbridge Balancing Pond	LNR	Open water	SO 849 166	7.7km NE
Alney Island	LNR	Wet grassland	SO 820 190	8.1km N
Bisley Road Cemetery	LNR	Grassland; scrub; specimen trees	SO 864 048	8.3km SE
Barnwood Arboretum	LNR	Calcareous grassland; scrub; specimen trees	SO 861 179	9.4km NE
Coopers Hill	LNR	Beech woodland	SO 893 147	10.0km NE

9.3.4 Sites of Special Scientific Interest (SSSIs) are nationally important sites, designated under Section 28 of the 1981 Wildlife and Countryside Act. National Nature Reserves (NNRs) are a selection of the most important of these, designated under Section 19 of the 1949 National Parks and Access to the Countryside Act and Section 35 of the 1981 Act.

9.3.5 Local Nature Reserves (LNRs) are locally important sites (although they may have other designations), which are designated by local authorities under Section 21 of the 1949 National Parks & Access to the Countryside Act.

Non-statutory Designated Sites

9.3.6 The GECR data search found no locally designated Key Wildlife Sites within 2km of the site centre. Gloucester & Sharpness Canal is listed at 2km in the Air Quality Assessment and is within 2km of the site boundary, but was slightly outside the central grid reference used in the GECR data search. Haresfield to Brookthorpe is listed on the Conservation Road Verges Register. This is a minor road with its closest point 1km east of the site boundary.

Protected and priority species

9.3.7 The following protected species records were obtained from GECR. These include species listed under Annex II and Annex IV of the EU Habitats Directive, implemented in UK through the 2010 Habitats and Species Regulations; species protected through listing under Schedules 1, 5 & 8 of the 1981 Wildlife and Countryside Act (except those protected from sale only); and the 1992 Protection of Badgers Act. Six-figure grid reference locations were received from GECR, but have been withheld from the table below in order to protect confidentiality. All records are within a 2km radius (greater horseshoe / barbastelle 4km).

Table 9.4: Protected species records

Species	Status	Date of record	Distance from site
Anguis fragilis slow-worm	Sch 5 W&CA 1981	2004	1.09km S
		1969	n/a (10km ref.)
Eptesicus serotinus serotine	Annex IV Habs. Dir. Sch 5 W&CA 1981	2010	1.89km S
Falco subbuteo hobby	Sch 1.1 W&CA 1981	2005	1.89km S
Meles meles badger	1992 Protection of Badgers Act	2011	1.92km SW
		2006	1.78km W
		2006	0.13km SE
Natrix natrix grass snake	Sch 5 W&CA 1981	1969	0.98km E
Nyctalus noctula noctule	Annex IV Habs. Dir. Sch 5 W&CA 1981	2007	0.87km E
Pipistrellus pygmaeus soprano pipistrelle	Annex IV Habs. Dir. Sch 5 W&CA 1981	2007	0.87km E
Plecotus auritus brown long-eared bat	Annex IV Habs. Dir. Sch 5 W&CA 1981	2007	0.87km E
Rhinolophus ferrumequinum greater horseshoe bat	Annex II & IV, Habs. Dir; Sch 5 W&CA 1981	2008	2.18km NNW
Triturus cristatus great crested newt	Annex II & IV, Habs. Dir; Sch 5 W&CA 1981	2005	1.79km S
		2007	1.09km S

Tyto alba barn owl	Sch 1.1 W&CA 1981	2006	n/a (10km ref.)

9.3.8 The following priority species, including species listed under Section 41 of the 2006 Natural Environment & Rural Communities Act, the UK Biodiversity Action Plan (BAP) and Gloucestershire BAP have been recorded within 2km of the site. Note that this list excludes protected species which are also priority species.

Table 9.5: Priority species records

Species	Status	Date of record
Alauda arvensis skylark	S41 NERC; UK BAP; Gloucs. BAP	2006
Carduelis cannabina linnet	S41 NERC; UK BAP; Gloucs. BAP	2006
Lepus capensis brown hare	S41 NERC; UK BAP; Gloucs. BAP	2006 2003
Muscicapa striata spotted flycatcher	S41 NERC; UK BAP; Gloucs. BAP	2005
Mustela putoria polecat	UK BAP	1990
Mythimna comma shoulder-striped wainscot	UK BAP	1998
Turdus philomelos song thrush	S41 NERC; UK BAP; Gloucs. BAP	2008 2006 2005
Xanthia icteritia sallow moth	UK BAP	2000
Xanthorhoe ferrugata dark-barred twin-spot carpet	UK BAP	1997

Local Ecological Context

9.3.9 The site is located at the southern end of the Javelin Park industrial development site, a cleared brownfield site with some new infrastructure in the form of roads and lighting already in place. To the north of Javelin Park is a garden centre with a large car park and extensive covered retail space. A pond (ca.900 m^2 area) with extensive emergent vegetation lies just north of the garden centre, at the foot of the M5 motorway / B4008 junction.

9.3.10 The M5 motorway runs parallel to the site, around 75 m from its western boundary. The motorway verge is relatively narrow in this section, with scattered trees. To the west of the motorway is a mixed lowland agricultural landscape leading to the Gloucester and Sharpness Canal and River Severn. This has generally quite large field sizes, but with some areas of dense hedgerows, hedgerow trees and parkland. There are also a number of small farm woodlands.

9.3.11 A large arable field wraps around the western and southern boundaries of the site, with a total area of over 20ha. The north-eastern field corner is uncultivated rough grassland, with the remains of an old concrete hardstanding visible. This very open arable / improved grassland landscape, interspersed with small and isolated groups of trees and shrubs, continues for around 0.8km south of the site as far as Warren Farm.

9.3.12 The B4008 runs along the eastern boundary of the development. To the east of this road is a landscape with significantly smaller field sizes and a greater density of hedgerows and hedgerow trees. This continues east and south-east of the village of Haresfield towards the wooded Cotswold escarpment, some 2.2 km from the site's eastern boundary.

9.3.13 The contrasting ecological characteristics of the site's landscape setting is reflected in the Strategic Nature Areas (SNA) map produced by the Gloucestershire Biodiversity Partnership. SNAs are landscape-scale areas where characteristic habitats which typify the county occur, and identify areas where these habitats can be expanded and linked to create a more resilient natural environment. The site lies near the eastern edge of the Severn Vale SNA, and is within ca. 2 km of the western edge of the Cotswold Escarpment and Valleys SNA.

Habitats and Vegetation

9.3.14 Habitats within the site are described more fully in Extended Phase 1 Habitat Survey included as Appendix 9.1. Extended Phase 1 Habitat Survey report provides a detailed description of species composition and is described in a series of target notes in accordance with Phase 1 methodology. The following paragraphs summarise the key habitat features at the site. The spatial distribution of habitats across the site is shown on Figure 9.1.

9.3.15 Habitats within the site are all of relatively recent origin, reflecting its recent disturbance and former industrial use. The largest single habitat is ephemeral – short perennial vegetation, comprising an open sward of herbs established on a relatively coarse substrate. Vegetation cover is variable (ca. 20-60%), but tall herbs such as teasel (*Dipsacus fullonum*) are abundant throughout much of the area, and there appear few constraints in terms of soil properties preventing fairly rapid succession to tall ruderal vegetation.

9.3.16 The central part of the site is dominated by tall ruderal vegetation, indicative of a slightly longer period of establishment and conditions of relatively high nutrient supply. This area has quite a high species diversity, with hemlock (*Conium maculatum*) and teasel particularly abundant. Brambles (*Rubus fruticosus*) are encroaching in places, beginning the succession to scrub vegetation.

9.3.17 In the most recently disturbed parts of the site in the south-east, which previously held soil mounds, ephemeral – short perennial vegetation grades to open bare ground over a coarse aggregate surface with areas of subsoil. Colonisation by vegetation has begun, with weld (*Reseda luteola*) and water figwort (*Scrophularia auriculata*) among the early colonists. Given that soil mounds were present on a topographic survey dated May 2010 and reported in the 2010 RPS ecological survey, establishment of the cleared site by scattered tall herbs has been rapid.

9.3.18 The western part of the site has a more established sward of tall, tussocky grassland, variously dominated by tufted hair-grass (*Deschampsia cespitosa*) and false oat-grass (*Arrhenatherum elatius*), grading to a more diverse shorter sward with abundant creeping cinquefoil (*Potentilla reptans*). A small area of seasonally inundated land adjoining this area supports a terrestrial flora indicative of infrequent wetting.

9.3.19 A former culvert running along the southern and western boundaries has been opened up and landscaped to form a valley feature with planted blocks of scrub and trees, interspersed with grassland. The tree and scrub planting mostly comprises native species, including hazel (*Corylus avellana*), dogwood (*Cornus sanguinea*) and field maple (*Acer campestre*). The grassland is a relatively fine-leaved sward with abundant red fescue (*Festuca rubra*) and associated species including bird's-foot trefoil (*Lotus corniculatus*). A hedge runs along the western and southern boundaries, which are formed by a security fence. There are a few more mature ash (*Fraxinus excelsior*) trees in the south-east corner of the site.

9.3.20 The stream channel varies from 1 – 3m in width, with very shallow (<20cm) running water in the early season surveys, and completely dry by mid-July. Marginal plant species have been introduced to the stream corridor, and clearly became well established to the extent that the channel has been recently cleared to improve flows in flood conditions. The most abundant species include water mint (*Mentha aquatica*) and creeping bent (*Agrostis stolonifera*), with a wide range of other introduced species including sweet flag (*Acorus calamus*). The limited range of in-channel habitats, seasonal drying, and lack of connectivity to other sections of open channel (through culverting) severely limit potential aquatic invertebrate diversity, and render the stream unsuitable for fish.

9.3.21 The south-eastern and eastern margins of the site are planted up with a mix of native and ornamental shrubs, with some standard trees including ash, oak (*Quercus robur*) and field maple. A short (<80m) length of open ditch runs parallel to the eastern boundary. It is culverted for a short section prior to discharging into the aforementioned stream.

Fauna

Badger

9.3.22 The RPS Extended Phase 1 Habitat survey located a badger sett less than 10m south of the site boundary. The sett was clearly active in March 2010, with evidence of access under the security fence to the southern margins of the site. The April 2011 habitat survey found possible badger footprints in mud at the side of the stream, but no other signs of badger activity.

9.3.23 The badger survey in May 2011 found little evidence of badger activity within the site. A single dung-pit was found near the southern boundary, with old dung present.

9.3.24 No evidence of badger activity has been found in any other part of the site. As soils are either undeveloped or recently disturbed, the site is likely to support a low earthworm population, and not provide suitable foraging habitat outside the stream corridor. The security fence also provides at least a partially effective barrier to badger access.

Bats

9.3.25 The results of the bat surveys are described in full in Appendix 9.2. Figure 9.2 shows Batcorder locations, transect routes, and the main location and direction of bat activity on site.

9.3.26 The transect surveys showed that almost all bat activity was concentrated along the southern boundary of the site, with the greatest level of activity in the south-eastern part of this corridor. In contrast, much lower levels of activity were detected in the western landscape corridor, and very few flights detected across the main open parts of the site.

9.3.27 At least six species of bat were recorded on site, including the following taxa:

- Barbastelle (*Barbastella barbastellus*);
- *Myotis* spp.;
- Common pipistrelle (*Pipistrellus pipistrellus*);
- Soprano pipistrelle (*Pipistrellus pygmaeus*);
- Noctule (*Nyctala noctula*); and
- Greater horseshoe bat (*Rhinolophus ferromequinum*).

9.3.28 Common pipistrelle was by far the most frequent species detected in both automated and manual surveys. Activity was concentrated along the southern stream corridor, especially the south-eastern section. Bats were typically recorded accessing the site from the east and south-east from just before 30 minutes after sunset. Intensive foraging by small numbers of bats

(<10) was observed and recorded until ca. 1.5 hours after sunset, with a pre-dawn activity peak also recorded on two occasions.

9.3.29 *Myotis* bats were the second most frequently recorded species group, with activity typically beginning 1 – 1.5 hours after sunset. Activity was also mostly confined to the southern site boundary, with individuals recorded on the northern and western site boundaries in the July survey. *Myotis* bats mostly could not be confirmed with sufficient confidence to species level, although analysis of Batcorder recordings suggest most if not all are whiskered or Brandt's bats (*Myotis mystacinus / M.brandtii*).

9.3.30 Soprano pipistrelles were no more than occasional visitors to the site. Soprano pipistrelles were not recorded during transect surveys and recorded only occasionally during the May Batcorder data, once in the June recording and absent in the July survey. The first bat was recorded over 1 hour 40 minutes after sunset, suggesting that the site does not provide a favoured foraging site for bats from the nearest known roost , 0.9km to the east.

9.3.31 Greater horseshoe bats were recorded briefly in all three surveys, all within the southern site boundary, towards the south-east corner of the site. In May, when the Batcorder was located in the south-east corner of the site, 4 recordings were made between 1h 25min and 6h 49min after sunset. In June, 4 recordings were made between 3h 5min and 4h 22min after sunset. In addition, heterodyne and time-expansion recordings of this species were made during the transect survey between 2h 46min and 3h 5min after sunset. In July, no Batcorder or time-expansion recordings of this species were made, with a single registration on a heterodyne detector 2h 56min after sunset.

9.3.32 Barbastelle were only recorded in the first Batcorder survey, with a total of 13 recordings in the latter part of the night, from 3h 26min to 6h 12min after sunset. The recordings, some of which had high quality signals, suggested foraging along the southern boundary, possibly because of opportunistic exploitation of a favoured habitat nearby.

9.3.33 Noctule had the smallest number of automated recordings, and were only recorded commuting high across the site on a small number of occasions.

Unlike other species, these were not closely linked to the stream corridor, with sightings showing typical noctule behaviour of high directional flight without obvious reference to landscape features.

Other Mammals

9.3.34 Evidence of fox (*Vulpes vulpes*) was recorded during the badger survey, with an old fox scat located in the southern stream corridor, just north of the watercourse.

9.3.35 A red, Sika or red / Sika hybrid deer (*Cervus sp.*) hind and fawn were recorded during the earlier season surveys. Analysis of a photograph of the fawn was inconclusive, although all three taxa are naturalised in Gloucestershire. Deer tracks were frequent in the mud at the side of the watercourse, including in the later July survey.

Breeding Birds

9.3.36 A total of 28 species of bird were recorded within the site, of which 13 were probable or possible breeding species on the site, and 4 which may have bred in adjacent habitats. Further details are given in the Breeding Bird Report included as Appendix 9.3, and Figure 9.3.

9.3.37 Open habitats supported a possible breeding attempt by little ringed plover (*Charadrius dubius*), which was holding territory on recently cleared land in the northern half of Javelin Park. It is likely that the presence of gulls and corvids using lighting columns as lookouts would reduce the breeding success of little ringed plover.

9.3.38 No other ground-nesting species were recorded on site, but there were two skylark territories nearby, one just to the north-west of the site, in the northern half of Javelin Park, the other in fields to the east of the B4008.

9.3.39 The largest number of breeding territories on site were held by whitethroat (*Sylvia communis*) with five recorded. Four of these were in the southern, eastern and western peripheral scrub, with one extending into dense tall herb vegetation to the north of the landscape corridor. Other warbler territories including single chiffchaff (*Phylloscopus collybita*) and lesser whitethroat (*Sylvia curruca*) were recorded in the peripheral scrub along the south of the site.

9.3.40 Other species recorded along the southern landscape corridor included spotted flycatcher (*Muscicapa striata*), with song thrush (*Turdus philomelos*) holding territory just off-site to the east. Dunnock (*Prunella modularis*) was recorded on the east side of the B4008.

9.3.41 Small flocks of linnet (*Carduelis cannabina*) and goldfinch (*Carduelis carduelis*) were recorded foraging over the site and adjacent parts of Javelin Park.

Reptiles

9.3.42 The 2010 reptile survey by RPS found no evidence of reptiles using the site despite the suitability of habitats at the site. The reptile survey report produced by RPS is included as Appendix 9.4. It is possible the recent disturbance history may be responsible for the current lack of records, with the stream corridor previously having been culverted and presenting much less favourable habitat quality.

Amphibians

9.3.43 RPS carried out a risk assessment on waterbodies within the site, and concluded there was a low risk of occurrence of great crested newt (*Triturus cristatus*). The risk assessment is included as Appendix 9.5. The habitat surveys undertaken in 2011 concur with this assessment; in fact conditions on site in 2011 appeared significantly less suitable for great crested newt than those reported in the RPS report. The stream corridor has been cleared out preventing still water being impounded by vegetation, and the very shallow running water habitat, that was observed to dry out during the survey period, is completely unsuitable for newts. Similarly, the eastern peripheral ditch was dry during all surveys.

9.3.44 There are no known great crested newt breeding ponds within 500m of the site, the nearest being 1.09km to the south (see Table 9.4).

9.3.45 No other amphibian species are known to have been recorded on site.

Invertebrates

9.3.46 Butterfly and diurnal moth species recorded during the habitat and other surveys include orange-tip (*Anthocaris cardamines*), green-veined white (*Pieris napi*), common blue (*Polyommatus icarus*), and cinnabar moth (*Tyria jacobaeae*).

9.3.47 The floriferous tall herb vegetation is likely to be attractive to a range of nectar-feeding invertebrates, and the range of habitats present, including bare and sparsely vegetated areas, are likely to be attractive to a range of invertebrates able to exploit ephemeral habitats. In contrast, aquatic invertebrates will be limited by seasonal drying of the stream.

Ecological Interest Features

Protected Species

9.3.48 A total of eight species with special legal protection have been recorded on the site, and are listed in Table 9.6 below with an assessment of their representation on site. In order to assess the level of value as ecological interest features, it is important to consider the following:

- the extent to which the site contributes to the maintenance of their conservation status in the wider area; and
- their level of legal protection, in order to address whether the development would comply with current legislation, and assess whether any operations may require a Natural England licence.

9.3.49 Barbastelle and greater horseshoe bat are protected under Annex II and Annex IV of the Habitats Directive. Other bat species are protected under Annex IV. The Habitats Directive is implemented in England and Wales through the 2010 Conservation of Habitats and Species Regulations. All bats are also protected through listing under Schedule 5 of the 1981 Wildlife & Countryside Act, as amended by Variations of Schedules Orders and the 2000 Countryside and Rights of Way Act.

9.3.50 Little ringed plover are protected through listing under Schedule 1.1 of the 1981 Wildlife and Countryside Act (as amended). All other wild bird species receive some protection through the 1981 Act. The protection afforded to nests, eggs and young is particularly relevant in a development context.

9.3.51 Badger are protected under the 1992 Protection of Badgers Act.

Table 9.6: Status of protected species on site

Species	Representation in survey area
Barbastelle	Limited foraging in southern boundary of site on 1 of 3 survey occasions.
Greater horseshoe bat	Small number of recordings on southern boundary on 3 of 3 surveys, probable occasional use for foraging.
Common pipistrelle	Southern boundary favoured foraging destination for relatively small numbers of pipistrelle likely to be roosting <1km to E or S of site.
Soprano pipistrelle	Limited activity with occasional foraging on southern boundary, despite presence of roost within 1km.
Myotis sp. bats	Frequently recorded foraging in small numbers, mostly along southern boundary, on site later than common pipistrelle.
Noctule	Very infrequent overflights, no foraging activity.
Little ringed plover	Maximum 1 pair attempted to breed, utilising cleared land to north as well as on site.
Badger	Sett <10m to south of site boundary but limited activity on site, confined to southern boundary corridor.

Priority Species

9.3.52 The following priority species, listed as being of principal importance for the conservation of biodiversity in England under Section 41 of the 2006 Natural Environment and Rural Communities Act, have been recorded within the survey area. These species are also listed on the UK Biodiversity Action Plan (UK BAP).

Table 9.7: Priority species recorded on site

Species	Representation in survey area
Cinnabar moth (*Tyria jacobaea*)	Found in tall ruderal vegetation and stream corridor in areas with ragwort
Herring gull (*Larus	Occasional individuals on site, lower

Species	Representation in survey area
argentatus)	numbers than lesser black-backed gull
Skylark (*Alauda arvensis*)	Two singing male to NW and E of site, no records on site
Dunnock (*Prunella modularis*)	Holding territory to E of site, none breeding on site
Song thrush (*Turdus merula*)	One singing male in scrub near the M5, north of the survey area
Spotted flycatcher (*Muscicapa striata*)	Single bird foraging from northern edge of southern peripheral scrub in June
Linnet (*Carduelis cannabina*)	Small flocks foraging over site and surrounds

9.3.53 Spotted flycatcher is of particular interest. Although widespread, it has undergone a significant national decline (87% from 1967 – 2008: *BTO Breeding Birds in the Wider Countryside*), and can now be regarded as uncommon in Gloucestershire.

9.3.54 All of the above species remain common and widespread, but have been subject to significant local declines. The population sizes recorded do not indicate that the site is important for the maintenance of their conservation status in the wider area.

9.3.55 The Section 41 list also includes some of the protected species occurring on the site, comprising barbastelle, greater horseshoe bat, soprano pipistrelle and noctule.

9.3.56 There are no additional local Biodiversity Action Plan Priority species listed in the Gloucestershire BAP. Of the species already listed above as protected and / or Section 41 species, the following are also local BAP priority species: skylark, linnet, spotted flycatcher, song thrush, barbastelle and greater horseshoe bat.

Priority Habitats

9.3.57 The areas of ephemeral – short perennial vegetation, inundation vegetation and sparsely vegetated early successional communities of bare spoil could collectively be regarded as an example of Open Mosaic Habitat on Previously Developed Land Priority Habitat. However, the likely rapid succession of areas which are currently sparsely vegetated mean this habitat would not persist long in the absence of development.

9.3.58 The stream is classified as a Local BAP priority habitat in Gloucestershire. It is not considered a UK priority habitat as defined by UK Biodiversity Action Plan; Priority Habitat Descriptions (Maddock (ed), 2008).

9.3.59 Scrub is a Local BAP priority habitat in Gloucestershire. The stream corridor with its scrub and running water habitats can therefore collectively be regarded as being of at least local interest for nature conservation. This is further enhanced, at least in relation to the southern stream channel, by its use by foraging bats.

Other Interest Features

9.3.60 As well as the protected and priority species noted above, the breeding birds supported by the site can be considered a feature of local conservation interest. The numbers and diversity of breeding birds is not high, and may reflect the proximity of the motorway and negative impact of traffic noise on some species. Nevetheless, up to five pairs of whitethroat, and one pair each of lesser whitethroat, chiffchaff, chaffinch and woodpigeon may be nesting within the site, together with other possible species including blue tit, great tit and blackbird.

Summary of Ecological Interest Features

9.3.61 The table below summarises the ecological interest features identified on and adjacent to the site, with an assessment of their geographical scale of importance. Statutory designated sites in the wider vicinity of the site, listed in Tables 9.2 and 9.3, can be considered as being of international importance in the case of SAC and SPA sites, national importance for NNR and SSSI sites, and local to County-level importance for LNR sites.

Table 9.8: Summary of ecological interest features

Feature	**Legal and policy status**	**Level of importance on site**
Barbastelle	Annex IIa and IVa of Habitats Directive; 2010 Habitats & Species	Very limited use of site detected, but rare species so local

Feature	Legal and policy status	Level of importance on site
	Regulations; Schedule 5 Wildlife & Countryside Act; S41 Natural Environment & Rural Communities Act; UK BAP; Gloucestershire BAP; PPS9 para. 15.	importance.
Greater horseshoe bat		Regular but limited use of site for foraging, rare species dependent on habitat continuity so at least district-level importance.
Soprano pipistrelle	Annex IVa of Habitats Directive; 2010 Habitats & Species Regulations; Schedule 5 Wildlife & Countryside Act; S41 NERC Act; UK BAP; PPS9 para. 15	Small numbers and sporadic use – negligible interest.
Noctule		Small numbers overflying site – negligible interest.
Pipistrelle bat	Annex IVa of Habitats Directive, 1994 Habitats Regulations; Schedule 5 Wildlife & Countryside Act; PPS9 para.15	Intensive use of part of site but by relatively small numbers, feature of local to district-level interest.
Myotis sp. bats		Regular use by small numbers – local interest.
Little ringed plover	Schedule 1.1 W&C Act; PPS9 para. 15	Maximum one pair in ephemeral habitat – local importance.
Badger	1992 Protection of Badgers Act; PPS9 para.15	Sett off-site but evidence of past use of part of site – negligible interest.
Cinnabar moth	S41 Natural Environment & Rural Communities Act 2006; PPS 9 para. 16	Small population, local interest.
Herring gull		Limited use of site by common & widepread species negligible interest.
Skylark		Two territories off site, negligible interest.
Dunnock		1 territory off site, negligible interest.
Song thrush		1 territory close to site, local interest.
Spotted flycatcher		1 record on site, local importance.

Feature	Legal and policy status	Level of importance on site
Linnet	S41 Natural Environment & Rural Communities Act 2006; PPS 9 para. 16	Use part of site for foraging, local interest.
Open mosaic habitats on previously developed land		Habitat likely to have short-term persistence, local interest.
Stream	Gloucestershire BAP	Limited channel features, prone to drying, limited connectivity – local interest.
Scrub		Local interest.
Breeding birds	1981 Wildlife & Countryside Act (as amended)	Limited diversity and numbers – local interest.

9.4 Assessment of Effects

Incorporated Mitigation

9.4.1 A number of mitigation measures have been incorporated into the scheme design, construction and operational procedures in order to avoid, reduce or compensate for potential ecological impacts. These include:

- minimising impacts on the southern and western stream corridors;
- creation of new landscape planting, particularly in south-eastern part of site;
- creation of permanently wet waterbodies; and
- design of lighting to minimise light spillage and avoid unnecessary lighting, especially during summer.

9.4.2 Direct development impacts on the stream corridor have been minimised by avoiding any development on the stream valley or channel, and on habitats on the southern and western bank of the stream. Impacts would be limited to loss of some scrub and grassland habitats above the right bank of the stream channel with much of this area landscaped following construction. Development would be completely avoided in the eastern, upstream 117m of the stream corridor. This would have the effect of retaining intact the area of greatest value to foraging bats.

9.4.3 A new landscaped area of around 0.53ha would be created in the south-eastern part of the site, enhancing the value of both the south-eastern stream corridor and the eastern site boundary to foraging bats and breeding birds. The landscaped area would contain scrub habitats, trees, grassland and wetland. This area provides the greatest opportunity for significant ecological benefits, based on current evidence of use by European protected species of adjoining habitats. Other open spaces along the northern boundary of the site provide additional opportunities for habitat creation. The design of the landscape scheme has been informed by the habitat requirements of bats, including features such as linear glades linked to the adjacent stream corridor. Glade habitats are also likely to be used by birds such as spotted flycatcher.

9.4.4 The creation of permanently wet waterbodies, particularly in the eastern part of the site where a pond would be constructed, would provide high quality foraging habitat for bats using the southern stream corridor and eastern landscape corridor. This may increase the species diversity of bats using the site, by providing more favourable habitat for soprano pipistrelle in particular, which roost within 1km but currently make relatively little use of the site. Wetland habitats would also benefit a range of other flora and fauna, complementing habitats along the stream corridor. Three additional settlement lagoons are planned along the northern boundary, and may also have some ecological value. However, these are located closer to the main building and the northern half of Javelin Park that is likely to be subject to development in the near future, and do not have the same degree of linkage to adjoining habitats. Nonetheless, they would provide additional ecological enhancement, but would not have a primary role in the ecological mitigation function.

9.4.5 The value of southern peripheral habitats for foraging bats has informed the site's lighting design, described in Chapter 5.0. This has sought to minimise light spillage through a range of measures, including avoiding building-mounted lights and lighting of external facades, and the use of directed downward lighting. Most importantly, external lighting would be reduced outside of vehicle delivery times, and internal lighting to offices would be automatically turned off outside of working hours. In addition, the layout of the facility places car parking and access roads to the north of the main site buildings. These design features, combined with additional mounding and planting would serve to further reduce light levels reaching the southern landscape corridor during the bat activity season.

9.4.6 Measures to avoid off-site impacts on the water environment during the construction and operation of the plant have been described fully in Chapter 11.0. These include measures such as the construction of detention basins which would have secondary ecological benefits, as well as ensuring that there would be no significant ecological impacts downstream of the development. Construction phase impacts would be addressed through the preparation and implementation of a Construction Environmental Management Plan (CEMP), as described more fully in Chapter 5.0.

9.4.7 Measures to avoid impacts on breeding birds and comply with bird protection legislation are described in Chapter 5.0, and comprise avoidance of the bird breeding season when carrying out site clearance operations.

9.4.8 Measures to avoid significant off-site impacts on designated sites and habitats of conservation impact as a result of aerial deposition of nitrogen and acidifying pollutants are described in the Air Quality chapter, and incorporate an advanced flue gas treatment system. Measures are also described which address potential local-scale impacts such as transport and deposition of dust on vegetation.

Construction Phase

Direct Impacts on Habitats and Species

9.4.9 The areas of habitats that would be directly affected as a consequence of the construction phase of the development are listed in Table 9.9.

Table 9.9: Direct impacts during construction

Habitat	Approximate area affected (% of extent on site)
Ephemeral – short perennial vegetation	1.518ha (97.4%)
Tall ruderal habitat	1.229ha (99.5%)

Habitat	Approximate area affected (% of extent on site)
Bare / sparsely vegetated ground	0.717ha (100%)
Grassland	0.259ha (34.4%)
Scrub	0.141ha (24.0%)
Inundation community	0.011ha (65.6%)
Running water	0.0ha (0.0%)
Ornamental shrub	0.0ha (0.0%)

9.4.10 The above table includes construction impacts as a consequence of landscaping works (e.g. in the north-west corner of the site), as well as impacts within the development footprint.

9.4.11 Potential indirect impacts during construction include:

- disturbance of wildlife in adjacent habitats due to noise, lighting, vibration and human activity; and
- pollution of adjacent land and watercourses as a consequence of leakage of hydrocarbons from plant or stored fuels, and deposition of waste materials from construction operations.

9.4.12 The magnitude of disturbance impacts would vary according to the time of day and season of operations. They would tend to be greater in summer, and when night working is undertaken. Human activity involved with construction at height, sudden construction noise, and high intensity lighting if used on summer nights are likely to be the most disturbing activities. Movement of vehicles and plant is generally less disturbing, with habituation of birds likely. There is the potential for a reduction in breeding bird numbers when construction activities cause disturbance in the southern and western landscape corridors, but very little risk that this would have an effect beyond the site boundary. Similarly, construction activities and security lighting during summer nights may have an impact on bat foraging behaviour along the southern boundary of the site, but is unlikely to have a wider scale effect on habitats outside the site. The potential impact on populations is considered below. Vibration impacts have the potential to affect badger setts, with 30m recognised by Natural England as the distance within which licensing may be required for normal excavations, and 50m for operations such as piling which produce greater subsurface effects.

9.4.13 The risk of water pollution of adjacent and downstream habitats would be minimised by measures outlined in the Incorporated Mitigation section above.

9.4.14 The Air Quality Assessment does not predict any impacts on sensitive ecological receptors as a consequence of the construction phase of the development. With implementation of incorporated mitigation measures, local scale impacts such as dust deposition to retained vegetation would be minimal, and very unlikely to have a measurable ecological effect.

Impacts on Ecological Interest Features

9.4.15 Table 9.10 lists the potential construction phase impacts on ecological interest features identified in the preceding section based on habitat loss and likely indirect impacts. The significance of these impacts is discussed later in the chapter.

Table 9.10: Construction phase impacts on interest features

Interest feature	**Potential impact and magnitude / extent**	**Risk of occurrence and reversibility**
Barbastelle Greater horseshoe bat Soprano pipistrelle Noctule Common pipistrelle *Myotis* sp. bats	Loss of scrub - 0.11ha on S site boundary with possible reduction in habitat quality. Disturbance during construction due to lighting.	Certain to occur, not reversible during construction phase. Moderate risk if summer construction requires high intensity lighting.
Little ringed plover	Loss of 0.21ha of suitable breeding habitat, contributes to loss of habitat for 1 pair. Risk of accidental disturbance of birds breeding on cleared site / loss of eggs or young.	Certain to occur, not reversible. Moderate risk if site cleared, then left undisturbed in early part of breeding season.
Badger	Disturbance of sett due to subsurface construction works.	Moderate risk – most works over 50m away, very few operations likely closer than 30m.
Cinnabar moth	Reduction in breeding	Certain to occur, not

Interest feature	Potential impact and magnitude / extent	Risk of occurrence and reversibility
	population within site due to loss of food plant.	reversible during construction phase.
Herring gull	No measurable impacts predicted.	No risk of occurrence.
Skylark	Possible disturbance of 1 breeding pair just north of site.	Moderate risk if the northern part of Javelin Park remains undeveloped.
Dunnock	Breeding off site – potential disturbance.	Low risk of occurrence, reversible.
Song thrush		
Spotted flycatcher	Partial loss of foraging and possible breeding habitat, maximum impact on 1 breeding pair.	Certain to occur, not reversible during construction phase.
Linnet	Loss of foraging habitat used by small numbers (<6) individuals.	Certain to occur, not reversible during construction phase.
Open mosaic habitats on previously developed land	Loss of ca. 2.2ha of habitat.	Certain to occur, not reversible.
Stream	Risk of inadvertent impacts.	Risks of inadvertent impact avoided by mitigation.
Scrub	Loss of 0.141ha on N and E side of stream corridor.	Certain to occur, not reversible during construction phase.
Other breeding birds	Disturbance of breeding and foraging birds in adjacent areas of site.	Moderate risk of occurrence, not reversible during construction phase.

Operational Phase

Potential Ecological Impacts

9.4.16 The operational phase of the development would not result in any additional direct impacts in terms of land-take and consequent habitat loss. The proposed landscaping and the development of wetland areas would start to offset habitat losses during the construction phase, leading to positive impacts through increased habitat availability for breeding birds, foraging bats and other wildlife.

9.4.17 Potential indirect impacts during the operational phase could involve the ecological effects of lighting, noise, human disturbance and emissions to air and water. These are discussed in further detail in the following paragraphs.

Potential Ecological Impacts of Lighting

9.4.18 Following implementation of measures described above in the incorporated mitigation section, a landscape corridor would be maintained along the southern (and western) boundary which is not subject to significantly increased levels of summer nocturnal lighting as shown within Appendix 5.2. This would mitigate impacts on light-sensitive species such as greater horseshoe bat.

Potential Ecological Impacts of Noise

9.4.19 Breeding birds utilising scrub habitats around the periphery of the site, and in similar habitats off-site, such as the hedgerows bounding the B4008 and the wooded stream corridor east of the site may be sensitive to an increase in noise. For the most sensitive bird species, a 52dB contour has been used in some road developments to define a zone of potential impact (ECONAT, 2008). However, it is worth noting that the avifauna of the present site is already subject to traffic noise from the M5 and B4008 with measured noise levels at the site in excess of 52dB. The Noise and Vibration assessment does predict an increase over baseline levels. However, as a result of noise thresholds set by Stroud District Council and Restrictive Covenants associated with the site a number of noise mitigation measures have been included in the scheme design that would reduce noise impacts from the facility. Whilst localised noise impacts may influence the behaviour of breeding birds in areas close to the facility during day time operating hours, these impacts are considered to be minor and not significant.

Potential Disturbance Impacts

9.4.20 The operation of the site would introduce a greater level of human disturbance to the site in the form of vehicle, staff and visitor movements, which could have an impact on birds and other fauna. The site layout locates staff and visitor parking on the north side of the buildings, together with access to the site and visitor centre. The main disturbance factor in the southern and eastern part of the site, which adjoins the area with the greatest potential to support breeding birds, is vehicle movements. There is ample evidence that vehicle movements are much less disturbing to birds than people movements, and also evidence for habituation to both vehicle and predictable people movements. The sensitive ecological receptors in this location are birds of woodland edge and scrub habitats such as whitethroat and chaffinch, which are less likely to be disturbed by movements around the margins of the site than birds of open habitats.

Potential Ecological Impacts of Emissions to Air

9.4.21 In ecological terms, the emissions of greatest potential concern are oxides of nitrogen, sulphur dioxide and ammonia, because of their fertilising or acidifying effect on ecosystems. Nitrogen dioxide and ammonia have a fertilising effect and all three can have an acidifying effect when deposited to soils and vegetation (the alkaline gas ammonia as a source of hydrogen ions). Sensitivity varies between habitats and particular components of habitats, and is reflected in a series of Critical Loads for deposition of nitrogen and acidity. Because of their potential to affect sensitive ecological receptors remote from the site, including European designated sites, it is important to give careful consideration to these potential ecological impacts.

9.4.22 In the wider vicinity of the EfW facility, key potential impacts are associated principally with nitrogen deposition, as levels of sulphur dioxide have declined in recent decades with the reduction in domestic and industrial coal burning.

9.4.23 An air quality assessment has been undertaken for the proposed development and is reported in Chapter 13.0. The assessment predicts the likely stack emissions from the EfW facility and models the dispersion and deposition of nitrogen and acidifying pollutants to sensitive ecological receptors surrounding the site in line with Environment Agency guidelines as follows:

- Special Protection Areas (SPAs), Special Areas of Conservation (SACs) or Ramsar sites within 15 km of the installation (noting that the Environment Agency EPR-H1 guidance note on requires an assessment of sites within 10km of the facility) ; and

- Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs), Local Nature Reserves (LNRs), local wildlife sites and ancient woodland within 2km of the location of the installation.

9.4.24 The assessment found that the predicted contributions of pollutants in the habitats within the study area were less than 1% of the air quality objective or Critical Load for all pollutants, so the contribution is predicted to be insignificant. In order to assess the impact of deposition on these sites the predicted deposition levels were compared with background levels and were found to make a very small contribution. Air quality impacts on European sites are discussed further below.

Potential Ecological Impacts of Emissions to Water

9.4.25 Downstream habitats which could potentially be vulnerable to a water pollution incident include Severn Estuary SAC, SPA and Ramsar Site.

9.4.26 As described in Chapter 5.0, and in the Surface Waters and Flood Risk chapter, mitigation measures have been incorporated into the scheme design and operational procedures which would prevent release of untreated wastewaters to watercourses, and attenuate surface water drainage from car parking areas. Potential ecological impacts on the water environment would therefore be avoided.

Impact Significance

Impacts on European Conservation Sites

9.4.27 A Habitat Regulations Screening Assessment has been undertaken for the proposed EfW facility, this report is included as Appendix 9.6. The assessment considers the potential for the proposed development to result in significant impacts on European Sites within 15 km of the Javelin Park. The following impacts have been assessed within the report:

- loss of habitat;
- air quality impacts from process emissions, vehicle emissions and dust;
- water quality impacts including ground and surface water pollution and abstraction; and
- disturbance.

9.4.28 An initial screening of the above impacts concluded that the development was unlikely to have a significant impact on the integrity of European sites other than potentially from air quality impacts associated with process emissions. As such a more detailed assessment of air quality impacts was undertaken as described in previous section of this chapter.

9.4.29 The air quality dispersion modelling indicates that the predicted concentration of pollutants would be below the threshold at which potentially significant impacts may occur at all of the European sites within 15km of Javelin Park. This included levels of nitrogen deposition at Cotswold Beechwoods SAC, a site highlighted as being particularly sensitive to air quality impacts due to existing high background levels of nitrogen deposition.

9.4.30 Despite the findings of the air dispersion modelling an ecological survey was undertaken at Cotswold Beechwoods SAC to establish if the current background levels of nitrogen deposition were likely to be having an impact on the conservation status of the woodland. The assessment focused on Pope’s Wood, an area of Cotswold Beechwoods SAC where the dispersion modelling predicted the highest levels of nitrogen deposition from the proposed development.

9.4.31 The results of the field survey showed that there were no unequivocal indicators of eutrophication and as such the existing nitrogen deposition levels were not considered to be having a detrimental impact on the conservation status of the woodland.

9.4.32 On the basis of the air quality modelling results and the findings of the field survey it has been concluded that the small predicted increase in nitrogen deposition at Cotswold Beechwoods SAC would be unlikely to have a measurable or significant effect on the integrity of the woodland. As such the proposed EfW facility is not considered likely to result in any adverse effects on the integrity of any European sites.

Impacts on Ecological Interest Features

9.4.33 Table 9.11 summarises the significance of the potential impacts outlined in Table 9.8 above. This combines the scale of importance of the interest feature with the magnitude of predicted impact, to arrive at an assessment of impact significance. This utilises the site integrity or conservation status approach favoured in current guidelines, and arrives at a conclusion based on the criteria set out in Table 9.1. Note that features of negligible interest with no impacts predicted are excluded from the assessment.

Table 9.11: Impact significance

Interest feature	Scale of importance (on site)	Impacts	Potential impact on site integrity or conservation status
Barbastelle Greater horseshoe bat Soprano pipistrelle Noctule Common pipistrelle *Myotis* sp. bats	District-level to negligible	Minor reduction in habitat quality of southern stream corridor.	Very unlikely to prevent habitat utilisation and affect the conservation status of any species in local area. Impacts offset by mitigation and habitat creation during site operation. **Minor significance.**
Little ringed plover	Local	Loss of part of breeding habitat for 1 pair; risk of disturbance during construction.	Development would affect conservation status in local (sub 1km^2) area, but effect is likely to occur in absence of this development. **Moderate significance.**
Badger	Local	Construction disturbance.	Disturbing activities would remain outside licensable range and would not affect conservation status in wider vicinity of site. **Negligible significance.**
Cinnabar moth	Local	Loss of breeding habitat.	Very unlikely to affect conservation status in local area due to common & widespread status and low magnitude of impact. **Negligible significance.**
Skylark Dunnock Song thrush	Negligible (on site)	Disturbance of up to 1 pair on adjacent land.	
Spotted flycatcher	Local	Disturbance / reduction in breeding. habitat quality	Unlikely to affect conservation status in wider area. At most **minor significance**.

Interest feature	Scale of importance (on site)	Impacts	Potential impact on site integrity or conservation status
		for up to 1 pair.	
Linnet	Local	Loss of foraging habitat for small nos.	
Open mosaic habitats on previously developed land	Local	Loss of feature.	Planned development of site and rapid succession makes it unlikely this habitat would persist in absence of development. **Minor significance.**
Stream	Local	Risk of inadvertent impact.	Impacts avoided by incorporated mitigation.
Scrub	Local	Loss of 0.14ha / gain of up to 0.5ha.	Losses during construction phase: **negligible significance**. Gains following mitigation: **minor positive significance.**
Other breeding birds	Local	Loss of small number of territories during construction / similar or slightly larger gains due to mitigation.	No significant impact on conservation status of any component species in the wider vicinity of the site, losses / gains of **negligible significance**.

Compliance with Protected Species Legislation

9.4.34 It is necessary to consider the predicted impacts to determine whether there is any possibility of breaching protected species legislation. Key questions to consider include:

- Will the development comply with European protected species legislation, as implemented by the 2010 Habitats and Species Regulations?
- Will the development comply with UK protected species legislation, including the Schedule 1.1 and Schedule 5 Wildlife & Countryside Act species recorded on site?
- Will the development comply with the 1992 Protection of Badgers Act?

- Are there any other protected species which may need to be considered, other than those already recorded?

9.4.35 The six bat species recorded on site are all European protected species listed on Annex IV of the Habitats Directive, with the rarer barbastelle and greater horseshoe also listed on Annex II; Annex II addresses the need to designate SACs to ensure their favourable conservation status within their European range.

9.4.36 There are no potential bat roosts on site, and site development does not involve any licensable activities. However, there remains a need to properly consider whether the development would avoid disturbance to bats in order to comply with Article 12(1)(b) of the Habitats Directive, as implemented in England through Regulation 41 of the 2010 Habitats and Species Directive. Recent case law emphasises the need to take an individual, species-by-species approach to the assessment of disturbance, and this approach is adopted below.

9.4.37 Of the bat species recorded on site, greater horseshoe are the most likely to be affected by disturbance. They are known to be dependent on habitat corridors and avoid foraging in lit areas. Activities which damage habitat connectivity could be construed as disturbance likely to affect the conservation status of the species in the local area. Evidence from the bat survey suggests an origin from roost sites remote (>4km) from the site and the small number of records suggests the southern landscape corridor is not an important foraging area. As such disturbance effects would be very limited and not considered to affect the conservation status of this species.

9.4.38 In contrast to greater horseshoe, common pipistrelle are a much more abundant species, and while they utilise habitat corridors are known to be less affected by lighting and less exacting in their habitat requirements. However, the south-eastern part of the site appears to be a well-used foraging area for a small population using a roost in reasonable proximity to the site (probably <1km). As such, activities which damage habitat quality or quantity could be construed as disturbance likely to affect local conservation status. Utilisation of the site by other species is at much lower levels, and any disturbance is very unlikely to affect their local conservation status.

9.4.39 The minor habitat loss of scrub on the north side of the stream corridor, lighting and other disturbance during construction, and lighting and other disturbance during operation of the site have been assessed collectively as constituting impacts of minor significance with regard to bat species identified at the site. In terms of the criteria set out in Table 9.1, it is not a major factor in decision-making, is of local importance, and can be addressed through detailed design of the project.

9.4.40 The southern landscape corridor would remain intact and functional for foraging and commuting bats throughout the construction and operating period of the development and a series of design mitigation measures have been described that would reduce / avoid impacts on bats. As such the residual impacts of the development are not considered to constitute disturbance under the current understanding of Article 12(1)(b), and would not '*affect significantly the distribution and abundance of bats in the local area*' (Reg. 41(2)(b), 2010 Habitats & Species Regulations).

9.4.41 The only known Schedule 5 Wildlife & Countryside Act species on site are the bat species. As there is no roost on site or in very close proximity, and the development is unlikely to deliberately or recklessly kill or injure bats, there is little risk of contravening legislation. Measures to avoid site clearance during the bird breeding season would ensure legislative compliance with respect to most breeding birds. The situation with little ringed plover is more complex. As a Schedule 1.1 species, protection extends to deliberate or reckless disturbance during the breeding season, and site clearance operations are likely to inadvertently create habitats which are temporarily more favourable for breeding. Additional mitigation measures would therefore be needed in order to ensure legislative compliance and prevent delays to the construction timetable.

9.4.42 Based on present knowledge of the sett location, the development should comply with the Protection of Badgers Act, using Natural England's current guidelines to define disturbance distances, and should not require licensing. However, as badgers can move setts, it is recommended that permission is gained from the landowner to visit the sett site, and that further checks are made to the status of badgers on site prior to the commencement of construction, in order to ensure that this is still the case.

9.4.43 With regard to other protected species, the County Ecologist raised the possibility that reptiles could occur on site, despite the negative result obtained by RPS using a methodology fully compliant with current guidelines. The commoner reptiles (e.g. slow-worm and grass snake) are protected under Schedule 5, section 9 of the 1981 Wildlife and Countryside Act (1981), as amended by the 1988 Wildlife and Countryside Act 1981 (variations of schedules) Order, against intentional injury or killing (section 9(1)) and trade (section 9(5)). A further check on status is therefore recommended prior to the commencement of development, allowing sufficient time to implement any translocation and advance habitat enhancement works.

9.5 Additional Mitigation

9.5.1 The incorporated mitigation measures previously described adequately address the need to avoid, reduce and compensate for most significant impacts on ecological interest features. Features which cannot reasonably be mitigated for (e.g. little ringed plover) are described in the residual impacts section below.

9.5.2 There are three specific areas described in the preceding section where mitigation measures directed at avoiding impacts on protected species should be strengthened. All of these could be incorporated within the CEMP, as they involve the construction phase of the development. They comprise:

- pre-construction reptile survey (and translocation if required);
- avoiding deliberate or reckless disturbance of little ringed plover during construction;
- ensuring there are no impacts on badger setts prior to construction; and
- avoiding lighting impacts on the stream corridor during the bat activity season.

9.5.3 Measures should be taken following site clearance to reduce the risk of little ringed plover nesting on site. However, this would only be an issue if site clearance proceeds the bird breeding season and construction is scheduled to begin in spring / summer. A late summer / autumn site clearance followed by an autumn to early spring start on site would not create problems, but may not fit with the preferred construction programme. Measures to prevent little ringed plover nesting on site following site clearance could involve using tape or bunting to subdivide open areas, and not leaving exposed aggregate at the surface.

9.5.4 A check should be made on the current status of badger before works commence on site. The surveys should leave enough time for licensing if sett entrances are found within 30m of groundworks or 50m of activities likely to produce subsurface vibration, such as piling.

9.5.5 The CEMP would specifically address the need to minimise light spillage to the southern stream corridor during the main season of bat activity (late March – October). However, on the basis that construction working hours are 0700 – 1900 the likelihood of impacts within most of the bat activity season is low.

9.5.6 Ecological mitigation and enhancement measures would be targeted at achieving the relevant objectives for maintenance of favourable conservation status of Section 41 species and habitats, and of local species and habitats in the Gloucestershire Biodiversity Action Plan. Targeted species and habitats are summarised in Table 9.12, with measures described in more detail in the Landscape and Ecological Management Plan or Construction Environmental Management Plan as appropriate. A draft Landscape and Ecological Management Plan for the proposal is included as Appendix 8.7.

Table 9.12: Summary of ecological mitigation and enhancement targets

Interest feature	Mitigation	Compliance with national and local policy
Bats	Retention of stream corridor; avoidance of lighting impacts; creation of new foraging habitats including pond and glade habitats	Contributes to UK targets for increase of all bat populations. Maintains linkages in the wider landscape in accordance with action plan policy BAT 4.3 in the local BAP.
Little ringed plover	Avoidance of disturbance of breeding birds by timing of site clearance / monitoring of site use	Not a national or local BAP priority species, measures designed to ensure compliance with protection under Schedule 1.1 of 1981 W&C Act

Interest feature	Mitigation	Compliance with national and local policy
	during construction	
Badger	Check survey to ensure no construction disturbance to sett	Not a national or local BAP priority species, measures designed to ensure compliance with protection under 1992 Protection of Badgers Act
Song thrush	Creation of new scrub / woodland edge habitats in restoration scheme	Contributes to UK target of reaching 115% of 2003 population level, also reflected in Local BAP target
Spotted flycatcher	Creation of new glade habitats in restoration scheme	No specified actions for this species in either UK or local BAP, but development would contribute to maintenance of local population levels
Linnet	Incorporation of wildlflower grasslands with seed sources into landscape plan	Contributed to UK target of reaching 115% of 2005 baseline population; actions in local BAP targeted at arable management, which is likely to be more important than actions at this site level
Stream	Retention of corridor with measures to maintain water quality	Complies with Local Habitat Action Plan for Rivers and Streams by maintaining water quality and habitat continuity
Scrub	Net gain at least 0.3ha, designed to maximise wildlife interest by species choice and design	No specific targets in Habitat Statement within Local BAP.

9.6 Residual Effects and Conclusions

Residual Effects

9.6.1 Residual effects which are not amenable to mitigation comprise the loss of an area of "Open Mosaic Habitat on Previously Developed Land" listed as a UK BAP priority habitat. This habitat is used by one protected species (little ringed plover) and two priority species (linnet and cinnabar moth). The area is likely to be of local interest for other foraging birds, and adjoining tall ruderal habitat supports at least one breeding pair of whitethroat.

9.6.2 The only impact likely to affect the conservation status of species in the local area is the loss of part of one little ringed plover territory, due to the lack of similar cleared industrial land in the wider vicinity of the site. It should be emphasised that the impact on little ringed plover would be likely to occur in the absence of proposed development due either to the implementation of the extant planning permission that exists at the site, or if the site remained undeveloped a fairly rapid succession to closed vegetated swards dominated by tall ruderal species.

9.6.3 Smaller areas of suitable habitat for cinnabar moth and linnet would be retained in the southern and western periphery of the site, and in the new landscaped areas. However, it is not possible to deliberately create cinnabar moth habitat, since their food plant, ragwort, is proscribed under the 1959 Weeds Act. There would be a net reduction in suitable habitat area for linnet (flowering grassland and tall ruderal habitat producing weed seeds), which can be regarded as a residual impact of minor significance.

9.6.4 The other identified residual impacts are either of negligible significance, or involve minor impacts during construction which would be mitigated or enhanced by habitat creation.

Conclusions

9.6.5 The assessment has identified a number of ecological interest features on site, of which foraging bats utilising the southern peripheral landscape are the most important in both legislative and nature conservation terms. There is evidence that this part of the site may be important for the maintenance of a small population of common pipistrelle in the local area, and it is used regularly but less intensively by small numbers of greater horseshoe bat. Another rare species, barbastelle, was recorded on one of the three survey occasions, and is unlikely to be dependent on habitat quality or connectivity within the site. *Myotis* bats and soprano pipistrelle also use the site, with occasional overflights by noctule.

9.6.6 The southern landscape corridor also supports a number of breeding birds, with whitethroat the most abundant. Breeding bird density in the western part of the site may be influenced by the proximity of the M5.

9.6.7 Other interest features, notably little ringed plover, utilise more open habitats on the cleared site. These habitats are ephemeral in nature and likely to lose their value for this species in the absence of development.

9.6.8 The construction and operation of the EfW facility would comply with protected species legislation. With the exception of species dependent on ephemeral, open habitats, the development would maintain the favourable conservation status of the protected and priority species identified on site.

9.6.9 A detailed assessment of air quality impacts has demonstrated that the development can proceed without a likely significant effect on European conservation sites. This has been determined both by dispersion modelling and by the assessment of the ecological status and sensitivity of Cotswold Beechwoods SAC.

9.6.10 Ecological mitigation and enhancement proposals implemented as part of the landscaping scheme are designed to link into the most valuable habitat in the south-eastern part of the site and are targeted towards achieving real benefits in habitat quality for key elements of the site's fauna. The landscaping scheme also recognises how the development relates to the wider landscape in terms of species movement, maximising the likelihood of habitat utilisation and maintenance and strengthening of existing wildlife corridors. In this way, the probability of a net positive biodiversity benefit is increased.

9.6.11 On the basis of the ecological impact assessment it can be concluded that the residual impacts resulting from the proposed development are either of negligible significance, or involve minor impacts during construction which would be mitigated or enhanced by habitat creation.

9.7 References

Bat Conservation Trust (2007). Bat Surveys. Good Practice Guidelines. (www.bats.org.uk).

Bibby, C.J.; Burgess, N.D.; Hill, D.A. & Mustoe, S. H. (2000). *Bird Census Techniques. 2nd. Ed*. Academic Press, London.

Department for Communities & Local Government (2006). *Environmental Impact Assessment: a guide to good practice and procedures.*

ECONAT (2008). *Peer exchange group – Transport and Natura 2000.* Seminar of 11th March 2008, Hull.

(http://econat-network.org/docs/documents/Session5a_Transport_PAPER.pdf).

Gilbert. G.; Gibbons, D.W. & Evans, J. (1998). *Bird Monitoring Methods: A Manual of Techniques for Key UK Species*. RSPB, Sandy.

Institute of Ecology and Environmental Management (2006). *Guidelines for ecological impact assessment in the United Kingdo*m. Approved version, 26th June 2006.

Institute for Environmental Assessment (1995). *Guidelines for baseline ecological assessment*. E & FN Spon.

JNCC (2010). *Handbook for Phase 1 habitat survey. A technique for environmental audit*. JNCC, Peterborough.

Marchant, J. H., Hudson, R., Carter, S.P. & Whittington, P.A. (1990). *Population Trends in British Breeding Birds*. BTO, Tring, Herts.

10.0 GEOLOGY, SOILS AND GROUNDWATER

10.1 Introduction

10.1.1 This chapter provides an assessment of the potential impacts from the proposed development on the geology and groundwater at the site. As part of the consideration of ground conditions the assessment considers the geological setting, designated geological sites, contaminated land, hydrogeology, geohazards and geotechnical issues associated with the proposed development and the site.

10.1.2 The presence of contaminated land has the potential to affect both the proposed development and the surrounding environment as a result of development activity. Although the assessment of contaminated land is not a formal requirement under the EIA Regulations or specific legislation (Part 2A of the Environmental Protection Act), current industry best practice is to include an assessment of contamination and the potential impacts arising from it.

10.1.3 The assessment of geohazards and geotechnical issues is similarly not a formal requirement of the EIA regulations though it is also best practice to include it in any assessment. Geohazards is a term covering a broad range of geological and ground related hazards such as landslips, underground mining and compressible soils such as soft clays and peat. Geotechnical issues dictate the foundation design for the scheme and any associated environmental impacts.

10.1.4 The assessment was undertaken for the site and up to 1km from the site where receptors might be impacted. The key justification for this is to identify any potential historic land uses which may have contributed to contamination issues within the site and potentially sensitive land uses in the surrounding area that could be impacted if contaminants were mobilised.

10.1.5 This assessment is aimed at assessing the sensitivity of receptors and magnitude of potential impacts, and used to determine the significance of each impact. The assessment has also been used to assess constraints on the development from geology and ground conditions, including areas where development should be avoided and where mitigation measures might be needed.

10.2 Methodology

Assessment Methodology

10.2.1 The scope of this assessment was as follows:

- a review of whether any designated geological features (RIGS) were likely to be impacted by the development;
- a review of historical land use and potentially contaminated land uses;
- a site walkover;
- a review of the geological and hydrogeological setting;
- a review of the geohazards and mining history of the site and implications on development;
- a review of geotechnical issues and the associated engineering requirements;
- a review of ground gas and radon;
- a review of environmental regulatory information;
- an assessment of the potential impacts and any mitigation measures that might be required; and
- residual impacts following implementation of mitigation measures

10.2.2 Cumulative contamination impacts have been assessed in Chapter 17.0,

Information for Review

10.2.3 The following reports, which provide information on historical site uses, environmental conditions and information relating to intrusive ground investigations at the Javelin Park were reviewed:

- WSP Environmental Ltd, September 2002. Geo-Environmental Assessment, Javelin Park, Gloucester. Prepared for Slough Estates Plc (Appendix 10.1);
- WSP Environmental Ltd, April 2005. Asbestos and Hydrocarbon Investigation Report, Javelin Park, Stonehouse Road, Gloucester. Prepared for Slough Estates Plc (Appendix 10.2);

- RPS Health, Safety & Environment, February 2007. Remedial Strategy, Javelin Park, Gloucester. Prepared for Graftongate Developments (Appendix 10.3);
- RSA Geotechnics Ltd, May 2007. Ground Investigation Report - Proposed Commercial Development of Javelin Park, Quedgeley, Near Gloucester. Prepared for Graftongate Developments Ltd (Appendix 10.4);
- RPS, July 2007. Desk Study for Potential Historical Ordnance Contamination, Javelin Park, Gloucester. Prepared for Graftongate Developments (Appendix 10.5);
- RPS, January 2008. Remedial Completion Report, Javelin Park, Gloucester. Prepared for Graftongate Developments (Appendix 10.6);
- Churngold Remediation Ltd, February 2008. Health and Safety File – Javelin Park, Gloucester. Prepared for Graftongate Investments Ltd (Appendix 10.7);
- Stroud District Council, 28th February 2008. Javelin Park, Gloucester - Remedial Strategy letter (Appendix 10.8)
- Goodrich Projects Ltd, 2nd May 2008. Report on Discovered Asbestos Lagged Pipework, Javelin Park Gloucester (Remediation). Prepared for Graftongate Investments Ltd (Appendix 10.9);
- RPS, September 2008. Desktop Study, Phase 1 Assessment, Javelin Park, Gloucester. Prepared for Gloucester County Council (Appendix 10.10);
- RPS, June 2010. Phase 2 Intrusive Site Investigation, Javelin Park, Haresfield, Gloucester. Prepared for Gloucester County Council (Appendix 10.11); and
- Hydrock Contracting Ltd, November 2010. Javelin Park Addendum Asbestos Pipe and Assocciated Asbestos Impacted Soils Removal Report. Prepared for Graftongate Investments Ltd (Appendix 10.12);.

10.2.4 In addition to the reports outline above the following sources have also been used to provide information on the conditions at the site.

- Landmark Envirocheck report and historical Ordnance Survey maps (included in the RPS (2008) report in Appendix 10.10);

- British Geological Survey 1:50,000 scale map for Gloucester, Solid and Drift Edition (Sheet 234);
- Environment Agency website for Groundwater Source Protection Zones and Aquifer Designations (www.environment-agency.gov.uk);
- Zetica Bomb Risk Map for Gloucestershire (www.zetica.co.uk);
- Health Protection Agency, 2007. Indicative Atlas of Radon in England and Wales. HPA-RPD-033;
- Building Research Establishment (BRE), 2007. Radon - Guidance on Protection Measures for New Buildings ; and
- Gloucester Geology Trust for Regionally Important Geological Site (RIGS) information; (www.glosgeotrust.org.uk).

Intrusive Surveys (Ground Investigation)

10.2.5 A number of ground investigation surveys have been carried out on the site and the wider Javelin Park area to obtain information on ground conditions.

10.2.6 A summary of the works undertaken as part of each investigation has been provided below:

WSP (2002)

10.2.7 This investigation comprised 18no. cable percussion boreholes up to 8.5m below ground level (bgl), six rotary cored boreholes up to 15m bgl, 34no. machine excavated trial pits to between 0.8m and 4.2m bgl and seven window sampler holes up to 4m bgl on the Javelin Park site. The Javelin Park site relates to a larger parcel of land that includes the site comprising an overall area of approximately 11 hectares. As described in Chapter 4.0 the wider Javelin Park site is subject to a number of extant planning permissions for distribution warehousing. As such a number of the ground investigations extend to cover the entire Javelin Park site.

10.2.8 Within the Javelin Park site 27no. of the trial pits and cable percussion boreholes were located on the site.

10.2.9 A total of 38no. soil samples were scheduled for a range of potential contaminants, of which 14no. were located in the site. One groundwater sample was scheduled for chemical testing, this was obtained from the south of the site. In the other wells the amount of water was too small to provide sufficient sample for chemical testing.

10.2.10 Three rounds of ground gas monitoring were undertaken on 18no. wells installed at the Javelin Park site between 1st and 16th August 2002, 10no. of the wells were located on the site.

WSP (2005)

10.2.11 This investigation comprised 35no. trial pits across the Javelin Park site up to 3m bgl, 10no. of these trial pits were located on the site.

10.2.12 14no. soil samples were submitted for laboratory testing comprising petroleum hydrocarbon, none of which were obtained from the site. 20no. samples were also tested for asbestos identification, 3no. of which were obtained from the site.

RSA (2007)

10.2.13 This investigation comprised 13no. trial pits across the Javelin Park site up to 3m bgl to obtain geotechnical information only. However, no location plans were provided with the report so it has not been possible to determine whether this investigation included the site. Therefore, the RSA report has only been used to provide an indication whether any evidence of contamination was noted during the site investigation.

RPS (2007)

10.2.14 This investigation was undertaken on 26th June 2007 on former areas where fuel storage had previously been identified. This site works comprised the excavation of 11no. trial pits (TP1 to TP11) up to 3m depth.

10.2.15 TP1 to TP4 were located in the south of the site, TP5 to TP11 were located to the north of the proposed development are but within the wider Javelin Park site.

10.2.16 Chemical testing was undertaken for petroleum hydrocarbons and volatile organic compounds on 21no. soil samples, of which 8no. were from the site.

RPS (2010)

10.2.17 The ground investigation comprised 15no. machine excavated trial pits up to 3m bgl, eight window sample holes up to 4m bgl, and 10no. rotary drilled boreholes up to 25m bgl. This investigation was undertaken after remediation in 2007 (discussed below) and specifically undertaken for the proposed development. The investigation focussed solely on the site.

10.2.18 Combined gas and groundwater monitoring wells were installed into seven of the rotary drilled boreholes and eight of the window sample holes.

10.2.19 28no. soil samples were tested for a range of potential contaminants.

10.2.20 Two rounds of gas monitoring were undertaken on 28th April and 18th May 2010.

Remediation Works

10.2.21 Remediation works were undertaken at Javelin Park by Churngold Remediation Ltd between 8th October and 21st December 2007, these works are discussed further in Section 10.3. RPS prepared a completion report for the remediation works a copy of which is located in Appendix 10.6.

10.2.22 Vegetation clearance was undertaken followed by handpicking to remove asbestos material which was placed in suitable sacks and stored in skips prior to off-site disposal. Handpicking, using visual identification was used to remove asbestos from stockpiles of demolition rubble, with an excavator being used to turn over the stockpiles for inspection. Visual screening and handpicking of asbestos was also used following the breaking out of concrete slabs and associated site scrape.

10.2.23 Regular monitoring of airborne asbestos fibre concentrations was undertaken on the Javelin Park site (which includes the site) and around the site boundary. The results of the monitoring were included in the Health and Safety File prepared by Churngold which is located in Appendix 10.7.

10.2.24 Further remediation works were undertaken between 30th September and 9th November 2009 by Hydrock to remove asbestos lagged pipes in ducts which had previously been identified in the east of the Javelin Park site (including in the north-east of the site). A copy of the report for this remediation works is located in Appendix 10.12.

Consultations

10.2.25 Consultation was undertaken by RPS in 2007 with the Environment Agency and Local Authority, Stroud District Council (SDC), on the proposed remediation strategy prepared by RPS prior to the remediation works commencing. Correspondence from the consultation process is contained with the RPS Remediation Completion Report (2008) a copy of which is located in Appendix 10.6.

10.2.26 A number of comments were provided to RPS on the proposed remediation strategy by SDC on 19th April 2007. RPS responded to these comments on 4th May 2007 and confirmation was received from the Council on 10th May 2007 that they were satisfied with the remediation proposals.

10.2.27 The Environment Agency also raised a number of comments and concerns relating to contamination in their letter to RPS dated 22nd May 2007. RPS provided a response to these comments on 20th June 2007 which included the proposal to undertake additional investigation in areas of former fuel storage.

10.2.28 The results of this additional investigation were reported by RPS to the Environment Agency in a letter dated 2nd August 2007. Following the additional investigation RPS considered that hydrocarbons within the soils at the site appeared to pose a low risk to controlled waters.

10.2.29 The Environment Agency's response dated 5th September 2011 stated they were in agreement with RPS' findings from a controlled waters perspective.

10.2.30 In a written response to RPS dated 26th February 2008, SDC confirmed they were satisfied with the remediation that had been undertaken at the site. A copy of this correspondence is located in Appendix 10.8.

Summary

10.2.31 The information outlined above has been used to establish the following:

- the geological setting and whether any Geological Designated Sites are present on or close to the site;
- the status of aquifer units at the site and the presence or otherwise of Source Protection Zones;
- likelihood of whether or contamination was likely to be present on the site or in the vicinity; and
- likelihood of whether geohazards or mining were likely to be present on the site or in the vicinity.

10.2.32 The contaminated land assessment has considered the following legislation, regulations and best practice guidance:

- Part 2A of the Environmental Protection Act (EPA), 1990;
- Contaminated Land (England) Regulations, 2006;
- Circular 01/2006 Environmental Protection Act 1990: Part 2A Contaminated Land by Department for Environment, Food and Rural Affaires (DEFRA), September 2006;
- Planning Policy Statement (PPS) 23: Planning and Pollution Control. Annex 2 Development on Land Affected by Contamination. Office of the Deputy Prime Minister (2004) (see comments below);
- BS10175, 2011. Investigation of Potentially Contaminated Sites – Code of Practice;
- BS5930 and Amendments, 2010. Code of Practice for Site Investigations; and
- Environment Agency, 2004. Contaminated Land Report (CLR) 11: Model Procedures for the Management of Contaminated Land.

10.2.33 The assessment of contaminated land in the UK is based on a ‘suitable for use’ approach for a defined end-use. Therefore, the chemical testing results for soil and groundwater have been compared to generic criteria for a commercial land use and relevant published standards taking into account the environmental setting.

10.2.34 A review of the ground gas data collected by WSP (2002) and RPS (2010) from monitoring wells installed as part of these ground investigations has been carried out in accordance with current best practice presented in CIRIA C665 (2007). The results of the preliminary qualitative analysis were developed as part of this assessment, together with gas monitoring results to give a semi quantitative estimate of risk for the site. The method used both gas concentration and borehole flow rates to define a characteristic situation for the site based on the limiting borehole gas volume flow for methane and carbon dioxide.

10.2.35 Unexploded ordnance has been included in this Chapter on the basis that ordnance would be located below ground.

Assessment of Significance / Assessment Criteria

10.2.36 There are no formal guidance documents defining a framework for the specific assessment of impacts with regard to geology and ground conditions. Some aspects of this assessment, for example, contaminated land, do have a structured approach based on risk assessment and where appropriate this has been taken into account in determining the assessment criteria.

Qualitative Risk Assessment for Contaminated Land

10.2.37 Current guidance and best practice for the assessment of contaminated land is based on risk assessment. This risk assessment can be either qualitative or quantitative. It is considered that qualitative risk assessment is sufficient to allow for assessment of the potential impacts for EIA purposes. However, such an assessment is only required if there is a realistic proposition of contamination being present on site.

10.2.38 Under current guidance risk assessment is based on the following model:

Source - Pathway – Receptor

10.2.39 For a risk to be considered plausible a pollutant linkage must be "present and operating", i.e. all three components of the model need to be present. The aim of the risk assessment is to identify, on a qualitative basis, the extent to which linkages may be present and the risks associated with them. The assessment of whether Source – Pathway – Receptor linkages are present is based on a Conceptual Model developed specifically for the site. A Conceptual Site Model has been developed for the proposed development and is described in Section 10.3.

10.2.40 If no contamination sources are considered to be present then the risk assessment would not be developed any further than the Conceptual Site Model. Scenarios have been assessed for the Do-nothing, Construction and Operational Stages.

10.2.41 This approach is considered to be consistent with current guidance and best practice and results in a proportionate approach to assessing contamination and to addressing sites where contamination is very unlikely to be present.

10.2.42 The initial assessment as to whether significant impacts are likely to be present has been based on identifying pollutant linkages using the approach outlined in CIRIA C552 Contaminated Land Risk Assessment A Guide to Good Practice (2001) (CIRIA C552) for a qualitative risk assessment.

10.2.43 The following descriptions on the classification of probability, consequence and risks are provided in CIRIA C552:

Classification of Consequence

Table 10.2 – Classification of Consequence

CIRIA C552 Classification	Examples of Criteria Threshold
Severe	Short term (acute) risk to human health likely to result in 'significant harm' as defined in EPA, 1990 Part IIA. Short term risk of pollution of sensitive water course. Catastrophic damage to buildings/property. A short term risk to a particular eco-system or organism forming part of such eco-system.
Medium	Chronic damage to human health ('significant harm'). Pollution of sensitive water resources. A significant change in a particular eco-system or organism forming part of such eco-system. Significant damage to plants, buildings, structures and services.
Mild	Pollution of non-sensitive water resources. Damage to sensitive buildings, structures, services or the environment
Minor	Harm, although not necessarily significant which may result in financial loss or expenditure to resolve. Easily repairable effects of damage to buildings structures and services.

Classification of Probability

Table 10.3 – Classification of Probability

CIRIA C552 Classification	**Examples of Criteria Threshold**
High Likelihood	There is a pollutant linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution
Likely	There is a pollutant linkage and all the elements are present and in the right place, which means that it is probable that an event will occur
Low Likelihood	There is a pollutant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place, and it is less likely in the shorter term
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term

Table 10.4 – Risk Assessment Matrix

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**High Likelihood**	Very high risk	High risk	Moderate risk	Moderate/low risk
	Likely	High risk	Moderate* risk	Moderate/low risk	Low risk
	Low Likelihood	Moderate risk	Moderate/low risk	Low risk	Very low risk
	Unlikely	Moderate/low risk	Low risk	Very low risk	Very low risk

10.2.44 A description of the classified risks and likely action is outlined below:

- Very High Risk: There is a high probability that severe harm could arise to the designated receptor from an identified hazard or there is evidence that severe harm to a designated receptor is currently happening. The risk, if realised is likely to result in substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
- High Risk: Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and

remedial works may be necessary in the short term and are likely over the longer term.

- Moderate Risk: It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur, it is likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and determine the potential liability. Some remedial works may be required in the longer term.
- Low Risk: It is possible that harm could arise to a designated receptor from an identified hazard but is likely that this harm, if realised, would at worst normally be mild.
- Very Low Risk: There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

10.2.45 It is important to note that the Moderate* risk category is not contained in CIRIA C552. However, it has been included on the basis of the definitions provided for a ‘likely probability’ and ‘medium consequence’. This probability would mean that it is probable that an event will occur, i.e. a significant possibility. A ‘medium consequence’ could involve chronic damage to human health, pollution of sensitive water resources, a significant change in a particular eco-system or organism forming part of such eco-system, significant damage to plants, buildings, structures and services, i.e. ‘significant harm’. Other moderate risks involve either a ‘low probability’ or a ‘mild consequence’ and, therefore, have not been considered to represent a ‘Significant Possibility of Significant Harm’.

10.2.46 Based on the definitions provided in CIRIA C552, Moderate*, High and Very High risks are considered to have the potential to meet the requirements outlined in Part IIA for ‘Significant Harm’ or a ‘Significant Possibility of Significant Harm’.

10.2.47 The risk assessment considered whether a source-pathway-receptor linkage was likely to be present. The degree of risk was then assessed through analysis of the consequence of the effect and the probability of the effect based on guidance outlined in CIRIA C552. The risk assessment assumes that no mitigation measures are introduced.

Effect Assessment

10.2.48 Risks identified as moderate* or above have been identified as having a potentially significant effect in EIA terms on the basis of their potential to meet the requirements outlined in Part IIA for ‘Significant Harm’ or a ‘Significant Possibility of Significant Harm’.

10.2.49 In determining the significance of the effect, the sensitivity of the receptor and the magnitude of the impact are combined. Sensitivity, magnitude and significance criteria were developed for the geology and ground conditions baseline at the site. These are detailed in Table 10.5 to 10.7 below:

Table 10.5: Sensitivity Criteria

Sensitivity	Criteria
Low	Receptor is not a designated geological site Receptor is unproductive strata in hydrogeological terms Low sensitivity land use in terms of contamination for instance a car park, commercial (shops/offices) or industrial development Construction/maintenance works not involving excavations No evidence of geohazard/s on site, within 100m depth beneath the site or in the wider vicinity
Medium	Receptor is locally designated for its geological importance via RIGS system Receptor is a Secondary A or B aquifer Moderate sensitivity land use in terms of contamination for example residential apartments with limited areas of landscaping Construction/maintenance works involving excavations with mitigation measures Geohazard/s are present in the vicinity but are unlikely to be present on the site, within 30m to 50m of the ground surface at the site or within 50m of the site boundary
High	Receptor designated for its geological importance on a national (SSSI/NNR) or international basis Receptor is a Principal aquifer High sensitivity land use in term of contamination for example residential houses with gardens, a children’s nursery/crèche or play area. Construction/maintenance works involving excavations without mitigation measures. Geohazard/s present on site, or at depths of less than 30m

Sensitivity	Criteria
	beneath the site or within 50m of the site boundary

Geologically Designated Areas

10.2.50 This heading considers the sensitivity and potential impacts on sites designated because of their geological importance.

Hydrogeology

10.2.51 This heading considers the sensitivity and potential impacts on groundwater resources. These could arise from alterations in site conditions or from contamination or changes in hydrology but could also be direct impacts from construction, for example, loss of fuels or oils into an important aquifer. In this respect there are links between hydrogeology and contaminated land and hydrology.

Contaminated Land

10.2.52 This heading addresses the risks specifically associated with historic contamination that may be present on the site including potential impacts on human health, ecology and sensitive receptors.

10.2.53 The sensitivity criteria consider two aspects of contamination, firstly whether significant harm or a significant possibility of significant harm is likely to be present or not. This links to Part 2A of the Environmental Protection Act that covers the concept of statutory contaminated land and cases where remediation may be needed regardless whether the site is developed or not. The second aspect is the sensitivity of the site in terms of the end use. Low sensitivity end uses would be ones not used extensively by humans or ones where the proposed development is unlikely to give rise to exposure to contamination. Low sensitivity land uses are considered to be commercial / industrial land uses (as discussed in current guidance) whilst high sensitivity end uses would be residential land uses.

10.2.54 As noted above under current guidance and best practice the assessment of the effects of contamination is based on risk assessment. If contamination is thought to be present then a qualitative risk assessment will be required in addition to any impact assessment. For the purposes of the EIA it has been assumed that this will be necessary for all sites with a potential for contamination to be present and/or a moderate to high sensitivity end use.

10.2.55 Contaminated land links to geotechnics since some geotechnical engineering activities (particularly piling and earthworks) have the capability to alter risks/impacts.

Geohazards

10.2.56 This heading represents a range of potential ground related hazards including mine works, ground dissolution, slope stability, landslide hazard, running sand, shrink/swell clay and collapsible/compressible soils.

Geotechnical Issues

10.2.57 Ground conditions define the geotechnical requirements of the Scheme such as works needed for foundation construction and these activities can give rise to environmental impacts.

Magnitude Criteria

10.2.58 The criteria used to determine the magnitude of a potential impact are defined in Table 10.6 below. Assessment of magnitude includes consideration of the amount and intensity of disturbance and duration, such as whether it is temporary or permanent.

Table 10.6: Magnitude Criteria

Magnitude	Assessment Criteria
Negligible	No or little change from baseline conditions.
Minor	Detectable change to designated geological site or hydrogeological conditions. Development changes site conditions and resulting exposure to contamination represents a low risk to receptors* Development unlikely to be affected by geohazard/s and unlikely to alter any geohazard/s on or near the site
Moderate	Evident change to designated geological site or hydrogeological conditions resulting in temporary or consequential changes to baseline. Development changes site conditions and resulting exposure to contamination represents a moderate risk to receptors* Development may be affected by geohazard/s or could alter a geohazard/s on or near the site

Magnitude	Assessment Criteria
Major	Large scale change to designated site or hydrogeological receptor. Change likely to be permanent/long term. Development changes site conditions and resulting exposure to contamination represents a high or very high risk to receptors* Development represents a near or certain probability of encountering geohazard/s and/or altering geohazard/s over a wider area
* Based on the risk definitions in CIRIA C552 Contaminated Land Risk Assessment A Guide to Good Practice (2001) (CIRIA C552) using a qualitative risk assessment.	

Impacts

10.2.59 The combination of magnitude and sensitivity can be combined to provide a matrix categorisation of impacts. Impacts considered to be significant are shown in grey and are classed as ‘high’. These are shown in Table 10.7 below.

Table 10.7: Impacts Matrix

		Sensitivity		
		Low	**Medium**	**High**
Magnitude	**Negligible**	Negligible	Low	Low
	Minor	Low	Low	Moderate
	Moderate	Low	Moderate	High
	Major	Moderate	High	High

Identification and Assessment of Effects

10.2.60 The following information has been considered as part of the effect assessment.

- status of the effect (beneficial or adverse);
- duration of the effect (short/medium/long term);
- permanent or Temporary;
- direct or Indirect; and
- significance (significant or not significant)

10.2.61 There are no formal guidance documents detailing specific assessment criteria of effects with regard to geology and ground conditions. However, conclusions can be drawn on the significance of each effect through reference to relevant EIA legislation and guidance, professional judgment, evaluation against the effect assessment criteria detailed below and the outcome of the contaminated land risk assessment.

Status of the Effect

10.2.62 The status of the effects were assessed by considering whether the proposed development would have a beneficial or adverse effect on the receptor, and whether the proposed developments would lead to a change in exposure.

Duration of the Effect

10.2.63 In assessing the effect, the likely length of the effect has been considered. These have been summarised under the following timescales:

- Short Term – construction (ground works only) phase; and
- Long Term – operational phase;

Permanent or Temporary

10.2.64 In assessing whether an effect is permanent, the effect will be regarded as one which is not reversible and would last for the lifespan of the proposed development and beyond.

10.2.65 A temporary effect was considered to be one that is reversible or where it ceases to be an issue at some point during the proposed development.

Direct or Indirect

10.2.66 Direct effects are considered to arise from the proposed development. For the purposes of this particular assessment an indirect effect is one which is not considered to arise directly from the proposed development or one which is already present and may continue after the proposed development has been constructed.

Significance of the Effect

10.2.67 Significance has been assessed using the matrix in Table 10.7. In addition to any standard best practice measures adopted during construction and operation of the site, consideration has been given to the need for mitigation measures for moderate and high impacts.

Do Nothing

10.2.68 Consideration has been given to the "Do Nothing" scenario where existing impacts will continue.

10.3 Baseline

10.3.1 This section provides a detailed description of the baseline conditions based on survey data and relevant information gathered from previous assessment work, investigations and consultations.

Geology & Designated Geological Sites

Published Information

10.3.2 Information relating to ground conditions has been derived from the published British Geological Survey (BGS) maps, 1:50,000 scale, Sheet 234, Solid and Drift edition, Gloucester.

10.3.3 The geological maps show the site is underlain by Lower Lias bedrock which is described as "mainly clay". No superficial deposits (drift) are shown at the site. The nearest are "Third (Main) Terrace" which are described as gravels of the River Severn approximately 200m southwest of the site.

10.3.4 The Envirocheck Report provided in Appendix 10.10 describes the bedrock as Blue Lias Formation and Charmouth Mudstone Formation which are of Jurassic age. These are described as a sequence of very stiff clay and mudstone with interbedded thin limestone bands. No superficial deposits (drift) are shown at the site, the nearest are Cheltenham Sand and Gravel deposits less than 200m southwest of the site.

10.3.5 The Cheltenham Sand and Gravels and the "Third (Main) Terrace" gravels appear to relate to the same deposits, with the Cheltenham Sand and Gravels being the more recent name.

10.3.6 No made or reworked ground is shown on the published information for the site. However, made and/or reworked ground is likely to be present associated with the former land uses identified in Table 10.9 below.

Previous Investigations

10.3.7 A number of previous ground investigations have been undertaken on and adjacent to the development area. The most recent was undertaken in 2010 and related only to the site. This investigation was also undertaken after the remediation works in 2007 and represents the most recent information relating to ground conditions.

10.3.8 The following sequence of ground conditions were identified during the 2010 investigation which are consistent with those encountered during previous investigations.

Table 10.8 – Review of Current Ground Conditions in Development Area

Strata	Depth to Base (m bgl)	Thickness of Strata (m)	Description
Topsoil	0.1 to 0.4	0.1 to 0.4	Firm dark brown silty clay with frequent roots and organic matter
Subsoil	0.4 to 0.8	0.3 to 0.7	Brown silty clay frequently with organic matter
Made ground	0.05 to 2.0	0.05 to 2.0	Gravels and cobbles of concrete and stone, clays, gravelly clays and sands with frequent infill material largely comprising brick and concrete
Superficial Deposits	1.8 to 2.8	0.4 to 2.2	Soft grey brown clay, slightly friable in places – only encountered in two locations.
Highly Weathered	0.8 to 2.6	0.1 to 2.2	Firm to stiff grey, brown, green, orange and blue mottled clays. Thinly laminated, fissured in and gravelly in places.
Lower Lias Clay (Bedrock)	1.6 to 4	0.2 to 2.15	Stiff to very stiff grey occasionally brown clay with mudstone in places
Lower Lias Clay (Bedrock)	Base of this strata was not proved	Base of this strata was not proved	Hard grey clay and weak to moderately weak mudstone

10.3.9 No geologically designated sites (SSSI or RIGS) have been identified within 1km of the site and there are no rock outcrops exposed on the site.

Hydrogeology

10.3.10 The Envirocheck Report provided in the RPS (2008) Desk Study report (included in Appendix 10.10) shows the site to be located in an area classified as Non-Aquifer. The classification 'Non Aquifer' is defined as "formations which are generally regarded as containing insignificant quantities of groundwater. However, groundwater flow through such rocks, although imperceptible, does take place and needs to be considered in assessing the risk associated with persistent pollutants."

10.3.11 In April 2010 the Environment Agency introduced a new classification system for aquifers.

10.3.12 The Environment Agency website shows the superficial deposits at the site are classed as unproductive strata. These are underlain by a strata classed as a Secondary (undifferentiated) aquifer which is associated with the bedrock.

10.3.13 The Environment Agency consider unproductive strata to be rock layers or drift deposits with low permeability that have a negligible significance for water supply or river base flow. The term "Secondary Undifferentiated" aquifer has been assigned in cases where strata has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

10.3.14 No groundwater abstraction source protection zones are located within 1km.

10.3.15 The following evidence of groundwater was encountered on the site and at the adjacent Javelin Park site immediately to the north during ground investigations:

- WSP (2002): No groundwater was encountered by WSP in boreholes during drilling in 2002. Subsequent water monitoring encountered standing water levels between 0.1m and 4.41m bgl;

- WSP (2005): "Perched" groundwater was noted by WSP in two of the 35no. trial pits within the made ground at 0.4m and 1.4m bgl. Groundwater was not encountered in the bedrock;
- RSA Geotechnics (2007): "Perched" groundwater was encountered as seepages at 0.9m to 1.2m bgl in trial pits. Groundwater was subsequently noted as standing in two of the trial pits at 1.8m and 2.2m depth on completion of the excavations;
- RPS Letter Report to EA, 2nd August 2007(in RPS Completion Report, 2008): No groundwater was encountered in the 11no. trial pits which were excavated up to 2.9m bgl; and
- RPS (2010): Groundwater was encountered in 7no. of the 15no. exploratory holes investigated; six from the made ground and one in the underlying clay. Subsequent water level monitoring by RPS showed standing water levels of 0.24m to 2.08m bgl in soils. In the bedrock standing water levels ranged from 1.05m to 2.95m bgl. Groundwater in the bedrock appears to be confined (i.e. groundwater is under pressure and would rise above the level of overlying strata when penetrated during drilling).

Contaminated Land

Desk Study

10.3.16 The historical Ordnance Survey (OS) maps (included in Appendix 10.10 of this Chapter) date from 1885 onwards and show the following features at the site.

Table 10.9 – Summary of Historical Land Uses

Date	Development Area	Surrounding Area
1885 – 1968	The development area is shown as open fields separated by field boundaries. Two drainage ditches are shown on the 1885 to 1923 maps flowing from the east of the site in a westerly direction before flowing in a north-westerly direction from the centre of the site.	The surrounding area is mainly open fields; an area of woodland is shown to the east of the site until 1988. The 1954/1955 map shows the area to the south-west of the site as "airfield".
1972 – 2008	One large and one smaller building are shown located in the east of the site (the larger building extends to the north of the site boundary) with the remainder of the site comprising	A series of buildings are shown to the north of the development area, with a tank shown to the north of the buildings approximately 200m north of

Date	Development Area	Surrounding Area
	hardstanding (runway and dispersal areas associated with the former airfield) and soft landscaping areas. A small building is shown towards the centre of the site on the 1974 and 1988 maps. The smaller of the two buildings at the eastern boundary is no longer shown on the 2000 map. In 1988 the site is shown as the Bilton Industrial Estate, the Bilton Cargo Centre in 2000 and Javelin Park in 2008 when the building on-site and immediately to the north are no longer shown.	the site. To the east of these buildings are "sewage beds" approximately 30m north of the development area. Part of a runway and dispersal areas associated with the former airfield are present.

10.3.17 Although not shown on the historical OS maps the site formed part of a larger airfield during World War II and was used by the Gloster Aircraft Company to build aircraft during and after the war. Information on activities at the site during and after World War II relating to the former airfield is discussed below.

10.3.18 The Envirocheck Report does not contain any records of landfills or registered waste management facilities within 250m of the site.

10.3.19 This Envirocheck Report has records of one Control of Major Accident Hazards Site (COMAH) located 65m to the north-east of the site. This relates to W L Vallance Ltd, Bilton Cargo Centre although it notes that "Record Ceased To Be Supplied Under COMAH Regulation" which appears to be consistent with the buildings to the north in the Javelin Park site having been demolished.

10.3.20 There are no other records for any hazardous substance authorisations, discharge consents, contemporary trade directory entries, fuel stations, or statutory environmentally designated sites within 500m of the site.

10.3.21 There is one recorded pollution incident in the Envirocheck Report on 9th April 1997 at the site which relates to a "small amount of oil" from a leaking tank which had "no adverse effects" and was recorded as a Category 3 - Minor Incident. The location of this incident at the site is not given.

Evidence of Contamination

10.3.22 Evidence of contamination has been identified during previous ground investigations. A review of the contaminants encountered has been provided below, this is presented in chronological order.

WSP (2002) Geo-Environmental Assessment

10.3.23 This investigation relates to the site but also includes the wider Javelin Park site to the north comprising an overall area of approximately 11 hectares. The work was undertaken for a proposed distribution warehouse and light industrial estate use with associated car parking and service areas, known as Javelin Park.

10.3.24 At the time of this investigation the following buildings were still present in the eastern part of the site. These were described as four large warehouse buildings originally constructed as aircraft hangars and were referred to by the following numbers:

- 1067, 1069 and 1072 were present as three separate buildings and located to the north (i.e. outside) of the site; and
- 1070, 1073 and 1074 were all adjacent to each other and located within the site, although the northern end of 1070 and 1073 extended beyond northern boundary. WSP appear to have counted this as one building even though three reference numbers were applied to it.

10.3.25 The buildings were described as being constructed of corrugated iron sheeting with asbestos cladding and roofing on steel frames. The location of these buildings is shown in Appendix II of the WSP report.

10.3.26 The following areas of fuel/oil storage have been noted on and adjacent to the site:

- a diesel tank to the south of former Building 1070 located in the south-east corner of site, WSP noted this tank had been removed “by 2002” but no further information was provided;
- a diesel tank and dispensing pumps enclosed in a metal container to north-west of former building 1073, approximately 10m to 15m north of the site;

- a tank at the northern corner of former Building 1069 approximately 200m north of the site. This tank is shown on the 1972 historical map in Appendix 10.10; and
- within approximately 50m to the north of the eastern end of the development area were two brick bunds on a grassed area at southern edge of former Building 1072 – although the tanks were not longer present. An electrical substation was noted as being present adjacent to these bunds – this substation is shown on the Envirocheck report in Appendix 10.10 at the south-west corner of Building 1072.

10.3.27 References provided by WSP relating to a previous report (not available) dating from 1999 notes there was a "bunded red diesel tank and dispensing pump by the south-west corner of former Building 1073" which would have been within the site, close to the southern boundary. Comments were provided from a site walkover in February 1999 which noted the bund was "evidently leaking, and had allowed relatively large amounts of fuel to spread". However, the report also noted that no obvious signs of spillage were subsequently observed near these tanks during a site visit in June 2001.

10.3.28 In addition to the above fuel tanks a former timber treatment tank was noted by the south-west corner of former Building 1067 approximately 120m north of the site.

10.3.29 It should be noted that none of the above tanks are now present on the site, they have all been removed as part of the demolition and clearance process.

10.3.30 Derelict sewage beds were noted north of the former runway in the Javelin Park site which is to the north of the site.

10.3.31 Fragments of cement bound asbestos were noted across the wider Javelin Park site during this investigation in 2002. Within the site, fragments were noted at the following locations:

- within a bund parallel to the stream on the southern boundary;
- on the concrete hardstanding to the south of Buildings 1073 and 1070;
- on the grassed area immediately west of Building 1073; and

- fly tipping to the south-east of an above ground air raid shelter.

10.3.32 This appears to have been located towards the centre of the development area in an area described by WSP as being immediately south of a compound located on the southern edge of the central airstrip (the location of the air raid shelter is shown in the WSP 2005 report in Appendix 10.2).

10.3.33 Evidence of contamination was noted in the following exploratory holes located on, or close to the site. The location of these exploratory holes is shown in Appendix II of the WSP report which is located in Appendix 10.1 of this Chapter:

- TP28 that was excavated to the south of Building 1073; a “hydrocarbon odour” was noted in the made ground from 0.2m to 0.8m bgl;
- BH13cp that was drilled to the southwest of Building 1073; “slight hydrocarbon odours” were noted in the made ground from 0.5m to 1.5m bgl;
- BH6CP and TP36 that were located adjacent to the diesel tank and dispensing pumps north-west of Building 1073 (close to the northern site boundary); an “oily touch” and “hydrocarbon odour” was noted in made ground from 0.25m to 0.5m depth in BH6cp and “diesel” odours were noted at 0.2m to 0.8m depth in TP36; and
- TP13 that was excavated to the south of Building 1072 (north of the site); this trial pit was terminated at 1.5m depth due to fast infill of water which had an oily floating layer on the surface and a diesel odour.

10.3.34 The chemical testing results for soils are considered low for the proposed land use.

10.3.35 One groundwater sample was obtained from BH13cp and scheduled for chemical testing. This well was installed into clay/weathered bedrock in the south of the site, near to the location of the former fuel tank in the south-west corner of Building 1073. Elevated concentrations (350µg/l) of petroleum hydrocarbons were present in groundwater from this borehole. In the other wells the amount of water was too small to provide sufficient sample for chemical testing.

10.3.36 The WSP report has been included as Appendix 10.1.

WSP (2005) Asbestos and Hydrocarbon Investigation

10.3.37 This report relates to the site but also includes the wider area of Javelin Park to the north. The aim of this investigation was to identify and delineate areas of asbestos and hydrocarbons and supplement the data recovered in 2002 (discussed above).

10.3.38 The former warehouse buildings identified at the site in 2002 had been demolished prior to this investigation although the concrete floor slabs were still reported to be present along with the surrounding access roads. Rubble from the demolished buildings was reported to be present in several large stockpiles.

10.3.39 Fly tipped material was reported within the stockpiles and along the northern boundary of Javelin Park, north of the development area. Fly tipped material previously noted in 2002 near the southeast corner of the site was no longer present and it is possible this could have been mixed into the stockpiles present onsite at that time.

10.3.40 Significant quantities of surface lying asbestos cement were identified across the majority of the site, and in particular at the following locations:

- in the immediate vicinity of the electrical substation (south of Building 1072, to the north of the site);
- within the air raid shelter;
- amongst vegetation at north-east corner of the Javelin Park site (but outside of site); and
- an area adjacent to the perimeter fence adjoining the garden centre (outside of site, north-east of Javelin Park).

10.3.41 Within the site the majority of asbestos observations at trial pits locations relate to surface material with only two asbestos cement fragments being identified below the ground surface at the following locations which are shown in Appendix I of the WSP located in Appendix 10.2 of this Chapter:

- TP120 at 0.2m bgl located at southern end of former Building 1073 in the south of the site; and

- TP125 at 0.0 to 0.2m bgl located in a former grassed area towards the centre of the site.

10.3.42 Pipe insulation containing amosite asbestos was identified on a pipe crossing the stream in the south-east of the site.

10.3.43 Visual and olfactory evidence of hydrocarbon contamination was noted in the wider Javelin Park site during the ground investigation, but not within the site.

10.3.44 The highest concentrations of hydrocarbons were obtained from TP116 located close (approximately 10m) to northern boundary of the site, to the north-west of Building 1073.

10.3.45 The WSP report has been included as Appendix 10.2.

RPS (2007) - Remediation Strategy

10.3.46 The Remediation Strategy identified the requirement to remediate asbestos located at the ground surface and within stockpiles in the development area by hand picking of fragments.

10.3.47 Whilst the Remediation Strategy identified the need to remediate asbestos within the made ground, this was associated with the area of Javelin Park site to the north of the site.

10.3.48 Copies of correspondence provided from the Environment Agency and Local Authority shows they had agreed to the proposed remediation strategy. Consultations with regulatory authorities have been discussed in Section 10.2.

10.3.49 The RPS report has been included as Appendix 10.3.

RSA (2007) Ground Investigation

10.3.50 This investigation was undertaken to determine the ground conditions and provide recommendations as part of the design for two proposed large warehouse units, and in particular to assess the suitability of re-using shallow soils as engineered fill. These buildings were not subsequently constructed.

10.3.51 This investigation did not include any contamination testing or assessment as this information was obtained during investigations in 2002 and 2005 (discussed above).

10.3.52 Copies of the exploratory hole logs and plan showing the exploratory hole locations was not provided. However, the report indicates that "occasional asbestos fragments" present in the made ground in the western part of the site.

10.3.53 The RSA report has been included as Appendix 10.4.

RPS (2008) Remediation Completion Report

10.3.54 Remediation works were undertaken by Churngold Remediation Ltd between 8th October and 21st December 2007 to mitigate potential risks from asbestos contamination on and within the ground.

10.3.55 Following the breaking out of a concrete slab as part of the remediation works two underground storage tanks (each approximately 2m diameter by 5m length) were encountered to the south of the former substation which was located north of the site (adjacent to the southwest corner of former Building 1072). These tanks were located in a chamber within "firm clay". The base of the chamber was lined and the tanks surrounded by clay.

10.3.56 Prior to their removal, water was removed from both tanks with no evidence of hydrocarbons noted in the tanks. The surrounding clays within the chamber were noted as being stained black with a moderate hydrocarbon odour. However, the impact was noted as being limited by the concrete wall and base with hydrocarbons only extending approximately 0.1m into the surrounding clays. Impacted soils were excavated and sent for off-site disposal. Five soil samples were collected from the faces and base of the excavation for validation with a peak result of 350mg/kg indicating that hydrocarbon impacted soils were successfully removed from this location.

10.3.57 A second chamber constructed of red bricks was identified in the south-eastern corner of the tank chamber discussed above during excavations. This chamber was approximately 6m by 12m by 2m and appeared to have been filled with demolition rubble, much of which was also described as black stained and odorous. The concrete and brick walls to this chamber were subsequently broken out. Validation samples were collected from the base and faces of the excavation. Two samples contained no detectable hydrocarbons, and the highest recorded concentration was 46 mg/kg indicating that hydrocarbons had been successfully removed from this location.

10.3.58 Water removed during the remediation works to the north of the site totalled 11,250 litres and contained 0.15% oil.

10.3.59 During a site visit by RPS on 24th October 2007, preliminary excavations were undertaken to remove diesel-impacted fill material approximately 200m north of the site (towards the northern boundary of the Javelin Park site). Hydrocarbon-impacted soils were encountered within a band of 0.1m thickness, immediately overlying clay deposits. Earthworks were undertaken to delineate the impacted made ground. Approximately 0.6m thickness of "clean" fill material was removed and segregated followed by excavation of the underlying hydrocarbon impacted material. Validation samples from the faces and base of the excavation showed a peak concentration of 14 mg/kg for petroleum hydrocarbons indicating that diesel-impacted soils had been successfully removed from this location.

10.3.60 All of the works discussed above to remove petroleum hydrocarbons were located outside of the site.

10.3.61 A total of 3 tonnes of asbestos and 590 tonnes of hydrocarbon-impacted soils (classified as non-hazardous waste) were disposed off site. The excavations resulting from remedial activities were infilled using site-won 6F2 crushed concrete and bricks produced from the breaking out of ground slabs.

10.3.62 In addition, a number of pipes were identified in a culvert beneath a concrete slab towards the north-eastern boundary of the site during the remediation works. These pipes were noted as being lagged with a fibrous material subsequently identified as containing amosite fibres. Additional excavations at the time confirmed that the pipes extended to a length of up to 110m, and in some locations, four pipes were found parallel to each other. These pipes appear to have extended from the stream in the southeast corner of the site, parallel to the eastern site boundary (where an examination pit was excavated at one location along its route), before passing beneath the wooden fence and extending towards the road. Further information on these pipes has been provided below.

10.3.63 The RPS report has been included as Appendix 10.6.

Churngold (2008) Health and Safety File

10.3.64 Further information relating to the remediation works in 2007 is contained in the Churngold Health and Safety File which is located in Appendix 10.7. This includes method statements, risk assessments, laboratory testing, asbestos surveys, site photographs and waste transfer notes.

10.3.65 The works to remove asbestos containing materials comprised:

- asbestos survey on two buildings prior to demolition;
- initial walkover of the site to surface pick asbestos containing materials prior to commencing works with plant and machinery;
- vegetation clearance, which included a watching brief for asbestos containing materials;
- breaking out of hardstanding and inspecting the sub-base for asbestos containing materials;
- sorting of four stockpiles using an excavator with the handpicking of any asbestos containing materials; and
- a final site walkover on completion of the works to hand pick any remaining asbestos containing material.

10.3.66 It should be noted that with the exception of works to remove former fuel storage tanks, a rubble filled chamber (which was outside of the site) and breaking out of hardstanding, no further works were undertaken to remove asbestos containing materials from below ground level.

10.3.67 No asbestos fibres were detected from any of the health and safety monitoring undertaken during the works. The monitoring comprised personal monitors for operatives involved in the picking of asbestos fragments and also environmental monitors situated around the working area to screen for airborne fibres.

10.3.68 Information relating to the removal of petroleum hydrocarbons (which were located outside the site) has been provided in the section above relating to the RPS Remediation Completion Report. Stroud District Council subsequently confirmed they were satisfied with the remediation that had been undertaken at the site. A copy of this letter has been included in Appendix 10.8.

Goodrich (2008) Asbestos Lagged Pipework

10.3.69 This report relates to a survey of lagged pipes in a duct discovered during the breaking out of concrete hardstanding in the eastern part of the Javelin Park site (which includes the north-east of the site) as part of the remediation works in 2007.

10.3.70 In some areas the duct was noted as containing nine pipes. Testing of the lagging showed this contained amosite and chrysotile asbestos. The duct and pipe work are likely to have been associated with a former heating main at the site.

10.3.71 Removal of these pipes was carried out in 2009 and information relating to the removal of these pipes has been provided below. The Goodrich report has been included as Appendix 10.9.

RPS (2008) Desk Study

10.3.72 This report was undertaken in 2008 specifically for the site and, therefore, post-dates the remediation works in 2007. None of the structures previously identified on the site were present during the site visit in September 2008.

10.3.73 The western half of the site was largely free from above ground features. One piece of corrugated cement bound asbestos cement sheet was noted on the ground surface.

10.3.74 Eight stockpiles were identified in the eastern half of the site comprising brick, concrete, earth, vegetation and tarmac that are understood to have been recovered during demolition and remediation of the site. Individual fragments of cement bound fibrous material were noted which were considered to be potentially asbestos containing material at three of the five stockpiles located in the south of the site.

10.3.75 A series of three brick lined pits and a trench with pipe work was present in the north-east corner of the site. The pipe work appeared to be insulated with possible asbestos lagging. A pair of vertical pipes were also noted to the south of the trench that were considered could be associated with an underground tank or fire hydrant. These appear to be the same asbestos pipes identified during the remediation works.

10.3.76 No visual or olfactory evidence of hydrocarbon contamination was noted during the site walkover.

10.3.77 The RPS report has been included as Appendix 10.10.

RPS (2010) Intrusive Site Investigation

10.3.78 This report relates to a ground investigation undertaken on the site. The works were undertaken for the proposed “strategic waste management facility” at the site.

10.3.79 A concrete rubble stockpile was present in the north-east part of the site.

10.3.80 The following visual and/or olfactory evidence of contamination was identified during the ground investigation in the central and eastern parts of the site:

- sands and gravels of ash and clinker in BH6 (0.35 to 0.4m bgl);
- sands and gravels of ash and clinker in WS8 (0.65 to 0.7m bgl);
- sands and gravels of ash and clinker in TP12 (0.6m bgl);
- sands and gravels of ash and clinker in TP13 (0.6m bgl); and
- black silt within silty topsoil in BH7 (0.0 to 0.2m bgl).

10.3.81 No olfactory evidence of contamination was noted in the exploratory holes listed above. The location these exploratory holes are shown on Drawing JER4688-001a which is located in Appendix 10.11 of this Chapter.

10.3.82 Visual and olfactory evidence of contamination was identified in TP10 as oily staining within an upper peat layer in the superficial clay between 1.4m and 1.6m depth. TP10 was located in the south of the site, near to a former fuel tank. This appears to be localised contamination.

10.3.83 A fragment of asbestos cement roof cladding, about 15cm by 2cm was noted at the ground surface of TP10.

10.3.84 None of the soil testing results exceeded the human health assessment criteria for a commercial land use.

10.3.85 No asbestos was recorded in the six soil samples tested.

10.3.86 Seven groundwater samples were obtained for chemical testing. Locally elevated concentrations of boron, selenium, ammoniacal nitrogen, sulphate, polyaromatic hydrocarbons and petroleum hydrocarbons were identified in the groundwater samples tested. Bis(2-ethylhexyl)phthalate was also present above lower detection limit in one location (BH7D, weathered bedrock).

10.3.87 Two rounds of gas monitoring were undertaken on 28th April and 18th May 2010 and the results are discussed below.

10.3.88 The RPS report has been included as Appendix 10.11.

Hydrock (2010) Asbestos Pipe and Impacted Soil Removal

10.3.89 This report relates to the removal of asbestos lagged pipes and associated fill material from the duct discovered in the eastern part of the Javelin Park site (which includes the north-east of the site) during the remediation works in 2007.

10.3.90 The works comprised the following:

- supplementary investigations to confirm the extent of the ducts and the presence/absence of asbestos fibres on and around the works area;
- excavation of gravel fill material overlying the pipes within the ducts. The majority of this material was considered suitable for retention and was stockpiled at Javelin Park to the north of the site. Unsuitable material was disposed to landfill; and
- removal of asbestos lagged pipes and remaining gravel fill from the ducts. Asbestos impacted material was disposed to landfill.

10.3.91 A total of 90 tonnes of asbestos contaminated material were removed off-site to landfill.

10.3.92 Ambient air monitoring for asbestos fibres during the works did not show the control limit was exceeded. These monitors were located around the working area.

10.3.93 All "known asbestos impacted materials" identified during the works on the site was reported to have been removed to landfill or stockpiled at Javelin Park to the north of the site.

10.3.94 The Hydrock report has been included as Appendix 10.12.

Geohazards

10.3.95 The Landmark Envirocheck Report included in Appendix 10.10 shows the following potential for geohazards at the site:

- Potential for Collapsible Ground Stability Hazards – no hazard;
- Potential for Compressible Ground Stability Hazards – no hazard;
- Potential for Ground Dissolution Stability Hazards – no hazard;
- Potential for Landslide Ground Stability Hazards – very low (as the site is flat there is unlikely to be a landslide hazard);
- Potential for Running Sand Ground Stability Hazards – no hazard;
- Potential for Shrinking or Swelling Clay Ground Stability Hazards – low; and
- Shallow Mining Hazards – no hazard

10.3.96 The Landmark Envirocheck Report does not list any of the following in the development area:

- Brine Compensation Area;
- Mining Instability; and
- Natural and Mining Cavities.

Mining

10.3.97 Information provided with the Envirocheck report indicates there is no hazard from Coal Mining Affected Areas as the site is "in an area which may not be affected by coal mining". This is standard terminology used by the Coal Authority and the ground conditions identified do not indicate that coal mining would be present in this area.

10.3.98 Desk based research and observations made during the site walkover revealed there to be evidence of historic quarrying on the site or within 500m of the site. No other forms of mineral extraction have been identified within 500m of the site.

Ground Gas and Radon

10.3.99 No current or historic landfills have been identified within 250m of the site in the Envirocheck report or from historical OS maps (Appendix 10.10).

10.3.100 A total of five round of ground gas monitoring have been undertaken at the site. The results from the monitoring are as follows:

- Methane was recorded at 0.1% or below the lower instrument detection limit (<0.1%);
- Carbon dioxide has ranged from <0.1% to 2.5%; and
- the peak borehole flow rate was 0.7 litres per hour (l/hr).

10.3.101 A gas screening value (GSV) has been derived using the gas monitoring results and guidance outlined in CIRIA C665 (2007). This has been based on the peak results obtained for methane, carbon dioxide and flow rate from all the previous rounds of ground gas monitoring at the site. Where gas concentrations did not exceed the lower instrument detection limit it is assumed the parameter is present at the detection limit. The use of the peak values from the site is potentially a conservative approach as it includes results from different horizons.

10.3.102 A gas screening value of 0.0175l/hr has been calculated for carbon dioxide and 0.007l/hr for methane at the site.

10.3.103 On this basis, the GSV derived for methane and carbon dioxide within the building footprint would correspond with Characteristic Situation (CS)1 in CIRIA C665 (2007) and protection measures for ground gas would not be required.

10.3.104 The results for carbon dioxide exceed the long and short term workplace exposures limits.

10.3.105 The Health Protection Agency Indicative Atlas of Radon in England and Wales (2007) shows the site to be in an area where less than 1% of homes are at or above the action level for radon. BR211 indicates that no protection measures would be required for radon.

UXO

10.3.106 The Zetica Bomb Risk Map for Gloucestershire shows the site to be in an area of low risk area from unexploded ordnance (UXO).

10.3.107 Zetica lists low-risk regions as those with a bombing density of up to 10 bombs per 1000 acres. These areas are considered by Zetica to have a significant but low UXB risk. In general, further action to mitigate the risk is considered prudent, although not essential. Care is required when assessing the risk for specific sites where the risk may be higher because of local wartime activity.

10.3.108 The RPS Desk Study for Potential Historical Ordnance Contamination Report (2007) in Appendix 10.5 indicates the site is located in the north-eastern part of a former airfield which extended to the west and south-west.

10.3.109 The information obtained indicates that Harefield airfield opened in November 1939 as a landing ground and occasional training base for various military units. In 1941 the site was upgraded to a permanent training base when it became known as RAF Moreton Valance. In 1943 the main runway was lengthened and additional hangers constructed to accommodate the Gloster Aircraft Company for developing, building and test flying aircraft. At the end of World War II the RAF withdrew from the site leaving it to the Gloster Aircraft Company with the site ceasing all aviation operations and closing in 1962. The former assembly hangers were converted to a trading estate, with other buildings and runways left to deteriorate.

10.3.110 The airfield is understood to have contained a number of bomb stores and related buildings to the south of the former airfield (shown on a 1948 plan within the report in Appendix 10.5). However, no evidence was obtained to suggest that ordnance was stored on the site as the buildings were associated with the Gloster Aircraft Company rather than the RAF.

10.3.111 The town of Gloucester was subject to a low level of bombing during World War II and no records were identified any specific records of bomb strikes at the site or discoveries of UXO. It is unlikely that bombs landing on the site would have gone undetected or being dealt with as the airfield was active during World War II. There are understood to have been records of bombs landing approximately 2km to the east near the Village of Moreton Valance on 12th March 1941 comprising more than 20no. high explosive bombs. Anecdotal evidence was also noted relating to bomb craters adjacent to the A38, which was used extensively by military vehicles produced in Gloucester and convoys carrying troops, suggesting it was bombed during the war.

10.3.112 The risks associated with UXO from enemy bombing, airfield munitions and anti-aircraft shells are considered to be low.

10.3.113 The RPS report has been included as Appendix 10.5.

Aggressive Ground Conditions

10.3.114 Testing for concrete in aggressive ground conditions has been undertaken as part of the ground investigations on the site and the results compared to guidance provided in BRE Special Digest 1 (2005).

10.3.115 The results obtained for water soluble sulphate are consistent with a design sulphate class up to DS-4, and the Aggressive Chemical Environment for Concrete (ACEC) class AC-4 based on mobile groundwater conditions.

10.3.116 The results derived for total potential sulphate in the site have ranged from DS-1 to DS-5, ACEC class AC-1 to AC-5.

10.3.117 The results from previous investigations indicate that protection measures would be required for buried concrete due to aggressive ground conditions.

Conceptual Site Model

10.3.118 The baseline information has been used to prepare a conceptual site model on the existing conditions at the site including development proposals. The impact assessment has been prepared on the basis of the conceptual site model, as follows:

- The site is currently open land comprising a mix of rough vegetation and soil/rubble at the ground surface. A stream is located along the southern and western site boundary, approximately 1m to 2m lower than the existing site level. The banks of the stream are heavily vegetated in places with trees and bushes.

  The site is flat lying although a number of small soil/rubble stockpiles are present towards the boundary of the site.
- The proposed development comprises the construction of an Energy from Waste Facility. The central part of the proposed building would be excavated into the ground. A series of landscape mounds would be created in the east of the site.
- Foundations are likely to be piles into bedrock.
- Ground conditions comprise made ground which in turn overlies weathered Lower Lias Clay bedrock. Alluvium is present in localised areas overlying the bedrock. Topsoil and subsoil are present at the ground surface in some parts of the site.
- No geologically designated sites are located within 1km of the site
- The site is not in an area where coal or other mining has historically taken place and no recorded mine workings or quarrying has been identified within 500m of the site.
- The site is located in an area with a low potential for encountering shrinking or swelling clay, no other specific geohazards have been identified at the site.
- The site is underlain by a Secondary Undifferentiated Aquifer associated with the bedrock. However, only localised water strikes have been encountered during ground investigations - within the made ground and also in the Lias Clay bedrock which appears to be locally confined.
- The site is not within a groundwater abstraction source protection zone and no potable groundwater abstraction licenses have been identified within 1km of the site.
- The site was open land from 1885 until 1939 when the site and surrounding area was developed as part an airfield which was used

mainly for training and also by the Gloster Aircraft Company for developing, building and test flying aircraft. The airfield was in use until 1962.

- Located in the east of the site were hangars (which also extended to the north of the site) with a runway and associated dispersal areas surrounded by grassed areas were located in the west of the site. An above ground air raid shelter was located near to the runway, towards the north and west of the site.
- The hangars were later used as warehouses before being demolished between 2002 and 2005, with the remaining hard standing removed in 2007.
- Contaminants have previously been identified on the site comprising asbestos cement fragments on or very close to the ground surface. Asbestos fragments had also been noted in soil stockpiles on the site, although these stockpiles are no longer present. As noted below remediation works have been undertaken at Javelin Park in relation to asbestos and hydrocarbon contamination.
- In the surrounding area, asbestos fragments, former fuel storage tanks, a former electrical substation and sewage beds were located to the north of the site with the wider airfield to the west and southwest. As noted below remediation works have been undertaken at Javelin Park in relation to asbestos and hydrocarbon contamination.
- Petroleum hydrocarbons have been identified associated with former fuel storage tanks located towards the south of the site, although the chemical testing results did not exceed the human health assessment criteria for a commercial land use.
- Groundwater testing shows only locally elevated concentrations of boron, selenium, ammoniacal nitrogen, sulphate, polyaromatic hydrocarbons and petroleum hydrocarbons. Elevated concentrations of petroleum hydrocarbons have been identified in groundwater near to the former fuel storage tanks located towards the south of the site.
- Remediation works in 2007 comprised the removal of asbestos fragments by handpicking from the ground surface in the site and also the area to the north of the site. The asbestos lagged pipes identified in

the north-east of the site were removed in 2009 after the main remediation works.

- Former underground fuel tanks and associated hydrocarbon impacted soils were also removed from the adjacent part of Javelin Park to the north as part of these works, but this did not include the petroleum hydrocarbons identified in the south of the site as an unacceptable risk was not identified from contaminants in this area.
- Ground gas monitoring indicates the site is consistent with Characteristic Situation 1 and that protection measures should not be required. However, concentrations of carbon dioxide have been encountered above the workplace exposure limits.
- The site is in an area where less than 1% of homes are above the action level of radon and protection measures should not be required.
- Aggressive ground conditions have been encountered that could represent a risk to buried concrete and drinking water pipes.
- The site is located in a low risk area of UXO.

10.3.119 A Qualitative Risk Assessment has been prepared based on the Conceptual Site Model outlined above and has been used to identify whether any potentially significant effects could be present.

10.4 Assessment of Effects

Site Activities – Construction Phase

10.4.1 Activities that are likely to be occurring on site during the construction stage which could involve dealing with the ground or which could affect the ground are as follows:

- compound establishment, storage and use of fuels / chemicals on site;
- movement of plant and machinery on the site and from the compound;
- vehicles moving across soils at the site;
- soil stripping and excavation of underlying materials;
- excavations for foundations, drainage works or services;
- storage of materials and stockpiling of excavated soils on site;
- processing of material to render it suitable for particular uses; and
- re-use of excavated material onsite or imported materials for re-profiling.

10.4.2 These activities have been considered during the construction stage effect assessment.

Site Activities - Operational Phase

10.4.3 Activities that are likely to be occurring on site during the operational stage which could involve dealing with the ground or which could affect the ground are as follows:

- storage and use of fuels/chemicals on site;
- processing and/or storage of waste materials;
- maintenance which could involve excavations; and
- storage of excavated materials.

Receptors

10.4.4 Geology and ground conditions have the capability to affect a wide range of receptors, for the purposes of this assessment the following have been considered as potential receptors:

- designated geological sites;
- groundwater resources;
- human health;
- flora and fauna;
- buried concrete;
- buried services; and
- structures, buildings or roads.

Categorisation of Impacts

10.4.5 The categorisation of the impacts assessed at the site is given in Table 10.10 and 10.11 below:

Incorporated Mitigation

10.4.6 Whilst remediation works have been undertaken at the site, the RPS (2008) Desk Study and the RPS (2010) Phase 2 Intrusive Site Investigation identified the potential for isolated asbestos fragments and petroleum hydrocarbons to still be present at the site. On the basis of the information available it is considered unlikely that such contamination is widespread nevertheless it would be necessary for standard best practice measures to be employed to protect general public, construction workers, site maintenance staff.

10.4.7 Specific mitigation measures are discussed in Section 10.5. However, for the purposes of the impact assessment it is considered reasonable to assume that mitigation measures would be adopted to protect the general public and workers during ground works. For construction workers and site maintenance workers (specifically where ground excavation is required) this would involve personal protective equipment whist undertaking ground excavation and on this basis they are considered medium sensitivity receptors rather than high. In addition it is assumed that targeted remediation works would be undertaken to reduce the risk presented from any remaining asbestos fragments following the previous remediation works, such as hand picking prior to or during earthworks. Whilst it is not considered necessary to remediate the petroleum hydrocarbons identified in the south of the site to protect the environment, it is assumed that mitigation measures would still be adopted during the construction works if excavations are undertaken in this area, for instance to prevent run-off.

10.4.8 As identified above the levels of contamination may also result in impacts on drinking water pipes. As such alternative pipe work material to polyethylene, such as barrier pipe, would be installed where necessary.

10.4.9 The effect assessment in Table 10.10 and 10.11 below assume these mitigation measures have been adopted.

Contaminated Land Risk Assessment

10.4.10 As described in Section 10.2, a qualitative risk assessment for contaminated land has been undertaken for the construction and operational phase. These risk assessments are included in Appendix 10.13. Where risks have been identified that may result in potentially significant environmental impacts these have been further considered in the following impact assessment.

Impact Assessment - Construction Stage

10.4.11 The following assessment has been undertaken to determine potentially significant impacts for the construction stage.

Table 10.10 - Categorisation of Impacts – Construction Stage

Potential Impact	Effect Status	Effect Duration	Permanent / Temporary	Direct/ Indirect	Sensitivity of Receptor	Magnitude of Impact	Categorisation of Impact	Significant Impact	Commentary
Physical damage to designated geological sites	Adverse	Short Term	Permanent	Direct	Low	Minor	Low	No	No designated geological sites identified within 1km.
Impacts on groundwater from dewatering during excavations	Adverse	Short Term	Temporary	Direct	Medium	Minor	Low	No	Shallow groundwater has only been encountered in localised areas and a shallow standing water table is not considered to be present.
Impacts on ground and groundwater conditions from construction activities, such as material storage, processing, stockpiling, storage and use of fuels/oils	Adverse	Short Term	Temporary	Direct	Medium	Minor	Low	No	Shallow groundwater has only been encountered in localised areas and a shallow standing water table is not considered to be present. Standard best practice measures would need to be employed during the works.
Exposure of construction workers to contaminated land during excavations	Adverse	Short Term	Temporary	Direct	Medium	Minor	Low	No	Contamination identified on site during previous investigations, in particular asbestos and petroleum hydrocarbons. Remediation has been undertaken, but evidence of asbestos fragments still remain. As such standard best practice mitigation would need to be employed during ground works.
Damage to structures, foundations, roads due to	Adverse	Short Term	Permanent	Direct	Low	Minor	Low	No	The site is in an area with low potential for shrink/swell clay,

Potential Impact	Effect Status	Effect Duration	Permanent / Temporary	Direct/ Indirect	Sensitivity of Receptor	Magnitude of Impact	Categorisation of Impact	Significant Impact	Commentary
ground instability									no other geohazards in terms of ground stability have been identified.
Exposure of construction workers to ground gas in confined spaces	Adverse	Short Term	Temporary	Direct	Medium	Minor	Low	No	Elevated concentrations of carbon dioxide have been encountered which are above the workplace exposure limits with potential to represent a risk in confined spaces. As such PPE would need to be worn by site operatives.
Direct contact with UXO during excavations	Adverse	Short Term	Temporary	Direct	Low	Moderate	Low	No	The potential for encountering UXO is considered to be low.

Impact Assessment – Operation Stage

10.4.12 The following assessment has been undertaken to determine potentially significant impacts for the operation stage.

Table 10.11 - Categorisation of Impacts – Operation Stage

Potential Impact	Effect Status	Effect Duration	Permanent / Temporary	Direct/ Indirect	Sensitivity of Receptor	Magnitude of Impact	Categorisation of Impact	Significant Impact	Commentary
Impacts on ground conditions and groundwater during operational activities	Adverse	Long Term	Temporary	Direct	Medium	Minor	Low	No	It is assumed that standard best practice measures would be employed for activities during the operation stage and on this basis the proposed development is unlikely to have a long term impact on groundwater or ground conditions.
Exposure of ground maintenance workers to contaminated land during excavations	Adverse	Long Term	Temporary	Direct	Medium	Minor	Moderate	No	Contamination identified on site during previous investigations, in particular asbestos and petroleum hydrocarbons. Remediation has been undertaken, but evidence of asbestos fragments still remain. As such standard best practice mitigation would need to be employed during ground works.
Exposure of site users to tainted drinking water in buried plastic pipes	Adverse	Long Term	Permanent	Direct	Medium	Minor	Moderate	No	Elevated concentrations of contaminants have been identified in the site with the potential to impact on water quality in buried pipes. As such alternative pipe material would be used where required.
Damage to structures, foundations, roads due to	Adverse	Long Term	Permanent	Direct	Low	Minor	Low	No	The site is in an area with low potential for shrink/swell clay,

Potential Impact	Effect Status	Effect Duration	Permanent / Temporary	Direct/ Indirect	Sensitivity of Receptor	Magnitude of Impact	Categorisation of Impact	Significant Impact	Commentary
ground instability									no other geohazards in terms of ground stability have been identified.
Exposure of ground maintenance workers to ground gas in confined spaces	Adverse	Long Term	Temporary	Direct	Medium	Minor	Low	No	Elevated concentrations of carbon dioxide have been encountered which are above the workplace exposure limits with potential to represent a risk in confined spaces. As such PPE would need to be worn by site operatives.
Direct contact with UXO during excavations	Adverse	Long Term	Temporary	Direct	Low	Moderate	Low	No	The potential for encountering UXO is considered low
Damage to buried concrete from aggressive ground conditions	Adverse	Long Term	Permanent	Direct	Low	Moderate	Low	No	Foundations are likely to comprise piles to bedrock and elevated levels of sulphate have been identified in the bedrock.

10.5 Additional Mitigation

10.5.1 As described above a number of standard best practice measures would need to adopted during construction and operation of the site in order to ensure that the contamination identified at the site does not result in any significant environmental impacts.

10.5.2 The following sections provide further description and detail of mitigation measures in addition to standard best practice measures that may be employed at the site in order to avoid potentially significant impacts resulting from the construction and operation of the proposed development.

10.5.3 There are a variety of best practice measures which can mitigate the identified impacts during the construction phase. The Construction Environmental Management Plan (CEMP) would set out how environmental impacts would be managed during construction. Details of the CEMP and construction process are given in Chapter 5.0.

Mitigation – Construction Stage

Groundwater Resources

10.5.4 No significant impacts have been identified to groundwater resources. However, best practice mitigation measures should be implemented regardless.

Oils, Fuels and Chemicals

10.5.5 Oils, fuel and chemical storage facilities would be designed with regard to EA Pollution Prevention Guidelines (PPG). Best practices with regard to controlling pollution and spillages include (but are not limited to) the following:

- designated facilities specially designed for the storage of fuels and oils in accordance with PPG2;
- an oil, chemical and product inventory for the site;
- site drainage plans;
- emergency procedures;
- use of drip trays beneath stationary plant;
- keeping plant well maintained;

- site induction for all personnel on emergency procedures;
- contact list of emergency services, water suppliers, Local Authority EHO and HSE; and
- emergency response equipment.

10.5.6 Measures should be employed to prevent accidents occurring in the first instance together with a means of dealing with pollution incidents if they occur.

Buried Concrete

10.5.7 Chemical testing indicates that protection measures would be required for buried concrete due to aggressive ground conditions, and from sulphate in particular. Typically this involves altering the concrete mix to provide greater resistance for concrete against sulphate. This is an operation stage effect but mitigation would need to be introduced during construction works.

10.5.8 For the construction of foundations, ready-mixed concrete would be transported to the site from off-site commercial sources. Measures shall be incorporated to prevent accidental spillage of concrete during the construction phase and systems put in place for the clean up of accidental spills.

10.5.9 An area shall be designated for the wash-out of vehicles carrying concrete and would be located away from watercourses and have suitable bunds in place.

Buried Water Pipes

10.5.10 Chemical testing indicates that protection measures would be required for buried drinking water pipes due elevated concentrations of petroleum hydrocarbons being present in soils from the site. This typically involves using an alternative pipe work material to polyethylene such as barrier pipe. The pipe work material would be agreed with the water authority as part of the construction works.

Dewatering Activities

10.5.11 Dewatering of excavations should not be undertaken without relevant consent from the Environment Agency where this is likely to exceed $20m^3$ per day. Water should be pumped out of excavations into silt traps and then onto suitable areas of the site in accordance with industry best practice. Silt traps would be in place to minimise sediment transport.

10.5.12 It is possible that contaminants could be present in groundwater from excavations at the site. Chemical testing should be undertaken on groundwater to confirm whether treatment is required prior to disposal. Discharge of groundwater into surface water would not be undertaken without consent from the Environment Agency.

10.5.13 Dewatering may have a temporary effect on the shallow local hydrogeological regime during construction but is unlikely to have any permanent effect on groundwater flow.

Contaminated Land

10.5.14 Evidence of asbestos cement has been identified in localised areas on the ground surface and from shallow soils (up to 0.2m depth) for which specific mitigation measures would be required as part of the construction works.

10.5.15 Mitigation measures for removing asbestos cement fragments from soils typically involve hand picking of fragments for off-site disposal to a licensed landfill. The hand picking could be undertaken as earthworks progress as part of a watching brief or, based on the shallow nature of the asbestos fragments identified, following a site strip and stockpiling of shallow soils in a suitable location at the site to allow other construction works to progress. Soils could then be re-used without further restriction in terms of the risk to future site users.

10.5.16 Alternatively, it may be possible to use shallow soils which could still contain asbestos fragments within landscape bunds beneath a suitable layer of topsoil/surface soil, subject to meeting the requirements of the Environmental Permitting Regulations.

10.5.17 Asbestos lagged pipes and surrounding gravel fill identified in ducts towards the north-east of the site were removed in 2009. However, a watching brief would still be implemented as part of the construction works for asbestos containing materials.

10.5.18 Additional mitigation measures would still be required as part of the construction works if asbestos fragments are present. Such measures could include damping of soils to reduce the potential for asbestos fibres being released, use of appropriate protective equipment by workers and boundary monitoring to ensure asbestos fibres are not migrating off-site. Mitigation measures would be implemented by a suitably qualified specialist.

10.5.19 Previous investigations have encountered hydrocarbon contamination in the ground adjacent to a former diesel tank near to the southern site boundary. Although remediation is not considered to be required and the contamination is thought to be isolated, measures would still be needed during excavations in this area to minimise the risks to ground workers from contaminants such as the use of appropriate personal protective equipment. It would also be necessary to ensure that mitigation measures are implemented to prevent off-site migration of contaminants as dust/vapours or run-off during excavations and soil stockpiling.

10.5.20 A strategy would be prepared outlining where remediation and/or mitigation measures are required for contamination prior to construction works commencing. The Contractor would develop this strategy into a detailed methodology for the site works for agreement with Regulators.

10.5.21 A protocol to address unexpected contamination would be incorporated into the CEMP should any potentially contaminated materials be encountered during excavations.

Geohazards

10.5.22 The principal geohazard that has been noted at the site relate to elevated concentrations of carbon dioxide which could represent to workers in confined spaces such as excavations. In order to comply with health and safety requirements during construction it would be necessary to ensure that monitoring is undertaken prior to entering confined spaces and use appropriate protective equipment where necessary.

10.5.23 Mitigation measures are not considered to be required to protect above ground structures from ground gas.

UXO

10.5.24 An explosive safety and awareness briefing would be provided for all personnel conducting intrusive works as part of the standard site induction.

Mitigation - Operational Stage

10.5.25 In addition to activities involving the storage and use of waste materials, fuels and chemicals, consideration has also been given to potential operation phase impacts should there be a need to carry out any excavations once construction is complete, for instance workers involved in service maintenance.

Groundwater Resources

10.5.26 No significant impacts have been identified to groundwater resources during the operational stage, however, best practice mitigation measures should be implemented regardless.

Oils, Fuels and Chemicals

10.5.27 Oils, fuel and chemical storage facilities would be designed with regard to EA Pollution Prevention Guidelines (PPG). Best practices with regard to controlling pollution and spillages include (but are not limited to) the following:

- designated facilities specially designed for the storage of fuels and oils in accordance with PPG2;
- an oil, chemical and product inventory for the site;
- site drainage plans;
- emergency procedures;
- use of drip trays beneath stationary plant;
- keeping plant well maintained;
- site induction for all personnel on emergency procedures;
- contact list of emergency services, water suppliers, Local Authority EHO and HSE; and
- emergency response equipment.

10.5.28 These mitigation measures would apply to the operation and also the decommissioning phases when oils, fuels and chemicals are in use.

10.5.29 Measures should be employed to prevent accidents occurring in the first instance together with a means of dealing with pollution incidents if they occur.

Dewatering Activities

10.5.30 Dewatering of any excavations during the operation stage should not be undertaken without relevant consent from the Environment Agency where this is likely to exceed $20m^3$ per day. Water should be pumped out of excavations into silt traps and then onto suitable areas of the development site in accordance with industry best practice. Silt traps should be in place to minimise sediment transport.

10.5.31 It is possible that contaminants could be present in groundwater from excavations at the site. Chemical testing should be undertaken on groundwater to confirm whether treatment is required prior to disposal. Discharge of groundwater into surface water would not be undertaken without consent from the Environment Agency.

10.5.32 Dewatering of excavations during the operation stage may have a temporary effect on the shallow local hydrogeological regime but is unlikely to have any permanent effect on groundwater flow.

Contaminated Land

10.5.33 Mitigation measures would be needed during excavations in case residual asbestos fragments were to be present. These include a watching brief, damping of soils to reduce the potential for asbestos fibres being released, use of appropriate protective equipment by workers and boundary monitoring to ensure asbestos fibres are not migrating off-site. Mitigation measures would be implemented by a suitably qualified specialist.

10.5.34 With regards to the hydrocarbon contamination identified in the ground near to the southern site boundary, assuming these contaminants are not removed during the construction works, then measures would be needed during excavations to minimise the risks to ground workers, such as the use of appropriate personal protective equipment. It would also be necessary to ensure that mitigation measures are implemented to prevent off-site migration of contaminants as dust/vapours or run-off during excavations and soil stockpiling.

Geohazards

10.5.35 The principal geohazard that has been noted at the site relate to elevated concentrations of carbon dioxide which could represent to workers in confined spaces such as excavations. In order to comply with health and safety requirements during the operation stage it would be necessary to ensure that monitoring is undertaken prior to entering confined spaces and use appropriate protective equipment where necessary.

10.6 Residual Effects and Conclusions

10.6.1 No potentially significant effects have been identified relating to designated geological sites, hydrogeology or geotechnical issues for the proposed development.

10.6.2 A number of historical land uses have been identified, including demolition of previous structures, which resulted in asbestos fragments and petroleum hydrocarbons being present on, and in the ground at the site and the wider Javelin Park site.

10.6.3 Remediation works were undertaken in 2007 at Javelin Park, which included the site, to remove asbestos fragments from the ground surface. Following the remediation works, Stroud District Council stated they were satisfied with the remediation undertaken at the site.

10.6.4 Individual asbestos fragments were identified at the site following the remediation works. However, these fragments also appear to have been removed from the site. Notwithstanding this, the requirement for mitigation measures has been identified as part of the construction works in case any remaining asbestos fragments are present.

10.6.5 Asbestos lagged pipes were identified in ducts towards the north-east of the site following removal of ground slabs during the remediation works in 2007. These pipes, along with asbestos contaminated fill material also present within the ducts, were removed from the site in 2009.

10.6.6 Petroleum hydrocarbons were identified adjacent to a former diesel tank near to the southern boundary of the site. Although remediation of the petroleum hydrocarbons is not required to protect the environment, it would be necessary to protect workers and prevent migration of contaminants as dust/vapours or run-off during any excavations in this part of the site and subsequent soil stockpiling by implementing mitigation measures. Where removal of any residual contamination is undertaken during the construction works, this would have a beneficial effect on the ground conditions.

10.6.7 In addition to adopting standard best practice measures during the construction and operation of the site, mitigation measures would also be required for buried concrete and water pipes due to aggressive ground conditions, and also to protect workers in confined spaces, such as excavations, from ground gas.

10.6.8 Following implementation of the mitigation measures outlined above there are considered to be no residual significant effects.

11.0 SURFACE WATERS AND FLOOD RISK

11.1 Introduction

11.1.1 This chapter considers the impact of the development on water quality, the impact of flood risk to the development and the impact of surface water run off from the development on upstream and downstream receptors. It also considers the flood risk associated with the construction phase, and whether the change in the surface water regime on site would affect any existing surface water flow paths across the site.

11.1.2 This chapter utilises the results of the site specific Flood Risk Assessment (FRA) (18917-WT-01) prepared for the proposals as a requirement of and according to PPS 25 Development and Flood Risk which is included as Appendix 11.1 . Previous FRAs for the site are included for information in Appendices 11.2 and 11.3.

11.1.3 The assessment has taken into consideration the broader qualitative impacts on the site from upstream sources of runoff, and from the site to downstream receptors. Incorporated mitigation measures are described which have been included in the scheme design to reduce identified impacts.

11.1.4 The information used to produce this section is based on:

- the results of a topographic site survey;
- proposed layout drawings;
- the Environment Agency's (EA) online database of indicative floodplain maps;
- a previous FRA for the site undertaken by RPS (Report BES0453, February 2011), (included in Appendix 11.2);
- a previous FRA undertaken for Javelin Park by EPG Clear Ltd (July 2007), (included in Appendix 11.3);
- Gloucestershire County Council's Strategic Flood Risk Assessment (SFRA), by Halcrow (September 2008); and
- Stroud District Council's SFRA (Halcrow, September 2008).

11.2 Methodology

Assessment Methodology

11.2.1 The methodology for assessing the impact of the development on surface waters and flood risk was as follows:

- the constraints and existing regime were defined (the baseline situation); and
- the proposed effects and their impacts were assessed.

11.2.2 The assessment was based on Flood Risk Assessments undertaken for the site according to Planning Policy Statement 25 (PPS 25), watercourse analysis using Flood Estimation Handbook (FEH) techniques, and surface water runoff analysis applying the Wallingford Procedure and Modified Rational Method within Microdrainage WinDes software.

11.2.3 Three sets of impacts have been considered with regard to surface waters and flood risk:

- the impact of flood risk to the site from fluvial flooding (i.e. risks *to* the proposed development);
- the impact of the development on local hydrology and (downstream) flood risk due to the increase in surface water runoff or loss of floodplain (i.e. risks *from* the site, as a result of the proposed development); and
- the impact of the development on water quality in the local water environment.

Assessment of Significance / Assessment Criteria

The Impact of Flood Risk to the Site

11.2.4 The assessment of flood risk has been determined based on the vulnerability of the development land use to the identified flood risk.

11.2.5 A low overall impact would result if the land use is in an area with a low probability of flooding (low magnitude), regardless of the vulnerability of the land use (importance).

11.2.6 A neutral overall impact would result if the land use is in an area with medium or high probability of flooding but the land use is compatible with the level of flood risk (according to Table D1 of PPS 25). For example, land classified as ‘more vulnerable’ is acceptable in an area with medium probability of flooding.

11.2.7 A significant adverse overall impact would result if the land use is in an area with medium or high probability of flooding but the land use is not compatible with the level of flood risk (according to Table D1 of PPS 25). For example, land classified as ‘highly vulnerable’ is not acceptable in areas with either medium or high probability of flooding.

11.2.8 A low or neutral overall impact is acceptable in terms of flood risk to the development, in accordance with the guidelines in PPS 25 and is not considered to be significant in EIA terms.

Local Hydrology, Surface Water Runoff and Flood Risk Off Site

11.2.9 The impact that the development has on local hydrology and (downstream) flood risk is less easily quantified. Should the proposal include development within the functional floodplain, this would result in a loss of floodplain storage, which would increase the risk of flooding downstream. The Environment Agency may object to a development which compromises the floodplain, and therefore any loss of floodplain is a significant adverse impact.

11.2.10 Similarly, should the development result in increased peak surface water runoff (either through an increase in impermeable area or as a result of increased rainfall intensities due to the effects of climate change) this would increase the risk of flooding downstream. Through recommended planning conditions, the Environment Agency places constraints on developments which increase surface water runoff, obliging the developers to reduce surface water flows. Therefore any increase in peak surface water runoff is a significant adverse impact.

Water Quality

11.2.11 The impact that the development has on local water quality will be assessed qualitatively using the SuDS selection criteria in CIRIA Report C697 “The SuDS Manual”. The degree of impact will depend on the sensitivity of the receiving watercourse, the nature of the development, and the number of treatment train components incorporated into the design. A neutral impact will result if sufficient treatment measures (referred to in the guidance as treatment train components) are incorporated into the design as defined by CIRIA C697. An adverse impact will result if insufficient treatment train components are incorporated according to CIRIA C697.

Limitations

11.2.12 The assessment in this chapter is reliant on the data presented in the previous Flood Risk Assessments for the scheme by RPS and EPG Clear, particularly the Brownfield runoff rate and drainage ditch flow calculations. The Environment Agency's floodplain maps presented on their website are only indicative and data presented on their website can change over time. The SFRAs undertaken for Gloucestershire County Council and Stroud District Council were undertaken in 2008 and there is a possibility that more flood data is available since their production. However, it is not considered that the above limitations will have a significant bearing on the outcome of this assessment.

11.3 Baseline

Site Location and Surrounding Use

11.3.1 The site is located on the southern half of Javelin Park, in Haresfield, Gloucestershire. The boundaries of the site are formed by fields to the south and west (backing on to the M5), Javelin Park to the north and Stonehouse Road (B4008) to east.

11.3.2 The site is currently undeveloped but was previously part of a former airfield and contained hard landscaped areas. Ground levels vary from around 22mAOD in the north-eastern portion of the site to around 19.5mAOD in western portion of the site. There is a drainage ditch running along the southern and western boundary, flowing in a northerly direction, and levels at the bed of the channel vary from 20.14mAOD at its eastern extent to 18.49mAOD where it exits the site in the north-west corner.

Geological Setting

11.3.3 The British Geological Survey map for the area, Sheet 234 for Gloucester, 1:50,000 series Solid and Drift Edition indicates that the site is underlain by Lower Lias bedrock, with no superficial deposits shown. However, site investigation by RPS in 2010 established the sequence on site as topsoil and subsoil overlying made ground, above superficial (clayey) deposit above the Lower Lias formation (encountered at 0.8-2.6mbgl).

Hydrological Setting

11.3.4 As mentioned above, there is a local drainage ditch passing through the site along the southern and western boundaries. This drainage ditch serves a small (0.6km^2) catchment upstream and receives flows from this catchment through culverts beneath the B4008. Along part of the eastern boundary a smaller drainage ditch receives highway runoff from the B4008, and then connects to the main drainage ditch through a section of culvert. After passing off site, the drainage ditch discharges into two concrete culverts to the north-west of the site, which pass beneath the M5 motorway. The watercourse ultimately discharges into the Gloucester and Sharpness Canal located 2km west of the site. The canal discharges into Severn Estuary, located approximately 4km to the west of the site.

Hydrogeological Setting

11.3.5 The EA has developed Groundwater Source Protection Zones to assist in assessing the risk to groundwater supplies taken from an abstraction point. The site does not lie within a Groundwater Source Protection Zone.

11.3.6 The EA website also shows aquifers and provides designations which are in line with the Water Framework Directive and are based on maps produced by the BGS. The bedrock beneath the site is designated a Secondary ‘undifferentiated’ aquifer. Definitions for the aquifer types are provided below based on the EA website:

- Secondary A aquifer: “permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.”

- Secondary B aquifer: “predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.”
- Secondary ‘undifferentiated’ aquifer: “it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.”

Existing Drainage Regime

11.3.7 When the site was formally used as an airfield and subsequently warehousing, it is understood that surface water runoff from the site was collected through downpipes and gullies and discharged into a culvert that discharged flows to the north and ultimately into the Gloucester and Sharpness Canal. It is believed that the culvert has fallen into a state of disrepair. As described previously surface water from the site now flows into the drainage ditch along the south and west boundary of the site.

11.3.8 The 2007 EPG FRA undertook an assessment of the capacity of the existing drainage systems for the wider Javelin Park site (of which a proportion is the current site). The site was modelled using Infoworks and the FRA concluded that the 1 in 2 year peak runoff from the Javelin Park site was 387l/s. This corresponded to the 10.8ha wider site. For the 4.87ha part of the site which would be developed as part of this application, this equates to a “Brownfield” runoff rate of 174.5l/s.

11.3.9 The 2010 RPS FRA calculated Greenfield runoff rates for the site using the Institute of Hydrology Report 124 (IoH 124) methodology. These are presented in Table 11.1 below.

Table 11.1 Greenfield Run-off Rates

Return Period (years)	**1 in 2**	**1 in 30**	**1 in 100**
Greenfield Rate per hectare (l/s/ha)	3.3	7.2	9.5
Site Rate (4.87ha) (l/s)	16.1	35.1	46.3

Existing Flood Risk

11.3.10 Flood risks to the site from various sources have been assessed. There are a number of key potential sources of flooding that can put sites at risk. These include fluvial (rivers), tidal (the sea), groundwater, sewer, surface water and infrastructure failure (including reservoirs, canals, industrial processes, burst water mains and blocked sewers or failed pumping stations). Each of these will now be considered in turn and the risks posed to the site considered.

Tidal and Fluvial Flood Risk

11.3.11 The EA indicative floodplain maps identify areas in England and Wales at risk of flooding by allocating them into flood risk zones.

11.3.12 The flood risk zones shown on the Flood Maps are defined in Table D1 of PPS 25:

- Zone 1: Low Probability. According to PPS 25, land in this zone is considered to have less than 1 in 1000 annual probability of river or sea flooding in any year. This is < 0.1%.
- Zone 2: Medium Probability: According to PPS 25, land in this zone is considered to have between a 1 in 100 and 1 in 1000 annual probability of river flooding in any year (between 1% and 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding in any year (0.5%-0.1%) .
- Zone 3a: High Probability: According to PPS 25, land in this zone is considered to have a 1 in 100 or greater annual probability of river flooding in any year (> 1%) or a 1 in 200 or greater annual probability of flooding from the sea in any year (>0.5%).
- Zone 3b: The Functional Floodplain: According to PPS 25, land in this zone is used for water flow or storage in times of flood. This flood zone should be identified by a Strategic Flood Risk Assessment (SFRA). It is considered to have a 1 in 20 or greater chance of river flooding in any year which is > 5%. However, another probability can also be agreed between the LPA and the EA.

11.3.13 The EA's indicative flood maps show that the site is located in Flood Zone 1, at low risk of flooding. However, the Level 2 FRA concluded that further assessment was required to ascertain whether the drainage ditch on site posed a fluvial flood risk. The FRA included calculations for the peak flows expected within the ditch using the ReFH methodology. These flows relates to the small ($0.6km^2$) catchment which the ditch serves, and were $0.903m^3$/sec for a 1 in 100 year (+20% climate change) event and $1.371m^3$/sec for a 1 in 1000 year event. Catchment descriptors are included in Appendix B of the RPS FRA (Appendix 11.2).

11.3.14 The capacity of the drainage ditch has been calculated using the steady uniform flow equation based on the cross sections measured from the topographic survey. The cross section varies along the length but is narrowest just prior to discharge off-site in the north-western corner of the site. At this location the capacity of the channel has been calculated for different roughness coefficients appropriate to a channel of this nature (through use of Manning's "n"). These are $2.2m^3$/s for Manning's n=0.050 and $3.1m^3$/s for Manning's n=0.035. This demonstrates that the channel has sufficient capacity to accommodate peak flows in excess of the 1 in 1000 year event, which would correspond to a water depth in the region of 600mm. Furthermore, flows into the drainage ditch on-site are likely to be throttled by the upstream culverts to a degree. Therefore flood risks to the site from the drainage ditch are considered to be low. Calculations are presented in the Flood Risk Assessment in Appendix 11.1.

Groundwater Flood Risk

11.3.15 Groundwater flood risk is considered to be low due to the impermeable nature of the underlying soils. A degree of perched groundwater was encountered in the made ground by the site investigation. However, this is not considered to pose a significant flood risk to the site.

Other Sources of Flood Risk

11.3.16 There are no reservoirs or other water storage areas in the vicinity of the site that could present a hazard upon failure, and this is confirmed by the EA's online hazard maps. Gloucestershire was affected by flooding in 2007, and anecdotal evidence from local residents suggests that the culvert beneath the B4008 and drainage ditch through the site did not function effectively due to blockage and overgrowth leading to surcharging upstream of the B4008.

However, since then remedial measures have been undertaken including clearance of the ditch channel throughout the site, enabling it to perform at full capacity in the incidence of a similar storm event. The site specific FRA (Appendix 11.1) concludes that flood risks to the site from sewers/water mains infrastructure failure is low. Therefore flood risks to the site from other sources are considered to be low.

Flood Risk Summary

11.3.17 In summary, the flood risks to the site from various sources are low, as outlined in Table 11.2 below.

Table 11.2: Flooding Sources

Flooding Source	**Potential**			**Comments**
	High	**Medium**	**Low**	
Tidal/Fluvial			X	Site located in FZ1, ditch capacity sufficient for catchment flows
Groundwater			X	Site underlain by impermeable soils
Reservoirs, canals and other artificial sources			X	None in vicinity of the site

11.4 Assessment of Effects

Incorporated Mitigation

11.4.1 Due to an increase in impermeable areas as a result of the development and allowing for increased rainfall intensities over the lifetime of the development, the scheme is likely to result in an increase in peak surface water runoff rates.

11.4.2 As such, it is proposed that surface water runoff from the development would be reduced to the 1 in 100 year Greenfield runoff rates of 46.3l/s (i.e 9.5l/s/ha) for all storm events up to the 1 in 100 year + climate change event. This is a significant betterment compared to the Brownfield runoff rates of 174.5l/s for a 1 in 2 year storm. Attenuation measures to achieve this runoff rate are incorporated within the scheme design.

11.4.3 The attenuation measures take the form of various detention basins that would provide approximately 900m^3 of attenuation storage, with outflows throttled to the Greenfield rates prior to discharge into the existing drainage ditch. The proposed conceptual drainage strategy is shown in Figure 11.1, this includes the design calculations for the proposed detention basins. The proposed development would also include rainwater harvesting of roof drainage for use in operations at the site.

11.4.4 In terms of water quality, runoff from road areas would be collected by trapped road gullies and passed through oil interceptors prior to discharge into the detention basins. The detention basins themselves would provide a degree of water treatment prior to the ultimate discharge into the existing drainage ditch. The entire facility would be subject to strict management and regulation under the controls imposed by the Environmental Permit issued and regulated by the EA. Therefore there would be measures in place to prevent gross-pollutants from entering the drainage system. Furthermore, should a pollution event occur within the detention basins, penstocks would be incorporated in the outlet chambers to enable the basins to be isolated and prevent polluted discharge into the watercourse.

Construction Phase

Flood Risk to the Site

11.4.5 As presented above, the existing flood risk to the site from all sources is low. On the basis that the construction phase of the project would be limited in duration, the statistical probability of a flood event occurring during this phase is further reduced. It has been demonstrated that the drainage ditch has sufficient capacity to accommodate flows for a 1in 1000 year flood event. Therefore during the limited construction phase of the development there is a low overall impact of flood risk to the site.

Surface Water Runoff and Flood Risk Off-Site

11.4.6 As presented above, the scheme includes measures to reduce runoff rates over the lifetime of the development, sized for a 1 in 100 year return period storm. Since the construction phase of the project would be limited in duration, the statistical probability of a storm event of this size occurring during this phase is low. The contributing impermeable area on site would increase cumulatively during the construction phase therefore actual surface water runoff rates would vary during the construction but would be less than in the operational phase. Surface water attenuation features, which would also serve as settling lagoons, would be developed on the site during the construction phase. On this basis, there would be a low overall impact of surface water runoff and flood risk off-site during the construction phase.

Water Quality

11.4.7 During construction a potential significant adverse impact would be the risk of pollutants from construction processes and excavations entering the drainage ditch. Typical types of pollution from construction sites include suspended solids, oils and hydrocarbons, cement and concrete products, heavy metals and metalloids, bentonite and solvents/paints among others. Sources of these pollutants can include excavations, stockpiles, plant and wheel washing, fuel storage tanks, general plant use and maintenance, and accidents and spillages. There is also potential adverse impact on the detention basins from scour during their construction should the planting not be allowed to establish prior to runoff being directed through them.

Operational Phase

Flood Risk to the Site

11.4.8 Different classes of development are considered by PPS 25 to have different levels of vulnerability to flooding. Depending on their flood risk vulnerability classification, an assessment can then be made as to which class of development may or may not be appropriate in different flood risk zones.

11.4.9 The different classes of flood risk vulnerability are:

- Essential Infrastructure
- Highly Vulnerable
- More Vulnerable
- Less Vulnerable
- Water-compatible

11.4.10 According to table D2 in PPS 25, the development is designated as “More Vulnerable” as a proposed waste management facility. Development of this designation is not appropriate in areas at high risk of flooding (Zones 3a and

3b) but is appropriate in areas at medium and low risk of flooding (Zones 2 and 1). Therefore the Sequential Test is passed and there is no requirement for the Exception Test.

11.4.11 Since the site is at low risk of flooding as defined in the previous section the proposed waste management facility is an appropriate class of development on the site and therefore according to the assessment criteria there is low overall impact of flood risk to the site during the operational phase.

Surface Water Runoff and Flood Risk Off-Site

11.4.12 Following construction of the facility the impermeable area on site would increase to 2.25ha, approximately 46% of the developed area. The building itself is approximately 1 ha, and the rest of the impermeable area is predominantly the access road and car parking.

11.4.13 PPS25 identifies that rainfall intensities will increase in the future as a result of the predicted effects of climate change and that the resultant increases in surface water runoff need to be accounted for when designing new drainage systems.

11.4.14 The Wallingford Procedure and the Modified Rational Method have therefore been used to calculate the post-development runoff rates taking into account the changes in impermeable areas. In addition, the rainfall intensities have been increased by 30% to allow for climate change, according to the recommendations of PPS 25. Calculations are presented within the Flood Risk Assessment (Appendix 11.1) and summarised in Table 11.3 below.

Table 11.3: Post development peak runoff rates (based upon impermeable areas and 30% increase for climate change)

Return Period (years)	1 in 2	1 in 10	1 in 30	1 in 100
Post-Development Surface Water Run-off - (l/s)	248	383	468	600

11.4.15 Due to the increase in impermeable areas, and allowing for the predicted effects of climate change increasing future rainfall intensities over the lifetime of the development, peak runoff rates are predicted to increase following development. Without mitigation these would result in an increased risk of flooding to downstream receptors from surface water runoff, which would be a significant adverse impact according to the assessment criteria.

11.4.16 In terms of flood routing, the scheme would maintain flow routes across the site through retention and maintenance of the drainage ditches along the eastern, southern and western boundaries. Therefore there would be no increased risk of upstream flooding through obstruction or blockage of flow routes across the site.

11.4.17 As described above, the proposed development includes a number of attenuation measures specifically designed to reduce peak surface water runoff rates to Greenfield levels. As such the impact of surface water runoff to flood risk off-site is reduced to a low overall impact and is therefore not considered significant in EIA terms.

Water Quality

11.4.18 As presented above, there are incorporated mitigation measures for water quality in the form of a treatment train, whereby runoff is collected through trapped gullies, passed through oil interceptors and finally through detention basins prior to discharge into the drainage ditch.

11.4.19 The impact that the development has on local water quality has been assessed qualitatively using the SuDS selection criteria in CIRIA Report C697 “The SuDS Manual”. The degree of impact depends on the sensitivity of the receiving watercourse, the nature of the development, and the number of treatment train components incorporated.

11.4.20 The drainage ditch on site is under riparian ownership and is not designated as a Main River. As such it has no water quality designations under the Water Framework Directive and is therefore considered to be low sensitivity.

11.4.21 The proposed EfW facility would be classed as an “industrial area” and therefore three treatment train components are required in accordance with CIRIA C697 guideline.

11.4.22 Since sufficient treatment train components are incorporated for both the sensitivity of the receiving watercourse and the nature of the development, the project would have a neutral overall impact on water quality into the receiving watercourse and therefore into the River Severn catchment as a whole. This approach is in accordance with the requirement for every project to play an appropriate part in Water Framework Directive improvements and complies with the principles set out within the Severn River Basin Management Plan for actions to improve water quality within the catchment. It should also be noted that the facility would be regulated under an Environmental Permit issued by the Environment Agency. As a requirement of the permit it would be necessary to demonstrate that the facility has sufficient pollution prevention measures in place, this would include appropriate storage areas for chemicals and fuels, emergency spill kits and appropriate foul and surface water management systems. The facility would also be required to have in place procedures to deal with any potential pollution incidents that may arise during operation of the facility.

11.5 Additional Mitigation

11.5.1 As described above, best practice construction measures would be adopted at site to reduce the potential for water quality impacts during the construction phase. Good site practice, following the recommendations and mitigations measures set out in the EA's Pollution Prevention Guidelines (PPGs), CIRIA document C532 "Control of Water Pollution from Construction Sites" and CIRIA document C698 "The Site SuDS Manual" would mitigate the risks to surface water quality. Examples of some of the measures that would be adopted at the site are included below:

- silt traps, straw bales placed within stream channel and temporary settlement lagoons;
- protective coverings to stockpiles and locations away from watercourses;
- retention of vegetated strips along the watercourse;
- tanked areas for plant and wheel washing;
- bunded fuel storage and refuelling areas;
- provision of spill kits;
- location refuelling areas away from watercourses; and
- provision of vegetation/grass cover on earth stockpiles.

11.5.2 On the basis that the incorporated mitigation measures are implemented, no further mitigation measures are deemed necessary to mitigate operational impacts.

11.6 Residual Effects and Conclusions

11.6.1 This chapter has considered the impact of the development on water quality, the impact of flood risk to the development from various sources of flooding and the impact of surface water runoff from the development on upstream and downstream receptors. It has also considered the flood risk associated with the construction phase, and whether the change in the surface water regime on site would affect any existing flow paths across the site from upstream.

11.6.2 The site is not located in an area at risk of flooding, and flood risks to the development from the existing drainage ditch are considered to be low.

11.6.3 The development would increase impermeable areas on site, which when coupled with the predicted effects of climate change on rainfall intensities over the lifetime of the development, would increase surface water runoff from the site. However, the scheme includes mitigation measures in the form of detention basins to attenuate surface water runoff from the site to Greenfield rates. As a result there would be a low overall impact from the development upon surface water runoff and off-site flood risk, and overall a minor improvement in terms of runoff rates to those currently experienced.

11.6.4 Since sufficient treatment train components are incorporated for both the sensitivity of the receiving watercourse and the nature of the development, the project would have a neutral overall impact on water quality into the receiving watercourse and therefore into the River Severn catchment as a whole.

11.6.5 Potential adverse impacts associated with the construction phase include the potential for pollution of the drainage ditch from suspended solids, oils and hydrocarbons, cement and concrete products, heavy metals and metalloids, bentonite and solvents/paints among others. However, good site practice measures such as silt traps, coverings to stockpiles, and bunded fuel storage areas would reduce the magnitude of these impacts to a low overall impact.

11.6.6 The findings of this assessment have demonstrated that the development would not result in any significant adverse impacts on surface waters and flood risk and would result in an overall a minor improvement in terms of runoff rates.

12.0 NOISE AND VIBRATION

12.1 Introduction

12.1.1 This chapter assesses the likely significant effects of the proposed development in terms of noise and vibration. In particular, the potential effects of noise and vibration from the construction and operation of the proposed development upon sensitive receptors close to the site. The potential to cause nuisance around the site has been considered and mitigation measures have been proposed where necessary.

Scope of Assessment

12.1.2 The assessment incorporates the following sections:

- **Methodology** – defines the approach used for the technical assessment, including the extent of the study area under consideration;
- **Baseline –** details the collection of daytime and night-time background noise level data via noise surveys in order to determine the existing baseline noise climate at potentially sensitive local receptors in the vicinity of the site;
- **Assessment of Effects –** quantitative and qualitative assessment of noise and vibration levels at potentially sensitive local receptors during the construction and operational phases of the development and determination of the significance of the impacts;
- **Additional Mitigation –** provision of proposals for mitigation measures, where appropriate, in order to minimise any potential negative impacts arising from the development; and
- **Residual Effects and Conclusions** – summary of any impacts that could remain as a result of the development following implementation of mitigation measures.

12.1.3 A glossary of noise and vibration terms is included at Appendix 12.1 to assist the reader with the noise terminology.

12.2 Methodology

Noise Assessment - Construction Phase

12.2.1 Noise emissions from construction activities have the potential to impact upon nearby noise sensitive receptors (usually residential properties). At this stage in the development process it is often difficult to provide complete certainty as to the construction methods and scheduling of works. Therefore, the assessment of the construction noise impact has taken into account typical plant and working methods used in the construction of major infrastructure schemes. A description of the construction phase is provided in Chapter 5.0.

12.2.2 Construction activity would involve the use of a variety of different operating procedures and types of plant and operations would vary across the site throughout the construction period. Therefore, noise levels from the construction works would vary over time as the distance from construction noise sources and the type of construction activity change.

12.2.3 Construction noise predictions are based on the methodology contained within British Standard (BS)5228:2009 Code of practice for noise and vibration control on construction and open sites - Part 1 taking into account the proposed construction programme and the construction techniques likely to be employed at the site.

Noise Assessment - Operational Phase

12.2.4 The operational assessment has been based on the EfW facility operating on a 24-hour basis.

12.2.5 The predicted noise levels generated by the operation of the facility have been calculated using the proprietary noise modelling software CADNA-A® (CADNA), which implements the common European methods of noise prediction. In this instance, the operational noise predictions have been undertaken in accordance with the noise prediction framework set out in ISO 9613-2.The CADNA noise model has been setup based on the following parameters:

Source Noise Levels

- Internal noise levels are based on the assumption that sound attenuation measures would be incorporated sufficient to ensure that the total overall reverberant noise levels within all internal operational areas would not exceed 80dB(A). Noise sources located outside of the main building are noted below;
- the external condenser block has been modelled with 3No. cooler condenser fans, each generating L_W = 83dB(A) at roof level;
- the flue at the western end of the building would generate L_W = 68dB(A) at the top of the stack;
- five HGVs have been modelled external to the building on the internal service roads during the day-time scenario to simulate on-site traffic movements. Each heavy goods vehicle (HGV) generates L_W = 100dB(A); and
- the EfW facility would operate on a 24hr basis, although there would be no deliveries during the night-time period and therefore no circulating HGVs or open doors.

Sound Insulation

- The building elevations would be constructed using a composite cladding panel capable of providing a weighted sound reduction value of R_W = 24dB(A), it is assumed that junction details would not reduce this sound insulation performance;
- all roller shutter doors are to be acoustically treated to provide a weighted sound reduction value of R_W = 18dB(A);
- the office areas on the northern elevation of the building would attenuate noise from the waste bunker and tipping hall operations beyond;
- the roof would be constructed using a composite cladding panel capable of providing a weighted sound reduction value of R_W = 23dB(A). It is assumed that junction details would not reduce this sound insulation performance;
- roller shutter doors situated along the northern elevation would only be open on an infrequent basis and hence these have been modelled as being closed;

- the roller shutter doors to the tipping hall, situated on the southern and eastern elevations of the building have been modelled as being open in the day-time and closed at night. The open door scenario is likely to be conservative as rapid action doors are proposed. However, the high frequency of vehicles accessing this part of facility is expected to result in the door being open for a significant period of time (note that the noise of the rapid opening/closing doors is negligible in the context of other noise generated by the development as therefore not been included in the modelling); and
- louvres have been modelled based on the preliminary mechanical and electrical services design for the facility. The louvres situated on the northern façade have been modelled as being acoustic louvres that would provide a 10dB(A) sound transmission loss. All remaining louvres have been modelled as standard weather louvers with a sound transmission loss of 3dB(A).

External Mitigation Measures

- Landscaping bunds have been modelled along the eastern boundary of the site, adjacent to the eastern elevation of the building and also to the north-east of the main car park.

12.2.6 The predicted noise levels at the noise sensitive residential receptors have been assessed using the methodology of BS4142: Method for rating industrial noise affecting mixed residential and industrial areas. This has been used to establish the likelihood for complaints to occur as a result of noise emissions from the development. A +5dB(A) character correction has been applied to the predicted noise levels at the residential receptors within the study area in line with BS4142 to take account of the potential for tonal characteristics.

12.2.7 The predicted noise levels at sensitive receptors in the study area have been assessed against the indoor ambient noise levels set out in BS8233: Internal noise level guidance for dwellings and the World Health Organisation Guidelines. These guidelines suggest appropriate criteria and limits for a range of different situations.

12.2.8 If an emergency shut-down event is required, the steam from the boiler would have to discharge to atmosphere, this can cause relatively high noise levels. It is difficult to assess the level of noise generated as it depends upon a number of factors, including steam pressure and velocity. Mitigation measures could include the installation of steam vent silencers to reduce the impact from this rare event. Due to the infrequent occurrence of these events taking place and the limited operational duration when they do, these events are not considered to represent a significant impact and therefore a quantitative assessment has not been undertaken.

Road Traffic Noise

12.2.9 The noise level changes on the existing road network caused by increased road traffic flows associated with the proposed facility have been assessed using the guidance given within DMRB, using the Calculation of Road Traffic Noise (CRTN) Methodology.

12.2.10 The results of the Transport Assessment (which accompanies the Planning Application) have been used as the basis of the road traffic noise assessment. It should be noted that the flows on the M5 Motorway attributable to the proposed development would be negligible in terms of overall flow and as such would not be sufficient to generate any significant increase in noise levels at any sensitive receptors. On this basis the proposed development related traffic noise impacts on the M5 have been screened out of the traffic noise assessment.

12.2.11 The results of the Transport Assessment (which accompanies the Planning Application) have been used as the basis of the road traffic noise assessment. The traffic noise predictions have been carried out at a notional receptor located 10 metres from the edge of the carriageway and 1.5 metres above ground level using the calculation methods set out in the CRTN guidelines to determine the change in noise level. A notional receptor has been used because it is the change in traffic noise level that is of interest, not the absolute noise levels at any given receptor. The predicted changes in noise level would occur at noise-sensitive receptors along each of the roads considered, regardless of whether they have been specifically considered or not.

12.2.12 The Transport Assessment has considered the current traffic flows and has predicted flows for the 2016 opening year and 2026 future year scenarios.

For the purpose of the traffic noise assessment the following scenarios have been assessed:

- Year 2011: Current traffic flows *(2011 Baseline scenario)*
- Year 2026: Traffic flows attributable to growth in vehicle numbers with no committed development flows added *(2026 Baseline scenario)*
- Year 2026: Traffic flows attributable to growth in vehicle numbers with committed development traffic estimates added *(2026 do nothing scenario).* The committed development flows includes for full development at the Javelin Park site as a B8 distribution development.
- Year 2026: Traffic flows attributable to growth in vehicle numbers with committed development traffic estimates added plus the traffic flows from the proposed EfW facility *(2026 do something scenario).* In this scenario, the proposed facility would replace the committed B8 proposed on the southern half of Javelin Park (Units 2 & 3).

Vibration Assessment - Construction Phase

12.2.13 Some construction activities can produce a significant amount of ground-borne vibration, which has the potential to cause concern at the nearby receptors. During construction, mechanical excavation, piling and soil ripping are likely to be the only potentially significant sources of vibration. There is no accepted method for predicting the vibration at a sensitive receptor due to the ground-borne vibration from construction plant. However, it is possible to provide an estimate based on historical measurements provided within BS5228 and therefore provide some guidance on the likely levels that might be generated during the construction period.

12.2.14 The significance of vibration has been assessed in accordance with the guidance in BS 6472: Guide to evaluation of human exposure to vibration in buildings. The distance of the vibration source, time of day and the nature of the tasks in each of the occupied spaces of a building have been considered when assessing the vibration exposure. The impact of vibration on people within a building is assessed by identifying the appropriate vibration dose. Present knowledge shows that vibration is best evaluated with the vibration dose value (VDV). The VDV defines a relationship that yields a consistent assessment of continuous, intermittent, occasional and impulsive vibration and correlates well with subjective response, VDV values are given in Table 12.1.

Table 12.1: Vibration Dose Values

Vibration Dose Value Ranges Which Might Result in Various Probabilities of Adverse Comment Within Residential Buildings			
Place and Time	**Low Probability of Adverse Comment** **$ms^{-1.75}$ (1)**	**Adverse Comment Possible** **$ms^{-1.75}$**	**Adverse Comment Probable** **$ms^{-1.75}$ (2)**
Residential buildings - 16hr day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings - 8hr night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

Note: For offices and workshops, multiplying factors of 2 and 4 respectively should be applied to the above vibration dose value ranges for a 16hr day. Below these ranges adverse comment is not expected. Above these ranges adverse comment is very likely.

12.2.15 The VDV values are split into day and night time periods. The lower acceptable levels for the night time period are intended to apply to residential properties only. However, as construction activity would not be undertaken after 19.00 hours the night-time thresholds are not applicable to this assessment. For office and workshop areas multiplication factors for the VDV levels are provided and the acceptable levels for an office environment are twice those of a residential building.

12.2.16 These values represent the best professional judgement currently available and are used for both vertical and horizontal vibration. The criteria have to be presented as ranges rather than discrete values, since widely differing susceptibility to vibration is evident among members of the population and also expectations of the vibration environment differ. The range of values for each category demonstrates that the judgement can never be precise.

12.2.17 There are currently no British Standards that provide a methodology to predict levels of vibration from construction activities, other than those contained within BS5228, which relates to percussive or vibratory piling only. BS5228 suggests that for the majority of people, vibration levels between 0.14 and 0.3 mms-1 peak particle velocity are just perceptible. Table 12.2 details the distances at which certain activities give rise to a just perceptible level of vibration. These figures are based on historical field measurements.

Table 12.2 Distances at which Vibration may just be Perceptible

Construction Activity	Distance from activity when vibration may just be perceptible (metres)
Excavation	10 - 15
Heavy vehicles (eg dump trucks)	5 - 10
Hydraulic breaker	15 - 20
Driven piling	50 - 100

12.2.18 The distances from the activities in Table 12.2 have been used to assess if vibration from construction activities would result in an impact on surrounding properties.

Vibration Assessment - Operational Phase

12.2.19 No significant operational vibration effects associated with the proposed EfW facility have been identified. Appropriate measures would be introduced within the facility to ensure that items of vibration inducing plant are isolated from the structure, thereby mitigating against ground-borne vibration.

12.2.20 The Design Manual for Roads & Bridges (DMRB) notes that there is no evidence to support the theory that traffic induced vibrations are a source of significant damage to buildings.

12.2.21 Based on the points above, a quantitative assessment of operational vibration impacts has not been undertaken.

Study Area

12.2.22 The study area for the noise and vibration assessment includes the sensitive residential receptors situated around the site boundary, as defined below. The properties within the study area are shown on Figure 12.1.

1. The Lodge – situated approximately 50m to the east of the development site;
2. Hiltmead House – situated approximately 250m to the north-west of the development site;

3. St Joseph's Travellers Park – situated approximately 440m to the west of the development site;
4. Lindas Home – situated approximately 530m to the west of the development site;
5. Old Airfield Farm – situated approximately 620m to the south-west of the development site;
6. Royston – situated approximately 700m to the east of the development site;
7. Broadfield Farm – situated approximately 725m to the north-west of the development site; and
8. Warren Farm – situated approximately 940m to the south of the development site.

12.2.23 The study area for the noise and vibration assessment has considered the commercial receptors situated around the site boundary that are defined below.

9. Blooms Garden Centre – situated approximately 270m to the north of the development site; and
10. G+M Motors Gloucester – situated approximately 470m to the south-west of the development site.

National Legislation, Regional Legislation, Local Legislation, Standards and Consultation

12.2.24 The relevant UK legislative framework and guidelines used for this assessment include the following:

- The Environmental Protection Act 1990;
- The Environmental Noise Regulations 2006;
- Environment Agency: How to comply with your Environmental Permit (EPR 1.00), V4.0, April 2011;
- Integrated Pollution Prevention and Control (IPPC): Horizontal Guidance for Noise (IPPC H3), Part 1 – Regulation and Permitting, Environment Agency;
- Integrated Pollution Prevention and Control (IPPC): Guidance Note (IPPCH3), Part 2. Horizontal Guidance for Noise – Noise Assessment and Control, Environment Agency;
- Control of Pollution Act 1974;

- BS4142: 1997 'Rating industrial noise affecting mixed residential and industrial areas';
- BS8233: 1999 'Rating Sound Insulation and noise reduction for buildings – Code of practice';
- BS5228: 2009 'Noise and vibration control on construction and open sites. Part 1: Noise';
- BS5228: 2009 'Noise and vibration control on construction and open sites. Part 2: Vibration';
- BS6472: 2008 'Guide to evaluation of human exposure to vibration in buildings. Part 1: Vibration sources other than blasting';
- 'The Calculation of Road Traffic Noise (CRTN)', Department of Transport and the Welsh Office (1988);
- Design Manual for Roads and Bridges (HD213/11) Volume 11, Section 3, Part 7; 'Traffic Noise and Vibration' February 2011;
- BS7445: 1991 'Description and measurement of Environmental noise';
- South-west Regional Assembly Draft Regional Spatial Strategy 2006-2026;
- Gloucestershire County Council Waste Local Plan 2002-2012; and
- Gloucestershire County Council Emerging Waste Core Strategy.

12.2.25 The Environmental Health Officer (EHO) at Stroud District Council (SDC) has been consulted regarding the assessment methodology for the noise impact assessment on the 6th May 2011 and 25th May 2011. The comments provided by the EHO have formed part of the assessment criteria and are described below.

Other Guidance

World Health Organisation Guidelines 1999

12.2.26 The World Health Organisation (WHO) published its Guidelines for Community Noise in 1999. The document sets out guidance on appropriate noise levels for different scenarios to ensure that communities are not subjected to unacceptable levels of noise. It should be noted that the WHO guidelines, although widely referenced in the UK, have no legal status. An extract of the relevant noise levels is presented in Table 12.3.

Table 12.3 WHO Guideline Values for Community Noise

Specific Environment	Critical Health Effect(s)	L_{Aeq} dB(A)	Time Base (hrs)	L_{AFmax} dB(A)
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
Inside bedrooms	Sleep disturbance, night-time	30	8	45
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60

Assessment of Significance / Assessment Criteria – Noise

Construction Stage

12.2.27 The significance criteria given in BS5228-1:2009 Annex E.2 has been used to assess the noise impact during the construction phase.

12.2.28 BS5228: 2009 'Code of practice for noise and vibration control on construction and open sites' gives recommendations for basic methods of noise and vibration control relating to construction work, as noted below:

"Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut. Noise levels, between 07.00 add 19.00hours, outside the nearest window of the occupied room closest to the site boundary should not exceed:

70 decibels (dBA) in rural, suburban and urban areas away from main road traffic and industrial noise;

75 decibels (dBA) in urban areas near main roads in heavy industrial areas."

12.2.29 For the purposes of this assessment, a façade noise level of 70 dB L_{Aeq} is considered to represent a significant impact.

Operational Phase – Significance of Impact

12.2.30 An impact magnitude has been determined for each of the operational assessments that have been undertaken as described in the following sections. The magnitude of impact determined by these assessments has been considered in conjunction with the sensitivity of the receptor as described in Table 12.5.

Table 12.5 Receptor Sensitivity

Receptor Sensitivity	Type of Receptor
High	Residential properties, schools, hospitals, churches etc.
Moderate	Commercial premises
Low	Industrial premises

12.2.31 Based upon the sensitivity of individual receptors and the assessment of impact magnitude, the matrix shown in Table 12.6 has been developed in order to provide an indication of the possible significance of each of the potential noise impacts.

Table 12.6 Significance Matrix

Impact Magnitude	Receptor Sensitivity		
	High	**Moderate**	**Low**
Major impact	Major	Major/Moderate	Moderate/Minor
Substantial impact	Major/Moderate	Moderate	Minor
Moderate impact	Moderate	Moderate/Minor	Minor/Negligible
Minor Impact	Minor	Minor/Negligible	Negligible
Negligible	Negligible	Negligible	Negligible

Operational Phase – BS4142 Assessment

12.2.32 BS4142:1997 ‘Method of rating industrial noise affecting mixed residential and industrial areas’ can be used to assess whether noise sources of an industrial nature are likely to give rise to complaints from people residing in nearby dwellings.

12.2.33 The procedure in BS4142 for assessing the likelihood of complaints is to compare the predicted noise level from the source in question, the “specific noise level”, with the background noise level. The likelihood of noise provoking complaints is assessed by subtracting the background noise level from the rating noise level. BS4142 states:

"A difference of around +10dB or higher indicates that complaints are likely. A difference of around +5dB is of marginal significance. A difference of -10dB is a positive indication that complaints are unlikely."

12.2.34 The standard also notes that "The greater the difference, the greater the likelihood of complaints."

12.2.35 SDC has stipulated that noise levels at residential receptors in the vicinity of the site should not exceed +3dB of the lowest average L_{A90} measured background noise level over the daytime 16h period and night time 8hr period determined from the acoustic survey.

12.2.36 Based on the above, a rating noise level up to 3dB(A) above the lowest measured background noise level would be compliant with the SDC recommendations and would be considered to result in a negligible impact. The facility would operate on a 24-hour basis and therefore it is necessary to consider both the daytime and night-time background noise levels.

Operational phase – Absolute Noise Levels

12.2.37 Guidance on the acceptable noise levels for areas within buildings is given in Table 5 of BS8233 and in the WHO guidelines. These provide a range of noise levels to inform the design of rooms based on the operations expected to be conducted within them. The predicted noise levels experienced by the receptors within the study area will be assessed against the values identified in Table 5 of BS8233 and also Table 12.3 to assess if the noise emissions from the EfW facility would result in an unacceptable impact. Where the predicted noise levels are at least 10dB(A) below the existing noise levels, there would be no increase to the current noise climate. Table 5 of BS8233 is reproduced below.

Table 12.7: BS8233 Indoor Ambient Noise Design Levels

Criterion	Typical situation	Design Range $L_{Aeq,T}$ dB(A)
Reasonable industrial working conditions	Heavy engineering Light engineering Garages, warehouses	70-80 65-75 65-75
Reasonable speech or	Department store	50-55

Criterion	Typical situation	Design Range $L_{Aeq,T}$ dB(A)
telephone communications	Cafeteria, canteen, kitchen Wash-room, toilet Corridor	50-55 45-55 45-55
Reasonable conditions for study and work requiring concentration	Library, cellular office, museum Staff room Meeting room, executive office	40-50 35-45 35-40
Reasonable listening conditions	Classroom Church, lecture theatre, cinema Recording studio	35-40 30-35 25-30 20-25
Reasonable resting/sleeping conditions	Living rooms Bedrooms[a]	30-40 30-35
[a] *For a reasonable standard in bedrooms at night, individual noise events (measured with F time-weighting) should not normally exceed 45 dB L_{Amax}*		

12.2.38 The predicted noise levels experienced by the receptors within the study area will also be assessed against the values identified in Environment Agency guidance note EPR 1.00. EPR 1.00 provides the following guidance on noise levels:

'As a guide, annoyance becomes more likely where the resulting field rating level ($L_{AR,TR}$) exceeds 50 dB by day and a façade rating level exceeds 45 dB by night (23:00 to 07:00). Where very low background levels prevail, site noise levels should not be significantly above the background and, if practicable, should be well below. If you are in an area covered by the Environmental Noise Regulations 2006, site noise levels should, as far as practicable, be less than an L_{den} value of 55 dB(A) or an L_{night} value of 50 db(A).

Sometimes ambient noise increases over time (creeping background). This increases the environmental value of noise abatement measures. Where this has been identified in discussions with ourselves or previously with the local authority, you must consider it when planning noise control techniques to maintain acceptable noise levels.'

Operational phase – Restrictive Covenant

12.2.39 Specific restrictions for future development and operations on the development site are in place by virtue of covenants attached to the land. In particular these restrictions relate to the use of the site for receipt, processing and/or treatment of waste. With respect to noise emissions, the restrictive covenant states that:

'noise emissions will not exceed 5dB(A) of background levels as measured at the boundary of the Property adjoining the Retained Land and determined by acoustic survey'.

12.2.40 The Retained Land referred to in the covenant relates to the area of Javelin Park to the north of the proposed development site boundary.

Operational Phase – Road Traffic Noise

12.2.41 The classification of magnitude of long term noise impacts from DMRB (Table 3.2) has been used to assess the effects of variations in traffic flows. Table 3.2 has been reproduced below.

Table 12.8: Classification of Magnitude of Noise Impacts

Noise change, LA10,18h	**Magnitude of Impact**
0	No change
0.1-2.9	Negligible
3-4.9	Minor
5-9.9	Moderate
10+	Major

12.3 Baseline

12.3.1 A noise survey was undertaken at the development site in April and May 2010 by RPS Planning and Development Ltd (RPS). The survey comprised the collection of noise data from two long-term unattended locations and four short-term attended locations. The monitoring points were installed at locations representative of the nearest noise sensitive receptors and also on the site boundary.

12.3.2 A supplementary noise survey was undertaken by the applicant in May 2011 to obtain a greater understanding of the noise climate along the northern boundary of the development site, sufficient to ensure compliance with the restrictive covenant. The survey comprised a single unattended monitoring location.

12.3.3 The location of the attended and unattended measurements are shown on Figure 12.2. A description of each location is noted below in Table 12.9.

Table 12.9 Noise survey measurement information

Ref.	Description	Measurement type and period
LT1	Park End Farm	Unattended Survey 28 April 2010 to 12 May 2010 Unattended Survey 21:00-23:00 on 17 May 2010
LT2	The Lodge	Unattended Survey 28 April 2010 to 12 May 2010 Unattended Survey 21:00-23:00 on 17 May 2010
ST1	Blooms Garden Centre Car Park	Attended Survey 17:45 to 18:30 on 28 April 2010
ST2	Eastern boundary of development site, adjacent to B4008 highway	Attended Survey 21:00 to 22:30 on 17 May 2010
ST3	Western boundary of development site, close to M5 Motorway	Attended Survey 17:45 to 18:30 on 17 May 2010
ST4	Northern boundary of development site, adjacent to site access road	Attended Survey 21:15 to 23:00 on 17 May 2010
LT3	Northern boundary of development site, adjacent to site access road	Unattended Survey 20 May 2011 to 23 May 2011

12.3.4 All noise measurements were taken using precision equipment conforming to Type 1 of the specifications for sound level meters given in BS 60651. The equipment deployed during the survey are noted below:

RPS Survey (April/May 2010)

12.3.5 Refer to the RPS noise survey report contained within Appendix 12.2. for comprehensive details of the equipment used.

Gifford Survey (May 2011)

- Type 1 Sound Level Meter (SLM) Norsonic Type 140, s/n 1404236;
- Norsonic 1225 microphone, s/n 112825;
- Field Calibrator Norsonic Type 1251, 114dB @ 1kHz, s/n 32190;
- Heavy duty tripod; and
- Outdoor weather protection kit.

12.3.6 The instrumentation was calibrated once it was set up in the measurement position and each time it was moved. No significant drift in the calibration was recorded at any time during the survey. All instrumentation had been calibrated to UKAS traceable standards within the preceding two years of the survey and the calibrator within the preceding twelve months of the survey. Calibration certificates are included within Appendix 12.3.

12.3.7 Measurements were taken under free field conditions i.e. > 3.5m away from reflecting surfaces and with the meter positioned on a tripod at approximately 1.5m above ground level.

12.3.8 At each measurement location a comprehensive set of noise data was recorded for every second during the logging period T, along with the frequency spectra. The following sound level indices were logged for each defined measurement period T:

- $L_{Aeq,T}$ - The A-weighted equivalent continuous noise level over the measurement period; and
- $L_{90,T}$ - The A-weighted noise level exceeded for 90% of the specified measurement period. This parameter is often used to describe background noise.

Noise Monitoring Results

12.3.9 A summary of the noise levels measured at each of the monitoring positions are presented in the following sections.

Park End Farm (LT1)

12.3.10 The main noise source at location LT1 was road traffic on the M5 and on other local roads. Other sources of noise include industrial activities on both Park

End Farm and sites nearby, and birdsong which is the likely cause of high noise levels at approximately 05:00 hrs. The results of the long term noise survey are presented in Table 12.10 below.

Table 12.10: Long-term Noise Survey Results – LT1; Park End Farm

Date at Start of Period	Day	Daytime (07.00 to 19.00 hours)		Daytime (07.00 to 23.00 hours)			Night-time (23.00 to 07.00 hours)		
		$L_{Aeq.12h}$ (dB)	Hours in Dataset	$L_{Aeq.16h}$ (dB)	L_{A90} (dB)	Hours in Dataset	$L_{Aeq.8h}$ (dB)	L_{A90} (dB)	Hours in Dataset
28/04/10	Wednesday	62	3	59	53	7	54	46	8
29/01/10	Thursday	59	12	58	54	16	55	47	8
30/04/10	Friday	59	12	58	55	16	68	45	8
01/05/10	Saturday	54	12	53	48	16	65	43	8
02/05/10	Sunday	56	12	55	51	16	74	39	8
03/05/10	Monday	55	12	55	51	16	66	45	8
04/05/10	Tuesday	54	12	53	50	16	65	40	8
05/05/10	Wednesday	53	12	53	48	16	71	40	8
06/05/10	Thursday	55	12	55	51	16	53	43	8
07/05/10	Friday	56	12	55	52	16	64	42	8
08/05/10	Saturday	56	12	55	52	16	62	41	8
09/05/10	Sunday	54	12	53	50	16	64	43	8
10/05/10	Monday	53	12	53	50	16	50	42	8
11/05/10	Tuesday	55	12	55	47	16	55	43	8
12/05/10	Wednesday	53	12	52	48	16	49	44	5.25
Mean	**All Days**	**56**		**55**	**51**		**61**	**43**	
	Weekday	**56**		**55**	**51**		**59**	**43**	
	Sunday	**55**		**54**	**51**		**69**	**41**	
Minimum	**All Days**	**52**		**52**	**47**		**49**	**39**	

12.3.11 An additional short-term measurement was undertaken at LT1 so that there was a measurement concurrent with the short-term measurements carried out elsewhere on the site boundaries.

Table 12.11: Concurrent Noise Survey Results at Park End Farm – 17 May 2010

Time Period	Noise Survey Metric (dB)	
	L_{Aeq}	L_{A90}
21:00 – 21:15	55	52
21:15 – 21.30	55	52
21:30 – 21.45	54	50
21:45 – 22.00	52	48
22.00 – 22.15	54	50
22:15 – 22.30	53	49
22:30 – 22.45	51	46
22:45 – 23:00	51	48

The Lodge (LT2)

12.3.12 The main noise source at location LT2 was traffic on the B4008. In addition there was some noise from construction activities on the Javelin Park site during daytime hours. However, the mean daytime noise levels were not significantly different on a weekday (i.e. during construction activities) than on a Sunday or during the evening (i.e. not during construction activities). On this basis, noise from construction activities on the site has not significantly affected overall baseline levels determined for the daytime period. The results of the long term noise survey are presented in Table 12.12 below.

Table 12.12: Long-term Noise Survey Results – LT2: The Lodge

Date at Start of Period	Day	Daytime (07.00 to 19.00 hours)		Daytime (07.00 to 23.00 hours)			Night-time (23.00 to 07.00 hours)		
		$L_{Aeq.12h}$ (dB)	Hours in Dataset	$L_{Aeq.16h}$ (dB)	L_{A90} (dB)	Hours in Dataset	$L_{Aeq.8h}$ (dB)	L_{A90} (dB)	Hours in Dataset
28/04/10	Wednesday	59	2	58	52	6	54	46	8
29/01/10	Thursday	59	12	59	55	16	55	49	8
30/04/10	Friday	61	12	60	57	16	53	47	8
01/05/10	Saturday	59	12	58	50	16	53	47	8
02/05/10	Sunday	61	12	60	53	16	52	41	8
03/05/10	Monday	58	12	57	52	16	56	47	8
04/05/10	Tuesday	58	12	57	51	16	52	42	8
05/05/10	Wednesday	58	12	58	52	16	52	43	8

Date at Start of Period	Day	Daytime (07.00 to 19.00 hours)		Daytime (07.00 to 23.00 hours)			Night-time (23.00 to 07.00 hours)		
		$L_{Aeq.12h}$ (dB)	Hours in Dataset	$L_{Aeq.16h}$ (dB)	L_{A90} (dB)	Hours in Dataset	$L_{Aeq.8h}$ (dB)	L_{A90} (dB)	Hours in Dataset
06/05/10	Thursday	58	12	57	51	16	51	41	8
07/05/10	Friday	58	12	57	51	16	51	43	8
08/05/10	Saturday	58	12	57	52	16	54	41	8
09/05/10	Sunday	57	12	56	48	16	53	44	8
10/05/10	Monday	58	12	57	48	16	54	41	8
11/05/10	Tuesday	58	12	58	51	16	53	44	8
12/05/10	Wednesday	57	12	57	49	16	53	43	8
Mean	**All Days**	**58**		**58**	**51**		**53**	**44**	
	Weekday	**58**		**58**	**52**		**53**	**44**	
	Sunday	**59**		**58**	**51**		**53**	**43**	
Minimum	**All Days**	**57**		**56**	**48**		**51**	**41**	

12.3.13 An additional short-term measurement was undertaken at LT2 so that there was a measurement concurrent with the short-term measurements carried out elsewhere on the site boundary.

Table 12.13: Concurrent Noise Survey Results at The Lodge – 17 May 2010

Time Period	Noise Survey Metric (dB)	
	L_{Aeq}	L_{A90}
21:00 – 21:15	57	51
21:15 – 21.30	56	52
21:30 – 21.45	55	50
21:45 – 22.00	54	51
22.00 – 22.15	55	51
22:15 – 22.30	53	49
22:30 – 22.45	54	50
22:45 – 23:00	53	49

Blooms Garden Centre Car Park (ST1)

12.3.14 The dominant noise source at location ST1 was road traffic on the M5. There was also contributing noise from cars travelling within the Garden Centre Car Park.

Table 12.14: Short-Term Noise Survey Results – ST1: Blooms Garden Centre Car Park

Time Period	Noise Survey Metric (dB)	
	L_{Aeq}	L_{A90}
17:45 – 18.00	62	60
18:00 – 18:15	63	60
18:15 – 18:30	63	60
Average	63	60

Eastern Boundary of Site with B4008 (ST2)

12.3.15 The dominant noise source at location ST2 was traffic on the M5 and B4008.

Table 12.15: Short-Term Noise Survey Results – ST2: Eastern Boundary of Site with B4008

Time Period	Noise Survey Metric (dB)	
	L_{Aeq}	L_{A90}
21:00 – 21:15	60	54
21:45 – 22:00	57	54
22:15 – 22:30	57	52
Average	60	54

Western Boundary of Site with M5

12.3.16 The dominant noise source at location ST3 was traffic on the M5.

Table 12.16: Short-Term Noise Survey Results – ST3: Western Boundary of Site with M5

Time Period	Noise Survey Metric (dB)	
	L_{Aeq}	L_{A90}
21:15 – 21:30	64	60
22:00 – 22:15	63	59
22:45 – 23:00	61	57
Average	63	59

Northern Boundary of Site (ST4)

12.3.17 The dominant noise source at location ST4 was traffic on the M5.

Table 12.17: Short-Term Noise Survey Results – ST4: Northern Boundary of Site

Time Period	Noise Survey Metric (dB)	
	L_{Aeq}	L_{A90}
21:45 – 22:00	58	56
21:30 – 21:45	56	53
22:30 – 22:45	56	53
Average	57	54

Northern Boundary of Site (LT3)

12.3.18 The dominant noise source at location LT3 was traffic on the M5. The daytime readings were influenced by wind speeds in excess of 5m/s. Despite this, the day-time readings were comparable to the RPS survey dataset and the average Saturday reading was only 1dB(A) more than the average 'all days' background reading measured at The Lodge. Also, the lowest background reading during the Saturday daytime survey at LT3 was 1dB(A) below the lowest 'all days' background level measured at The Lodge.

Table 12.18: Long-Term Noise Survey Results – LT3: Northern Boundary of Site

Date	Time Period	Average L_{A90} (dBA)	Lowest L_{A90} (dBA)
Friday 20/05/11	Daytime (15:00 - 19:00)	56	50
	Night time (23:00 to 07:00)	47	41
Saturday 21/05/11	Daytime (07:00 - 23:00)	52	47
	Night time (23:00 to 07:00)	45	40
Sunday 22/05/11	Daytime (07:00 - 23:00)	56	51
	Night time (23:00 to 07:00)	46	40
Monday 23/05/11	Daytime (07:00 - 10:00)	57	56

12.4 Assessment of Effects

Incorporated Mitigation

12.4.1 The following mitigation measures have been incorporated into the scheme design:

- **site location** – there are only a limited number of noise sensitive receptors in the vicinity of the development site and with the exception of The Lodge, these are generally situated at considerable distances from the development site boundary. There is also a relatively high background noise level at the site which is attributable to the M5 motorway situated to the west of the development site;
- **building orientation** – the building is orientated in such a way that the impacts on the nearest residential property would be reduced;
- **landscaping bunds –** earthwork bunds are proposed along the eastern boundary of the site and also adjacent to the eastern façade of the building and main car park. These bunds would act to reduce noise emissions experienced at The Lodge;
- **soft landscaping –** the proposed development would incorporate large areas of soft ground which would act to attenuate noise emissions from the facility;
- **ventilation louvres** – to control noise breakout from the ventilation louvres on the façade of the building, the louvres would be positioned to minimise the impact on noise sensitive properties. Where this cannot be achieved it is intended that acoustic louvres would be adopted at key locations;
- **rapid action roller shutter doors –** to control noise breakout from within the building, it is proposed that rapid action roller shutter doors would be adopted. All doors (including personnel doors) would be kept closed and would only be opened to accommodate deliveries. This would act to limit the periods when unattenuated noise breakout can occur; and
- **no vehicle deliveries at night** – whilst the facility would be operational 24 hours a day, there would be no deliveries during the night-time period which reduce noise levels in the vicinity of the development site. This

would also enable all doors to be closed throughout the night time period and limit noise breakout.

Construction Phase Assessment – Noise

12.4.2 The construction programme is expected to commence in early 2013 and the construction period is expected to have a duration of 33 months.

Predicted Impacts

12.4.3 The construction activities which are associated with this development and have the potential to cause noise impacts are listed below:

- **site establishment** - activities including establishment of site compound and erection of hoarding around the perimeter of the site;
- **site preparation** - activities including site stripping, removal of existing vegetation to facilitate site access, haul road construction, forming earthwork bunds etc;
- **building substructure works** - the main building would require piled foundations that have the potential to cause noise and vibration impacts;
- **building superstructure works & general site activities** - activities requiring the use of construction plant such as cranes, delivery wagons, excavators, lifting platforms, compressors, generators etc;
- **infrastructure works** - activities including formation of site access road, car park, footways, service installations etc; and
- **traffic** - the construction activities would also generate additional traffic on the road network to bring workers to/from site and also for deliveries of materials.

12.4.4 Exact details of the construction methods and plant to be employed on site have not been finalised. However, in accordance with industry best practice, an estimate of the worst case noise levels is presented to provide initial guidance on the magnitude of the construction noise impact on the surrounding noise sensitive receptors. Table 12.19 presents typical construction site activities likely to occur during various phases of construction at the site.

Table 12.19 Construction Activities

Site Activity		Plant	Source data ref	Noise level at 10m (dB)	Noise/ Activity (dB)
Site Establishment	Establishment of welfare/site accommodation	Mobile crane	C4.38	78	85
		lorry	C6.21	80	
		Generator	C8.24	59	
	Site hoarding	Small excavator	C2.24	73	
		Hammer	C1.19	69	
		Nail gun	C4.95	73	
		Dump truck	C2.30	79	
Site Preparation	Site clearance, earthworks & haul roads	Dozer	C2.10	80	88
		Tracked excavator (x2)	C2.3	78	
		Wheeled loader	C2.27	80	
		Dump truck	C2.30	79	
		Lorry	C2.34	80	
		Vibratory roller	C5.20	75	
		Wheeled loader	C2.27	80	
Substructure Works	Piled foundations	Crawler mounted rig	C3.21	79	89
		Tracked excavator	C3.24	74	
		Concrete pump	C3.25	78	
		Concrete mixer	C4.27	79	
		Dump truck	C2.30	79	
	R.C. concrete beams and bases	Tracked excavator	C2.14	79	
		Dump truck	C2.30	79	
		Concrete pump	C3.25	78	
		Concrete mixer	C4.27	79	
		Poker vibrator (x2)	C4.33	78	
Superstructure Works	Frame, envelope and primary plant	Mobile telescopic crane	C4.46	67	84
		Tower crane	C4.49	77	

Site Activity		Plant	Source data ref	Noise level at 10m (dB)	Noise/ Activity (dB)
	installation	Lifting platform (x2)	C4.57	67	
		Lorry	C6.21	80	
		Tracked excavator	C2.14	79	
		Generator	C4.86	65	
		compressor	C5.5	65	
Infrastructure Works	Site access roads, footways, car parks and secondary service installations	Dozer	C2.10	80	88
		Tracked excavator (x2)	C5.18	80	
		Articulated dump truck	C5.16	81	
		Lorry	C6.21	80	
		Vibratory roller	C5.20	75	
		Asphalt paver + tipper lorry	C5.31	77	
		Circular saw	C4.72	79	

12.4.5 It should be noted that the plant and operations assessed have been estimated using data from similar developments. This enables an indication to be provided of the worst case noise level that would affect the surrounding noise sensitive receptors during the construction period. The assessment assumes that all the plant would operate continually, for each phase of work, at the closest point to each sensitive receptor without any mitigation measures in place.

12.4.6 Table 12.20 shows the noise levels (dB) at various distances from the activities by estimating the noise reduction with distance from the source, assuming 6dB reduction per doubling of distance. A 3dB façade correction factor has been applied in accordance with BS5228.

Table 12.20 Site Operations during Construction and Corresponding Noise Levels

Site Operation	Distance to Receptor (metres)							
	10	45	75	100	125	150	200	250
Site Establishment	88	74	70	68	66	64	62	60
Site Preparation	91	78	74	71	69	68	65	63
Substructure Works	92	79	74	72	70	68	66	64
Superstructure Works	87	74	69	67	65	63	61	59
Infrastructure Works	91	78	74	71	69	68	65	63

12.4.7 It is considered that an appropriate façade noise level during the construction works is 70dB which is typically used in rural, suburban and urban areas away from main road traffic and industrial noise. Due to the presence of the M5 in the vicinity of the site, this is a conservative assessment.

12.4.8 It can be seen from Table 12.20 above, the noise levels are expected to be close to the 70dB criteria up to distances of 125m from certain construction operations. The façade of the closest residential receptor (The Lodge) is situated approximately 50m from the site boundary and therefore works associated with site establishment, site preparation and infrastructure works would exceed the 70dB $L_{Aeq,10h}$ limit. Due to the separation distance between the proposed building and The Lodge (approx. 160m at the closest point), it is not considered that construction works associated with main building would exceed the 70dB $L_{Aeq,10h}$ limit.

12.4.9 The façade of the second nearest receptor (Hiltmead House) is situated approximately 250m from the development site boundary and therefore the 70dB $L_{Aeq,10h}$ limit is not predicted to be exceeded. The noise levels experienced by the other residential receptors within the study area are predicted to be lower than Hiltmead House and therefore have not been considered further.

12.4.10 The façade of the closest commercial receptor (Blooms Garden Centre) is situated approximately 270m from the development site boundary and therefore the 70dB $L_{Aeq,10h}$ limit is not predicted to be exceeded.

12.4.11 Consideration of the factors described above show that, if not adequately mitigated noise from construction activities may cause a nuisance at The Lodge. The impact is considered to be of moderate adverse significance at this receptor.

Construction Phase – Vibration

12.4.12 There are currently no British Standards that provide a methodology to predict levels of vibration from construction activities, other than those contained within BS5228, which relates to percussive or vibratory piling only. BS5228 suggests that for the majority of people, vibration levels between 0.14 and 0.3 mms-1 peak particle velocity are just perceptible. Table 12.21 details the distances at which certain activities give rise to a just perceptible level of vibration. These figures are based on historical field measurements.

Table 12.21 Distances at which Vibration may just be Perceptible

Construction Activity	Distance from activity when vibration may just be perceptible (metres)
Excavation	10 - 15
Heavy vehicles (e.g. dump trucks)	5 - 10
Hydraulic breaker	15 - 20
Driven piling	50 - 100

12.4.13 Whilst the boundary of the site is approximately 50 m from The Lodge no piling activities would be undertaken within 100 m of the property. The closest piling would be a distance of approximately 160m from The Lodge. As such and based on the distances noted in Table 12.21, it is not considered that the residential receptors in the vicinity of the proposed development site would be affected by any of the vibration inducing construction activities and therefore would result in a negligible impact.

Operational Phase – Noise

12.4.14 Based on the output of the CADNA noise model, the predicted noise levels at each of the receptors within the study area is identified in 12.22 below. The values provided in the table do not include a correction for acoustic features in accordance with BS4142.

Table 12.22 Predicted Noise Levels from CADNA Model

Receptor	Predicted Noise Level	
	Daytime (07:00 to 23:00)	**Night-time (23:00 to 07:00)**
The Lodge	46 dB(A)	37 dB(A)
Hiltmead House	42 dB(A)	37 dB(A)
St Josephs Travelling Park	43 dB(A)	34 dB(A)
Lindas Home	41 dB(A)	32 dB(A)
Old Airfield Farm	42 dB(A)	35 dB(A)
Royston	33 dB(A)	28 dB(A)
Broadfield Farm	37 dB(A)	29 dB(A)
Warren Farm	34 dB(A)	26 dB(A)
Blooms Garden Centre	39 dB(A)	37 dB(A)
G+M Motors Gloucester	42 dB(A)	34 dB(A)

BS4142 Assessment

12.4.15 As noted in Table 12.22, the predicted noise levels at the façade of the closest residential property (The Lodge) are as follows:

- Daytime: 46dB $L_{Aeq,T}$ [5]
- Night-time: 37dB $L_{Aeq,T}$

12.4.16 In accordance with the guidance in BS4142, a +5dB correction factor should be applied to the predicted values to take account of acoustic features which are likely to increase the likelihood of complaint. This is applied where the noise source contains one or more of the following features:

- the noise contains a distinguishable, discrete, continuous note (whine, hiss, screech, hum);
- the noise contains distinct impulses (bangs, clicks, clatters, or thumps); or
- the noise is irregular enough to attract attention.

[5] The reported noise levels have been based on continuously operating noise sources and are therefore representative of any assessment period

12.4.17 Whilst the facility would be designed to try and avoid tonal emissions a +5dB correction factor has been applied to the predicted values in order to provide a robust assessment, this gives the following rating levels:

- Daytime: 51dB $L_{Aeq, T}$
- Night-time: 42dB $L_{Aeq, T}$

12.4.18 The EHO at SDC has stipulated that the operational noise levels should not exceed a level 3dB(A) above the minimum background noise levels (L_{A90}). Adding 3dB(A) to the lowest measured background noise levels (lowest average 16hr and 8hr L_{A90} levels) at The Lodge gives noise limit values of 51dB(A) during the daytime and 44dB(A) at night. The average of the lowest night time $L_{A90,60mins}$ levels recorded during the baseline noise survey was 39dB(A), which typically occurred between the hours of 2am to 3am. Adding the 3dB(A) to this gives a value of 42dB(A).

12.4.19 Although there would be increased noised levels experienced at The Lodge it is evident from the above that the noise threshold limits stipulated by SDC would not be exceeded. It is therefore considered that the noise levels would represent a negligible impact. With reference to Tables 12.5 and 12.6, the significance of effect is negligible.

12.4.20 The noise levels experienced at The Lodge during the daytime are dominated by HGVs that have been modelled in the vicinity of the proposed gatehouse.

12.4.21 Due to its proximity to the development site and separation distance from the M5 Motorway, The Lodge represents the most susceptible residential receptor within the study area. The predicted noise levels at the next closest residential property (Hiltmead House) are 42dB(A) during the daytime and 37dB(A) at night. The predicted daytime level is lower than that at The Lodge and the night-time level is the same. However, due to the proximity of Hiltmead House to the motorway, the background noise levels would be significantly higher and therefore the impact is reduced. Based on this, it is considered that the noise levels would represent a negligible impact. With reference to Tables 12.5 and 12.6, the significance of effect is negligible. This level of significance would also be applicable to the other residential properties within the study area as they are all further way from the site and as such would experience lower noise levels.

Assessment of Absolute Noise Levels

12.4.22 As noted above, the predicted equivalent continuous noise levels $L_{Aeq,T}$ at the façade of the closest residential property (The Lodge) are 46dB(A) during the daytime and 37dB(A) at night. These values are at least 10dB(A) below the minimum measured $L_{Aeq,T}$ values for the day and night-time periods and therefore the proposed facility would not result in a significant contribution to the existing noise climate.

12.4.23 Based on predicted equivalent continuous noise levels $L_{Aeq,T}$, it is considered that the absolute noise levels from the operational phase of the development would result in a negligible impact at the closest residential receptor. The noise levels at the other residential receptors located within the study area would be lower than those experienced at The Lodge due to noise propagation with distance. Based on this, the noise levels at all residential receptors within the study area are considered to represent a negligible impact. With reference to Tables 12.5 and 12.6, the significance of effect is negligible.

12.4.24 The noise levels at Blooms Garden Centre are predicted to be 39dB(A) in the daytime. This value is at least 10dB(A) below the average $L_{Aeq,T}$ measured at this location during the baseline survey and therefore the predicted noise levels are not sufficient to influence the noise climate and are considered to represent a negligible impact. With reference to Tables 12.5 and 12.6, the significance of effect is negligible.

12.4.25 The noise levels at G+M Motors Gloucester are predicted to be 42dB(A) in the daytime. No measurements were taken at this location during the baseline survey. However, due to the proximity to the motorway and the nature of the work being undertaken at the receptor, it is not considered that the noise emissions from the proposed development would influence the noise climate at this location sufficient to represent a significant impact. Based on this, it is considered that the noise levels at Hiltmead House would represent a negligible impact. With reference to Tables 12.5 and 12.6, the significance of effect is classified as Negligible.

12.4.26 On this basis the impact at all other receptor locations would be classified as negligible.

Restrictive Covenant

12.4.27 For the purposes of assessing the noise levels at the northern boundary of the proposed development site i.e. at the interface with the Retained Land, three receivers were introduced into the CADNA model. The receivers were spread along the boundary line in the area where the facility is in close proximity at a height of 1.5m above ground level. Refer to Appendix 12.4 for locations of the receivers.

12.4.28 In accordance with the requirements of the restrictive covenant, 5dB(A) was added to the average night-time background noise levels taken from the baseline survey at location LT3 to provide a target level. The lowest average daytime reading from the survey was used (Saturday 22/05/11) in order to provide a robust assessment. This results in a target level of 57dB(A) during the daytime and 51dB(A) during the night-time.

12.4.29 Based on the output of the CADNA noise model, the predicted noise levels at each of the receptors within the study area is identified in 12.23 below.

Table 12.23: Predicted Noise Levels at the Receiver Points along Retained Land

Receiver Ref.	Predicted Noise Levels (dB)*	
	Daytime	Night-time
1	51	51
2	45	44
3	52	49

** Predicted noise level at 1.5m above ground level*

12.4.30 From the predicted noise levels, it can be seen that both daytime and night-time values would be compliant with the restrictive covenant.

12.4.31 The levels at Receiver 1 match, but do not exceed, the target value during the night-time period. Furthermore this is considered to represent a conservative assessment as Receiver 1 is closer to the motorway than the monitoring location (LT3) and as such is likely to experience higher background noise levels.

Road Traffic Noise

12.4.32 The traffic flows on each of the road links considered in the Transport Assessment are set out in Table 12.24. Refer to Figure 12.3 for the location of the road links.

Table 12.24: Traffic Flow Data

Link No	Description	Speed KPH	2011 Baseline		2026 Baseline		2026 Do nothing		2026 Do something	
			18hr flow	%HGV	18hr flow	%HGV	18hr flow	%HGV	18hr flow	%HGV
1	B4008 south of site access roundabout	81	9059	5.9	10332	6.0	15118	4.1	15084	4.1
2	B4008 north of site access roundabout	81	9059	5.9	10332	6.0	16144	6.9	15966	6.9
3	B4008 between M5 roundabouts	81	17442	7.2	19894	7.2	29989	5.7	29829	5.8
4	Slip Rd onto M5 – SB	113	5984	9.4	6825	9.4	8454	9.0	8431	8.7
5	Slip Rd off M5 – SB	113	6488	9.0	7400	9.0	10679	7.4	10683	7.4
6	Slip Rd onto M5 – NB	113	6525	6.5	7442	6.5	11803	5.0	11818	5.1
7	Slip Rd off M5 – NB	113	6889	9.2	7857	9.2	8637	9.8	8613	9.5
8	B4008 north of M5	97	28846	6.9	32902	6.9	47467	5.0	47315	5.1
9	Services access road	50	3127	12.1	3565	12.0	3565	12.0	3565	12.0
10	A38 south of roundabout	88	16568	7.0	18898	7.0	21353	6.3	21318	6.2
11	A38 North of roundabout	97	34634	6.6	39504	6.6	56334	4.7	56219	4.8
12	B4008 northbound	81	6568	2.8	7491	2.8	7491	2.8	7491	2.8

12.4.33 Based on the traffic data contained within Table 12.24, the predicted noise levels for the different scenarios have been calculated and are provided in Table 12.25.

Table 12.25: Road Traffic Noise Levels

Link No	**Description**	**Road Traffic Noise Levels L_{A10} (dB)**			
		2011 Baseline	**2026 Baseline**	**2026 Do nothing**	**2026 Do something**
1	B4008 south of site access roundabout	70.7	71.3	72.5	72.5
2	B4008 south of site access	70.7	71.3	73.4	73.3

Link No	Description	Road Traffic Noise Levels L_{A10} (dB)			
		2011 Baseline	2026 Baseline	2026 Do nothing	2026 Do something
	roundabout				
3	B4008 between M5 roundabouts	73.8	74.3	75.8	75.8
4	Slip Rd onto M5 – SB	72.1	72.7	73.5	73.5
5	Slip Rd off M5 – SB	72.4	73.0	74.3	74.3
6	Slip Rd onto M5 – NB	72.0	72.6	74.4	74.4
7	Slip Rd off M5 – NB	72.7	73.2	73.7	73.7
8	B4008 north of M5	77.3	77.8	79.1	79.1
9	Services access road	63.7	64.2	64.2	64.2
10	A38 south of roundabout	74.1	74.7	75.1	75.1
11	A38 north of roundabout	78.0	78.6	79.8	79.8
12	B4008 northbound	68.6	69.2	69.2	69.2

12.4.34 From the modelled scenarios, it is possible to calculate the change in road traffic noise levels between the scenarios considered in the assessment. These are presented in Table 12.26 below.

Table 12.26: Comparison of Road Traffic Noise Levels

Link No	Description	Change in Noise Levels (dB)		
		2011 baseline to 2026 baseline	2011 baseline to 2026 do nothing	2011 baseline to 2026 do something
1	B4008 south of site access roundabout	0.6	1.8	1.8
2	B4008 south of site access roundabout	0.6	2.7	2.6
3	B4008 between M5 roundabouts	0.5	2.0	2.0
4	Slip Rd onto M5 – SB	0.6	1.4	1.4
5	Slip Rd off M5 – SB	0.6	1.9	1.9
6	Slip Rd onto M5 – NB	0.6	2.4	2.4
7	Slip Rd off M5 – NB	0.5	1.0	1.0
8	B4008 north of M5	0.5	1.8	1.8
9	Services access road	0.5	0.5	0.5
10	A38 south of roundabout	0.6	1.0	1.0
11	A38 north of roundabout	0.6	1.8	1.8

Link No	Description	Change in Noise Levels (dB)		
		2011 baseline to 2026 baseline	2011 baseline to 2026 do nothing	2011 baseline to 2026 do something
12	B4008 northbound	0.6	0.6	0.6

12.4.35 It can be seen that the variation in noise levels between the 'do something' 2026 scenario and the 2011 baseline are all below 3dB which is considered to be smallest change in noise levels that are perceptible to the human ear. The 2026 'do something scenario' is considered to be a likely worst case scenario i.e. it represents the whole of Javelin Park being developed compared against existing conditions as per the sensitivity analysis undertaken in the traffic assessment presented in Chapter 7.0.

12.4.36 Applying the <3dB increase to the magnitude of noise impacts presented in Table 12.8, this would constitute a negligible impact. With reference to Tables 12.5 and 12.6, the significance of effect is negligible for both residential and commercial receptors.

12.4.37 From Table 12.25, it is evident that there would be only marginal difference between the 'do nothing' and 'do something' scenarios and a significant noise impact would not occur in either situation.

12.5 Additional Mitigation

Construction Phase

12.5.1 In order to minimise the disturbance caused by construction noise, the site contractor would be part of the Considerate Constructor scheme and employ the principles of 'Best Practicable Means' (BPM) as defined in the Control of Pollution Act 1974. BPM can be used to reduce unwanted noise generation throughout the construction period whilst not unreasonably inhibiting the construction works. The reduction of noise through the use of BPM has shown that it is possible to reduce the noise impact from construction by approximately 10dB. A summary of the BPM measures is presented in Appendix 12.5. Any specific measures should be agreed with the Local Authority prior to construction and incorporated into the working methodologies.

12.5.2 The reductions achieved using BPM would still constitute a worst case scenario since continuous equivalent noise levels during the construction phase are still likely to be much lower than those presented. This is because all of the assumed plant and equipment is unlikely to be running simultaneously and continuously over the working day and is likely to be situated at a greater distance from the sensitive receptors and/or be screened, and/or have additional noise abatement measures in place.

12.5.3 To reduce the construction noise levels at the nearest residential receptor (The Lodge), it is recommended that the proposed landscaping bund situated along the eastern boundary of the site is installed at the earliest opportunity within the construction programme.

Operational Phase

12.5.4 Regular maintenance of vehicles and plant at the facility should be undertaken to ensure noise emissions are minimised and do not increase over time.

12.5.5 Where there is expected to be planned abnormal noise events which have the potential to cause a disturbance to local noise sensitive receptors, community liaison should be undertaken to inform residents. Where possible, the noise producing activities would be undertaken at less sensitive periods of the day, to avoid causing annoyance.

12.6 Residual Effects and Conclusions

12.6.1 An assessment of effects of the proposed development on noise and vibration has been carried out. The assessment considered effects during the construction and operational phases of the development.

12.6.2 The assessment of potential noise effects during the construction phase has shown that there is a potential for noise to cause nuisance at the nearest noise sensitive receptor to the development site. However, through the programming of the works, implementation of suitable mitigation measures and good site practice, the effects from construction can be controlled and there would be no residual significant impact.

12.6.3 An assessment of potential vibration effects has indicated that receptors in the vicinity of the site would not be adversely affected by vibration inducing construction activities and therefore would not result in a significant impact. No significant operational vibration effects have been identified.

12.6.4 The assessment of potential noise effects during the operational phase has shown that the facility would adhere with the Local Authority criteria at the surrounding noise sensitive receptors and therefore an appropriate level of protection from noise would be provided. The proposed development would therefore not result in a significant impact on local residential receptors.

12.6.5 The assessment of absolute noise levels from the operational phase of the development over the course of a day/night has indicated that the predicted noise levels are not expected to cause a significant impact to the current noise climate at surrounding residential and commercial receptors.

12.6.6 The assessment of noise impact due to variation in traffic flows on the local road network has shown that the noise levels would not result in a significant impact.

13.0 AIR QUALITY

13.1 Introduction

13.1.1 This chapter considers the potential impacts of the proposed EfW facility at Javelin Park on local air quality.

13.1.2 The main focus of the chapter is the emissions from the stack of the EfW facility but impacts from fugitive emissions (dust and odour), the emissions from traffic associated with the facility and potential emissions during construction have also been assessed.

13.1.3 This chapter is intended to summarise the results of the air quality assessment that was undertaken using dispersion modelling for the proposed facility. Full details of the assessment can be found in Appendix 13.1.

13.1.4 The emissions from the stack would be subject to continuous monitoring, analysis and control. The approach taken in the UK and Europe is to minimise the emissions of pollutants in the flue gas to low levels and then use a sufficiently high stack to disperse these emissions to ensure that when the small amounts of pollutant return to the ground, the concentration is sufficiently low to not cause nuisance or health problems.

13.1.5 The emissions from this facility would be regulated by the Environment Agency through an Environmental Permit and would comply with the requirements of the Waste Incineration Directive (WID).

13.2 Methodology

Construction

13.2.1 The impact of the construction of the facility on local air quality has been evaluated qualitatively, with the main focus being on the methods used to prevent the release of dust. The assessment method set out in the London Best Practice Guide (LBPG) on Construction Dust has been taken into account.

Operational - General

13.2.2 In order to quantitatively assess the impact of releases from the stack to the atmosphere on local air quality, it has been necessary to model the dispersion of the pollutants in the atmosphere and to compare the resultant ground level concentrations with current air quality and with relevant air quality objectives and guidelines. This has been carried out using the following general methodology.

- The relevant air quality objectives and guidelines have been identified from national legislation and Environment Agency guidance documents.
- Current levels of pollutants in the atmosphere have been estimated using publically available monitoring data from national and local databases and from site specific monitoring.
- Ground level concentrations of pollutants resulting from emissions from traffic and the stack have been predicted, as described in later sections of this methodology.
- The predicted ground level concentrations have been compared with air quality objective and guidelines in order to assess the impact. The guidelines contained with the Environment Agency's Technical Guidance Note EPR-H1[6] have been used to assess significance. These state that an emission can be considered to be insignificant if the contribution to long term ground level concentrations is less than 1% of the air quality objective and the contribution to short term ground level concentrations is less than 10% of the air quality objective. If the contribution to long term ground level concentrations is greater than 1% of the air quality objective or the contribution to short term ground level concentrations is greater than 10% of the air quality objective the emission is considered to be not insignificant and further assessment needs to be undertaken.
- Where the emissions of a particular pollutant is considered not insignificant in terms of the EA guidelines, the predicted concentrations have been evaluated further, applying the guidance from Environmental Protection UK in their publication "Development Control: Planning for Air Quality." 7 This recommends the use of descriptors, shown in Table 13.1, to summarise the magnitude of contributions due to the emissions released

[6] Environmental Assessment Levels Horizontal Guidance Note EPR- H1 v2.0 April 2010
[7] Development Control: Planning for Air Quality", EPUK, 2010.

from the plant. This is the method commonly used to define the significance of effects within Environmental Statements.

Table 13.1 Summary of Comparison Descriptors

Magnitude of Change	Annual Mean increase as a percentage of the relevant air quality objective
Large	Increase/decrease 10-15%
Medium	Increase/decrease 5-10%
Small	Increase/decrease 1-5%
Imperceptible	Increase/decrease <1%

- EPUK then recommend the use of the descriptors described in Table 13.2 to evaluate the impact of any increase in concentration, utilising the descriptors of magnitude referred to above. Any long term impact classified as "insignificant" under the Environment Agency's criteria would be classified as "negligible" under the EPUK system. Impacts that are considered to be "not insignificant" under the Environment Agency's criteria would be classified as "negligible", "slight adverse", "moderate adverse" or "substantial adverse" under the EPUK system.

Table 13.2 Summary of Significance Descriptors

Absolute Concentration in relation to Objective/Limit Value	Application to Long Term AQO	Application to NO_2	Small	Medium	Large
Above Objective/Limit Value with scheme	>100% of the AQO	>40 µg/m^3	Slight adverse	Moderate adverse	Substantial adverse
Just Below Objective/Limit Value with scheme	90%-100% of the AQO	36-40 µg/m^3	Slight adverse	Moderate adverse	Moderate adverse
Below Objective/Limit Value with scheme	75%-90% of the AQO	30-36 µg/m^3	Negligible	Slight adverse	Slight adverse
Well below Objective/Limit Value with scheme	<75% of the AQO	<30 µg/m^3	Negligible	Negligible	Slight adverse

- The assessment of heavy metals has been undertaken using the three stage screening methodology outlined by the Environmental Agency in the guidance document "Guidance to Applicants on Impact Assessment for

Group 3 Metals Stack Releases – V.2 June 2011”.8 This document can be seen in Appendix 13.2.

Operational – Traffic Emissions

13.2.3 The impact of emissions from the traffic associated with the plant has been assessed using the screening method outlined in Chapter 3 of Volume 11 of the Design Manual for Roads and Bridges (DMRB), produced by the Highways Agency. This methodology is used to determine if significant air quality effects are likely to occur from traffic related emissions. On the basis of the relatively low predicted traffic numbers the DMRB screening method is considered an appropriate assessment to apply to this development. The DMRB includes a software tool to implement this method.

Operational - Stack Emissions

13.2.4 The only significant source of atmospheric emissions from the plant would be the main chimney, containing a single flue associated with the EfW facility. The emissions would be regulated by the Environment Agency under the terms of an Environmental Permit and would comply with the requirements of the WID.

13.2.5 The plant is contained within a building typically 43 metres in height and the flue gases are released through a 70 metre high stack. The stack height was selected to ensure that the effects of the building on dispersion were small and that the impact on local air quality, in terms of impact on human health and sensitive environmental habitats was acceptable.

13.2.6 The detailed flue gas dispersion modelling was carried out using the computer model ADMS 4.2, developed and supplied by Cambridge Environmental Research Consultants (CERC). ADMS 4.2 is a new generation dispersion model, which characterises the atmospheric boundary layer in terms of the Monin-Obukhov length and the boundary layer depth. In addition, the model uses a skewed Gaussian distribution for dispersion under convective conditions, to take into account the skewed nature of turbulence. Modules within the model take account of the effect of complex terrain and nearby

[8] EA Guidance “**Guidance to Applicants on Impact Assessment for Group 3 Metals Stack Releases – V.2 June 2011”**

buildings. ADMS 4.2 has been used on many occasions for the modelling of emissions for planning, PPC (Pollution Prevention and Control) and Environmental Permitting applications and air quality assessments using ADMS have generally been accepted by the Environment Agency.)

13.2.7 The emissions from the stack were characterised as shown in Table 13.3. Emissions are based on the plant operating at full capacity and it is assumed that the EfW facility would operate at the emission limits from the WID for the whole year. Similar plants operate below these emission limits for most of the time, so the actual average emissions would be lower than those in the dispersion model. In addition, the facility would only operate for around 90% of the year, rather than the entire year, due to necessary stoppages for maintenance. As a result the air dispersion model has predicted the worst case and in reality the pollutant levels are likely to be less than predicted.

Table 13.3 Source and Emissions Data

Item	Unit	EfW Emissions
Stack Height (from ground level)	m	70
Internal stack diameter	m	1.81
Stack position (Eastings, Northings)	m, m	379882,210464
Stack flue gas exit velocity	m/s	19.91
Temperature	°C	130
Oxygen	% v/v, dry	6.5%
Moisture content	% v/v	17.2%
Volume at reference conditions (dry)	Nm³/s	163,513
	Nm³/h	45.4
Volume at discharge conditions (wet)	Am³/s	201,046
	Am³/h	55.85

Emissions	Conc, (mg/m³)	Rate, (g/s)
Nitrogen dioxide (NO_2)	200	9.08
Sulphur dioxide (SO_2)	50	2.27
Carbon monoxide (CO)	50	2.27
Particulate matter < 10 microns (PM_{10})	10	0.45
Particulate matter < 2.5 microns ($PM_{2.5}$)	3.33	0.15
Hydrogen chloride (HCl)	10	0.45

Emissions	Conc, (mg/m^3)	Rate, (g/s)
Hydrogen fluoride (HF)	1	0.045
Volatile organic compounds (VOCs)	10	0.45
Ammonia (NH_3)	10	0.45
Mercury	0.05	2.27 mg/s
Cadmium and thallium	0.05	2.27 mg/s
Other metals	0.5	22.7 mg/s
Benzo(a)pyrene	0.0002	9.08 µg/s
Dioxins and furans	0.1 ng/m^3	4.54 ng/s

Table Notes

- Emission concentrations are for dry flue gas, 11% oxygen, and are taken from the WID, except for ammonia and benzo(a)pyrene which are not included in WID. Emission rates are corrected to the actual flue gas conditions.
- "Other Metals" are antimony, arsenic, chromium, cobalt, copper, lead, manganese, nickel, and vanadium. The distribution of these metals is discussed later in this chapter.
- For particulate matter, it is assumed that all of the particulate emissions would be below 10 microns, so would all be PM_{10}. Measurements from operating waste combustion plants show that the fraction of particulate matter which is smaller than 2.5 microns is about 33%, so the $PM_{2.5}$ concentration has been taken as 33% of the emission limit.
- The only Polycyclic Aromatic Hydrocarbon (PAH) that is of concern is Benzo[a]pyrene. The concentration of 0.0002 mg/m^3 is based on the highest recorded emission concentration of B[a]P from data collected from the Environmental Agency's public register of 0.105 ug/m^3, or 0.000105 mg/m^3. As this is not a regulated pollutant and only monitored periodically a safety factor of 2 has been applied.

13.2.8 The facility would release nitric oxide (NO) and nitrogen dioxide (NO_2) which are together referred to as NOx. In the atmosphere, NO would be converted to NO_2 in a reaction with ozone which is influenced by solar radiation. Since the air quality objectives are expressed in terms of NO_2, it is important to be able to assess the conversion rate of NO to NO_2. In this assessment, Environment

Agency guidance has been followed by assuming a conversion rate of 70% over the long term and 35% over the short term.

13.2.9 The impact of weather data was taken into account by using data from the Meteorological Office for the years 2005-2009 from the Bristol weather station, about 36 km to the south of the site. There are a number of weather stations in the area at a similar distance from the facility, but of these, Bristol weather station is considered to be the most representative, as it will take into account the local topography associated with the Severn Estuary. Five years of data were used to ensure that fluctuations in weather conditions would be taken in to account.

13.2.10 The area around the proposed EfW facility is generally rural. A surface roughness length of 0.3 metres, representative of the surrounding areas, has been used in the model. A 4 km by 4 km output grid was used with a 100m grid spacing.

13.2.11 The presence of adjacent buildings can significantly affect the dispersion of the atmospheric emissions in various ways. Wind blowing around a building distorts the flow and creates zones of turbulence. The increased turbulence can cause greater plume mixing. Also, the rise and trajectory of the plume may be depressed slightly by the flow distortion. This downwash leads to higher ground level concentrations closer to the stack than those which would be present without any buildings.

13.2.12 It is generally accepted that building effects are only significant for buildings which are taller than one third of the stack height. The EfW facility has been modelled as a number of separate buildings to take into account the massing of buildings on the site.

13.2.13 The general approach to the assessment of the impact of air quality on human health is to evaluate the highest predicted contribution of the emissions to ground level concentrations of pollutants at any point in the vicinity, irrespective of the occupancy of the location of that highest predicted contribution. In addition, the predicted contribution at a number of sensitive receptors has also been evaluated. These sensitive receptors are shown on Figure 13.1 and are listed below.

Table 13.4 Sensitive Receptors

Receptor Name	Distance from Stack
Broardfield Farm	800 metres
Chestnut Farm	1300 metres
Colethrop Farm	1700 metres
Gables Farm	1300 metres
Haresfield	1600 metres
Haresfield Court	1300 metres
Hill View Farm	1900 metres
Hiltmead Farm	300 metres
Old Airfield Farm	600 metres
Little Haresfield	1300 metres
The Lodge	400 metres
Lindas Home	400 metres
Royston	1000 metres
Newhouse Farm	1800 metres
Pool Farm	1900 metres
Putloe	1700 metres
Parkend Farm	900 metres
Road Farm	1100 metres
Round House	1400 metres
St Josephs Travellers Park	500 metres
Summer House Farm	1100 metres
Warren farm	1100 metres
Hunts Grove	900 metres
Kingsway	1,800 metres

Operational - Odour emissions

13.2.14 Whilst there is potential for odours to arise from an EfW facility due to the delivery and temporary storage of waste the likelihood of odours escaping the facility and resulting in complaints is considered to be low. The primary reason for this is that forced draught fans are used to draw air from the tipping hall, bunker hall and boiler hall into the furnace to feed the combustion process. This results in a negative pressure inside the building preventing odours being released. The high temperatures within the combustion chambers i.e. 850^{o}C destroys the odorous compounds within the air pulled in from the waste bunker and tipping hall. In addition, anaerobic conditions within the refuse bunkers, which can cause odour, would be prevented by regular mixing of the waste by the crane operators. All waste handling operations would be undertaken within the EfW main building. The bottom ash processing would not result in any malodours. Odour from waste vehicles would be contained by enclosure or sheeting of vehicles and as such odours from delivery vehicles are not considered likely to result in a significant odour source. Considering the above, the risk of odour nuisance is thought to be minimal and unlikely to present a significant impact from the proposed development, as such no quantitative odour assessment has been undertaken.

Operational – Traffic emissions

13.2.15 The impact of emissions from the traffic associated with the plant has been assessed using the screening method outlined in Chapter 3 of Volume 11 of the Design Manual for Roads and Bridges (DMRB), produced by the Highways Agency. This is a screening methodology, which is appropriate because the predicted changes in traffic levels are small. A software tool is available to implement this method. The detailed transport assessment has been used as the basis of the information. The following assumptions were made:

- emission factors for typical vehicles in 2016 were selected, the year for which the traffic has been modelled;
- a worst case receptor was selected as being The Lodge (off Haresfield Court), 35m from the B4008 (however, it should be noted that local highways restriction would prevent waste delivery vehicles (other than those from local collection rounds) from passing The Lodge, nonetheless this was selected as a worst case receptor) ; and
- an average vehicle speed of 45 km ph has been assumed.

13.2.16 The total two way flows along each of the roads and the composition of the traffic can be seen in the tables below, these figures have been derived from the Transport Assessment undertaken for the project.

Table 13.5 Traffic Details – Core Assessment

Predicted traffic demand associated with the Core Assessment (total 2 way flows)			
Traffic flows - B4008 North of site entrance	**Cars / LGVs**	**HGVs**	**All Vehicles**
Baseline - Development of the whole site for warehousing including background traffic flows.	10,046	1,042	11,088
Do Something – Development of EfW facility and warehousing on the remaining area of javelin Park, including background traffic flows.	9,878	1,032	10,910
Change - Increase in traffic due to EfW facility traffic	-168	-10	-178
Traffic flows - B4008 South of site entrance	**Cars / LGVs**	**HGVs**	**All Vehicles**
Baseline - Development of the whole site for warehousing including background traffic flows.	9,512	549	10,061
Do Something – Development of EfW facility and warehousing on the remaining area of javelin Park, including background traffic flows.	9,477	549	10,026
Change - Increase in traffic due to EfW facility traffic	-35	0	-35

13.2.17 As can be seen from the table above, the development of the EfW on the southern area of Javelin Park as opposed to the development of a warehousing development would result in a total of 203 less cars/LGVs and 10 less HGV movements each day.

13.2.18 In addition a sensitivity analysis was undertaken as part of the traffic impact assessment comparing the predicted traffic movements from the proposed facility against a baseline of no development at the site i.e. the sensitivity assessment did not take into account the fact that the site currently has consent for the development of warehousing units. The purpose of this assessment was to understand the traffic related impacts that would be experienced on the local highway network compared against existing conditions.

Table 13.6 Traffic Details – Sensitivity Assessment

Predicted traffic demand associated with the Sensitivity Assessment (total 2 way flows)			
Traffic flows - B4008 North of site entrance	**Cars / LGVs**	**HGVs**	**All Vehicles**
Baseline - Background traffic i.e. no development at the site	9,418	549	9,967
Do Something – Development of EfW only on Javelin Park including background traffic flows	9,528	757	10,285
Change - Increase in traffic due to EfW facility traffic	+110	+208	+318
Traffic flows - B4008 South of site entrance	**Cars / LGVs**	**HGVs**	**All Vehicles**
Baseline - Background traffic i.e. no development at the site	9,418	549	9,967
Do Something - Development of EfW only on Javelin Park including background traffic flows	9,426	549	9,975
Change - Increase in traffic due to EfW facility traffic	+8	0	+8

13.2.19 When compared to no development at the Javelin park site i.e. the current situation, the EfW will contribute 118 more cars/LGVs and 208 more HGV movements each day.

Greenhouse Gases

13.2.20 It is recognised that the construction and operation of the facility would result in the release of greenhouse gases. However, the release of greenhouse gases from the facility should not be viewed in isolation. This is because the facility would process waste, which would otherwise be sent to landfill or processed in another manner, both of which would also lead to greenhouse gases being released. Also, the facility would generate and export electricity, which would otherwise be generated by a different type of power station, which within the current UK energy mix is likely to be partly derived from the combustion of fossil fuels.

13.2.21 In order to understand the contribution that this facility would make to the UK emissions of CO_2 an assessment has been made of the Global Warming Potential (GWP) (expressed in tonnes of CO_2 equivalent per annum) of the construction and operation of the plant using the Environment Agency's Waste and Resources Assessment Tool for the Environment (WRATE). Further details are provided in Appendix 13.5.

Cumulative Impact Assessment

13.2.22 The proposed Gloucestershire EfW is located within 1km of the proposed Moreton Valence Resource Recovery Centre which incorporates an Advanced Thermal Treatment (ATT) technology. A cumulative impact assessment has been undertaken using emissions from the ATT plant to ensure that even with the potential emissions from this facility, the ground level concentrations are still acceptable.

13.2.23 The cumulative impact results require careful analysis. This is because the highest contributions from the plants do not occur at the same place or under the same weather conditions. Therefore, detailed dispersion modelling for the ATT has been undertaken based on the permitted development and the details from SLR's air quality assessment of the Moreton Valence Resource Recovery Centre (RRC)[9].

13.3 Baseline

Air Quality Objectives and Guidelines

13.3.1 In the UK, air quality standards and objectives for major pollutants are described in The Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 (known as the Air Quality Strategy or NAQS).[10] This document builds on the previous NAQS, published in 2000, and a 2003 Addendum to the NAQS.

13.3.2 The AQS defines "standards" and "objectives", as defined in paragraph 17 of the AQS:

13.3.3 "For the purposes of the strategy:

- *Standards are the concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on assessment of the effects of each pollutant on human health including the effects on sensitive subgroups or on ecosystems*

[9] Moreton Valence Resource Recovery Centre (RRC): Detailed Air Quality Assessment, Revision 1, SLR Ref: 402.03348.0001, November 2010
[10] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, CM 7169 NIA 61/06-07, July 2007, DEFRA – para 17 of Volume 1.

- *Objectives are policy targets often expressed as a maximum ambient concentration not to be exceeded, either without exception or with a permitted number of exceedences, within a specified timescale."*

13.3.4 The status of the objectives is clarified in paragraph 22 of the AQS, which also emphasises the importance of European Directives.

13.3.5 The air quality objectives (AQOs) in the NAQS are a statement of policy intentions or policy targets. As such, there is no legal requirement to meet these objectives except in as far as these mirror any equivalent legally binding limit values in EU legislation. Where UK standards or objectives are the sole consideration, there is no legal obligation upon regulators, to set Emission Limit Values (ELVs) any more stringent than the emission levels associated with the use of Best Available Techniques (BAT) in issuing permits under the Environmental Permitting Regulations.

13.3.6 The EU has recently adopted a new Air Quality Directive 2008/50/EC[11], which unifies most of the previous directives on air quality with the exception of the Fourth Daughter Directive and also introduces a new regulatory framework for $PM_{2.5}$.

13.3.7 The Environment Agency includes Environmental Assessment Levels (EALs) for other pollutants in Annex F of the Environment Agency Horizontal Guidance Note EPR-H1. The long term and short term EALs from this document have been used when the AQS does not contain relevant objectives.

13.3.8 The Expert Panel on Air Quality Standards (EPAQS) recommended more stringent EALs for some pollutants[12]. These have been included in the latest version of Technical Guidance Note EPR-H1.

13.3.9 Both AQOs and EALs are set at levels well below those at which significant adverse health effects have been observed in the general population and in particularly sensitive groups.[13]

13.3.10 Appendix 13.1 contains full details of the sources of objectives and guidelines used in the assessment, which are summarised in Table 13.7 below. For a

[11] Directive 2008/50/EC on ambient air quality and cleaner air for Europe.
[12] "Guidelines for metals and metalloids in ambient air for the protection of human health", EPAQS, 2009
[13] The Air Quality Strategy 2009 England, Scotland, Wales and Northern Ireland – Volume 1

number of pollutants, the short term AQO is defined in terms of a value which may only be exceeded for a certain number of periods each year. For example, the short term AQO for nitrogen dioxide is 200 µg/m^3 as an hourly average, which can be exceeded for 18 hours in each year.

Table 13.7 Air Quality Objectives (AQO) and Environmental Assessment Levels (EALs)

Pollutant	Limit Value (µg/m^3)	Averaging Period	Frequency of exceedence
Nitrogen Dioxide	200	1 hour	18 times per year (99.79th %ile)
	40	Annual	-
Sulphur Dioxide	266	15 minutes	35 times per year (99.9th %ile)
	350	1 hour	24 times per year (99.73rd %ile)
	125	24 hours	3 times per year (99.18th %ile)
Particulate Matter (PM10)	50	24 hours	35 times per year (90.4th %ile)
	40	Annual	-
Particulate Matter (PM2.5)	25	Annual	
Carbon Monoxide	10,000	8 hours, running	-
Hydrogen Chloride	750	1 hour	-
	20	Annual	-
Hydrogen Fluoride	160	1 hour	-
Lead	0.25	Annual	-
Benzene	5	Annual, running	-
1,3-butadiene	2.25	Annual, running	-
Benzo(a)pyrene	0.25 ng/m^3	Annual	-
Arsenic	0.2	Annual	-
	15	Hourly	-
	0.006	Annual, Daughter Directive	-
	0.003	Annual	-
Antimony	5	Annual	-
	150	Hourly	-
Cadmium	0.005	Annual	-
	1.5	Hourly	-
Chromium (II & III)	5	Annual	-
	150	Hourly	-

Pollutant	Limit Value ($\mu g/m^3$)	Averaging Period	Frequency of exceedence
Chromium (VI)	0.0002	Annual	-
Cobalt	0.2	Annual	-
	6	Hourly	-
Copper	10	Annual	-
	200	Hourly	-
Manganese	150	Annual	-
	1500	Hourly	-
Mercury	0.25	Annual	-
	7.5	Hourly	-
Nickel	0.02	Annual	-
	30	Hourly	-
Thallium	1	Annual	-
	30	Hourly	-
Vanadium	5	Annual	-
	1	Hourly	-

Air Quality Management Areas

13.3.11 The only Air Quality Management Areas within the vicinity of the proposed facility are around Gloucester and are all over 8 km away from the site. This reflects the generally rural location of the surrounding area.

Background Concentrations of Pollutants

13.3.12 The air quality in the area around Javelin Park has been reviewed by identifying various monitoring stations in the local area. In addition to this publically available data, GCC as part of the development of this site have undertaken extensive baseline monitoring of pollutants over an 8 month period.

13.3.13 The following section summarise data from the identified monitoring stations and the project specific monitoring. The most appropriate background concentration for use in the assessment has been selected from the available data and justified in Table 13.12.

Publicly Available Data

Automatic Monitoring Stations

13.3.14 There is limited historical air quality monitoring carried out in the vicinity of site. The closest relevant continuous monitoring stations are in Bristol, over 40km away from the site.

National Nitrogen Dioxide Survey Results

13.3.15 There are 28 sites within 10 km of the site that monitor nitrogen dioxide (NO_2) concentrations as part of DEFRA's national nitrogen dioxide diffusion tube survey between 1st January 2008 and 31st December 2010. The website currently does not allow this information to be accessed.

National Modelling Data

13.3.16 In order to assist councils with their responsibilities under Local Air Quality Management (LAQM), DEFRA have modelled the background concentration of pollutants throughout the UK on a 1 km by 1 km grid. This model is based on known pollution sources and background measurements. The predicted concentrations closest to the site stack location (at 379500, 210500) were as follows:

- Nitrogen dioxide 16.3 µg/m³ for 2011;
- PM10 17.1 µg/m³ for 2011;
- PM2.5 10.3 µg/m³ for 2011;
- Benzene 0.20 µg/m³ for 2010;
- Sulphur dioxide 1.89 µg/m³ for 2001;
- Carbon monoxide 0.25 mg/m³ for 2001; and
- 1,3-butadiene 0.11 µg/m³ for 2003.

National Dioxins and Furans

13.3.17 Dioxins and furans are monitored on a quarterly basis at a number of sites in the UK. Data for 2008 and 2007 is shown in the following table.

Table 13.8 Dioxin Monitoring Results, National

Site	2007		2008	
	Average Concentration (fg TEQ/m³)	Maximum Quarterly Concentration (fg TEQ/m³)	Average Concentration (fg TEQ/m³)	Maximum Quarterly Concentration (fg TEQ/m³)
Hazelrigg	6.7	17.8	3.7	7.2
High Muffles	1.4	5.2	1.7	3.0
London	7.2	11.6	11.0	14.8
Manchester	18.3	32.8	19.0	48.3
Middlesbrough	18.5	24.8	24.0	31.8
Stoke Ferry	5.9	13.3		
All Sites	9.7	32.8	11.7	48.3

13.3.18 The variation in concentration between sites is due to the fact that some sites are in rural areas while the other sites are in cities. There are no air quality standards for dioxins.

National polycyclic aromatic hydrocarbons (PAHs)

13.3.19 PAHs are monitored on a quarterly basis at a number of sites in the UK. For the purposes of this assessment, the most important PAH is benzo(a)pyrene, (B[a]P) as this is the PAH for which an AQO is set. The following table sets out the annual average concentrations of benzo(a)pyrene at all the rural monitoring sites in the UK between 2007 and 2009.

Table 13.9 B[a]P Monitoring Results, Rural Sites (ng/m³)

Monitoring Site	2007	2008	2009
Hazelrigg (rural)	0.08	0.12	0.06
High Muffles (rural)	0.05	0.19	0.07
Stoke Ferry (rural)	0.06		
Average	0.06	0.15	0.07

13.3.20 The highest annual average concentration of B[a]P at any rural monitoring station over the last three years was 0.19ng/m³, below the AQO of 0.25ng/m³.

Volatile Organic Compounds (VOCs)

13.3.21 The UK monitoring network includes a number of sites which measure the concentration of benzene. None of the national sites are particularly close to the site. The results for 2008-2010 for those sites in Central/ Southern England are shown in the following table.

Table 13.10 VOC Monitoring Results, Central / Southern England (µg/m³)

Site	Benzene		
	2008	**2009**	**2010**
Bath Roadside	0.36	0.52	0.75
Birmingham Roadside	0.55	0.85	N/A
Birmingham Roadside 2	N/A	0.85	0.51
Birmingham Tyburn	0.28	0.28	0.37
Birmingham Tyburn Roadside	N/A	N/A	0.53
Bristol Old Market	0.42	0.55	0.5
Coventry Memorial Park	0.16	0.16	0.13
Leamington Spa	0.26	0.2	0.26
Northampton	0.23	0.23	0.24
Oxford Centre Roadside	0.36	0.26	0.38
Oxford St Ebbes	0.16	0.2	0.08
Air Quality Objective	5		

13.3.22 It can be seen that AQO for benzene is not exceeded at any of the monitoring sites. The highest benzene reading was measured in 2010 at Bath Roadside, and was 15% of the air quality objective.

Hydrogen Chloride and Hydrogen Fluoride

13.3.23 Background concentrations of hydrogen fluoride are not measured locally or nationally, since these are not generally of concern in terms of local air quality. However, the EPAQS report[14] "Guidelines for halogens and hydrogen halides in ambient air for protecting human health against acute irritancy effects" contains some estimates of background levels, reporting that measured concentrations have been in the range of 0.034 µg/m³ to 2.35 µg/m³.

13.3.24 Hydrogen chloride is measured at 30 rural sites as part of Defra's nitric acid survey. In 2006, the annual average concentration varied from 0.14 µg/m³ to 0.56 µg/m³.

[14]EPAQS report, Guidelines for halogens and hydrogen halides in ambient air for protecting human health against acute irritancy effects, site:http://archive.defra.gov.uk/environment/quality/air/airquality/publications/halogens/fullreport.pdf

Project Specific Monitoring

13.3.25 RPS was commissioned by GCC in late 2010 to undertake an air quality survey to provide background information for proposed development. The survey results cover a 6 month period from 28 September 2010 to 30 April 2011. The pollutants that have been measured included measurements of NO_2 and SO_2, dioxins and furans, polychlorinated biphenyls (PCBs) and PAHs as well as heavy metals. These measurements were recorded by a continuous monitoring station at Javelin Park. In addition to the continuous monitoring station 12 NO_2 and SO_2 diffusion tubes were located in areas surrounding Javelin Park.

13.3.26 The survey takes account of the background levels in the vicinity of the facility and the contribution from the M5. The results of the RPS survey are considered to be most representative of the background levels around the site even though they have been gathered over a relatively short time period of 6 months.

13.3.27 Full details of all the site survey results, including the monitoring locations, can be found in the RPS Background Air Quality Report which is attached as Appendix 13.3.

13.3.28 RPS was subsequently commissioned by GCC to undertake an additional 2 month period of site monitoring, the results of this monitoring are contained in Appendix 13.4. A review of the report has indicated that the additional 2 month period of data does not significantly alter the baseline concentrations determined during the 6 month period. As the original report provided annually adjusted data this original data has been considered for the purpose of this assessment.

Particular Matter

13.3.29 Monitoring of particular matter was carried out for a period of 6 months. Over this period the monitoring showed an average PM_{10} concentration of 36.8 $\mu g/m^3$. To convert this into a representative long term annual concentration, the methodology outlined in Local Air Quality Management Technical Guidance (LAQM.TG(09) has been applied, by comparing the results of the 6 month period with the annual-mean from two long-running monitoring stations.

Following this methodology, the estimated 2010 annual mean PM_{10} concentration is 26.9 µg/m³. Over the monitoring period the 90.4th percentile of 24 hour daily means was 55.7 µg/m³. This latter value would be above the relevant AQO if extended over a full year.

13.3.30 Over the 6 month period the monitoring showed an average $PM_{2.5}$ concentration of 22.4 µg/m³. The LAQM.TG(09) methodology was applied to convert this into an annual average concentration. The estimated 2010 annual mean $PM_{2.5}$ concentration is calculated as 16.5 µg/m³.

Nitrogen Dioxide

13.3.31 Twelve NO_2 diffusion tubes were located at different locations in the vicinity of the site. The survey averages all fall below the air quality objective after correction to an annual average (2010) using the LAQM.TG(09) methodology and correcting for bias using co-located diffusion tubes with a continuous automatic analyser at Bristol St Pauls. The equivalent 2010 annual average concentration at different types of sites is given below:

- Roadside 28.5 µg/m³,
- Urban background 20.8 µg/m³,
- Rural 17.4 µg/m³,
- Sensitive habitats 16.8 µg/m³.

13.3.32 For the purposes of this assessment the urban background concentration of 20.8 µg/m³ is considered to be most representative to use as background concentration.

Sulphur Dioxide

13.3.33 Twelve SO_2 diffusion tubes were located at different locations in the vicinity of the site. The results have been corrected to an annual average (2010) using the LAQM.TG(09) methodology. The equivalent 2010 annual average concentration at different types of sites is given below:

- Roadside 1.5 µg/m³,
- Urban background 1.1 µg/m³,
- Rural 1.2 µg/m³,
- Sensitive habitats 1.5 µg/m³.

13.3.34 For the purposes of this assessment the average urban background concentration of 1.1 µg/m³ has been used given the low variability between the different measurement locations.

Polycyclic Aromatic Hydrocarbons

13.3.35 Polycyclic aromatic hydrocarbons were measured on site over a 6 month period. For the purposes of this assessment, the most important PAH is benzo(a)pyrene, as this is the PAH for which an AQO is set. The average concentration of benzo(a)pyrene was 0.31 ng/m³. This is above the air quality objective of 0.25 ng/m³.

13.3.36 The RPS baseline report (Appendix 13.3) notes that measured levels of PAHs could have been subject to interference from asphalt laying during the first two months (October and November 2010). The average concentration of benzo(a)pyrene excluding these two months is 0.21 ng/m³.

Dioxins and Furans

13.3.37 Dioxins and furans were measured on site over a 6 month period. There are no air quality standards for dioxins The average concentration of dioxins and furans was 44.1 fg TEQ/m³.

Metals

13.3.38 Heavy metals were measured on site over a 6 month period. The average background concentration for each heavy metal is shown in the following table.

Table 13.11 Heavy Metals Onsite Monitoring Results

Heavy Metal	Average Background Concentration (ng/m^3)
Arsenic	0.79
Antimony	1.35
Cadmium	0.37
Chromium	0.98
Chromium (VI)	0.14 (Note 1)
Cobalt	0.06
Copper	6.18
Lead	6.02
Manganese	3.08
Mercury	0.03
Nickel	1.59
Thallium	0.06
Vanadium	0.70

Note 1:Only a single sample of Chromium VI was taken. This sample was not taken at the same time as the Chromium sample and is below the limit of detection

13.3.39 The existing levels of heavy metals were below the relevant air quality objectives.

Summary of Background Air Quality

13.3.40 From this data, the following values for the annual average background concentration have been used in the assessment.

Table 13.12 Background Air Quality Concentrations

Pollutant	Background ($\mu g/m^3$)	Long term EAL/AQO ($\mu g/m^3$)	Justification
Nitrogen Dioxide	20.8	40	Site survey average concentration
Sulphur Dioxide	1.3	-	Site survey average concentration
PM_{10}	26.9	40	Site survey average concentration
$PM_{2.5}$	16.5	25	Site survey average concentration

Pollutant	Background ($\mu g/m^3$)	Long term EAL/AQO ($\mu g/m^3$)	Justification
Carbon monoxide	250	-	DEFRA Modelled concentration
Hydrogen chloride	2.35	20	Highest national annual average concentration
Hydrogen fluoride	0.56	-	Highest national annual average concentration
Benzene	0.20	5	DEFRA Modelled concentration, consistent with other non roadside sites in the region
1,3-butadiene	0.11	2.25	DEFRA Modelled concentration
		(ng/m^3)	
Benzo[a]pyrene	0.21	0.25	Site survey results excluding the potential anomalous results caused by asphalt laying in October and November 2010.
Arsenic	0.79	3	Site survey average concentration
Antimony	1.35	5000	Site survey average concentration
Cadmium	0.37	5	Site survey average concentration
Chromium	0.98	5000	Site survey average concentration
Chromium (VI)	Results awaited	0.2	
Copper	6.18	10,000	Site survey average concentration
Cobalt	0.06	200	Site survey average concentration
Manganese	3.08	1000	Site survey average concentration
Mercury	0.03	250	Site survey average concentration
Lead	6.02	250	Site survey average concentration
Nickel	1.59	20	Site survey average concentration
Thallium	0.06	1000	Site survey average concentration
Vanadium	0.70	5000	Site survey average concentration
Dioxins	44.1 fg TEQ/m^3	-	Site survey average concentration

13.4 Assessment of Effects

Incorporated Mitigation

13.4.1 The emissions from the facility would be tightly controlled and regulated through the environmental permit. To ensure that the emission limits are not exceeded, the facility incorporates a number of systems to reduce the emissions to atmosphere. The different systems in place are summarised below.

NOx Reduction System

13.4.2 Nitrogen oxides (NOx) abatement would be achieved by the use of selective non-catalytic reduction (SNCR). The SNCR is based on the injection of ammonia into the furnace chamber.

Acid Gas Abatement System

13.4.3 It is necessary to mitigate the acid gas emissions to the atmosphere as the levels of acid gases produced from the combustion of municipal waste are likely to be in excess of the permitted emission limits required by the WID.

13.4.4 The acid gases would be removed from the flue gases by using a dry acid gas abatement system. The dry system involves the injection of lime as a solid into the flue. The acid gases are adsorbed on to the surface of the solid particles and react with the lime. The lime and reaction products are collected on a bag filter, where further reaction can take place. The reaction with the lime neutralises the acid gases.

13.4.5 The lime injection rate would be controlled by upstream measurement of hydrogen chloride (HCl) thus optimising the efficiency of gas scrubbing and lime usage.

Gas Cleaning System

13.4.6 In addition to the NOx reduction system and the acid gas abatement system, activated carbon is injected into the flue gases. The activated carbon is used to adsorb dioxins, other volatile organic compounds (VOCs), trace heavy metals and mercury.

Particular Removal System

13.4.7 The proposed EfW plant would use a multi-compartment fabric filter for the control of particulates. The bag filters are used to remove the fine ash plus excess and spent lime and carbon as the gases pass through the bag filter fabric. The build up of the excess lime and carbon on the surface of the bag filters enhances the performance of the system. Reverse pulses of compressed air would be used to remove the accumulated particulate from the bags. As described in Chapter 5.0 procedures are in place for the maintenance and repair of bag filters to ensure that the system continually operates at the required efficiency.

Construction Phase

13.4.8 The development includes large scale construction comprising demolition of all existing hard standing and the construction of a EfW facility, IBA treatment facility, new access roads and weighbridges, new car park and admin/visitors centre block. This work has the potential to generate dust and best practice measures shall be used. The best practice guidance document "The Control of Dust and Emissions from Construction and Demolition" prepared in partnership by the Greater London Authority and London Councils has been used:

For site planning:

- Effective barriers around dusty activities or the site boundary would be erected;
- Bonfires would be forbidden on the site;
- Machinery and dust causing activities shall be located away from sensitive receptors;
- All site personnel would receive full training;
- A trained and responsible manager to be stationed on site during working times to maintain logbook and carry out on site inspections;
- All site haul roads to be a hard surface; and
- Real-time dust monitors across the site would be put in place.

For Construction traffic:

- Idling of vehicles on site would be minimised;
- Vehicles would be cleaned or washed effectively before leaving the site;
- All loads entering and leaving the site shall be covered;
- There shall be no site runoff of water or mud;
- On-road vehicles to comply to set emission standards;
- Minimise movement of construction traffic around the site; and

- Effective cleaning of all haul routes and appropriate speed limits around the site.
- All non road mobile machinery would use ultra low sulphur tax-exempt diesel where available and would be fitted with appropriate, approved exhaust after-treatment;

For site activities:

- Dust generating activities would be kept to a minimum;
- Water would be used as a dust suppressant where applicable;
- Stockpiles would be covered, seeded or fenced to prevent wind whipping; and
- All earthworks and exposed areas would be re-vegetated.

Operational Traffic

13.4.9 The results of the assessment of traffic emissions are shown below. Table 13.13 shows the predicted contribution to ground level concentrations associated the baseline and do something scenario for the core traffic assessment.

Table 13.13 Results of Operational Traffic Emission Modelling – Core Assessment

Pollutant	**Nitrogen dioxide (μg/m^3)**			**Particulate matter (μg/m^3)**		
Air Quality Objective (Long Term)	40			40		
Background Concentration	20.8			26.9		
Location	**Baseline**	**Do Something**	**Change**	**Baseline**	**Do Something**	**Change**
Residential House off B4008	2.14	2.13	-0.01	0.52	0.51	-0.01

13.4.10 It can be seen that there is an estimated reduction in the ground level concentration of NO_2 and particulate matter in the do-something scenario. This is due to a reduction in both car and HGV movements associated with the proposed EfW development.

Operational Traffic Sensitivity

13.4.11 A traffic flow sensitivity was considered as part of the traffic assessment presented in Chapter 7.0. For completeness we have considered the vehicle emissions associated with the results of this sensitivity analysis.

13.4.12 The traffic assessment sensitivity provided a comparison the predicted traffic movements from the proposed facility against a baseline of no development at the site i.e. the sensitivity assessment did not take into account the fact that the site currently has consent for the development of warehousing units. The purpose of this assessment was to understand the traffic related impacts that would be experienced on the local highway network compared against existing conditions.

Table 13.14 Results of Operational Traffic Emission Modelling Sensitivity Assessment

Pollutant	**Nitrogen dioxide (µg/m³)**			**Particulate matter (µg/m³)**		
Air Quality Objective (Long Term)	40			40		
Background Concentration	20.8			26.9		
Location	**Baseline – No Development**	**Do Something – EfW developed**	**Change**	**Baseline – No Development**	**Do Something – EfW developed**	**Change**
Residential House off B4008	2.00	2.05	+0.05	0.49	0.50	+0.01

13.4.13 The sensitivity analysis illustrates that compared to the current position of no development at Javelin Park the proposed development would result in a small increase in the ground level concentration of NO_2 and particulate matter.

13.4.14 For NO_2, it is estimated that there would be a increase of 0.05 µg/m³ at the residential house off the B4008. This is 0.1% of the relevant air quality objective and would be described as an “imperceptible” change based on the Development Control: Planning for Air Quality (2010 Update) document.

13.4.15 For particulate matter, it is estimated that there would be a increase of 0.01 µg/m³ at the residential house off the B4008. This is 0.03% of the relevant air quality objective and would be described as an “imperceptible” change based on the Development Control: Planning for Air Quality (2010 Update) document.

13.4.16 It should be noted that HGVs (other than those undertaking local collection rounds) would be prevented from passing the frontage of The Lodge due to local weight restrictions that apply to the B4008 to the south of the roundabout which provides access to Javelin Park. As such this assessment is considered to be a worst case scenario.

13.4.17 This sensitivity test demonstrates that even when compared to a baseline of no development there would be no significant traffic related air quality impacts at local sensitive receptors.

Stack Emissions

13.4.18 The predicted contribution of emissions from the facility to ground level concentrations of pollutants are shown in the Table 13.15, the figures in the table represent the point of maximum impact for each of the five years of weather data analysed. Any concentrations which cannot be screened out as insignificant using the Environment Agency's criteria (i.e. less than 1% of the long term air quality objective and less than 10% of the short term air quality objective) are highlighted.

Table 13.15 Results of Stack Dispersion Modelling at Point of Maximum Impact

Pollutant	Quantity	Ground Level Concentration at point of greatest impact (μg/m^3)						Max as % of AQO/ EAL
		2006	2007	2008	2009	2010	Max	
Nitrogen dioxide	Annual mean	2.26	2.92	3.40	2.79	2.89	3.40	8.5%
	99.79th %ile of hourly means	14.0	14.3	14.0	14.0	14.3	14.3	7.2%
Sulphur dioxide	99.9th %ile of 15 min. means	11.0	11.2	11.0	11.0	11.8	11.8	4.4%
	99.73rd %ile of hourly means	9.9	10.0	10.0	10.0	10.0	10.0	2.9%
	99.18th %ile of daily means	4.9	6.1	6.1	5.2	7.6	7.6	6.1%
Particulate matter	Annual mean	0.16	0.21	0.24	0.20	0.21	0.24	0.6%

Pollutant	Quantity	Ground Level Concentration at point of greatest impact (µg/m³)						Max as % of AQO/ EAL
		2006	2007	2008	2009	2010	Max	
(PM_{10})	90.4th %ile of daily means	0.6	0.7	0.8	0.7	0.6	0.8	1.5%
Particulate matter ($PM_{2.5}$s) (ng/m³)	Annual mean	0.05	0.07	0.08	0.07	0.07	0.08	0.3%
Carbon monoxide	8 hour running mean	53.6	69.3	80.7	66.3	68.5	80.7	0.8%
Hydrogen chloride	Annual mean	3.1	2.5	2.9	2.7	2.5	3.1	0.4%
	Hourly mean	0.02	0.02	0.02	0.02	0.02	0.02	0.2%
Hydrogen fluoride	Hourly mean	0.3	0.2	0.3	0.3	0.2	0.3	0.2%
Ammonia	Annual mean	0.16	0.21	0.24	0.20	0.21	0.24	0.13%
	Hourly mean	3.1	2.5	2.9	2.7	2.5	3.1	0.1%
VOCs	Annual mean	0.16	0.21	0.24	0.20	0.21	0.24	10.8%
Mercury (ng/m³)	Annual mean	0.8	1.0	1.2	1.0	1.0	1.2	0.00
	Hourly mean	15.7	12.3	14.3	13.6	12.3	15.7	0.2%
Cd and Tl (ng/m³)	Annual mean	0.8	1.0	1.2	1.0	1.0	1.2	See Table Below
	Hourly mean	15.7	12.3	14.3	13.6	12.3	15.7	
Other metals (ng/m³)	Annual mean	8.1	10.4	12.1	10.0	10.3	12.1	
	Hourly mean	157.4	123.0	142.6	135.5	123.5	157.4	
Dioxins (fg/m³)	Annual mean	1.61	2.09	2.43	1.99	2.06	2.43	
PaHs (pg/m³)	Annual mean	3.2	4.2	4.9	4.0	4.1	4.9	1.9%

13.4.19 Table 13.16 shows the highest predicted contribution of stack emissions to ground level concentrations of nitrogen dioxide at nearby receptors and compares these results with the highest predicted contribution at the point of maximum impact. (For clarity the results for other pollutants are not shown.) The concentrations for nitrogen dioxide are calculated using the EA's approach.

Table 13.16 Results of Stack Dispersion Modelling at Sensitive Receptors

	Long Term Annual Average		Short Term 99.79th %ile of hourly means	
Site Name	**Ground Level Concentration (μg/m^3)**	**% of AQO**	**Ground Level Concentration (μg/m^3)**	**% of AQO**
Max Impact	3.40	8.5%	14.3	7.2%
Broardfield Farm	0.19	0.5%	6.00	3.0%
Chestnut Farm	0.91	2.3%	4.15	2.1%
Colethrop Farm	0.34	0.8%	2.95	1.5%
Gables Farm	0.26	0.7%	4.90	2.5%
Haresfield	0.20	0.5%	3.05	1.5%
Haresfield Court	0.15	0.4%	3.92	2.0%
Hill View Farm	0.23	0.6%	2.89	1.4%
Hiltmead farm	0.28	0.7%	9.74	4.9%
House	0.41	1.0%	8.99	4.5%
Little Haresfield	0.15	0.4%	3.49	1.7%
Lindas Home	0.24	0.6%	8.12	4.1%
The Lodge	0.72	1.8%	10.46	5.2%
Royston	0.94	2.4%	5.37	2.7%
Newhouse Farm	0.30	0.7%	2.91	1.5%
Pool Farm	0.39	1.0%	2.71	1.4%
Putloe	0.29	0.7%	3.84	1.9%
Rarkend Farm	0.16	0.4%	5.58	2.8%
Road Farm	0.30	0.8%	5.14	2.6%
Round House	0.45	1.1%	3.73	1.9%
Summer House Farm	0.49	1.2%	5.06	2.5%
St Josephs Travellers Park	0.28	0.7%	9.44	4.7%
Warren farm	0.28	0.7%	4.22	2.1%
Hunts Grove	0.71	1.8%	5.60	2.8%
Kingsway	0.29	0.72%	2.78	1.4%

13.4.20 The highest contribution to long term annual mean nitrogen dioxide concentrations at any sensitive receptors is 0.94 µg/m³, which is 2.4 % of the AQO. Applying the EA criteria, the impact of the emissions would be considered not insignificant and as such has been assessed against the EPUK guidelines. Applying the EPUK criteria, the magnitude of change would be classified as ‘small’, and the absolute concentration value would be classified as being ‘well below the objective’, as such the final significance description would be classified as ‘negligible’.

13.4.21 The significance classification for all of the other pollutants at the identified receptors would also be classified as negligible.

Detailed Discussion of Results at Point of Maximum Impact

13.4.22 A detailed assessment of each of the pollutants where emission levels are not classified as insignificant by the EA’s criterion can be found below.

Nitrogen Dioxide

13.4.23 The highest contribution of the plant to the annual average ground level concentration is predicted to be 3.4 µg/m³, based on 2008 weather data. This ground level concentration includes a multiplication factor of 0.7 to account for the expected conversion rate from NO to NO_2 as recommended by the Environment Agency. The peak concentration occurs in a small area and is 8.5% of the AQO. If the peak contribution is added to the background concentration of 20.8 µg/m³, the total predicted ground level concentration is 24.2 µg/m³, which is 60.5 % of the AQO of 40 µg/m³. The predicted spatial distribution of nitrogen dioxide annual mean concentrations is presented as a contour plot in Figure 13.2

13.4.24 It can be seen that the impact of the stack emissions with respect to the long term ground level concentration of NO_2 is considered not to be insignificant using the EA criteria. Under the EPUK approach, the magnitude of change can be classified as 'medium’ (Table 13.1) and the absolute concentration classified as ‘well below the objective’. Using the EPUK significance matrix in Table 13.2, the final significance can be classified as 'negligible'.

13.4.25 The highest contribution of the plant to the 99.79th percentile of hourly average ground level concentration is predicted to be 14.3 µg/m³, based on 2007 weather data. This ground level concentration includes a multiplication factor of 0.35 to account for the expected conversion rate from NO to NO_2 as recommended by the Environment Agency. The peak concentration occurs in a small area and is 7.2% of the AQO.

13.4.26 It would not be correct to add the peak short term contribution from the plant to the highest recorded background concentration, since the two peaks would not be coincident in time or space. Instead, the EA recommends in Technical Guidance Note EPR-H1 that the short-term process contribution should be added to twice the long-term ambient concentration. If the short-term peak is added to two times the highest annual average concentration, the total predicted ground level concentration is 55.9 µg/m³, which is 28.0% of the AQO of 200 µg/m³. The distribution is shown in Figure 13.3

13.4.27 Overall, the contribution of the stack emissions to the short term nitrogen dioxide levels in the atmosphere would be less than 10% of the AQO and as such can be screened out as being insignificant using the EA criteria. The contribution the stack emissions to the long term nitrogen dioxide levels in the atmosphere, while not insignificant using the EA criteria, can be considered negligible against the EPUK significance criteria

Volatile Organic Compounds (VOC)

13.4.28 The emissions of VOCs include a large number of different organic compounds, including two compounds which are covered by air quality objectives – benzene and 1,3-butadiene. The air quality objective for 1,3-butadiene is more stringent. If all the emissions of VOCs are assumed to be 1,3-butadiene, these would exceed the 1% criterion being 10.8% of the AQO. However, data from similar facilities indicate that only a small proportion of the VOCs would be 1,3-butadiene and so the 1% criterion is unlikely to be exceeded. As such the impact would be classified as being insignificant using the EA criteria and negligible using the EPUK criteria.

Metals

13.4.29 There is a single emission limit for nine other metals (arsenic, antimony, chromium, cobalt, copper, lead, manganese, nickel and vanadium). The impact of metals has been assessed using the three stage screening methodology outlined in the Environmental Agencies guidance document "Guidance to Applicants on Impact Assessment for Group 3 Metals Stack Releases – V.2 June 2011"

13.4.30 Using this methodology, the first stage is to predict the impact of each metal, assuming each metal is emitted at 100% of the emission level. The impact is compared to the following screening criteria:

- Long-term EALs - Predicted Environmental Concentration (PEC) <70%
- Short-term EALs - Process Contribution (PC) <20% of the headroom[15]

13.4.31 On a short term basis if it is assumed that the concentrations of all metals are emitted at 100% of the combined limit for 'Other Metals' the impact would be less than 20% of the headroom. As such short term impacts can be screened out at this first stage.

13.4.32 The long term impact of arsenic, chromium (VI) and nickel cannot be screened out, and additional consideration has to be given to these pollutants. The third stage of the assessment is to consider site specific assumptions. As detailed previously the facility would incorporate a flue gas treatment system to remove heavy metals from the gas stream. This flue gas treatment system is typical to that in use at other UK EfW facilities and as such the performance of the proposed flue gas treatment system can be considered to be as effective in removing heavy metals as the systems employed at other typical UK EfW facilities. Using these site specific assumptions the predicted total concentration of arsenic, chromium (VI) and nickel are less than 1% of the EALs and therefore can also be considered as being insignificant using the EA criteria and imperceptible using the EPUK classification.

Cadmium and Thallium

13.4.33 A combined value for cadmium and thallium is used when modelling air quality impacts as shown in Table 13.3. If the emissions of Cadmium are assumed to be at the combined limit of cadmium and thallium for the entire year, these would exceed the 1% EA criteria for insignificance. However, from data collected from the start of 2006 until June 2007 from 15 MSW incineration plants, the highest recorded combined concentration of cadmium and thallium was 0.010 mg/Nm^3, which is 20% of the emission limit. Taking this maximum into account, the predicted annual average contribution is only 0.24 ng/m^3,

[15] The headroom is the difference between the air quality objective and existing background concentrations

which is 4.8% of the EAL and as such is considered not to be insignificant using the EA criteria.

13.4.34 If the predicted cadmium contribution from the plant is added to the background measurement of 0.37 ng/m^3, the predicted total concentration is 0.61 ng/m^3, still well below the environmental assessment level of 5 ng/m^3. Under the EPUK approach, the magnitude of change can be classified as 'medium', and the absolute concentration would be classified as 'well below the objective'. Using the EPUK significance matrix in Table 13.2, the final significance would therefore be classified as 'negligible'.

13.4.35 If the predicted thallium contribution from the plant is added to the background measurement of 0.06 ng/m^3, the predicted total concentration is 0.30 ng/m^3, still well below the environmental assessment level of 1,000 ng/m^3. Note that this EALs is not present in Appendix B to Annex F of the Environment Agency Horizontal Guidance Note EPR-H1 2010 but has been taken from the previous guidance, Part 2 of the Agency H1 Horizontal Guidance Note 2008. Under the EPUK approach, the magnitude of change can be classified as Imperceptible.

Mercury and Compounds

13.4.36 The predicted long term contribution of emissions of mercury is 1.2 ng/m^3, 0.5% of the air quality objective, and is considered to be insignificant using the EA criteria.

13.4.37 The predicted short term contribution of emissions of mercury is 15.7 ng/m^3, 0.2% of the air quality objective, and is considered to be insignificant using the EA criteria.

Benzo[a]pyrene

13.4.38 The predicted contribution of emissions of benzo[a]pyrene is 4.9 pg/m^3, 1.9% of the air quality objective, and is considered not to be insignificant using the EA criteria. If the predicted contribution of is added to background levels of 210 pg/m^3, the total predicted concentration is less than 214.9 pg/m^3, which is 84% of the AQO. Under the EPUK approach, the magnitude of change can be classified as 'small', and the absolute concentration can be classified as 'below the objective'. Using the EPUK significance matrix in Table 13.2, the final significance can be classified as 'negligible'

13.4.39 It can therefore be seen that the impact on air quality at the point of maximum impact is considered to be negligible for all pollutants except for cadmium which is considered to have a slight adverse impact.

Sensitive Environmental Receptors

13.4.40 The impact of emissions from the plant on environmentally-sensitive areas has been considered.

13.4.41 The assessment takes into account the ecological features identified in the *"Preliminary Assessment of Air Quality Impacts on Statutory Designated Sites"* undertaken to aid the development of the Javelin Park facility. This report identified features within the following distances:

- all habitat features designated by the EC Habitats Directive (90/43/EEC) - SAC's (Special Areas of Conservation), SPA's (Special Protection Areas) and Ramsar sites – within 15km of the plant;
- all habitat features designated by the Wildlife & Countryside Act 1981 - SSSI's (Sites of Special Scientific Interest) – within 10km of the plant; and
- Local Wildlife Sites – Ancient Woodlands, National Nature Reserves, Local Nature Reserves and other local wildlife sites – within 2km of the plant.

13.4.42 The Environment Agency's Technical Guidance Note EPR-H1 states that conservation sites need only be considered where they fall within set distances of the activity:

- Special Protection Areas (SPAs), Special Areas of Conservation (SACs) or Ramsar sites within 10 km of the installation.
- Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs), Local Nature Reserves (LNRs), local wildlife sites and ancient woodland within 2km of the location of the installation.

13.4.43 The sites identified in the *Preliminary Assessment,* which are located both within and outside of the H1 screening distances, have been presented in Table 13.17. These receptors have been considered in this assessment. It should be noted that a Habitat Screening Assessment has been undertaken for the proposed EfW facility. This includes an assessment of air quality impacts on European Sites within 15 km of Javelin Park using the following methodology. The screening assessment is discussed further in Chapter 9.0 and is included as Appendix 9.6.

13.4.44 For habitat features that encompass a large area (such as the Severn Estuary SAC) a number of points across the habitat have been considered. Points along the closest edge to the facility have been included to ensure that the maximum impact of the facility on the sensitive habitat is taken into account. For habitat features that are made up of a number of separate sites, the impact has been modelled at each individual site that makes up the larger habitat feature (such as Cotswold Beechwoods SAC).

Table 13.17 Habitat Receptors considered in Air Quality Assessment

Habitat Receptor	Distance from the Plant
Habitats within the H1 Screening Criteria	
Severn Estuary SPA,SAC & Ramsar (11 points)	6.5 km south-west
Walmore Common SPA, Ramsar (4 points)	6.6 km north-west
Cotswold Beechwoods SAC (28 points)	7.1 km east
Rodborough Common SAC (16 points)	8.0 km south-east
Glos And Sharpness Canal (Key Wildlife Site)	2 km west
Habitats outside of the H1 Screening Criteria	
Range Farm Fields SSSI	5.3 km north-east
Woodchester Park SSSI	8.6 km south
Swift's Hill SSSI	8.2 km south-east
Walmore Common SSSI	6.6 km north-west
Upper Severn Estuary SSSI	8 km south-west
Minchinhampton Common SSSI	10 km south-east
Cotswold Commons & Beechwoods SSSI	7.1 km east
Selsley Common SSSI	7.3 km south-east
Edge Common SSSI	4.5 km south-east
Rodborough Common SSSI	8 km south-east
Bull Cross, The Frith & Juniper Hill SSSI	6.7 km south-east
Hucclecote Meadows SSSI	8.9 km north-east
Frampton Pools SSSI	5.3 km south-west
Cotswold Commons and Beechwoods LNR	7.1 km east
Saintbridge Balancing Pond LNR	7.7 km north-east
Barnwood Arboretum LNR	9.4 km north-east
Robinswood Hill LNR	5.5 km north-east
Alney Island LNR	8.1 km north

Habitat Receptor	Distance from the Plant
Quedgeley Arboretum LNR	3.7 km north
Green Farm Orchard LNR	4.8 km north
Hucclecote Meadows LNR	8.9 km north
Wye Valley and Forest of Dean Bat Sites SAC	13 km north-west

13.4.45 It can be seen that five European Sites have been identified within 15 km. These are listed below, along with the general habitats contained within them.

- Severn Estuary SPA,SAC & Ramsar Site - Saltmarsh
- Walmore Common SPA, Ramsar Site – Improved grassland and mesotrophic standing water
- Cotswold Beechwoods SAC – Beech woodland and calcareous grassland
- Rodborough Common SAC – Calcareous grassland
- Wye Valley and Forest of Dean Bat Sites SAC - Taxus baccata woodland, beech forests and broadleved woodland

13.4.46 The potential impact on all of the sites included in Table 13.17 within the H1 Screening Criteria have been investigated as well as Wye Valley and Forest of Dean Bat Sites SAC which is located within 15km of the site, in terms of levels of pollutants in the atmosphere and the deposition of nitrogen and acid gases. Different air quality objectives are used for the protection of ecosystems and are outlined in Appendix B to Annex F of the Environment Agency Horizontal Guidance Note EPR-H1. The Air Quality Limit Values Regulations 2003 contain the following limit values for the protection of ecosystems. These are summarised below:

- For nitrogen oxides (as NO_2):
    1. 30 µg/m³ as an annual mean.
    2. 75 µg/m³ as a daily mean.
- For sulphur dioxide:
    1. 10 µg/m³ as an annual mean for the protection of vegetation and ecosystems where lichens & bryophytes are an important part of the ecosystem's integrity
    2. 20 µg/m³ for the annual mean concentration of sulphur dioxide for all other ecosystems), and as a winter average.
- For hydrogen fluoride:

1. 5 µg/m³ as a daily mean
- For ammonia:
    1. 1 µg/m³ for the annual mean concentration of ammonia for sensitive lichen communities & bryophytes and ecosystems where lichens & bryophytes are an important part of the ecosystem's integrity
    2. 3 µg/m³ for the annual mean concentration of ammonia for all other ecosystems)

13.4.47 Lichens and bryophytes are not relevant for the habitats being considered in this assessment.

13.4.48 In addition, the APIS Database[16] contains the following minimum critical loads for the European Sites within 15km of the facility:

- For nitrogen deposition:
    1. Severn Estuary: 20-30 kg N/hectare/year for atlantic salt meadow
    2. Walmore Common: none defined.
    3. Cotswold Beechwoods: 10-20 kg N/hectare/year for beech forest and 15-25 kg N/hectare/year for sub-atlantic semi-dry calcareous grassland
    4. Rodborough Common: 15-25 kg N/hectare/year for sub-atlantic semi-dry calcareous grassland
    5. Wye Valley: 5-15 kg N/hectare/year for Taxus baccata woods, 10-20 kg N/hectare/year for beech forests and 15-20 kg N/hectare/year for Tilo Acerion forests of slopes, screes and ravines.
- For acid deposition:

    In the cases of Walmore Common, Cotswold Beechwoods and Rodborough Common and Wye Valley Woodlands there are critical loads provided for acid deposition on grasslands and broadleafed /coniferous woodland habitat. The minimum critical loads for these grassland and woodland habitats are shown in Figure 1 of Appendix 13.1.

13.4.49 Full details of the modelling and the criteria used can be found in Appendix 13.1. It was found that the predicted contributions in the SPA, Ramsar, SAC,

[16] UK Air Pollution Information System at www.apis.ac.uk

SSSI and local wildlife site (Gloucester and Sharpness Canal) was less than 1% of the air quality objective or Critical Load for all pollutants, so the contribution is predicted to be insignificant. For a number of sites, there is no Critical Load available. In order to assess the impact of deposition on these sites, the predicted deposition levels were compared with background levels and were found to make a very small contribution.

13.4.50 Further discussion relating to the impact of air quality on the designated sites with regard to the 2010 Habitats and Species Regulations is provided in Chapter 9.0 (Ecology).

Greenhouse Gases

13.4.51 The Environment Agency's Waste and Resources Assessment Tool for the Environment (WRATE) was used to evaluate the impact on a number of environmental indicators. One of these is the Global Warming Potential (GWP), expressed in tonnes of CO_2 equivalent per annum. The assessment takes into account greenhouse gas emissions generated as a result of construction and operational impacts, transportation impacts and the reduction in greenhouse gas emissions as a result of the displacement of power generation from fossil fuel based power stations and from the avoidance of the production of landfill gases (carbon dioxide and methane[17]) as a result of diversion of waste from landfill. The result of this assessment has shown that implementing the EfW facility as opposed to not operating the plant would result in a net annual reduction of 40,480 tonnes of CO_2 equivalent per annum i.e. the greenhouse gas emissions associated with constructing and operating the facility would be more than offset by the displacement greenhouse gases generated from fossil fuel based electricity generation and reduction in greenhouse emissions from landfill.

Cumulative Impacts

13.4.52 Given the aforementioned presence of a planning permission for an Advanced Thermal Treatment (ATT) waste management facility at Moreton Valance a cumulative assessment of air quality effects has been carried out assuming both the Javelin Park EfW facility and the ATT plant were operating simultaneously.

[17] Methane is approximately 24 times more effective at trapping heat within the atmosphere than CO_2.

13.4.53 The results of the cumulative air dispersion modelling are described in more detail within Appendix 13.1 and summarised in this section. The cumulative impact results require careful analysis as the highest contributions from the two plants do not occur at the same place or under the same weather conditions. Table 13.18 summarises the cumulative impact of the EfW plant with ATT plant and shows the following:

- the highest contribution to ground level concentrations from the ATT plant and the EfW plant for all five years modelled;
- the highest cumulative contribution for all five years modelled;
- the difference between the peak cumulative contribution and the peak contribution from the ATT plant. This shows the impact of the EfW plant on peak concentrations. Note that these two concentrations are likely to occur in different locations; and
- the highest difference between the cumulative contribution and the ATT plant at any point for all five years modelled. This shows the highest impact of the EfW plant.

Table 13.18 Impact of ATT plant with EfW plant

Pollutant	Quantity	Peak Contribution (µg/m³)			Difference in Peak Contribution (µg/m³)	Highest Incremental Contribution (µg/m³)
		EfW	ATT	Combined		
Nitrogen Dioxide	Annual mean	3.4	4.71	5.39	0.68	3.40
	99.79^{th} %ile of hourly means	14.3	23.0	23.0	0.00	11.83

13.4.54 Emissions from the ATT plant dominate the combined contribution for nitrogen dioxide. This is because the stack on the ATT plant is short. It can therefore be concluded that the highest predicted short term ground level concentrations in the area affected by the ATT plant would be approximately the same with or without the proposed EfW plant at Javelin Park. For the point where the highest predicted long term ground level concentrations occur, the peak is expected to rise by 0.68 µg/m³ or 1.3% of the AQO as a result of the combined impact of the EfW at Javelin Park.

13.4.55 The contribution of emissions from the EfW at Javelin Park to the annual average ground level concentration of nitrogen dioxide can be seen in Figure 13.2. The combined contribution from the ATT and EfW is shown in Figure

13.4. It can be seen that the area of peak ground contribution for the two plants do not coincide.

13.4.56 However, even if the combined contribution is added to the background concentration, no breaches of air quality objectives are predicted. The predicted long term concentration of Nitrogen Dioxide is 26.2 µg/m³, well below the AQO of 40 µg/m³, and the predicted short term concentration of Nitrogen Dioxide is 64.6 µg/m³, well below the AQO of 200 µg/m³.

13.5 Additional Mitigation

13.5.1 Due to the use of the advanced flue gas treatment system as described previously, no further mitigation measures are deemed necessary for the operation of the plant.

13.5.2 A CEMP would be developed for the construction period as described in Chapter 5.0. The CEMP would include measures to avoid and reduce impacts on local air quality from construction operations as described in Section 13.4.

13.6 Residual Effects and Conclusions

13.6.1 It has been acknowledged that the operation of the EfW facility would give rise to a number of substances that would be emitted to the atmosphere. As a result, the potential environmental effects of these emissions have been assessed using detailed dispersion modelling.

13.6.2 The assumptions that have been adopted to determine the predicted emission levels from the plant, maximum ground level concentrations and background levels in the vicinity of the plant have been based on a ‘worst-case’ scenario.

13.6.3 The results of the modelling have indicated that the proposed stack would provide more than adequate dispersion to atmosphere and that the operation of the facility is predicted to have a negligible impact on local air quality.

13.6.4 Assessment of potential odour and dust sources has concluded that the facility is unlikely to result in dust or odour nuisance to local receptors.

13.6.5 As a result, no significant effects on air quality are predicted as a result of the construction or operation of the proposed facility.

14.0 HUMAN HEALTH

14.1 Introduction

14.1.1 There is no evidence that a well managed modern waste management facility leads to adverse health impacts on the local population. The DEFRA report "Review of Environmental and Health Effects of Waste Management"[18] reviewed a large number of papers and studies on health impacts of waste management facilities. A section of the summary of this report on "Health effects linked to municipal solid waste" is reproduced below.

The health effects of some waste management facilities have been investigated in detail, in response to public concerns.

The review did not find a link between the current generation of municipal solid waste incinerators and health effects. Adverse health effects have been observed in populations living around older, more polluting incinerators and industrial areas. However, the current generation of waste incinerators result in much lower levels of exposure to pollutants. We considered cancers, respiratory diseases and birth defects, but found no evidence for a link between the incidence of disease and the current generation of incinerators.

A detailed UK study was carried out to investigate whether there is any indication that living close to landfill sites results in an increase in the occurrence of cancer. This study did not detect an increase in the occurrence of cancer.

Studies have been carried out to investigate the existence of a link between composting facilities and the occurrence of cancers and asthma. No link has been identified.

Thus the studies suggest that if the operation of these facilities does have any effect on the health outcomes which have been investigated, any effect is very small – smaller than many other influences on these health outcomes."

[18] Review of Environmental and Health Effects of Waste Management: Municipal Solid Wastes and Other Similar Wastes, March 2004, DEFRA

14.1.2 The Health Protection Agency has issued a more recent statement on "The Impact on Health of Emissions to Air from Municipal Waste Incinerators" (September 2009)[19]. The summary of this statement is reproduced below:

The Health Protection Agency has reviewed research undertaken to examine the suggested links between emissions from municipal waste incinerators and effects on health. While it is not possible to rule out adverse health effects from modern, well regulated municipal waste incinerators with complete certainty, any potential damage to the health of those living close-by is likely to be very small, if detectable. This view is based on detailed assessments of the effects of air pollutants on health and on the fact that modern and well managed municipal waste incinerators make only a very small contribution to local concentrations of air pollutants. The Committee on Carcinogenicity of Chemicals in Food, Consumer Products and the Environment has reviewed recent data and has concluded that there is no need to change its previous advice, namely that any potential risk of cancer due to residency near to municipal waste incinerators is exceedingly low and probably not measurable by the most modern techniques. Since any possible health effects are likely to be very small, if detectable, studies of public health around modern, well managed municipal waste incinerators are not recommended.

14.1.3 Despite the advice from health specialists such as the Health Protection Agency that any potential damage to health is likely to be very small, and probably not detectable, the specific effects on human health of the proposed EfW facility have been considered. For most substances released from the plant, the most significant effects on human health would arise by inhalation. The air quality objectives discussed in Chapter 13.0 have been set by the various authorities at a level which is considered to present minimum or zero risk to human health. It is widely accepted that, if the concentrations in the atmosphere are less than the air quality objectives, then the pollutant is unlikely to have an adverse effect on human health.

14.1.4 For some pollutants which accumulate in the environment, inhalation is only one of the potential exposure routes. Therefore, other exposure routes are considered in the Human Health Risk Assessment. Full details can be found in Appendix 14.1. The assessment is summarised in this chapter.

[19] The Impact on Health of Emissions to Air from Municipal Waste Incinerators, September 2009, HPA.

14.1.5 In addition to the above assessment the psychosocial and mental health impacts of the proposal have been considered. This issue has been considered as a result of comments received within the scoping opinion for the project.

14.2 Methodology

Assessment Methodology

14.2.1 A detailed human health risk assessment (HHRA) has been carried out using the Industrial Risk Assessment Program-Human Health (IRAP-h View – Version 4.0). The programme, created by Lakes Environmental is based on the United States Environment Protection Agency (USEPA) Human Health Risk Assessment Protocol. This Protocol is a development of the approach defined by Her Majesty's Inspectorate of Pollution (HMIP) in 1996, taking account of further research since that date.

14.2.2 The emission concentration of each chemical is calculated from the results of the air quality modelling which is discussed in Chapter 13.0.

14.2.3 The IRAP programme considers the following pathways for exposure to Chemicals of Potential Concern (COPC):

- the ingestion of soil attached to unwashed vegetables, unintended ingestion when farming or gardening and, for children, ingestion of soil when playing;
- the transfer of COPC from the soil and the air to plants and the ingestion of homegrown plants by humans;
- the transfer of COPC to infants through the ingestion of breast milk; and
- the inhalation of COPC from the atmosphere.

14.2.4 The potential impact at a number of local receptors was considered. These were divided into residential receptors and farmers, with the farmer receptor being used to model those residents who consume more homegrown produce. Adults and children were considered separately.

14.2.5 The IRAP-h model uses a database of physical and chemical parameters to calculate the COPC concentrations through each of the different pathways identified. The base physical and chemical parameters have been used in this assessment. Data on weather, rainfall and evaporation were obtained from the Met. Office for the local area.

Agriculture

14.2.6 Concerns were expressed by local farmers during the consultation period about the potential impact of emissions from the facility on the soil and crops in fields around the facility. Therefore, an additional assessment was carried out.

14.2.7 The farming areas surrounding the facility were split into five areas to allow a detailed assessment to take place. These areas are shown in Figure 1 in Appendix 14.1 and were defined as follows:

- Area 1 - fields across the motorway to the north and west of the facility.
- Area 2 - fields directly to the south of the facility.
- Area 3 - fields directly to the south-east of the facility.
- Area 4 - fields directly to the north-east of the facility.
- Area 5 - fields across the motorway to the north of the facility.

Assessment of Significance / Assessment Criteria

14.2.8 IRAP calculates the total exposure through each of the different pathways so that a dose from inhalation and ingestion can be calculated for each of the local receptors. By default, these doses are then used to calculate a cancer risk, using the USEPA's approach. However, the Environment Agency have asked, for other similar applications, that the results be assessed using the UK's approach, which is explained in the EA's document *"Human Health Toxicological Assessment of Contaminants in Soil*", ref SC050021. This approach involves two types of assessment:

- For those chemicals with a threshold level for toxicity, a Tolerable Daily Intake (TDI) is defined. This is "an estimate of the amount of a contaminant, expressed on a bodyweight basis, which can be ingested daily over a lifetime without appreciable health risk." A Mean Daily Intake (MDI) is also defined, which is the typical intake from background sources. In order to assess the impact of the Javelin Park Facility, the predicted intake of a chemical is added to the MDI and compared with the TDI.

- For chemicals without a threshold level for toxicity, an Index Dose (ID) is defined. This is a level of exposure which is associated with a negligible risk to human health. The predicted intake of a chemical is compared directly with the ID without taking account of background levels.

14.2.9 Chemicals can reach the body either through inhalation or through ingestion (oral) exposure and the body handles chemicals differently depending on the route of exposure. For this reason, different TDI and IDs are defined for inhalation and oral exposure.

Agriculture

14.2.10 For each of the 5 areas identified, the IRAP-h programme was used to predict the concentrations of COPCs in produce, in beef and in soil. These were compared with the regulatory limits contained within European Commission Regulations (EC) No 1881/2006 as amended by the Commission Regulations (EC) No 629/2008 and the Commission Regulations (EC) No 124/2009. These are enforced by The Contaminants in Food (England) Regulations 2009 No 1223. For soil, the predicted concentrations were compared with Soil Guideline Values (SGVs) taken from Environment Agency guidance.

14.3 Baseline

14.3.1 The Mean Daily Intakes takes into account the typical intake of chemicals of potential concern from existing background sources. These MDIs are documented in a series of toxicological reports, available from the Environment Agency's website and summarised in Appendix 14.1.

14.4 Assessment of Effects

Incorporated Mitigation

14.4.1 As discussed in the air quality assessment, the facility incorporates a number of flue gas abatement systems to limit the emission of pollutants to the atmosphere.

Construction Phase

14.4.2 During the construction phase, no waste would be burnt on site and as such the pollutants of concern that are considered in the Human Health Risk Assessment are not emitted.

Operational Phase

14.4.3 The full results of the assessment can be found in Appendix 14.1 and are summarised in the following paragraphs.

14.4.4 For all the pollutants considered with a Tolerable Daily Intake (TDI), cadmium is the pollutant that results in the highest level of exposure. The combined impact of cadmium from existing background sources and contributions from the proposed EfW is 138.89% of the TDI for children. However, it is important to note that the Process Contribution from the proposed EfW for cadmium is exceptionally small, being only 0.005% of the TDI.

14.4.5 The TDI is set at a level *"that can be ingested daily over a lifetime without appreciable health risk",* therefore the ingestion of cadmium by children as a result of background sources is already above the TDI. The breakdown of the total Tolerable Daily Intake taking into account the existing Mean Daily Intake (typical intake from background sources) and the Process Contribution from the facility can be seen below:

- Mean Daily Intake (MDI) 138.89% of TDI
- Process Contribution (PC) 0.005% of TDI
- Total Daily Intake (TDI) 138.89% of TDI

14.4.6 On the basis that the Process Contribution of Cadmium is exceptionally small (only 0.005% of the TDI) it is not considered to increase the health risks from this pollutant significantly. For all other pollutants, the combined impact from the facility plus the existing MDI is below the TDI, so there would not be an appreciable health risk based on the emission of these pollutants.

14.4.7 For pollutants which do not have a TDI, a comparison has been made against an Index Dose (ID). The Index Dose is a threshold below which there are considered to be negligible risks to human health. The greatest contribution from the facility is from arsenic, this is only 5.97% of the Index Dose for children. Therefore, emissions from the facility of arsenic and all other pollutants are considered to have a negligible impact on human health.

Psychosocial and Mental Health Impacts

14.4.8 There is no reason to consider that the operation of the proposed facility should lead to psychosocial or mental health impacts in itself. The direct impacts on health are considered elsewhere in this chapter and are shown to be insignificant. However, it is possible that there is potential for the proposal to lead to anxiety and concern in the local population due to the perception of health effects.

14.4.9 It is accepted that there is some public concern about the proposals and health impacts were raised by a number of the attendees at the two public exhibitions held to raise awareness of the project. However, much of this concern may have been caused by statements from opponents of incineration in general, who tend to raise fears of health effects. While this may lead to genuinely-held beliefs that the proposed facility would lead to adverse impacts on health, these beliefs are not supported by the evidence presented in this chapter. The process of the health and air quality assessment being undertaken for the project was explained to all members of the public that raised concerns at the public exhibitions. This provided reassurance that health impacts were being addressed by the applicant and also provided the opportunity to explain to the public the stringent environmental controls that are in place within the UK that ensure the safe operation of such facilities.

14.4.10 The issue of the public perception of health effects has been considered at a number of public inquiries into proposed waste plants, a number of relevant extracts from published documents are provided below.

14.4.11 In October 2008 the Inspector considering a co-joined Inquiry for a Refuse Derived Fuel Plant (an EfW facility) and a Resource Recovery Park on land at Ince Marshes, Cheshire (DCLG ref: APP/Z0645/A/07/2059609 & DBERR ref: 01.08.10.04/36C) addressed health perception fears in a very direct manner in paragraphs 11.19, 11.24 and 11.28 of his conclusions (accepted by the Secretary of State at paragraph 6.1 of his decision letter). These read:

Health issues were examined through the inquiry. It is very evident that the perception of a risk to health is the principal matter leading members of the public to write objections to the proposals [3.131, 8.10, 10.4]. The focus of the concern being related to emissions to air from the Refuse Derived Fuel plant [3.15].

Concern over health impacts of modern incinerators and the argument that alternative methods of waste management posing a lower risk to public health should be pursued have to be viewed in the light of statements within up to date national policy. Paragraph 22 of Chapter 5 of Waste Strategy for England 2007 states that: "Research carried out to date shows no credible evidence of adverse health outcomes for those living near incinerators". I regard that statement as a full answer to those arguing against incineration of waste on the basis of the Precautionary Principle.

The one aspect of health impacts that has been officially recognised (in the Rapid Health Impact Assessment) is that of anxiety. It is evident that there is widespread concern in relation to the proposed Refuse Derived Fuel plant and it would appear that, principally by association, this has also become attached to the proposal for a Resource Recovery Park. However the position giving rise to doubts in the mind of the public, concern over health effects of incineration of waste, is one that is in direct conflict with a position taken by Government in a statement of national policy (paragraph 22 of Chapter 5 of Waste Strategy England). Such a statement will not satisfy everyone but should act to allay anxiety amongst the public at large. My conclusion is that although the proposal raises public anxiety this should not carry great weight in relation to the planning decisions on the proposals before the Secretaries of State.

14.4.12 A similar stance was adopted by the Inspector at the Cornwall Energy Recovery Centre (CERC) Inquiry (APP/D0840/A/09/2113075) with regard to adopting the precautionary principle. In addition, he gave significant weight to the granting of an Environmental Permit. Paragraphs 2103 and 2104 of his conclusions (accepted by the Secretary of State at paragraph 26 of his decision letter) read:

Third parties and some local residents suggested that the precautionary principle should be invoked. PPS23 makes it clear that the precautionary principle should apply only where there is good reason to believe that harmful effects may occur to health or to the environment and that there is a level of scientific uncertainty about the risks which would prevent a confident assessment to inform decision making. These considerations do not apply in this case. In the first place, PPS10 and WS2007 provide clear, unequivocal statements as to the absence of evidence of harm to health from incineration. The consultation responses from the PCT on the permit also provide a clear statement as to there being no good reason to suggest that the CERC facility would adversely affect human health. Second, the permit issued by the EA provides a firm, well founded framework for assessing risk and for putting into place the controls to minimise harm. (475, 476, 1083, 1161, 1544, 1704)

Accordingly, it is concluded that there is nothing arising from the evidence in this case to justify taking a different view from national policy that the use of the type of incineration technology proposed for the CERC facility would affect the health of those living in the locality. In addition, there is nothing in the evidence to warrant an intervention in a matter which is properly to be dealt with by another regulatory regime, that of the permit.

14.4.13 Finally, the Inspector at Kings Cliff Inquiry (APP/K2800/A/10/2126938) into the deposit of low level radioactive waste within a hazardous landfill set out his final conclusion on health perception at paragraph 7.44 of his report. This reads:

In conclusion on this issue, the perception of harm is a material consideration. All of the identified 19 perception factors would apply in varying degrees and, in general terms, the more that apply, the greater the perceived harm. The fears are real but there is limited evidence of any direct effects from the perception of harm at this stage. There is, as Augean states, a clear gulf between the technical assessment of the risk and the public perception. The mainstream scientific assessment of the effects of low level radiation is far removed from the perception that many people have, using information from the media and pressure groups, as the actual risk of harm would be extremely small and it would meet Government guidelines. The inquiry process, itself, highlights the issue and serves to focus fears and concerns. Indeed, an HPA *case study into the Ince Marshes Recovery Park concludes, "…major effects on physical health were…from its planning application". Nevertheless, the inquiry process also provides a direct link between residents and the decision-maker and knowledge that their views will be taken into account in making the decision. This knowledge, the lack of any objection on actual harm from all of the relevant statutory bodies and from NCC and its independent expert, and the stance of the Government on risk in its statement of national policy should assist in ameliorating public concerns. For these reasons, I attach only limited weight to the perception of harm in making my recommendation on this appeal.*

14.4.14 In conclusion, there are strong Government statements that that there is no quantifiable health risks from modern EfW facilities. Public perception of the risk to health (or other risks) is a material planning consideration that features in a number of Inquiry decisions. However, in the case of EfW proposals (or similar waste facilities):

- it has not be used as a reason to withhold planning permission in its own right;
- it would only ever carry any significant weight if there was hard evidence to show why, in a particular situation, the perception was real, logical and justified;
- the lack of objection on actual harm should reduce the weight afforded to perceived harm; and
- repeated Government messages stating a particular form of development does not pose a risk to health should carry weight in ameliorating any public concerns.

14.4.15 Finally, and as discussed above, there has been extensive public consultation on this facility. The approach to public consultation is documented within the Statement of Community Involvement contained within Part 5 of the Planning Application Document provides full details of the public consultation undertaken leading up to the submission of the planning application. The public consultation events have kept local residents informed about the potential effects of the project and how such facilities are regulated to ensure that there would be no health impacts on local populations. Whilst it is not possible to prevent members of the public being concerned about the potential effects of such a proposal, the public engagement activities will have assisted in avoiding any unnecessary psychosocial impacts from the proposal.

14.5 Additional Mitigation

14.5.1 The facility is designed in such a way to mitigate the emissions from the EfW facility such that the impact on human health in negligible. No additional mitigation is therefore required.

14.6 Residual Effects and Conclusions

14.6.1 It has been acknowledged that the operation of the EfW facility would give rise to a number of substances that would be emitted to the atmosphere and that these substances have the potential to accumulate in the environment and have an impact on human health. As a result, the risk to human health of these emissions has been assessed.

14.6.2 The results of the modelling have indicated that the emissions would have a negligible effect on human health.

Agriculture

14.6.3 The full results of the assessment can be found in section 10 of Appendix 14.1. The increase in COPC concentrations within the surrounding farming area as a result of the operation of the EfW facility has been considered and assessed against the relevant statutory limits.

14.6.4 The predicted levels of cadmium and lead in produce were less than 0.1% of the relevant limit from the Commission Regulations.

14.6.5 The predicted levels of cadmium, lead and dioxins in beef were less than 0.03% of the relevant limit from the Commission Regulations.

14.6.6 The predicted levels of heavy metals and dioxins in soil were less than 0.3% of the soil guideline values.

14.6.7 The impact of the emissions from the facility on the local agriculture activities would be at a maximum 0.3% of the statutory limit and as such the impact is extremely small and are considered negligible.

Psychosocial and Mental Health Impacts

14.6.8 There are strong Government statements that there is no quantifiable health risks from modern EfW facilities. Whilst it is not possible to prevent members of the public being concerned about the potential effects of the proposal public engagement activities have been undertaken in an attempt to provide reassurance to the local population on human health issues. Such public consultation is considered to assist in avoiding any unnecessary psychosocial impacts from the proposal.

15.0 ARCHAEOLOGY AND CULTURAL HERITAGE

15.1 Introduction

15.1.1 This chapter provides an assessment of the potential impacts on the cultural heritage resource associated with the proposed development. The aim of this assessment is to provide an understanding of the potential impacts of the proposed development upon the cultural heritage resource and to identify if mitigation measures are required to avoid, reduce or compensate for any adverse impacts. In summary, the aims of this ES chapter are to:

- identify the known and potential cultural heritage resource within the proposed development site and the surrounding area;
- assess the potential significance of direct and indirect physical impacts on identified cultural heritage resources; and
- if required define a programme of suitable mitigation measures to avoid, reduce or compensate for potentially significant adverse impacts.

15.1.2 This assessment is based on the results of a Cultural Heritage Baseline Assessment (RPS, February 2011; Appendix 15.1), which contains baseline information and a full review of planning policy related to the cultural heritage resource in the local area. This baseline report is been supported by an update of the cultural heritage resource within 5km of the site (see Appendix 15.2) and other assessment work discussed further below. The Cultural Heritage ES comprises an appraisal of the direct (physical) and indirect (setting) impacts on the cultural heritage resource of the proposed development.

15.2 Methodology

Study Area

15.2.1 As outlined in the Chapter 2.0 of this ES both English Heritage (Inspector of Ancient Monuments) and the Archaeological Advisor to Gloucestershire County Council were consulted during the production of this ES. During these consultations both were asked to confirm their approval of the size of study area to be assessed and the information that this was to assess. Based on these discussions the following study areas were developed:

15.2.2 To assess the impact of the proposed development on the cultural heritage resource a study area of 2km (for all cultural heritage features recorded on the Gloucestershire County Council Historic Environment Record) and 5km (all World Heritage Sites, Scheduled Monuments, Grade I and Grade II* Listed Buildings and Registered Parks and Gardens, excluding Historic Environment Record data) was used within the baseline assessment.

15.2.3 The purpose of the 2km study area is to identify any known heritage assets within the site boundary and understand the potential for previously unrecorded archaeological remains that may be subject to direct physical impact by the proposed development. The 5km study area was established to identify and assess heritage assets that may be sensitive to impacts on setting.

Assessment Methodology

Sources

15.2.4 This assessment is based on a Cultural Heritage Baseline Assessment undertaken by RPS in 2011 (Appendix 15.1). In addition the collation of baseline information included:

- a review of baseline information and online documentary evidence;
- a 2km search of the Gloucestershire Historic Environment Record (received 27th May 2011);
- a 5km search of Scheduled Monuments, World Heritage Sites, Registered Parks & Gardens & Registered Battlefields (http://magic.defra.gov.uk - 27th May 2011);
- a 5km search of Grade I and Grade II* Listed Buildings (http://www.heritagegateway.org.uk/gateway - 27th May 2011);
- a site walkover, undertaken on 25th May 2011, along with a wider visit to understand setting impacts on the 7th Sept 2011; and
- a review of relevant statutory requirements, national, regional and local planning policies and professional good practice guidance including English Heritage Guidance on The Setting of Heritage Assets (2011).

15.2.5 All cultural heritage receptors identified from the above sources are shown on Figure 15.1. Additional features to those identified in the baseline report

(Appendix 15.1) that were examined in relation to setting impact are shown on Figure 15.2. Where identified receptors are discussed in the text, the number assigned to them in the gazetteer of cultural heritage receptors (Appendix 15.2) is used, and is listed in square brackets e.g. [123].

Assessment of the Cultural Heritage Resource

15.2.6 The cultural heritage resource is defined as the sum of archaeological and historical receptors (in a given area) that hold the potential to inform about persons, actions, periods, or events in the past. These receptors can be an individual archaeological site, building, monument, landscape or group of such features, which together form a unit for assessment.

15.2.7 This assessment comprises a record of all known cultural heritage receptors within the 2 km study area and all Scheduled Monuments and Grade I and II* Listed Buildings within the 5 km study area defined above.

15.2.8 In addition the below-ground archaeological potential within the proposed development site was assessed, based on the range and density of known cultural heritage receptors.

15.2.9 Any identified cultural heritage receptors within the 5 km study area (along with any potential cultural heritage receptors within the application boundary) were assessed for direct and indirect impact.

Assessment of the Value of Cultural Heritage Receptors

15.2.10 As part of this assessment all receptors subject to potential direct or indirect impact were assessed for historic value.

15.2.11 There is currently no standard adopted statutory or government guidance for assessing the importance of a cultural heritage feature. However, it is general practice to prescribe value based upon factors such as statutory and non-statutory designations, architectural, archaeological or historical significance, and the contribution to local research agendas. Considering these criteria, each receptor is assigned a level of importance, according to the five point scale in Table 15.1.

Table 15.1 - Value of Cultural Heritage Receptors

Receptor Value	Definition
Very High	World Heritage Sites (including nominated sites), other assets of acknowledged international importance, or sites that can contribute significantly to acknowledged international research objectives.
High	Scheduled Monuments (or undesignated assets of schedulable quality and importance) and Grade I and Grade II* Listed Buildings. Well preserved historic landscapes, whether inscribed or not, with exceptional coherence, time depth or other critical factor(s).
Medium	Designated or undesignated archaeological sites; well-preserved structures or buildings of historical significance, historic landscapes or assets of a reasonably defined extent and significance, or reasonable evidence of settlement, ritual, industrial activity etc. Examples include burial sites, deserted medieval villages, Roman roads and dense scatters of finds representative of complex activity.
Low	Evidence of human activity more limited in historic value than the examples above, or compromised by poor preservation and/or survival of context associations, but which still have the potential to contribute to local research objectives. Examples include sites such as undesignated structures / buildings of limited historic merit, out-of-situ archaeological findspots, historic field systems and boundaries and ephemeral archaeological evidence etc.
Negligible	Historic assets with little or no surviving archaeological interest. Examples include destroyed antiquities, modern buildings of almost no architectural / historic merit, or relatively common landscape features such as quarries, drains and ponds etc.

15.2.12 For sites identified during the production of this report where no previous assessment of value has yet been undertaken an estimate has been made of the likely importance of that receptor based on professional knowledge,. Where there is a total absence of diagnostic material from which to assess the importance of a site (e.g. where the feature is a cropmark noted on an aerial photograph) it may be appropriate to assess the value of the potential receptor as ‘unknown’.

15.2.13 For some types of finds or sites there is no consistent historic interest and importance may vary on a site by site basis. Examples of this are Grade II Listed Buildings, Conservation Areas and registered battlefields. While a feature will also be assigned the level of value according to the table above, where it is felt important to highlight factors associated with the historic interest of a receptor this will be explained.

Assessment of Magnitude of Impact

15.2.14 The criteria for assessing the magnitude of impact, which is subjective and based on professional judgement, are set out in Table 2 (below), which follows examples given in Design Manual for Roads and Bridges (DMRB) Volume 1, Section 3, Part 2 Annexes 5 and 7.

Table 15.2 - Criteria for Determining Magnitude of Impact

Level of Magnitude	**Definition**
Major	Change to most or all key archaeological materials or historic building elements, such that the resource is totally altered. Comprehensive changes to the setting of archaeological assets or historic buildings. Change to most or all key historic landscape elements, parcels or components; extreme visual effects; gross change of noise or change to sound quality; fundamental changes to use or access; resulting in total change to historic landscape character unit.
Moderate	Change to many key archaeological materials/historic building elements, such that the resource is clearly/significantly modified. Considerable changes to setting that affect the character of the archaeological asset. Changes to many key historic landscape elements, parcels or components, visual change to many key aspects of the historic landscape, noticeable differences in noise or sound quality, considerable changes to use or access; resulting in moderate changes to historic landscape character.
Minor	Change to key archaeological materials/historic building elements, such that the asset is slightly altered. Slight changes to the setting of the archaeological asset. Change to the setting of an historic building, such that it is noticeably changed. Changes to few key historic landscape elements, parcels or components, slight visual changes to few key aspects of the historic landscape, limited changes to noise levels or sound quality, slight changes to use or access; resulting in limited changes to historic landscape character.
Negligible	Very minor changes to archaeological materials or setting. Slight changes to historic building elements or setting that hardly affect it. Very minor changes to key historic landscape elements, parcels or components, virtually unchanged visual effects very slight changes in noise levels or sound quality; very slight changes to use or access; resulting in a very small change to historic landscape character.

No Change	No change to archaeological assets. No change to the fabric or setting of historic buildings. No change to elements, parcels or components of the historic landscape; no visual or audible changes; no changes arising from amenity or community factors.

15.2.15 Where buried archaeological deposits exist, or are predicted to exist, it can be difficult to accurately define the total extent, survival and form of the potential below-ground resource during early assessment works. This means the scale of potential impacts is difficult to accurately predict. In such circumstances a professional judgement is applied to provide a guideline to the suspected level of impact.

15.2.16 However, there are cases where the presence of below-ground archaeological deposits is poorly understood. This can occur when, for example, unknown features are identified on aerial photographs, or changes in topography are detected during a site-walkover survey. In such instances the nature of the impact cannot be predicted with any level of confidence. In these cases the level of impact is assessed as 'Unknown'.

15.2.17 The overall significance of effect upon a cultural heritage receptor is determined by correlating the value of each feature against the perceived magnitude of direct impact. Table 15.3 provides a matrix for determining the overall significance of the effect. The effects of a development can be classified as adverse or beneficial.

Table 15.3 Matrix for Determination of Significance of Effect

VALUE	**MAGNITUDE**			
	MAJOR	**MODERATE**	**MINOR**	**NEGLIGIBLE**
Very High	Severe	Major	Moderate	Moderate / Minor
High	Major	Major / Moderate	Moderate	Minor
Medium	Moderate	Moderate	Minor	Minor / Neutral
Low	Moderate / Minor	Minor	Minor / Neutral	Neutral
Negligible	Minor	Minor / Neutral	Neutral	Neutral

Mitigation of Effects

15.2.18 Where there is an adverse effect, in relation to either direct or indirect impacts, the significance of effect provides an indication as to the level of mitigatory measures that may be appropriate for the proposed receptor. In broad terms there are considered to be :

- Severe - Key factors in the overall project decision-making process, the viability of the proposal would need to be considered in its proposed form;
- Major - Factors forming important considerations in the decision-making process relating to Cultural Heritage;
- Moderate - A range of mitigatory measures need to be applied;
- Minor - A range of basic mitigatory measures need to be considered; and
- Neutral - No perceptible effect or change and does not require mitigation.

15.3 Baseline

Consultation

15.3.1 Consultation with Gloucestershire County Council and English Heritage has been undertaken as part of this Environmental Statement.

15.3.2 The English Heritage Inspector of Ancient Monuments for this area was consulted regarding the proposed development. English Heritage requested that all Grade II* Listed Buildings in the vicinity of the Project were identified and assessed. In addition, English Heritage also requested that the significance of the Grade II Listed former Haresfield Court [**95**], to the east of the development, be recorded as 'although not a Registered Park and Garden, the site retains some of the original design including The Lodge and drive' (*pers*. *comm*. 1st June 2011). The listed building information on this structure can be found in Appendix 15.3. However, while the structure sits in mature gardens, the focus of the entry discussing the reasons for listing relate entirely to the fabric of the structure.

15.3.3 Consultation with the Archaeological Advisor to Gloucestershire County Council (GCC) took place between 17th May and 10th June 2011. GCC was provided with the original baseline report (RPS, February 2011; Appendix 15.1) and, based on their review of this document, requested that a new search be made of the Gloucestershire Historic Environment Record to inform the production of the Environmental Statement (information incorporated into an update of Gazetteer of Cultural Heritage Receptors; Appendix 15.2).

15.3.4 During consultation works GCC requested additional information regarding the ground conditions on site to allow them to understand the potential for previously unrecorded archaeological deposits within the site boundary to have survived. A geotechnical investigation report (RPS, June 2010) and remediation works report (RPS, January 2008) were supplied GCC. Based on their review of this information GCC confirmed that given the extent of the previous ground disturbance, including the remediation works, GCC would not require any further archaeological investigation as part of the preparation of the ES.

Archaeological & Historic Background

The Prehistoric Period (to the Iron Age) (c. 500,000 BC – c. 700BC)

15.3.5 The lower Severn Valley has been an area of human settlement throughout the prehistoric, with numerous recorded sites and finds within the wider region. Within the study area there are examples of such activity dating to the later prehistoric, including the scheduled remains of two bowl barrows, dating between the Late Neolithic to Early Bronze Age [**01**], located to the south of Court Hill Farm, some 2.3 kilometres south of the proposed development area.

15.3.6 However, there are no recorded remains of prehistoric date within the proposed development and little potential for the recovery of such evidence within the site limits given the previous ground disturbance.

The Iron Age - Romano-British Period (c. 700BC – c. AD 400)

15.3.7 Activity dating to the Iron Age within the study area is represented by the scheduled Iron Age Hillfort known as the Bulwarks [**04**], which is located on the summit of Haresfield Hill, approximately 2.5km to the south-east of the site. Additionally there are a number of Iron Age – Romano-British sites within the study area [**06 -10**].

15.3.8 The proposed development area is located within an area that was heavily Romanised and occupied during the Roman period. The large Roman city of

Gloucester was located some 8 kilometres north-east of the proposed development area.

15.3.9 A major Roman road, running from Seamills near Bristol to Gloucester, was also located approximately one kilometre to the west of the proposed development site and a number of Roman finds and settlement sites in the area [**11 – 23**] confirm that the landscape was utilized during this period. This includes a potential villa site c. 2km to the west of the site [**22**].

15.3.10 There are no recorded remains of Iron Age – Romano-British date within the proposed development site and, again, little potential for such remains due to previous ground disturbance.

The Early Medieval Period (c. AD 400 – 1066)

15.3.11 There are no recorded remains of Early Medieval date within the proposed development site or within the areas surrounding it. Based on this and the previous impacts within the limits of proposed development, there is little potential for the recovery of previously unrecorded archaeological deposits dating to this period.

The Medieval Period (AD 1066 – c. AD 1550)

15.3.12 The Place-name 'Haresfield' first appears in documents in the Domesday Survey of 1086. It apparently derives from Old English and is recorded as meaning '*Hersa's tract of open country*' (Smith, 1964: 182).

15.3.13 There is a cluster of Medieval sites and monuments to the east of the development site, including, at Haresfield, the Scheduled remains of the Mount moated site [**25]**. the now demolished site of a Moated Manor House at Haresfield Court [**49**] and the Grade II* Listed Church of St Peter [**33**], which has a 12th century core.

15.3.14 An archaeological evaluation in the churchyard at St Peters Church produced evidence of medieval activity in the area adjacent to 'the Mount' and the existing church boundary. Additionally, potentially medieval pottery has been recovered during field walking in the area around Haresfield [**46**]. Continuation of the medieval layout of this settlement is demonstrated in the medieval road, linking Little Haresfield with Gloucester – Bristol [**36 & 38**] and a number of ancient oak trees [**37**] within the settlement.

15.3.15 The Sites and Monuments Record notes that “the Mount [**25**] is believed to have been the site of the manor house of the Manor of Haresfield, held after the Norman Conquest by Durand, sheriff of Gloucester, and later by the de Bohun family. Although it is not known precisely when The Mount was constructed, a house called 'The Mount' was assessed at eight hearths in 1672 and in 1680 was described as 'adjoining the great old stone house and shooting towards the moat.”

15.3.16 Other moated sites within the study area include: the scheduled remains of moated sites at Church Farm [**27**]; a moated site to the west of St James’s Church; and another moated site at Manor Farm [**43**]. There are also undesignated settlement remains at Hardwick Court [**28**] and Pool Farm [**26**]. There are ten listed medieval churches within the study area, including the Church of St Nicholas in Hardwicke [**32**], St Stephen in Morton Valence [**34**] and St Nicholas in Standish [**35**]. Also at Standish is the Grade II* Listed Almory Gateway [**40**] and the Grade II Listed Standish Court [**48**].

15.3.17 There are no recorded remains of medieval date within the proposed development site. However, historic aerial photographs consulted as part of the original baseline report (RPS, February 2011; Appendix 15.1), revealed ridge and furrow within the proposed development site and surrounding area. This indicates that the site was used for agricultural purposes during the medieval period. The aerial photographs were taken in the 1940s prior to the construction of the airfield, following construction and subsequent demolition of the airfield evidence of ridge and furrow at the site has been lost.

The Post-Medieval Period Onwards (c. AD 1550 – Present Day)

15.3.18 Construction began on RAF Haresfield, later RAF Moreton Valence (SMR number 21459) in 1939. The airfield was used for training during the Second World War. In 1943 aircraft assembly sheds were constructed in the north-east corner of the airfield as part of a test facility for the Gloster Aircraft Company. The test facility was used for Gloster f9/40 and Meteor jet aircraft tests. At least one American jet aircraft was also brought to the site for evaluation.

15.3.19 The use of the airfield by the RAF ceased in October 1946 and was handed to the Gloster Aircraft Company (SMR number 21459). An aerial photograph taken on 30th December 1946 shows the large building and four structures to its west. Traces of earthwork ridge and furrow are visible in a small area to the west of the large building. By May 1947 an aerial photograph shows the remains of ridge and furrow had been removed.

15.3.20 By 1970, aerial photographs show the main runway being excavated to form the M5 motorway. An aerial photograph taken on 12th April 1971 shows that the motorway was in use and that the other runways had been backfilled. The Ordnance Survey (OS) mapping of 1972 shows the motorway.

15.3.21 The OS mapping of 1988 shows the proposed development area marked as 'Bilton Industrial Estate'. OS mapping of 2000 marks the proposed development area as 'Bilton Cargo Centre' and shows a series of buildings at Javelin Park. Aerial photographs on Google Earth indicate that the buildings were intact in December 1999, but had been cleared by April 2005.

Ground Conditions

15.3.22 An assessment of the anticipated ground conditions within the site boundary has been completed in order to understand the extent of any remaining above ground features relating to previous development and the implications for the preservation of below ground archaeological deposits. The ground conditions were assessed based on two site visits (RPS, February 2011 & AB Heritage Limited (Gifford), 25th May 2011), along with consideration of the Geotechnical Investigation report (RPS, June 2010) and the Remediation Works report (RPS, January 2008). The geotechnical reports are discussed further in Chapter 10.0 of the ES and the reports identified above are contained within Appendix 10.11 and 10.6 respectively.

15.3.23 The geotechnical report confirms that the ground conditions of the majority of the site comprise made ground overlying solid geology, suggesting that any potential archaeological horizons would not have survived if present. It is likely that this truncation occurred during the time the site was developed as a military airfield. However, remediation undertaken in January 2008, also required substantial ground works across the site.

15.3.24 No previously unrecorded archaeological remains were noted during either site visit. The site visits undertaken in 2011 indicated that most of the proposed development area, including most of the previously developed areas have been disturbed and are devoid of topsoil. The majority of the development area is covered in crushed concrete with the exception of the area around the perimeter (south, east and west) which is bound by a grassed bank, stream and tree planting.

Identified Cultural Heritage Resource

Cultural Heritage Features Identified Within the Project Boundaries

15.3.25 There are no confirmed cultural heritage receptors within the proposed development site that may be subject to direct (physical) or indirect (setting) impacts.

Archaeological Potential within Project Footprint

15.3.26 This assessment concludes, based on the known remains from within and surrounding the site that there is no potential for the recovery of complex archaeological remains dating to between the prehistoric and post medieval periods.

15.3.27 This was confirmed the Archaeological Advisor to Gloucestershire County Council (GCC). GCC advised that given the previous ground disturbance within the site, including the recent remediation works, there would be no requirement for any further archaeological investigation as part of the preparation of the ES.

Key Receptors in the Surrounding Study Area

15.3.28 As part of the original RPS Cultural Heritage Baseline Assessment (Appendix 15.1; Section 5) a number of Scheduled Monuments and Listed Buildings were identified surrounding the site that may be subject to potential setting impact.

15.3.29 During the update of the baseline in this ES it was decided that, in addition to these receptors, designated sites within c. 1km of the site would also be examined, to understand whether they also may potentially be subject to setting impacts associated with the proposed development.

15.3.30 Based on the receptors listed in the Desk-Based Assessment (RPS, 2011, Appendix 15.1), consultation with English Heritage and more detailed baseline assessment as part of the production of this document (including on-site examination of cultural heritage receptors in the area), a total of 15 individual or grouped cultural heritage receptors were identified for further assessment, as listed in Table 15.4 below. Site visits were undertaken at all receptors identified in Table 15.4 to undertake detailed assessment to understand their character setting, and whether this feature of them would be impacted by the proposed development.

Table 15.4 - Structures of significance to be examined for setting impact

ES No	Location	Cultural Heritage Receptor	Period	Assessed Value	Distance/ Orientation from Project
4	Haresfield	Haresfield Hill Camp & Ring Hill Earthworks (Scheduled).	Iron Age	High	2.5km to SE
25		The Mount Moated Site (Scheduled).	Medieval	High	0.7km to E
33		Grade II* Listed St Peter's Church (includes a number of listed grave monuments in the cemetery [36-38, 82-93]).	Medieval – Post Medieval	High	0.7km to E
71, 81, 97-98 & 104		Grade II Listed Post Medieval structures to west of railway line comprising 17th [104] and 18th & 19th cent. activity [71, 81, 97-98]	Post Medieval	Medium	c.0.9km to E
95		Grade II Listed late 17th century country house, now divided into flats, known as Haresfield Court.	Post Medieval	Medium	0.85km to ESE
96		Grade II Listed Lower Green Farmhouse, probably 18th century with 19th century enlargements.	Post Medieval	Medium	1km to SE
105 & 115-118	Little Haresfield	A number of Grade II Listed post-medieval structures comprising late 17^{th} / early 18^{th} century farmhouse buildings [105 & 115-117] and a former Vicarage [118].	Post Medieval	Medium	c.1.1km SSE
77-79	Parkend	3 Grade II Listed late 16^{th} to late 17^{th} century timber framed buildings.	Post Medieval	Medium	c.0.85km to W
107		Grade II late 17^{th} century timber framed farmhouse, with 20th century extensions and alterations.	Post Medieval	Medium	0.25km to W
35a	Brookthorpe-with-	Grade II* Listed St Swithin's Church.	Medieval	High	3.7km to NE

ES No	Location	Cultural Heritage Receptor	Period	Assessed Value	Distance/ Orientation from Project
	Whaddon				
32	Hardwicke	Grade I Listed St Nicholas's Church (includes a number of listed grave monuments in cemetery [144-150, 150, 159]).	Medieval – Post Medieval	High	2.1km to N
34	Moreton Valence	Grade I Listed St Stephen's Church.	Medieval – Post Medieval	High	2.2km to SW
27		The Moated Site at Church Farm (Scheduled).	Medieval	High	2.4km to SW
1	Standish	Two bowl barrows on Court Hill, 210m and 420m south-east of Standish Court Farm, Standish (Scheduled).	Late Neolithic – Bronze Age	High	2.4km to S
35		Grade I Listed St Nicholas's Church (includes a number of listed grave monuments in the cemetery [121-139]).	Medieval – Post Medieval	High	2km to S

15.4 Assessment of Effects

Construction Phase

Known and Potential Below-Ground Archaeological Deposits within the Site

15.4.1 The assessment identified no known cultural heritage receptors within, or in very close proximity to the site and it is concluded that in the past there was at most a low potential for the recovery of complex below ground archaeological remains.

15.4.2 However, due to past development of the site from the mid 20th century onwards it is likely that any archaeological remains that did previously survive at the site have been removed. As such it is considered that the proposed development would have no direct or indirect impact potential cultural heritage receptors within the site.

Operational Phase

Indirect (Setting) Impact on Cultural Heritage Receptors

15.4.3 The table below (Table 15.5) identifies the perceived magnitude of setting impact on the 15 individual or grouped cultural heritage receptors examined in the field as part of this assessment.

Table 15.5 Perceived Magnitude of Setting Impact on Identified Key Cultural Heritage Receptors

ES No.	Name	Description of Setting and Potential Impact upon Setting	Mag. Of Impact
4	Haresfield Hill Camp & Ring Hill Earthworks (Scheduled)	This monument is located on a ridge overlooking the Valley. While the physical remnants and fabric of the receptor strongly influence the receptors overall significance, the setting/location of such monuments are likely to have been an important factor in their initial placement. Views out of the camp/fort would have been necessary to view the wider landscape and identify encroaching threats, while views towards the site would have created a powerful sense of an authority and land owner in the contemporary viewers mind. However, there are no specific key view corridors out of the monument placed for sole avenues of view i.e. directly towards Javelin Park. In addition, the receptor is some distance from the project and, when viewed from the receptor, the proposed development blends into the wider context of the landscape (see photomontage 8.3y). Furthermore, the project is largely screened by the tree cover around the edges of the site, with only a few gaps allowing views to the west towards Javelin Park. Finally, there would be little influence on the receptors character in relation to views towards the scheduled diste as the area surrounding the site has piecemeal surrounding development, including the line of the M5 which results in constant traffic drone (influencing the viewers perception). For these reasons there is concluded to be only a negligible change on the current setting character of this receptor.	Negligible
25	The Mount Moated Site (Scheduled)	As stated in the English Heritage listing description, the significance of this monument primarily relates to the potential for buried archaeological remains, which are associated with the original medieval occupation of the site. In terms of the monuments character setting this receptor is likely to have formed an important feature within the medieval community, suggested by the number of footpaths converging at the site. However, it is speculated that this would have been more from a social / community aspect than an awareness of the receptors sense of place. In addition, the limit of this medieval feature does not extend far enough to the west to suggest that it would suffer significant adverse setting impact by the Project. In relation to the monuments current setting character the receptor is located on private ground (inaccessible to the public). Where there is any focus of views towards the	No Impact

ES No.	Name	Description of Setting and Potential Impact upon Setting	Mag. Of Impact
		scheduled site these relate to its immediate location, overlooked by the few surrounding properties and St. Peter's church. There is substantial tree coverage on the internal platform, which currently degrade a fuller appreciation of the feature. From a visual perspective there is a tree line along the western periphery of the Moated site that block views to and from the proposed development. As such it is concluded that there would be no impact on either the character setting of the monument, or its potential to inform and educate.	
33	Grade II* Listed St Peter's Church (incl. listed grave monuments in cemetery [36-38, 82-93])	The church would have been designed primarily with views towards the church in mind. It was designed as a community focal point, not only for the worship of God but also to demonstrate the affluence of the local community. Different elements of a church are intended to perform different functions e.g. the steeples are designed to be seen from some distance as a reference point to people approach the building, while lower levels of the structure are designed to create a more personal experience related to worship and to provide architectural statements. The development of the proposed EfW facility does not affect either of these functions. With regard to views of the proposed EfW facility from the church it would be visible from the very western edge of the churchyard (see photomontage 8.4d). However, the church itself is well bound by trees and as such there would be no direct views towards the proposed EfW facility from the church. It is also worth noting that there would be no positions from which the development, the church and the listed grave monuments could be seen in combination, as the church itself screens potential views of the development from the listed grave monuments. Regarding views in the surrounding area the proposed EfW facility and the church would rarely be seen in composite from other locations and, where this was the case, it would be unlikely to result in any significant change on the setting of this receptor. From the east the proposed development would be well screened by the dense vegetation at Haresfield; some glimpsed views of the stack may be available, particularly in winter, but this would be much less apparent than the church spire. From the west, both the proposed development and the church spire would be visible from the M5 and from the fields immediately west of this, from this position views are already strongly influenced by road traffic (especially HGVs). From views towards the church from the north and south the development would not be a prominent feature in the view. In most instances the development would only be present in the periphery of the view and in some instances would not be visible at all. Typically the viewer would have to actively rotate their gaze to see both features in combination.	Negligible
71, 81, 97-98 &	Grade II Listed Post Medieval structures to	This character setting of this collection of properties is strongly influenced by their roadside setting. Where	No Impact

ES No.	Name	Description of Setting and Potential Impact upon Setting	Mag. Of Impact
104	west of railway line comprising 17th [104] and 18th & 19th cent. activity [71, 81, 97-98]	design elements relevant to the listing are apparent (i.e. on the main houses) the effect is to draw the viewers gaze towards the structures, not away from them. There are no prominent lines of sight towards the proposed EfW from the properties, apart from at Mount Farm [97] where the wide drive way to the property could also have acted as a vista out from the property, as well as directing views towards the house itself. However, the building sits gable end on towards the development and, even if views were possible, it would not detect from the house. Overall, due to the rolling landscape, a combination of small and large field plots and tree cover, these properties would be almost entirely screened from the proposed development. While there may be glimpses possible in winter, or from the upper windows of some properties, this is not concluded to impact the character setting of these properties.	
95	Grade II Listed late 17th century country house, now divided into flats, known as Haresfield Court	The Listed Building entry for this property focuses on the historic fabric of the structure (Appendix 15.3). There is mention of the grounds in which it sits, but the gardens are mature and include extensive banks of large trees. In relation to intervisibility such tree cover between the project site and house would filter views. In addition, as with the previous entry, the perception of this house, and influence on setting was heavily dictated by the viewers site towards the property, rather than their views out from this receptor. The construction was made to show wealth and prosperity, hence the huge edifice and dominant nature of the architecture. The surrounding gardens were the likely focus of the viewer from the property, not the wider landscape surrounding it. It is unlikely given the glimpsed views towards the proposed development alongside the views towards the M5, that the development would play any significant role in changing the character setting of this property. For this reason the setting impact is concluded to be negligible.	Negligible
96	Grade II Listed Lower Green Farmhouse, prob. 18th cent. with 19th cent. enlargements	This is an isolated roadside property lying immediately adjacent to a minor country road. There are direct views from this property (see photomontage 8.4l) towards the proposed development. However, the original significance of the property does not lie in the buildings setting but in its historic fabric. Even in relation to its contemporary setting, where views may play a more important role in the appreciation or value of the structure, it was noted that views out from the property over the surrounding fields are shielded somewhat by the intervening hedgerow on the opposite side of the road. The property was originally designed as a working structure. Where there is felt to be any setting zone which may influence the significance of the structure, it is suggested that this falls in a relatively narrow band to the west of the structure, with views towards the structure predominating. This means there is at most a field or two	Minor

ES No.	Name	Description of Setting and Potential Impact upon Setting	Mag. Of Impact
		to the west that relates to the setting character of this structure. Overall, while the proposed development would be visible from the property, and vice versa, from the perspective of creating an impact on the setting of the structure and its value, this is concluded to be Minor in nature.	
105 & 115-118	Grade II Listed post-medieval structures comprising late 17th/early 18th cent. buildings	The setting focus of all these structures is facing towards the road and not northwards towards the proposed development. The significance of the structures is also more dependent on their historic fabric rather than the views out from them. There are also modern extensions to the rear of a number of the properties (e.g [105] which already detract from the setting of the building. However, regardless of these factors, the proposed development would be part screened by intervening tree cover in most cases. There would be some intervisibility between the proposed development and the Old Vicarage, but such views would principally be from the garden, not the house, which is well screened. It is concluded that there would be no impact on the historic value of the properties setting.	No Impact
77-79	3 Grade II Listed late 16th to late 17th cent. timber framed buildings	Examination of these properties showed that their significance is largely dictated by their historic fabric. In relation to setting it is quite clear that they had a road focused character, with views of the properties focussed from the west. Only glimpsed views of the proposed development would be seen while appreciating the properties from the road In addition the setting of the properties has already been influenced as a result of the nearby travellers site which lies between the properties and Javelin Park. It is concluded that the proposed development would therefore have no impact on the current setting of the site.	No Impact
107	Grade II Listed 17th century timber framed Hiltmead farmhouse	There would be a prominent direct view of the proposed development from Hiltmead (see photomontage 8.4u). However, there are number of existing influences/factors that need to be considered when assessing the magnitude of the impact of the development on the setting of this building. Firstly, the historic value of the property is mainly related to its historic fabric and not the character setting of the area in which it stands. This is especially relevant as the property would have originally been an isolated farm property that has been subsequently been surrounded by modern development (in the form of the M5 motorway and the travellers site). Secondly, the house originally lay gable end on towards Javelin Park and the focus of activity was towards the central yard area that does not face Javelin Park. Finally, the house has undergone substantial modern renovation in the form of an extension to the eastern wing which faces towards the site. This extension itself has significantly altered the character of the property.	Negligible

ES No.	Name	Description of Setting and Potential Impact upon Setting	Mag. Of Impact
		On the basis of the above factors it is considered that from a historic setting perspective, the proposed development would have at most a negligible impact on the property.	
35a	Grade II* Listed St Swithin's Church	Setting impact is not an issue in relation to this receptor as there are no clear views towards the project with dense intervening vegetation between the building and the site. There is dense tree cover in the churchyard and hedgerows along the minor road network beyond. The development would be partly below the horizon in the unscreened views north of the church (Fig 8.4m) and would be difficult to see from the church itself (probably only being visible from edge of churchyard)	No Impact
32	Grade I Listed St Nicholas's Church (incl. number of listed graves in the cemetery [144-150, 150, 159])	Setting impact is not an issue in relation to this receptor as the receptor is some distance from the development and there are no views towards the proposed development due to intervening vegetation and buildings. The church is screened by adjacent tree cover, by the intervening buildings east and south-east of the church and by tree and hedgerow vegetation along intervening field boundaries and the A38.	No Impact
34	Grade I Listed St Stephen's Church	Setting impact is not an issue in relation to this receptor as there are no clear views towards the proposed development site. Views are screened by tree cover along intervening field boundaries and the A38. In addition Old Airfield Farm Industrial Estate lies directly between the church and the development site further screening views towards the site.	No Impact
27	The Moated Site at Church Farm (Scheduled)	The original value of this feature is likely to have been related to its fabric and social / community aspects, rather than an awareness of the receptors sense of place / setting. However, given the distance from the project there is likely to be little intervisibility with the project, with tree cover along field boundaries, the A38 and M5 screening views.	No Impact
1	Two bowl barrows (Scheduled)	Setting concerns were likely to be a large factor in the original placement of these monuments and as such the value of the receptors setting is considered high. However, the earthworks themselves do not survive as significantly obvious features within the landscape and the development of the railway line to the east has changed how the setting of these features is perceived. While the barrows are on a localised hill, one of these barrows lies on the south-west slope with the peak of the hill preventing views towards the site. In addition, both barrows are at some distance from the project and there is intervening tree cover along the road (B4008), which runs between the barrows and Javelin Park. In combination with structures in Little Haresfield that lie between Javelin Park and receptors, these factors create a separation and screening from the proposed development. As such it is considered that the proposed development would not alter the character or setting of the barrows.	No Impact
35	Grade I Listed St	Views to the proposed development are largely screened	No Impact

ES No.	Name	Description of Setting and Potential Impact upon Setting	Mag. Of Impact
	Nicholas' Church (incl. number of listed graves in the cemetery [121-139]	by trees along the roadside and by the village hall as such there is not considered to be an impact of the setting of this receptor.	

15.4.4 Where potential impacts have been identified above the significance of the impact has been derived by combining the value of the receptor with the identified magnitude of impact, this is summarised in Table 15.6 below. It can seen that all impacts are classified as minor adverse in significance.

Table 15.6 Potential effect of the Project on the cultural heritage resource associated with the existence and operation of the plant.

ES No	Name	Value	Magnitude of Impact	Significance of Effect
4	Haresfield Hill Camp & Ring Hill Earthworks (Scheduled)	High	Negligible	Minor Adverse
33	Grade II* Listed St Peter's Church (incl. listed grave monuments in cemetery [36-38, 82-93])	High	Negligible	Minor Adverse
95	Grade II Listed late 17th century country house, now divided into flats, known as Haresfield Court	Medium	Negligible	Minor Adverse / Neutral
96	Grade II Listed Lower Green Farmhouse, prob. 18th cent. with 19th cent. Enlargements	Medium	Minor	Minor Adverse
107	Grade II Listed 17th century timber framed Hiltmead farmhouse	Medium	Negligible	Minor Adverse / Neutral

15.5 Mitigation

15.5.1 It is recognised that the proposed development is significant in scale and, as such, would be visible from a number of locations in the surrounding area. This would result in Minor Adverse effects on the setting of five cultural heritage receptors.

15.5.2 As set out in Chapter 5.0 of the ES (Project Description), the facility has been designed to minimise adverse visual impacts through orientation, construction methods, architectural design and use of colour and texture. Given the scale of the facility it is not considered possible to further mitigate the visual impacts of the facility.

15.6 Residual Effects and Conclusions

15.6.1 This chapter comprises a cultural heritage assessment of the baseline heritage resource and the likely impacts of the construction of the proposed EfW facility.

15.6.2 This assessment concludes that there are no statutorily designated sites (e.g. Scheduled Monuments, listed Buildings) that would form a planning constraint in the development of the site. Although the site is located within a landscape which has been utilized from the Prehistoric – post Medieval period, there is low potential for previously unrecorded archaeological deposits within the site. It is likely that any previously surviving archaeological deposits have now been lost as a result of previous development and ground disturbance from the mid 20th century onwards.

15.6.3 Due to the low potential and past impacts across the site no further archaeological works are recommended in relation to below ground archaeological deposits.

15.6.4 In relation to potential setting effects it is concluded that the facility would result in minor residual impacts on the setting of five cultural heritage receptors these impacts are not considered to be significant.

16.0 SOCIO-ECONOMIC AND COMMUNITY EFFECTS

16.1 Introduction

16.1.1 This Chapter of the ES considers the socio-economic and community effects of the proposed development. It identifies background information for the County of Gloucestershire, its districts and wards, in particular the District of Stroud, within which the Javelin Park site is located. It then identifies the main socio-economic and community effects of the proposed development.

16.1.2 The key issue to be addressed in this assessment is to understand the existing situation and consider whether the proposed development would result in any socio-economic impacts / benefits.

16.2 Methodology

16.2.1 The assessment has been carried out by undertaking a desk based study and reviewing key statistical information. The background information uses key sources of data which includes the 2001 Census published by the Office of National Statistics (ONS), the Land Registry, Gloucestershire County Council and Stroud District Council's own research and reports.

16.2.2 The scope of the assessment is to:

- identify the current population and employment characteristics for the study area;
- assess employment impacts of the development; and
- assess the overall socio-economic and community effects of the proposal.

16.3 Baseline

16.3.1 The County of Gloucestershire is located in the South West region and is comprised of six districts:

- Forest of Dean District
- Tewkesbury District
- Gloucester City
- Cheltenham Borough
- Stroud District

- Cotswold District

16.3.2 The District of Stroud, within which the application site is located, has the main towns of Stroud, Dursley, Stonehouse and Nailsworth as well as several other small towns. The District is bounded by Gloucester City and Tewkesbury District to the north and the Cotswold District to the east / south east. To the west, beyond the M5 motorway, is the Severn Estuary and the Forest of Dean District. The M5 motorway bisects the County in a southwest / northeast direction providing good road communication to the Midlands, Bristol, the South West and London via the M4 motorway.

16.3.3 The application site is approximately 5 ha in area and forms the southern part of Javelin Park, a disused former airfield. Javelin Park has been subject to a number of planning permissions for employment uses and has an extant consent for storage / distribution buildings (B8 use). The site currently comprises derelict ground, hardstanding and vegetated areas.

16.3.4 There are a number of settlements in the surrounding area which include:

- Haresfield located approximately 1km to the east of the site;
- Little Haresfield and Standish located approximately 1 km and 1.5 km to the south of the site respectively; and
- Moreton Valence located approximately 2 km to the south-west of the site.

16.3.5 The site falls within the ward of Hardwicke.

Population Characteristics

16.3.6 At the time of the 2001 Census, Gloucestershire had a population of 564,559. The District of Cheltenham had the largest proportion of the County's population (110,013), followed by Gloucester (109,885) and then Stroud (107,898). The ward with the largest population was Barton and Tredworth in Gloucester City with a population of 10,327 and the ward with the lowest population was Oxenhall and Newent in Forest of Dean District with a population of 1,508. The ward of Hardwicke comprised of 4,593, which was 4.3% of the total population of the District of Stroud.

16.3.7 Approximately 70% of the County's population were at working age (16 to 74 years old) at the time of the Census. The South West had 67.5% at working age and for England it was 67%. The ward of Hardwicke was higher than the County and district with a working age of 78.5%.

16.3.8 The ONS published mid-year population estimates in June 2010. These figures show that the population of the County increased to 593,500, an increase of approximately 5%. Gloucester City has the largest population out of the six districts (118,400), followed by Cheltenham Borough (115,300) and then the District of Stroud (111,700).

16.3.9 The Gloucestershire County Council Research Team produced a Housing Trend Analysis & Population and Household Projections report in May 2011, which suggests that the population of Gloucestershire will be circa 669,900 by 2031, which is an increase of approximately 10% since 2009.

16.3.10 In terms of health, according to the 2001 Census, the proportion of those recorded as stating their general health was 'not good' in England was 9%, the South West was 8.5% and the County was 7.6%. The percentage of people in the District of Stroud with 'not good' health was 7.2% and Gloucester City had the highest percentage out of the six districts with 8.6%.

16.3.11 The County Council's Research Team published a Population Monitor Report in February 2011 which contains migration figures in terms of inflow and outflow. The Report contains figures for the year 2007–2008, which show that all of the districts had a net inflow with the exception of Cheltenham. Stroud had the highest number of people moving into the district from elsewhere in the UK.

Housing

16.3.12 There were a total of 246,832 dwellings in Gloucestershire at the time of the 2001 Census. The majority of the dwellings were owner-occupied (74.3%). Cheltenham had the highest number of dwellings (49,959), followed by Gloucester (46,992) and then Stroud (45,975).

16.3.13 The districts with the highest density, i.e. persons per hectare (pph) were Gloucester (26.92 pph) and Cheltenham (23.59 pph). The other four districts had a density less than 3 pph, with the Cotswold District only having a density of 0.69 pph. The average density for Gloucestershire was 2.13 pph, the South West was 2.07 pph and England was 3.77 pph.

16.3.14 The Land Registry provides average house prices by household type. Table 16.1 below shows the average house prices for England and Wales and Gloucestershire for June 2011. The figures for Stroud are from the District Council's Annual Monitoring Report 2009 / 2010 (December 2010) and are for the third quarter of 2010.

Table 16.1: Average House Prices

	England and Wales	**Gloucestershire**	**Stroud**
Overall Average	£160,945	£169,138	£251,451
Detached	£253,527	£285,695	£351,186
Semi-detached	£152,978	£157,388	£198,162
Terraced	£121,612	£131,799	£179,517
Flat	£151,523	£113,348	£126,544

16.3.15 The table illustrates that the average house prices for Stroud are considerably higher than the averages for England and Wales and Gloucestershire for all house types with the exception of flats.

Economic Activity and Employment

16.3.16 In terms of economic activity, the 2001 Census showed that the percentage of those economically active (aged between 16 and 74) in England was 66.9%, in the South West it was 67.5% and for Gloucestershire and each of its six districts it was approximately 70%.

16.3.17 The key statistics from the 2001 Census for Gloucestershire relating to industry of employment show that the highest percentages of people were employed in manufacturing (17.5%), followed by wholesale and retail trade / repairs (15.9%). Approximately 7% of the County's population worked in construction. For the District of Stroud the highest percentage of people were employed in manufacturing (19.5%) and approximately 7% worked in construction.

16.3.18 Travel to Work Areas (TTWAs) were defined using 2001 Census data and tend to bisect local authority boundaries. In order to determine TTWAs the same criteria as the 2001 Census was used - 75% of people living in an area also work in it, 75% of people working in an area also live in it and that there was a minimum working population of 3,500. The majority of TTWAs are actually larger than this, and there are now fewer but larger areas. This reflects the fact people are having to / choosing to travel a greater distance to their place of work. Stroud is located within the Swindon TTWA, which also includes Cirencester, Faringdon, Swindon, Malborough and Chippenham.

16.3.19 The mode of travel to work in the 2001 Census with the highest percentage for Gloucestershire was by car (as a driver or a passenger) with a figure of 67.7%. Public transport (rail and bus) accounted for 4.5%. At the time of the Census, 10.7% of the County's population worked from home or mainly from home.

16.3.20 Gloucestershire County Council produces monthly 'Unemployment Bulletins' to provide updates on the unemployment data for the County and provides comparisons with the situation in the South West region and the UK. The data used to produce the updates is from the ONS. The claimant rate is the number of claimants as a proportion of the working age population and the claimant count measures the number of people claiming unemployment related benefit i.e. Job Seeker's Allowance (JSA).

16.3.21 The bulletin for November 2011 states that the claimant rate for Gloucestershire was 2.6%, which was the same as the October 2011 figure. The South West rate increased to 2.7% from 2.6% and the UK rate remained at 3.9%. The district with the highest claimant rate was Gloucester City with an average rate of 3.9%. Cheltenham Borough was 3.0% and the District of Stroud was 2.0%. Table 16.2 below illustrates the claimant rates for each of the districts in comparison to Gloucestershire, the South West and the UK.

Table 16.2: Claimant Rates

Area	**Claimant Rate**
UK	3.9%.
South West	2.7%
Gloucestershire	2.6%
Forest of Dean District	2.6%
Tewkesbury District	2.1%

Area	Claimant Rate
Gloucester City	3.9%
Cheltenham Borough	3.0%
Stroud District	2.0%
Cotswold District	1.5%

16.3.22 The unemployment bulletins rank the 142 wards in Gloucestershire based upon the claimant rates, where number 1 is the ward with the lowest level of unemployment and number 142 is the ward with the highest level of unemployment. The wards with the highest level of unemployment are in Gloucester and Cheltenham. There are four wards in Gloucester with claimant rates above 5.0%; the ward of Westgate has a claimant rate of 8.1% and is ranked number 142.

16.3.23 The ward of Hardwicke, within which the application site is located, was joint number 31 (with eleven other wards) of the 142 wards in the County. Of the thirty wards in the District of Stroud, Hardwicke was ranked number 7, again with 1 having the lowest level of unemployment.

16.3.24 The figures in the bulletins are based on the number of people claiming JSA and therefore the claimant count / rate is normally a lower figure than those actually seeking work as some unemployed people are not entitled to claim JSA or choose not to do so.

16.3.25 The unemployment bulletin also identifies the numbers of young people (16 to 18 years old) not in education, employment or training (NEET) in Gloucestershire. At the end of November 2011 there were 891 NEETs, of which 256 were in Gloucester, 194 in Cheltenham, 132 in Stroud, 101 in Tewkesbury, 139 in Forest of Dean and 69 in Cotswold.

16.3.26 The principal employers in Gloucestershire include:

- GCHQ (Government Communications Headquarters)
- NHS
- Spirax Sarco
- Renishaw
- Messier Bugatti Dowty
- Ecclesiastical Insurance

- Endsleigh

16.3.27 Gloucestershire County Council also employs a large number of local residents.

Indices of Deprivation

16.3.28 The Indices of Deprivation are national measures which highlight characteristics of deprivation such as unemployment, low income, crime and poor access to education and health services. The indices are used by the Government to help target policies and funding to the areas and communities who are most disadvantaged. (The Indices of Deprivation 2010 are based on data from 2008, and do not reflect the impact of the recession).

16.3.29 Areas are divided into Lower Super Output Areas (LSOAs) rather than wards in the indices, as this allows the identification of small pockets of deprivation in less deprived areas. In Gloucestershire, there are 367 LSOAs and 8 of these were amongst the 10% most deprived neighbourhoods in England (approximately 12,700 residents). The County's neighbourhoods are most deprived in terms of 'geographical barriers to services', with 80 neighbourhoods amongst the 10% most deprived in England.

16.3.30 There are 11 neighbourhoods (approximately 16,000 residents) amongst the 10% most income deprived in England and over 45,000 residents are living in the most income deprived 20% of neighbourhoods. In terms of employment, approximately 12,700 residents in the County live in neighbourhoods classified as being within the 10% most deprived in England, and all of these are in Gloucester and Cheltenham.

16.3.31 The District of Stroud has small pockets of deprivation in parts of its wards including Uplands, Central and Trinity. The main issues in these areas are low income, unemployment, poor health and poor educational attainment. The ward of Hardwicke, within which the application site is located, was not found to be significantly affected by the deprivation measures of income, employment, health, education, barriers to housing, crime or living environment in the Indices of Deprivation.

16.4 Assessment of Effects

Economic Effects / Benefits

16.4.1 There are a number of potential economic effects / benefits associated with the proposed development at Javelin Park which are summarised below under the following headings:

- Direct and indirect employment arising from the proposal
- Benefits to Gloucestershire County Council in terms of costs associated with the procurement and development of an EfW facility compared with continuing to landfill
- Other economic benefits including providing an alternative source of renewable energy supply and production of saleable by-products

Direct and Indirect Employment arising from the Proposal

16.4.2 One of the most significant economic (and social) benefits of the proposal is in relation to employment during both the construction and operation of the facility.

16.4.3 During the construction phase up to 300 temporary jobs would be created. The development would take circa 33 months to complete and it is expected that a large proportion of these temporary jobs would be locally sourced.

16.4.4 There would be approximately 40 people employed permanently at the site once the facility is operational. The majority of the employees would be skilled operatives (electricians/fitters/crane operatives) or technical engineers (control and plant) with a small number of low skilled jobs also created.

16.4.5 The staff would work in shift patterns, and it is anticipated that there would be a peak day-time staffing level of 25, supplemented by shift workers to maintain 24 hour plant operation. It is anticipated that shifts would operate on a typical 6am, 4pm, midnight shift pattern, with 4 staff members per shift (with two shifts effectively ‘off’ each day).

16.4.6 The project would also create a number of new apprenticeships targeted at local young people and would therefore have a positive impact on raising the skills-base within the local community and reducing the number of NEETs in the County. It is anticipated that a minimum of 8% of the workforce during construction would be apprentices, and a new apprenticeship would be provided every two years throughout the operation of the facility.

16.4.7 The level of unemployment for Gloucestershire was 2.6% in November 2011 and a number of neighbourhoods in the County are deprived in terms of income and employment. The Javelin Park EfW development would therefore provide opportunities for local residents to gain employment during both the construction and operation of the facility. This would increase the County's economic activity and help to reduce the levels of unemployment currently being experienced.

Benefits to Gloucestershire County Council

16.4.8 The Landfill Allowance Trading Scheme (LATS), which specifies the annual amount of biodegradable waste each Waste Disposal Authority (WDA) may dispose of to landfill, is to end in the scheme year 2012 / 2013. As a result LATS will no longer exist by the time the Javelin Park EfW facility is operational and has therefore not been considered further in this document.

16.4.9 An economic benefit of the proposal relates to the Landfill Tax regime, which was introduced in 1996. Landfill Tax is an escalating tax payable on every tonne of waste disposed of within a licensed landfill. For non-hazardous waste (the majority of municipal solid waste (MSW) and commercial and industrial (C&I) waste stream) the tax is presently £56 per tonne and will continue to rise by a further £8 per year until 2014 / 2015 by which time it will have reached a level of £80 per tonne. On 29th November 2011, in his Autumn Statement, the Chancellor George Osborne confirmed his commitment to maintaining the Landfill Tax escalator as the primary disincentive to landfill. This fiscal measure will continue to be used as the mechanism to move the management of residual waste up the waste hierarchy. The Chancellor confirmed that the escalator will continue until **at least** 2015.

16.4.10 The annual rise in Landfill Tax together with other landfilling costs (e.g. gate fees at the landfill sites) therefore increases the need for alternative facilities for the management of both MSW and C&I waste. The Javelin Park EfW facility would contribute towards moving the management of Gloucestershire's waste further up the waste hierarchy and therefore result in a consequential reduction in the quantity of their waste that is sent to landfill.

16.4.11 The County Council has undertaken financial appraisals of the costs of the residual waste project. The results showed that continuing to landfill compared to the development of a residual waste recovery facility would cost the Council in the region of up to an estimated £150 million over 25 years. This therefore demonstrates that the option of developing an EfW facility is more affordable, as well as being more sustainable and environmentally acceptable, than disposal of waste to landfill.

Other Economic Benefits

16.4.12 A further significant economic benefit of the development is that it would provide sustainable energy and importantly contribute towards a security of supply nationally. The UK is experiencing global energy price rises, and as the depletion of fossil fuel reserves continues, developments such as the Javelin Park EfW facility can provide an alternative and sustainable source of renewable energy.

16.4.13 The majority of the electricity generated by the facility would be exported to the local supply grid (14.5 MW), which would meet the domestic needs of circa 26,000 homes. A proportion of the electricity generated would also be used to power the facility.

16.4.14 The by-products recovered from the combustion process would be recycled with associated revenue streams. Metals within the bottom ash would be reclaimed and sold / shipped to reprocessors and the bottom ash itself would be used as a secondary aggregate for onward sale.

Social and Community Effects

16.4.15 The potential social and community effects of the Javelin Park EfW development would arise from:

- the visual impact of the development;
- the impact of the development on amenity;
- an increase in vehicle numbers visiting the site; and

- general adverse perception, or community concern, relating to the proposed EfW.

16.4.16 The assessments that have been undertaken as part of the Environmental Impact Assessment (EIA) process (to support the planning application) have considered the potential visual impacts and impacts on amenity (noise, air quality, human health) as a result of the proposed development. These assessments are contained within this Environmental Statement (ES) and the Technical Appendices.

16.4.17 The visual impact assessment identified that the proposed development would result in some localised impact by virtue of its scale, but from further afield the views would be better screened by both vegetation cover and buildings and other structures within the Severn Valley. As the local change resulting from the development would be set in the context of existing industrial / commercial development, and the corridor of the M5 and A38, the assessment concluded that the facility would not lead to a fundamental change in visual amenity.

16.4.18 The assessments contained within this ES relating to noise, air quality and human health concluded that the proposed development would not result in any significant impacts during the construction or operation of the facility.

16.4.19 A Transport Assessment (TA) has been submitted with the application and considers vehicle movements. The TA concluded that the facility could be expected to generate a small increase in HGV traffic volumes. This would generally be considered very low when compared to the potential number of vehicle movements if the extant planning permission for large storage / distribution buildings was implemented.

16.4.20 With regard to the fourth point, two public exhibitions were held at Javelin Park in order for people living close to the site to be able to attend to find out more information about the proposed UBB development.

16.4.21 Gloucestershire County Council publicised the events through posters, the distribution of a postcard and letters to stakeholders and local residents within a 2.5km radius of the Javelin Park site. Gloucestershire County Council also distributed press releases to a wide range of media contacts.

16.4.22 The first public exhibition was held on the following dates and times:

- Saturday 16th July - 12pm to 6pm
- Sunday 17th July - 12pm to 4pm
- Monday 18th July - 2pm to 8pm
- Tuesday 19th July - 2pm to 8pm

16.4.23 Key stakeholders, including local media representatives, MPs, Councillors and members of the Community Forum were invited to a preview of the exhibition on Friday 15th July. At the first exhibition, information about the proposal was displayed on a series of eleven A1 boards and included: a summary of the proposal and the purpose of the exhibition, information about Urbaser and Balfour Beatty, understanding the local environment, designing a waste management facility, design development, site layout, understanding the site (including details of the Environmental Impact Assessment), managing potential impacts, how energy-from-waste technology works, maintaining air quality, and benefitting the local community.

16.4.24 Members of the public were able to view UBB's waste management facility proposals for the Javelin Park site and speak to representatives of UBB and Gloucestershire County Council. In total, 332 people visited the exhibition and the feedback and enquiries from members of the public were recorded on a database. The actions taken by UBB in response to the feedback were logged so that any changes to the proposal as a result of the public consultation could be tracked.

16.4.25 The second public exhibition was held on the following dates and times:

- Saturday 12th November - 12pm to 6pm
- Sunday 13th November - 12pm to 4pm
- Monday 14th November - 2pm to 8pm

16.4.26 Key stakeholders, including local Councillors and members of the Community Forum were invited to a preview of the second exhibition on Friday 11th November. This exhibition was also held at Javelin Park, providing consistency and ensuring that members of the community living close to the site were able to attend. The exhibitions ran through the afternoons and evenings to ensure people with children and in full time employment were able to attend.

16.4.27 At the second exhibition, information about the proposal was displayed on a series of fourteen A1 boards and included: a summary of the proposal and the purpose of the exhibition, information about Urbaser and Balfour Beatty, how feedback from the first public exhibition was taken into account in the development of the proposal, why recover energy from waste (including the generation of renewable energy), the capacity and flexibility of the proposed facility for dealing with local waste, design evolution and development, how energy-from-waste technology works, how outputs will be managed sustainably, maintaining air quality, managing local impacts (noise, odour, litter, lighting and flood risk), minimising traffic impacts, serving the community and the timetable for planning, permitting and construction.

16.4.28 In total, 253 people visited the second exhibition over the four days 11-14 November 2011, of which 157 people signed-in and provided their details.

16.4.29 Full sets of the exhibition boards from both exhibitions were available as a booklet to take away, and the exhibition boards were available to download from the updated website www.ubbgloucestershire.co.uk. Representatives from UBB and their technical advisors were in attendance to discuss the proposal with members of the community and to answer questions.

16.4.30 UBB will be facilitating a Local Community Liaison Group throughout the planning application process and the life of the project. Members of the public would be invited to join the group which would also include representatives of UBB and representatives of Gloucestershire County Council.

16.4.31 A Statement of Community Involvement contained within Part 5 of the Planning Application Document provides full details of the public consultation undertaken leading up to the submission of the planning application.

16.4.32 The main community benefit of the proposal would be the sustainable management of the community's waste. There would also be the community benefit of a visitor centre at Javelin Park, which would be a valuable education resource and would provide local residents with information and educate school children on sustainable waste management and taking responsibility for their own waste. The visitor centre would help raise awareness of environmental issues and the importance of reducing, reusing and recycling products and materials, and encourage a change in attitude and responsibility towards the earth and its resources. The visitor centre could also available for use by other local groups as a meeting space.

Socio-Economic Effects

16.4.33 The assessment of background information has revealed that:

- The average house prices in June 2011 for Gloucestershire were higher than the average prices for England and Wales (for all household types);
- The levels of economic activity in the County and its six districts were similar to the levels for England at approximately 70%;
- The level of unemployment in Gloucestershire was 2.6% in November 2011, which was lower then the national average of 3.9%. However, there are a number of areas within the County with levels of unemployment above 5%;
- The Indices of Deprivation (2010) identified 8 neighbourhoods in the County that were amongst the most deprived 10% neighbourhoods in England (approximately 12,700 residents). A number of neighbourhoods within the districts of Gloucester and Cheltenham were classified as amongst the most income and employment deprived in the England. Stroud was also found to have small pockets of deprivation in some of its wards.

16.4.34 The proposed development would bring benefits to Gloucestershire in terms of employment opportunities during both the construction and operation of the facility and associated infrastructure. The proposal would also provide a more affordable and sustainable option of dealing with the County’s waste when compared to continuing to dispose of waste to landfill, provide a local sustainable renewable source of energy and produce saleable by-products for local businesses to benefit from.

16.5 Conclusions

16.5.1 The application site is currently derelict land but it does have an extant planning permission for large storage / distribution buildings. Therefore the key issue to be addressed in the socio-economic assessment is to understand whether the proposal would have any significant adverse impact further to the existing situation.

16.5.2 This Chapter has established that there are a number of socio-economic benefits associate with the proposed EfW development, specifically:

- the creation of up to 300 jobs during the construction of the development and 40 permanent jobs during the operation of the facility;
- the creation of new apprenticeships – a minimum of 8% of the workforce during construction would be filled by apprentices;
- providing the Council with a more affordable, sustainable and environmentally acceptable option of dealing with the County's waste compared to the option of disposal of waste to landfill;
- new visitor / education opportunities;
- generating electricity from a renewable source, which could meet the domestic needs of circa 26,000 homes; and
- enable the community to take responsibility for their own waste.

16.5.3 In conclusion, the proposal would not have any significant adverse impact further to the existing situation of a derelict site with an extant planning permission for large storage / distribution buildings. The proposal would in fact create a number of social and economic benefits for Gloucestershire and its residents as identified above.

17.0 CUMULATIVE EFFECTS

17.1 Introduction

17.1.1 This chapter provides an assessment of the potential cumulative effects of the proposed development during its construction and operation.

17.1.2 The EIA regulations require that a description of the likely significant effects of the development on the environment should be included in the Environmental Statement, including cumulative effects. The EIA regulations do not define cumulative effect. However, a commonly accepted definition is:

"Impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project" (European Commission, 1999)

17.1.3 This chapter provides an assessment of the cumulative effects of developments within the vicinity of the project.

17.2 Approach

17.2.1 There is no defined methodology in the UK as to how cumulative effects should be assessed. In determining the approach to this assessment reference has been made to the following guidance:

- Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (European Commission 1999);
- Cumulative Effects Assessment Practitioners Guide (Canadian Environmental Assessment Agency 1999);
- Guidelines for Environmental Impact Assessment (Institute of Environmental Management and Assessment 2006); and
- Environmental Impact Assessment: A guide to good practice and procedures - A consultation paper (Department for Communities and Local Government 2006).

17.2.2 In the context of the proposed EfW development it has been considered that all relevant past and present operational projects are considered in the baseline assessments undertaken for each of the EIA topics. Consequently the focus of the cumulative effects assessment is the appraisal of potential significant environmental effects in the context of reasonably foreseeable future development proposals. Reasonably foreseeable future development proposals are considered to be those that have been granted planning permission and are not yet operational, those for which planning applications have been submitted but are yet to be determined and any other projects in the planning stage that deemed appropriate to be included in the assessment.

17.2.3 It should also be noted that as part of the Transport Assessment GCC Highways Authority was consulted to identify if there were committed developments that should be included in the Transport Assessment. As such the Transport Assessment and the chapters that rely on the assessment e.g. air quality and noise, by their nature include cumulative effects of other projects that are likely to give rise to significant transport effects. Committed developments included within the Transport Assessment are as follows:

- Javelin Park Distribution Site;
- Hunts Grove Residential Site;
- Kingsway Residential & Employment Site; and
- Gloucester Quays Mixed Use Development

17.3 Projects Considered in Assessment

17.3.1 In order to identify development proposals relevant to the cumulative effects assessment consultation was undertaken with the planning authorities within a 5km buffer of the site, these are:

- Gloucestershire County Council;
- Stroud District Council;
- Gloucester City Council;
- Tewkesbury Borough Council; and
- Forest of Dean District Council.

17.3.2 The planning authorities were asked to identify any reasonably foreseeable major development projects (i.e. projects subject to EIA) within their jurisdiction that lay within 5km of the site, projects beyond this distance are considered unlikely to give rise to significant cumulative effects. The consultation identified a total of five projects as follows, the projects are illustrated on Figure 17.1.

Hunts Grove Housing Development, Quedgeley, Gloucester

17.3.3 Hunts Grove Housing Development (planning ref: S.06/1429) provides for the development of 1750 dwellings, a neighbourhood centre including a primary school, employment sites and open spaces and sports pitches as well as other community facilities and associated infrastructure. The site is currently in the process of being developed although it is understood that at the time of writing (Summer 2011) none of the development area has been occupied or is operational.

17.3.4 The development site covers an area of approximately 100 hectares and is located on land immediately to the north of the M5 and to the south of Quedgeley. The centre of the Hunts Grove development site is approximately 1.75 km to the north-east of Javelin Park.

Kingsway Residential Development, Quedgeley, Gloucester

17.3.5 The Kingsway (Quedgeley Urban Village) scheme (planning ref: 06/01242/OUT and 00/00749/OUT) is a large employment / residential development located on the site of the former RAF Quedgeley Base, to the north-east of the Cross Keys roundabout and Hunts Grove development area. The development site covers an area of approximately 30 hectares. The full site masterplan includes a total of 3,300 new dwellings and 20ha of employment development. Kingsway Residential Development is located approximately 3.5 k m to the north east of Javelin Park.

17.3.6 The site is currently under development and it is understood from GCC that at the time of writing 1,500 dwellings have been completed and are occupied. None of the employment areas have been developed to date.

Javelin Park B8 Distribution Warehousing, Haresfield, Gloucester

17.3.7 Outline planning permission (planning ref: S.01/1191) has been granted for the development of 45,151m^2 of B8 distribution warehousing at Javelin Park. A number of reserved matters applications have subsequently been approved for different building configurations at the site.

17.3.8 In terms of cumulative effects the area proposed for the EfW facility (southern half of Javelin Park) would obviously not be available for the development of distribution warehousing were the EfW to be constructed. As such cumulative effects would only occur from the development of the northern half of the Javelin Park site.

17.3.9 On the basis of the reserved matters schemes submitted to date this would equate to the development of approximately 25,000 m^2 of warehousing. The warehousing is considered likely to comprise a steel framed industrial unit with profile metal cladding up to 15.7m in height.

ATT Plant at Moreton Valence Resource Recovery Centre, Moreton Valence, Gloucester.

17.3.10 There is an extant consent for the development of a Advanced Thermal Treatment (ATT) (gasification facility) at Moreton Valence capable of treating 30,000 tonnes per annum of residual waste arisings from the existing operations at the Moreton Valence Resource Recovery Centre. The main building of the facility would be 25 m x 49 m in plan with the roof height of the ATT building varying from 12 m to 20 m. The development would also include an air cooled condenser unit and a 25 m high emissions stack.

Motorway Service Area at Ongers Farm, M5, Gloucestershire

17.3.11 A motorway service area is proposed on the M5 motorway to serve both northbound and southbound traffic. The service area would be located between Junction 11A and 12. Two separate facility buildings and associated amenities are proposed, one on either side of the motorway. The development would cover a total area of 25 ha on land currently used for agriculture. The proposed building would be up to 8.9 m in height.

17.4 Cumulative Effects Assessment

Hunts Grove Housing Development, Quedgeley, Gloucester

17.4.1 The development is currently underway and as such many of the physical effects of the development would have already occurred e.g. impacts on landuse and ecology. The Environmental Statement undertaken for the development did not identify any significant environmental effects from the development and the proposal included a number of measures to mitigate negative effects such as provision of new ecological habitats.

17.4.2 On the basis of the anticipated effects of the Hunts Grove development the most likely cumulative effects would be those associated with traffic and transport. As outlined above this development has been considered as a committed development within the Transport Assessment. The results of this assessment, and the assessments that rely on the transport data, have not identified any significant cumulative adverse impacts.

17.4.3 From a landscape perspective the Hunts Grove development would be viewed in conjunction with the proposed EfW facility from a limited number of viewpoints, notably elevated positions that provide panoramic views towards Gloucester from the east e.g. locations within Cotswolds AONB and also from Robins Wood Hill to the south of Gloucester city centre. However, the development of the Hunts Grove would not significantly alter the baseline of the assessment provided in Chapter 8.0 being on the fringes of Gloucester and set within an area already subject to residential and industrial development. In addition, as noted above the development has already commenced and as such the areas that have already been developed have been taken into account in the visual baseline of the landscape and visual assessment. On this basis this is considered unlikely that significant cumulative landscape and visual impacts would arise in conjunction with the Hunts Grove development.

Kingsway Residential Development, Quedgeley, Gloucester

17.4.4 As with the Hunts Grove development the Kingsway development is currently underway with a significant number of the proposed homes already constructed. The Kingsway development has been included within the Transport Assessment and no significant cumulative transport, noise or air quality impacts have been identified. For reasons similar to those stated above no significant cumulative landscape and visual impacts are anticipated from the proposed development.

Javelin Park B8 Distribution Warehousing, Haresfield, Gloucester

17.4.5 The consented B8 warehousing would be developed on the remaining area of Javelin Park to the north of the proposed EfW facility. The whole of Javelin Park site comprises derelict ground and hardstanding with sparse ruderal vegetation. As such the ecological impacts associated with a warehousing development are likely to be similar in nature to those of the proposed EfW i.e. loss of open mosaic habitat and the associated impacts on the species that depend this habitat including little ringed plover, cinnabar moth, spotted fly catcher and linnet. However, as described in Chapter 9.0 the habitats at the site are transient in nature and succession of the site over time would inevitably lead to the loss of the habitats that are currently present. Nonetheless, development of the whole site would have cumulative ecological effects but these are unlikely to be significant taking into account the mitigation proposed as part of the EfW development.

17.4.6 The future development of warehousing at Javelin Park has been taken into account in the Transport Assessment. This has shown that there would not be any significant cumulative effects in respect of traffic related impacts.

17.4.7 The additional cumulative landscape impacts associated with the distribution warehousing would be limited. The warehousing would result in an intensification of development in the local area but the warehousing would not be out of character with the existing development at Quedgeley East Business Park or Blooms Garden Centre and would be smaller in scale than that of the proposed EfW facility. The cumulative landscape and visual impacts would not be significantly different to those presented in Chapter 8.0.

17.4.8 The entire Javelin Park site was subject to remediation works undertaken by Churngold Remediation Ltd between 8th October and 21st December 2007. This included the removal of asbestos fragments and hydrocarbon remediation works associated with two underground storage tanks. Stroud District Council subsequently confirmed they were satisfied with the remediation that had been undertaken at the site. A copy of this letter has been included in Appendix 10.8. On this basis there are not considered to be any significant cumulative impacts associated with geology, soils or groundwater from the development of the remainder of Javelin Park.

ATT Plant at Moreton Valence Resource Recovery Centre, Moreton Valence, Gloucester

17.4.9 An EIA screening decision for the proposed ATT plant at Moreton Valance determined that an EIA was not required for the proposed development. However, the planning application was accompanied by a series of environmental assessments none of which identified any significant environmental impacts from the development.

17.4.10 The most likely potential significant cumulative effects are considered to relate to air quality and landscape. On the basis of the assessments included with the planning application and the distance from Javelin Park no significant cumulative impacts are anticipated in relation to noise, ecology, geology, hydrology and cultural heritage.

17.4.11 In respect to traffic related impacts the proposed ATT plant would not result in any additional vehicle movements to those already generated at the existing waste management site. As such there would not be any cumulative traffic related effects.

Air Quality

17.4.12 A detailed assessment of the cumulative air quality impacts of the two facilities is provided within Chapter 13.0 and Appendix 13.1. The assessment has shown the area where maximum ground level air quality impacts are experienced are different for the two facilities and therefore cumulative effects would be limited, refer to Figure 13.4.

17.4.13 On the basis of the findings of the dispersion modelling it can be concluded that the highest predicted short term ground level concentrations of pollutants in the area affected by the ATT plant would be approximately the same with or without the proposed EfW plant at Javelin Park. For the point where the highest predicted long term ground level concentrations of nitrogen dioxide occur, the peak is expected to rise by 0.68 $\mu g/m^3$ or 1.3% of the AQO as a result of the combined impact of the EfW at Javelin Park.

17.4.14 The air quality dispersion modelling has shown that if the combined contribution from both facilities is added to the background concentration, no breaches of air quality objectives are predicted. The predicted long term combined concentration for nitrogen dioxide is 26.2 $\mu g/m^3$, well below the AQO of 40$\mu g/m^3$, and the predicted short term concentration of Nitrogen Dioxide is 64.6 $\mu g/m^3$,well below the AQO of 200$\mu g/m^3$. As such no significant cumulative effects are predicted.

Landscape and Visual

17.4.15 The proposed ATT plant at Moreton Valence (refer to section 17.3 above for details) would form an extension to the existing industrial estate and lie between existing development at the Moreton Valence site and the M5 motorway. The ATT plant would be taller than existing structures at the site, but would be experienced in the context of this existing development.

17.4.16 The presence of the ATT and the proposed EfW at Javelin Park together would intensify the existing influence of built development upon the corridor of the A38 and M5 south of Gloucester. This influence is localised and its extent is limited by the vegetation cover. Cumulative effects upon landscape character would not be significant, or appreciably different from that described in Chapter 8.0.

17.4.17 Visually, the ATT plant would help screen views towards the proposed development from the Moreton Valance area to the south-west. From other directions, the proposed EfW facility at Javelin Park would appear more evident than the ATT plant by virtue of its greater height and mass. It should be noted that short-range views of both sites would be strongly influenced by the presence or absence of vegetation cover and clear views of both sites in the same field of view would not be available from any nearby sensitive receptors.

17.4.18 Both sites would be visible from the single residential property at Old Airfield Farm, in the context of the adjacent motorway and existing industry. The ATT plant would become progressively less evident as perimeter landscaping develops. Cumulative visual effects upon this receptor would not be significant and would not be appreciably different from that of the proposed EfW at Javelin Park in isolation.

17.4.19 From more exposed vantage points such as along the Cotswolds Way and on Robin's Wood Hill, both sites would be visible set in the wider landscape mosaic which includes a corridor of development to the south of Gloucester. The panoramic and expansive views available would remain, albeit with a minor change in the spread of features visible, and the proposed developments would not result in significant cumulative effects.

Motorway Service Area at Ongers Farm, M5, Gloucestershire

17.4.20 The proposed motorway services are located on the boundary of the 5km search area. It is therefore considered very unlikely that significant cumulative effects would result from this development in conjunction with the proposed EfW. It is possible that both developments would be visible from elevated viewpoints but the spatial separation of the developments means that they are unlikely to be seen together in the same field of view. The proposed motorway services have been designed to minimise visual impact through use of low profile buildings, extensive landscape bunding and planting and green roofs. As such the visual impact from distant views is considered to be limited. No other cumulative effects are considered likely to arise from the motorway service area in combination with the proposed development.

17.5 Conclusion

17.5.1 An assessment of potential cumulative effects during the construction and operational phase of the project has been undertaken. Consultation with the local planning authorities in proximity to the proposed development identified a number of projects within 5km that could have the potential to result in significant environmental effects in combination with the proposed EfW facility.

17.5.2 The nature of likely significant environmental effects that may arise from the identified projects have been considered in light of the predicted environmental effects of the proposed development. The conclusions of the assessment are that significant cumulative environmental effects are unlikely to arise from the construction and operation of the EfW facility.

18.0 GRID CONNECTION

18.1 Introduction

18.1.1 As described in Chapter 5.0 of this ES the EfW facility would recover energy from the combustion of waste by way of electricity and heat production. Electricity would be generated by a steam turbine, the generation capacity of which would be 17.4 MW.

18.1.2 A proportion of the electricity generated would be reused in the operation of the facility with the majority of the electricity, 14.5 MW, being exported to the local electricity distribution grid. The grid connection works required to export electricity from the facility do not form part of the Planning Application and fall either under Section 37 of the Electricity Act 1989 or under permitted development rights of statutory undertakers. However, on the basis that export of electricity is an integral part of the scheme it is considered appropriate that the potential environmental impacts associated with the connection to the local electricity grid are assessed within the ES. The application for the grid connection works would be undertaken by the local District Network Operator (DNO), E.ON Central Networks.

18.1.3 Consultation with the local DNO has confirmed that connection to the local electricity distribution network is feasible. Whilst currently the grid connection route has not been confirmed, there are two options presently under consideration by UBB. One is derived from a grid connection study undertaken by UBB the other from E.ON Central Networks. For the purposes of this ES, both options have been assessed. They can be described as follows:

- Option 1: a connection to Tuffey substation c.6km to the north-west of the site, this connection would be via underground cabling for the majority of the distance buried within existing highways carriageway or verge. The route would follow the B4008, the A38 and Cole Avenue. This grid connection route was identified within the UBB Grid Connection Study (Appendix 5.3).
- Option 2: a tee connection off the existing 33kV Ryeford – Nethrills – Coaley circuit, this connection would comprise an overhead line

suspended on newly erected wooden poles. This connection route was identified by the DNO.

18.1.4 The following sections describe the grid connection works in more detail and provide an assessment of potential environmental impacts that may arise from the options under consideration. The precise route of the grid connection would be subject to landowner negotiations and detailed design considerations by the DNO. As such the following assessment provides an appraisal of the likely environmental effects of the two grid connection options sufficient to identify the potential significant effects and confirm the feasibility or otherwise of the proposed grid connection routes.

18.2 Description of Development

18.2.1 The EfW facility would generate electricity at 11 kV. This would be ‘stepped up’ to 33 kV by an onsite transformer and exported from the EfW via the onsite substation. The construction of the onsite substation, which is located to the west of the ACC, has been considered within the main assessment within the preceding chapters of the ES.

18.2.2 The development description provided below describes the cabling infrastructure, the cable route and the construction methods required to connect to EfW facility to the local electricity distribution network.

Option 1: Connection to Tuffey Substation Via Underground Cable

Cable Route

18.2.3 The cable route would exit Javelin Park via the private access road which connects to the B4008. The cable would then run north along the B4008. The cabling would cross the M5 motorway at Junction 12 and would continue north along the B4008 until it reaches the A38. The cable would then follow the A38 north to its junction with the A430, before turning east for the remaining 500 m along the A38 Cole Avenue. The distance to the substation would be approximately 5.8 km.

Construction Methods

18.2.4 The electricity cable would be buried within a trench located either within the verge of the highway, within the footway that runs along much of the route or within the metalled roadway. The precise location would be subject to discussion with the Highways Agency, GCC Highways Department, other utilities companies and as a result of any local limitations e.g. avoidance of damage to trees, adjacent structures or sensitive habitats.

18.2.5 Rigid corrugated cable ducts would be laid within a trench excavated to a depth of approximately 1 m and to a width of approximately 0.7 m (the approximate width of an excavating bucket) using a wheeled excavator or similar. Hardstandings would be broken out using a hand operated or machine mounted pneumatic breaking hammer and mechanical road saws. The cabling duct would be placed on a blinding layer of sand or screened earth to prevent damage from sharp objects. A further blinding layer would then be placed on the ducting. For the purposes of heath and safety marking tape or tiles would be laid approximately 75mm above the duct to indicate the location of the duct. The trench would then be backfilled with the previously excavated material. The verge, footway or road surface would then be reinstated and surfaced to a specification required by the highways authority. The electric cabling would be pulled through the ducting once the ducting had been laid and secured in position. A working area of approximately 3 to 4 m in width would be required during the trenching and cable laying works for the operation of machinery and temporary storage of excavated material prior to backfilling. Traffic management e.g. temporary traffic lights, would operate where required during the period of the construction works. The cabling would be laid in short sections to minimise disruption to highways users.

18.2.6 It may be necessary for some sections of the cable route to be constructed using directional drilling / micro-boring techniques. These methods would avoid open excavations within the highway minimising traffic disruption. Such works may be required where the cable crosses a main carriageway or at major junctions where it would be desirable to avoid traffic management. These works would be carried out in accordance with the Design Manual for

Roads and Bridges, 'Guidance on the trenchless installation of services beneath motorways and trunk roads'[20].

18.2.7 At the junction with Tuffey substation the cable would be brought above ground and connected into the transformers for onward distribution to the local electricity network. There may be a requirement to upgrade some of the equipment at the substation but significant upgrades are considered unlikely given the capacity of the existing equipment. Any upgrades would be undertaken within the boundary of the existing substation.

18.2.8 The contractor would implement best practice construction methods throughout the period of the works to reduce potential environmental impacts.

Option 2: A Tee Connection Off The Existing 33kv Ryeford – Nethrills – Coaley Circuit

Cable Route

18.2.9 A short section of underground cable, approximately 50 m would be laid from the onsite substation to the southern boundary of the site using the underground cabling methods outlined above. The cable would cross the watercourse that runs along the southern boundary of the site either in a trench beneath the stream bed or via an overhead line.

18.2.10 An overhead cable would then be routed south-east supported by wooden poles for approximately 5km before reaching the existing 33kV Ryeford - Nethrills – Coaley overhead line where a connection would be made. The route would cross a number of roads, namely Standish Lane west of Standish, c. 1.8km south of Javelin Park; the minor road from Westend to Whitminster (also National Cycle Route 45), c.3.85km south of Javelin Park; and the A419 east of M5 J13, c.4.2km south of Javelin Park.

Construction

18.2.11 The DNO would determine if the cable would pass beneath or above the stream. If the cable passes beneath the stream it would be laid in a trench at a depth sufficient to protect the duct from scour and enable maintenance of the

[20] Design Manual for Roads and Bridges, Volume 4, Section 1, HA120/08 Guidance on the trenchless installation of services beneath motorways and trunk roads. August 2008.

stream bed without disturbing the cable duct. The trench would either be dug during low flow conditions (noting that the stream dried up for much of the summer in 2011) or the stream would be temporarily diverted around the working area using a large diameter pipe. Similar trenching methods to those described previously would be used.

18.2.12 Appropriate pollution protection measures would be employed during works in or adjacent to the watercourse, this is discussed further in the following sections of this chapter. The cable would be brought above ground to the immediate south of the stream at which point it would be connected to a terminal wooden H-pole (Figure 18.1), this would mark the start of the overhead cable route.

18.2.13 An alternative to placing the cable beneath the stream would be to bring the cable above ground to the immediate south of the site perimeter access road. The cable would be connected to a terminal wooden H-pole at this point and would cross above the stream corridor connecting to the next single wooden support pole to the south of the site boundary.

18.2.14 The overhead transmission line would be suspended from single wooden support poles typically 10 m in height (Figure 18.1). The poles would be similar in nature to those already seen in the area. Figure 8.4t, a viewpoint from Hiltmead House shows the type of pole and overhead line arrangement that would be used.

18.2.15 The wooden poles would be placed in an excavation approximately 2.5m deep, the holes would be excavated using a vehicle mounted augur. Access to the pole positions would be via existing field gates and access tracks. There is not anticipated to be any requirement to construct temporary roads or access points to facilitate the construction.

18.2.16 The wooden support poles would be erected approximately every 100 m. The poles would be micro-sited to avoid disturbance to sensitive areas e.g. hedgerows or field boundaries of particular value. Once the poles have been erected installation of conductors and stringing of the transmission lines would be undertaken. Cable stays used to support the wooden poles would be required where the direction of the line deviates significantly. Cable stays would also be required to provide support to H-poles. The cable stays would be typically be set at a 45 degree angle from the pole and fixed into the ground using screw anchors to a depth of approximately 1.2 m.

18.2.17 Prior to stringing the cable, roads crossed by the transmission lines would be protected for the period of the construction by building a temporary scaffold tunnel through which vehicles would pass. This would be removed following installation of the cables. A number of public footpaths cross the route to the south-west of Standish. Appropriate signage and health and safety measures would be put in place to protect the public using these footpaths. It may be necessary to temporarily close public footpaths whilst cables are being strung, this would be undertaken in liaison with the GCC Public Rights of Way Officer.

Operation

18.2.18 Underground cables and overhead transmission lines typically require very little maintenance. Nonetheless, the grid connection would be periodically inspected for damage to components and replacements would be made where necessary.

18.3 Approach to Assessment

18.3.1 As noted above the two grid connection options would be subject to refinement in order to take into account the requirements of affected parties and any limitations identified along the proposed grid routes. This assessment seeks to establish the likely significant environmental impacts associated with the installation and operation of the grid connection works and to determine if the routes are considered acceptable in relation to environmental impacts. As such the assessment identifies the nature of the impacts that may arise from the connection works along or close to the illustrated connection routes and defines the type of mitigation that would be put in place to avoid or reduce impacts.

18.3.2 The assessments presented below utilise the baseline data gathered as part of the main assessment. Where necessary this has been supplemented with further environmental information gathered through desk study and in the case of ecology, a site visit.

18.3.3 The assessment is based upon the methodologies used in the individual chapters of this ES, but seeks to summarise matters that are specific to the proposed grid connection works.

18.4 Traffic and Transport

Assessment of Effects

18.4.1 The main traffic and transport effects associated with the two options relate to:

- construction traffic on the local highways associated with staff movements, export of excavated material and general movement of construction plant along the proposed cabling route; and
- potential road closures during the construction works.

18.4.2 Only a small number of construction staff would be required to construct either route. The numbers of construction staff would be insignificant in comparison to the staff numbers being employed on the main site and as such there is not anticipated to be any significant traffic impacts from staff movements.

18.4.3 The volume of soil requiring export from the site would be limited due to the fact that much of the material would be re-used in reinstatement works. In relation to export of excavated materials it is considered unlikely that the works would generate more than two HGV movements per day. As such this would not represent a significant traffic impact.

18.4.4 As described previously temporary traffic management may be required along sections of the route corridor for Option 1. Where the road verge is sufficiently wide to provide safe working space for the excavation and cable laying it may be possible to avoid the use of traffic management. However, temporary traffic control measures are likely to be required along several stretches of the underground cable route. Traffic management measures are likely to involve use of temporary traffic lights and/or lane closures.

18.4.5 Whilst some delays would inevitably result from the introduction of traffic management, access along the routes affected would be maintained and as such the impacts are not considered to be significant.

18.4.6 No traffic management measures would be required for Option 2.

18.4.7 No significant impacts on traffic and transportation are considered likely once the construction works have been completed and the grid connection is ‘live’.

Mitigation

18.4.8 Construction vehicle movements would be managed to avoid peak traffic periods. The aforementioned temporary traffic management measures would be agreed in advance with GCC Highways Department. If deemed necessary directional drilling / micro-boring techniques would be used where the cable route crosses key junctions.

18.5 Landscape and Visual

Assessment of Effects

Option 1

18.5.1 On the basis that cabling would be underground, no permanent landscape or visual effects would result from this option. The digging up of road surfaces to install the cabling would be visible locally from along the length of the route. However, only short stretches of the route would be affected at any one time. This type of operation is not unusual within a highway corridor and visual effects arising would be very short-term in duration and as such the impact is considered to be negligible.

Option 2

18.5.2 The route of the transmission line would be parallel to the M5 motorway (c. 400m east of the road on average; at a narrower distance close to the southern end of the route). The route would pass predominantly through agricultural fields. The use of wooden poles to support electricity distribution lines and telegraph lines is common in rural areas and such lines can be seen throughout the study area.

18.5.3 The poles would be particularly visible where roads pass beneath the cable route. Such locations are at Standish Lane west of Standish, c. 1.8km south of Javelin Park; the minor road from Westend to Whitminster (also National Cycle Route 45), c.3.85km south of Javelin Park; and the A419 east of M5 J13, c.4.2km south of Javelin Park.

18.5.4 Several public rights of way would pass beneath or in close proximity to the cable route and as such would be visible by users of these rights of way. A particularly dense network of public footpaths is located between Standish and the A419.

18.5.5 The closest residential properties to the route are at Warren Farm, Standish Moreton Farm, Little Haresfield, New Moreton Farm, Standish and two properties in the village of Westend. Existing electricity and telegraph lines suspended on wooden poles run close to all these properties.

18.5.6 In landscape fabric terms there would be little disturbance to existing features. Localised excavations would be required to install each pole. This would result in minimal disturbance to areas of agricultural grassland, which would be reinstated post-construction. Effects on landscape fabric would be negligible.

18.5.7 In landscape character terms, the route would pass through an area typical of the wider Severn valley landscape, with a variety of different land uses set within a wider agricultural mosaic. Similar overhead lines carry electricity and telecommunications wires to rural properties in the area. In addition the nearby M5 is an ever-present influence on the landscape. No change in existing land uses or land cover would result. The introduction of the wooden poles and overhead transmission lines would not affect the wider character of the landscape. The proposed grid connection would be visible locally as a new feature in the landscape, but no effect upon character would result.

18.5.8 In respect of visual effects, the proposed wooden poles and cables would constitute a minor addition to views available from local receptors. Whilst they would be visible from some receptors, including from residential properties and public rights of way, this would be set in the context of existing views of similar such features. The nature of the views from receptors would be unaffected. No views would be obstructed, either wholly or partially, given the permeability of the proposed grid connection. On this basis visual effects would be at worse minor, from where public footpaths run close to the proposed grid connection route. Further from the route, for example from properties, effects would be negligible.

18.5.9 The proposed grid connection route would not lead to significant adverse effects upon either the landscape or upon views. The proposed wooden poles and overhead cables are common rural features and similar such features are already present within the area around the proposed route corridor.

Mitigation

18.5.10 No mitigation is considered necessary.

18.6 Ecology and Nature Conservation

Assessment of Effects

18.6.1 No statutory designated sites including Special Protection Areas (SPAs), Special Areas of Conservation (SACs), Ramsar, Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs) and Local Nature Reserves (LNRs) or any locally designated sites have been identified along either of the proposed connection route options. An area of Ancient & Semi-Natural Woodland named Mole Grove is located adjacent to Option 2. The woodland is located to the north of the hamlet of Westend.

18.6.2 Route 1 would involve the burial of cables within metalled roads, footways and highways verges. Given the homogenous nature of the habitats along Option 1 and the health and safety implications of a roadside survey it was decided to undertake a drive through survey, taking a video of the route for later analysis of any features of particular interest. In addition aerial photos of the route were inspected.

18.6.3 A Phase 1 walkover survey was conducted for Option 2. The survey was conducted from publicly accessible locations e.g. footpaths and roads and using aerial photographs of the grid connection route. The findings of the survey are shown on Figure 18.2a-g and key features of interest are described below.

Option 1

18.6.4 The precise location of the underground cable would be determined through consultation with GCC Highways Department and the Highways Agency. However, for the purposes of the assessment it has been assumed that where possible the cable would be buried within the highways verge.

18.6.5 Along the majority of the cable route the road verge comprises a strip of short managed grassland typically between 1 and 3 m in width. In areas requiring clear visibility, such as major junctions, larger areas of short managed grassland were noted.

18.6.6 Where the road verge extended beyond the strip of managed grassland the composition of the planting was that typical of roadside habitats comprising a matrix of rank grassland, tree and scrub planting. The majority of the landscaping appeared to be between 5 and 20 years old. The more mature areas of planting represent good bird breeding habitats and some of the more exposed, structurally diverse, south facing road verges could provide suitable reptile habitat for species such as slow worm. None of the communities recorded constitute habitats of high value or rarity.

18.6.7 Along some stretches of the A38 the roadside tree planting, most likely associated with the construction of the road in the 1970, has matured and has resulted in some reasonably large semi-mature specimens of ash, poplar, horse chestnut and lime. These are set some way back from the edge of the highway and so the only likely impacts associated with the trenching works would be potential damage to shallow root systems.

18.6.8 Based on the drive-through survey and inspection of aerial photographs it is concluded that the habitats along the proposed route do not represent habitats of notable conservation value. As mentioned above the more mature areas of planting would provide bird breeding habitat and some areas may support slow worm populations both considered to be of local value. It should be noted that slow worms are protected under Schedule 5, section 9 of the 1981 Wildlife and Countryside Act (1981) (as amended) as such measures may be required to prevent harm to this species, this is discussed further below.

18.6.9 Impacts on roadside woodland planting are likely to be minimal but depending on the precise cable route it may be necessary to prune or fell some trees. No trees of particular value e.g. for bat roosting, were noted during the survey.

18.6.10 Overall the impact on ecology is considered to be minor to negligible and would be limited to the construction period. It is likely that the disturbance or loss of habitat as a result of the cabling would be reversed in the short to medium term.

Option 2

18.6.11 The route is primarily comprised of agricultural fields used either for pasture or arable production. Several of the large fields along the grid route were being used for the production of oil-seed rape, barley or wheat during the walkover survey and as a consequence are low in ecological diversity.

18.6.12 The areas exhibiting the highest ecological value were typically the field boundaries where hedgerows, small woodlands, watercourses and field drains were present. A number of features of specific ecological interest were noted offline from the currently illustrated grid route. This included an old orchard to the east of Standish Moreton Farm. A number of the veteran trees within the orchard appeared to offer good bat roosting opportunities and the nearby woodland, stream and grassland would provide valuable feeding areas for bats. However, on the basis of the currently illustrated grid route there would be no direct impacts on trees within the orchard.

18.6.13 Running south-east from the orchard is a stream, lined with a number of mature alder, field maple, hazel, oak and hawthorn. This area presents an area of good ecological value both in terms of diversity and habitat structure and may provide valuable bat roosting opportunities and bat foraging habitats. The illustrated grid route passes over this narrow corridor of woodland.

18.6.14 A number of other hedgerows and wooded corridors are crossed on the line of the grid connection route. Several of these areas, especially those which contain mature trees and hedgerows, present features of local ecological value and would be used by breeding and nesting birds. Field boundary habitats also provide valuable habitats for invertebrates and small mammals and form an important ecological function within farmland habitats. Impacts on these features are likely to be limited due to the nature of the construction works but where possible impacts on hedgerow and field boundary habitats should be minimised.

18.6.15 At the closest point the currently illustrated route passes approximately 10 m to the south-east of the area of Mole Grove Ancient Woodland. As such no impacts are likely to occur to this area of woodland.

18.6.16 The grid route crosses a number of watercourses including the River Frome. Placement of support poles would be designed to avoid construction within or directly adjacent to watercourses and as such impacts on the ecology of these features would be avoided. This is with the exception of the channel that runs along the boundary of Javelin Park. The potential construction options at this location have been described previously and could include the excavation of a trench across the line of the ditch. This would result in the temporary loss of vegetation on the line of the excavation. The impact would be temporary in nature and would not have a significant effect of the ecological value of the watercourse corridor. The landscaping scheme would ensure that the area was suitably restored. Mitigation of water quality impacts is discussed in the following section on Surface Waters and Flood Risk.

18.6.17 As discussed previously the precise route of the grid connection has not been determined and would be influenced by landowner negotiations, physical obstructions and the need to avoid any important habitats or other sensitive features. It is clear from the ecological survey that whilst there are habitats of value along and close to the grid route it should be possible to avoid or reduce impacts through micro-siting of pole locations.

18.6.18 The DNO would require certain clearance distances between cables and trees to ensure that moving branches or falling trees would not cause damage to the grid connection. In the first instance this would be accommodated by micro-siting or use of taller cable support poles. However, in some circumstances it may be necessary for branches to be pruned or trees to be felled. Given the infrequency and low number of trees along the illustrated grid route it is considered unlikely that any significant tree felling would be required. Furthermore, it should also be possible to avoid damage to the trees of particular value e.g. those that exhibit high potential for bat roosts, through mico-siting of the pole positions.

18.6.19 On the basis that there would be very limited loss of habitat and impacts on features of high value could be avoided by micro-siting of poles it is considered that the ecological impact of the grid connection would at worst be of minor impact and most likely would be of negligible impact.

18.6.20 Once the overhead line has been constructed no significant ecological impacts are anticipated.

Mitigation

18.6.21 A detailed extended Phase 1 habitat survey of the final grid connection route should be undertaken to identify the requirement to undertake specific mitigation measures. With regard to Option 2 the detailed walkover survey would also inform the micro-siting the transmission cable support poles.

18.6.22 It may be necessary to implement measures to prevent harm to reptiles along isolated sections of Option 1. This may simply involve strimming of long grassland and undertaking a hand search prior to excavation work or could involve the erection of reptile fencing and temporary exclusion of reptiles for the period of the excavation works.

18.6.23 With regard to Option 2 if there is a requirement to prune any major branches (20cm diameter or more) the branches should first be inspected by a licensed bat worker to determine whether they have any risk of supporting a bat roost. Any major branches pruned as part of the works should be taken down using 'soft-felling' techniques in accordance with Bat Conservation Trust guidelines.

18.6.24 The placement of transmission cable support poles should be such that they avoid damage to hedgerows and field boundaries that offer good structural and species diversity.

18.7 Geology, Soils and Groundwater

Assessment of Effects

18.7.1 The construction works for Option 1 would involve shallow excavations to a maximum depth of approximately 1 m. Option 2 would involve excavations to a depth of approximately 2.5 m at each pole location.

18.7.2 Option 1 would involve the excavation within and adjacent to highways. As such the excavation is likely to be within areas of previously disturbed ground. It is considered unlikely that the route would be affected by widespread contamination as prior to the construction of the B4003 and the A38 the area was undeveloped agricultural land. However, it is possible that some isolated contaminated ground could be encountered in areas where materials have been imported for use in the road construction or as a result of localised pollution events. Standard construction working methods for the installation of utilities would be followed. This would include a health and safety risk assessment for site operatives. The assessment would identify the requirement for the use of personal protection equipment and would define operating procedures for working within areas of potentially contaminated ground.

18.7.3 With respect to Option 2 the majority of the excavations would occur on previously undeveloped agricultural land. As such it is considered unlikely that significant ground contamination would be encountered.

18.7.4 On the basis of the shallow nature of the excavation no significant impacts on groundwater are anticipated.

Mitigation

18.7.5 As described previously the contractor would undertake a health and safety risk assessment to identify any potential impacts on site operatives from contaminated material. The risk assessment would identify the requirement for the use of personal protective equipment by site operatives.

18.7.6 If any contaminated material was identified during the excavation works it would be disposed of at an appropriately permitted waste disposal facility.

18.8 Surface Waters and Flood Risk

Assessment of Effects

18.8.1 Neither of the grid connection options are considered likely to result in an increased flood risk as a result of the loss of floodplain, increased flows of surface water runoff or by affecting transmission of surface water flows during flood events.

18.8.2 The construction works would involve the excavation of soils and use of plant and machinery. As such there is the potential for surface water pollution from suspended sediment, oils, lubricants or fuels.

18.8.3 With regard to Option 1 the route would not involve construction adjacent to any watercourses and any waterborne pollution would flow into the road drainage network. Standard best practice construction measures would be implemented to prevent pollution incidents occurring. As such impacts on water quality are considered to be negligible.

18.8.4 Option 2 would involve the crossing of the unnamed watercourse that runs along the southern boundary of Javelin Park, the River Frome, approximately 0.25 km from the connection point with the Ryeford - Nethrills – Coaley overhead line, and a number of other unnamed minor watercourses and drainage ditches. With the exception of the channel that flows along the southern boundary of the site there would be no direct impacts on watercourses due to the positioning of poles to avoid construction within or directly adjacent to watercourses. Nonetheless standard construction mitigation measures would be implemented to avoid pollution of surface water resources e.g. appropriate storage of fuels and oils.

18.8.5 With regard to the crossing of the watercourse along the southern boundary of Javelin Park it is possible that a trench would be excavated within the channel to lay a short section of underground cable. This has the potential to result in pollution by suspended solids and possibly fuels and oils from machinery used to excavate the trench.

18.8.6 Pollution of the watercourse would be minimised or avoided by either undertaking the works during low flow periods (possibly even when the ditch is dry) or by temporarily diverting the watercourse around the area being excavated using a large diameter pipe.

Mitigation

18.8.7 Additional pollution prevention measures that could be adopted to prevent pollution of the watercourse along the boundary of Javelin Park include fixing a geotextile across the watercourse downstream of the excavation or placing straw bales within the channel downstream of the excavation for the period of the works. Both methods would help filter out suspended soils and prevent pollution of the watercourse downstream of the site.

18.8.8 The contractor would also employ best practice methods as outlined within the Environment Agency Pollution Prevention Guidelines.

18.8.9 Whilst potential pollution impacts are possible, it is considered that by implementing the mitigation measures outlined above impacts on water quality would be negligible.

18.9 Noise and Vibration

Assessment of Effects

18.9.1 Sources of noise that may arise from the construction works include mechanical excavators, road breakers with air compressors, mechanical road saws, tipper trucks with grab buckets, other general site vehicles and portable power generators for traffic control signals.

18.9.2 Typical construction hours for these works would be between 07:00 to 19:00. The nature of the works are not dissimilar to those that would be expected from routine road maintenance or replacement / repair of other utilities. The cable route for Option 1 passes adjacent to residential areas and office units and as such construction works have the potential to cause nuisance. However, these receptors are likely to already experience relatively high background noise levels associated with traffic along the A38 and Cole Avenue both main arterial routes within Gloucester. On the basis that the construction works would be temporary in nature and local receptors are likely to already experience relatively high background noise levels the impacts associated with Option 1 are considered to be minor.

18.9.3 The construction methods used for Option 2 are likely to be considerably less noisy than those associated with Option 1. Noise impacts associated with mechanical auguring would be limited both in noise level and duration and whilst the route does pass close to properties the number of affected receptors would be small.

18.9.4 On the basis of the low levels of noise that would arise from the erection of the poles and the limited period for which any disturbance would occur the noise impacts associated with Option 2 are considered to be negligible.

18.9.5 No significant sources of vibration are associated with the construction methods proposed for either grid connection option.

Mitigation

18.9.6 Noise attenuation measures would be applied at all times to plant and equipment to follow industry best practice and conform to BS 5228.

18.10 Air Quality

Assessment of Effects

18.10.1 Excavation of the trench associated with Option 1 would have the potential to give rise to the release of fugitive dust during dry and windy conditions. However, given the minor scale of the works such impacts would not be significant and are unlikely to have any adverse effects on residential or ecological receptors. As such no mitigation is proposed. Given the lack of ground excavation associated with Option 2 significant air quality impacts would not be expected.

18.11 Archaeology and Cultural Heritage

Assessment of Effects

18.11.1 A review of various heritage records was undertaken in relation to the two proposed grid connection routes. This involved reviewing online statutory designations (Scheduled Monuments, Listed Buildings, Conservation Areas, World Heritage Sites), registered receptors (battlefields, parks & gardens) and records held on the Gloucestershire Historic Environment Record within 300 m of both connection routes.

18.11.2 No World Heritage Sites, Scheduled Monuments, registered battlefields or parks & gardens were identified on the line of either connection routes.

18.11.3 Seven listed buildings, all of which are Grade II listed, were identified within 300 m of Option 1. On the basis that the construction works would be temporary in duration and would involve activities often experienced along major road corridors no permanent indirect effects on setting are considered likely to arise.

18.11.4 Four listed buildings were identified within 300 m of the Option 2 all are located within the hamlet of Westend and all are Grade II listed. Whilst the works would be visible from the Listed Buildings, the nature of the development would not be out of character with development in the surrounding area. As noted within the landscape assessment (above), wooden poles carrying electricity cables and telegraph lines are already visible from properties within this area. On this basis it is considered that the grid route would not be particularly obtrusive. Neither the construction or operation phase of works would significantly alter any setting character that may influence the historic value of the properties.

18.11.5 With regards to buried archaeology, a number of features are recorded on the Gloucestershire Historic Environment Record (HER) within 300 m of both grid routes. The finds range in date from the Iron Age period, through Romon-British and Medieval periods to the modern day.

18.11.6 With regard to Option 1 the HER includes a number of entries for field surveys and watching briefs associated with the construction of the A38 and subsequent junction modifications and with development adjacent to the A38. The majority of the records do not identify any notable finds. However, some of records did identify remains associated with settlements from the Romano-British period.

18.11.7 The cable route for Option 1 would be within the existing highways boundary and the cabling works would take place at similar depths to other utility runs located along the highway. The land adjacent to and within the highway is likely to have suffered previous disturbance as a result of the existing road construction. Whilst there would be some potential for the survival of buried archaeological remains the likelihood is considered low. On this basis, the impacts of Option 1 on below ground archaeological resources are considered to be minor.

18.11.8 A relatively low density of archaeological finds have been identified along the route of Option 2. However, the absence of such evidence does not negate the potential for the recovery of archaeology, it may simply relate to a lack of previous archaeological research in this area.

18.11.9 There are, however, a number of known sites of potential significance within the line of the cable route Option 2, these are shown on Figure 18.3. These include a site recorded as a possible Medieval and/or Post Medieval settlement (HER Ref. 40730) to the north-west of New Moreton Farm. The entry in the HER describes a number of earthworks associated with a former building platform and also notes ridge and furrow patterns within neighbouring fields.

18.11.10 In addition, approximately 500m from the point of connection with the 33kV Ryeford – Nethrills – Coaley overhead line a Roman building, possibly a villa, has been recorded within the HER (HER Ref. 5237 and 27742). The proposed cable route passes over this site.

18.11.11 Finally, the HER records a medieval to post medieval water meadow (HER Ref. 40794) within the line of Option 2. This feature runs along the banks of the River Frome and includes a number of earthworks noted as being visible in the adjacent fields.

18.11.12 The HER records on the line of the grid route are considered to represent features of varying archaeological value, with the site of the Roman building and medieval / post-medieval settlement possibly being of some local significance and classified to be of medium value.

18.11.13 Given the lack of previous ground disturbance along the line of Option 2 it is possible that such remains survive relatively undisturbed, aside from potential past agricultural activity, and could be disturbed by ground excavations.

18.11.14 It should be noted that the level of ground disturbance associated within the erection of the electricity cable support poles (Option 2) would be much less than that associated with the trenching works required for underground cabling (Option 1). This would reduce potential impacts on the buried archaeological resource within the footprint of Option 2, with such impacts concluded to be minor in nature.

18.11.15 On this basis, the minor magnitude of impact combined with the value of these receptors (potentially medium) results in an impact significance of minor.

Mitigation

18.11.16 In relation to Option 2, whilst cable support poles would be positioned to avoid key identifiable features on the ground, the spatial extent of the three HER sites described above may require poles to be positioned within the known extent of these sites. It is recommended that within and immediately adjacent to these sites, an archaeologist would be present to control the opening of small test pits in advance of the proposed auguring of holes. Thus would enable any impacts to be mitigated through the recording of any archaeological remains that may survive.

18.12 Residual Effects and Conclusions

18.12.1 An assessment has been undertaken to provide an appraisal of the likely environmental effects of the two grid connection options being considered to link the proposed EfW to the local electricity distribution network. Whilst further work would need to be undertaken by the DNO in order to define the precise grid route the assessment provides sufficient information to understand the likely significant effects of both options.

18.12.2 A detailed description of the route options and the likely construction methods has been provided. The assessment concludes that no significant residual adverse impacts are likely to arise from the construction or operation of either connection option. Some minor adverse impacts have been identified and mitigation measures have been proposed to avoid or reduce these impacts. Both connection options are considered acceptable in terms of environmental impacts and advantages and disadvantages to both grid routes have been identified. Neither option is considered favourable to the other in terms of environmental impacts.

19.0 SUMMARY OF EFFECTS

19.1 Introduction

19.1.1 This ES describes the proposed development of an EfW at Javelin Park and provides an assessment of the likely environmental effects that may arise from the construction and operation of the facility.

19.1.2 The facility would be a purpose built EfW plant situated on land at Javelin Park, Haresfield, Gloucestershire. The facility would have an installed electricity generating capacity of approximately 17.4 Megawatts (MW). It would generate electricity by way of a steam turbine which would be driven through the combustion of 190,000 tonnes per annum (tpa) of non-hazardous residual waste the significant majority of which would be municipal waste. A proportion of the waste treated at the facility would be commercial and industrial wastes similar in composition to the municipal waste. The facility would be capable of delivering Combined Heat and Power (CHP) with the turbine equipped with steam extraction points enabling export of heat to local heat users.

19.1.3 The scope of the ES was agreed in consultation with the Gloucestershire County Council. The potential effects of the proposals are described fully within the Main Report (Volume 1) with supporting data for the assessments bound separately within the Technical Appendices (Volume 2). A Non Technical Statement (Volume 3) is also provided. This document contains a brief description of the proposed development and a summary of the ES, expressed in non-technical language. The potential effects of the proposals as identified in the ES are summarised below.

19.2 Traffic and Transportation

19.2.1 Chapter 7.0 provides an assessment of the highways and transport related environmental impact of the proposed facility. The assessment relies on the findings of the formal Transport Assessment (TA) that has been submitted in support of the Planning Application. The TA sets out the detailed appraisal of highway network operational impact in terms of link capacity, junction capacity and delay.

19.2.2 The potential highways and transport related environmental impact of the operation of the proposed facility has been assessed via reference to the methodology set out in the Institute of Environmental Assessment (IEA) document “Guidelines for the Environmental Assessment of Road Traffic”.

Construction Impacts

19.2.3 Traffic impacts associated with the construction of the site would be temporary in nature and are likely to vary over the course of the construction period dependent upon the nature of activities taking place. It is proposed that a Construction Traffic Management Plan should be prepared (under the control of a planning condition), this would form part of the Construction Environmental Management Plan. Vehicle deliveries to / from the site during the construction phase should be managed to avoid impact on traditional AM / PM rush hour periods where at all practical. In addition, further on-site vehicle management practices would seek to limit typical construction traffic impacts such as dirt, dust, noise and vehicle related vibration.

19.2.4 Appropriate levels of staff parking would be provided on site to avoid any potential issues of overspill off-site parking on local routes, with the levels of staff vehicle demand to be controlled by travel management initiatives such as car sharing and off-site bus transfer where practical.

Operational Impacts

19.2.5 Link capacity assessments for the surrounding local network indicate that all existing links would operate with some level of spare capacity when compared to DfT TA46/97 capacity thresholds.

19.2.6 There is no evidence of any material local road safety hazards that would call the development into question. No local network safety or capacity improvements are considered necessary to accommodate the proposed development traffic demand.

19.2.7 Reference to IEA screening guidelines would suggest that overall changes in traffic flow over the immediate local network as a result of the proposed EfW scheme would not give rise to a material change in traffic related environmental conditions.

19.2.8 During the proposed core weekday waste site delivery period (07:00 – 19:00), the proposed EfW development could be expected to generate an increase in HGV traffic volumes, however, over the majority of the network such volumes would be of a level well below IEA 30% screening thresholds for perceptible impact. Such thresholds would only be exceeded on the immediate section of the B4008 between the Javelin Park access roundabout and M5 J12 and typically are only identified under worst case sensitivity scenario.

19.2.9 The B4008 section of network has recently been improved to a high standard and has little sensitive frontage development. It is considered that the predicted increases in HGV traffic in this location can therefore be accommodated without any unacceptable traffic related environmental impact. Furthermore it must also be recognised that any daily increases in EfW traffic movements would be less than for operation of the Javelin Park proposal site under currently permitted B8 commercial warehousing land use. Such B8 development could be delivered without the need for further environmental appraisal.

19.2.10 Given the review of anticipated future operational highway conditions and reference to appropriate guideline standards, it is concluded that the development of the facility would not result in a material impact on operational or environmental conditions over the local highway network.

19.3 Landscape and Visual

19.3.1 Chapter 8.0 provides an assessment of the landscape and visual impacts of the proposed EfW facility. The methodology used to carry out the assessment is based upon that set out in Guidelines for Landscape and Visual Impact Assessment (The Landscape Institute and Institute of Environmental Assessment – 1st ed. 1995 and 2nd ed. 2002).

19.3.2 The proposal has been designed in such a way as to reduce landscape and visual effects that could potentially occur due to its size, scale and location. The roof profile of the building has been designed to comprise a series of ‘steps’ at different elevations and different angles of pitch which echo the natural profile of the landform within the adjacent Cotswolds AONB. By breaking up the mass of the building, and using carefully selected cladding variants for each element, adverse visual effects are reduced, and to a degree the built form is assimilated with the surrounding mosaic of fields and hedgerows when seen from elevated vantage points.

19.3.3 The landscape proposals for the facility have been developed in order to provide a high quality external environment as well as mitigating against potential effects that could arise, notably the visual effects upon the immediate locality.

Construction Impacts

19.3.4 In overall terms, whilst there would undoubtedly be short term visual effects during the construction phase, their temporary nature would not result in any significant effect especially given the context of existing vehicle movements along the B4008 immediately east of the site and along the M5 to the west.

19.3.5 Effects upon landscape character would be set in the context of the corridor of existing development that extends southwards from Gloucester along the M5 and A38. Current construction activity is evidenced at several sites within this broad area including a number of housing developments to the north of the M5. As such, it is concluded that construction activity is not unusual in the wider area and that in this context, the temporary and localised effects of the proposed development would not be significant.

Operational Impacts

19.3.6 Effects upon the landscape fabric would not be significant in EIA terms. The proposed development would redevelop what is currently a vacant derelict site. Existing perimeter planting would be retained and additional new planting provided.

19.3.7 Effects upon landscape character would not be significant in EIA terms. Localised change would occur in the area around the site and along the corridor of the M5 and A38. Elsewhere, the existing character would be largely unaffected by the presence of the facility.

19.3.8 The proposed development would be prominent from locations closer to the site by virtue of its scale. From further afield, views would be better screened by both vegetation cover and buildings and other structures within the Severn valley. From the higher ground east and west of the valley, the proposed development would be visible set in an expansive context of diverse land uses. This would include a mosaic of agriculture crossed by major transport infrastructure and interspersed with commercial and industrial activity, including areas of extensive development at the edge of Gloucester and the edge of Stonehouse.

19.3.9 Significant visual effects (in EIA terms) would be experienced from twelve of the thirty-four viewpoints assessed. However, from only six of these viewpoints would effects be considered adverse in nature, with the remainder experiencing neutral effects. Three of the significant adverse effects relate to views from individual residential properties with the remainder being views from stretches of road, footpath and canal towpath. All viewpoints experiencing significant visual effects are within 2.5km of the site.

19.3.10 The assessment has concluded that the special qualities and setting of the Cotswolds AONB would not be materially affected by the proposed development. The impacts on the views from and into the AONB have been mitigated through the design of the facility which has been developed to have regard to the distinctive skyline formed by the Cotswolds Escarpment and views towards this area from the west.

19.4 Ecology and Nature Conservation

19.4.1 Chapter 9.0 provides an assessment of the ecological impacts of the proposed facility. The ecological assessment is based on evaluation of local nature conservation records and the results of the following field survey work undertaken specifically for the proposal:

- extended Phase 1 Habitat Survey;
- assessment of habitat suitability for great crested newt;
- reptile surveys;
- badger surveys;
- breeding bird surveys; and
- bat surveys.

19.4.2 This impact assessment follows the methodology set out by the Institute of Ecology and Environmental Management (IEEM 2006).

19.4.3 The habitats at the site are those typically found at recently cleared brownfield sites. The site supports a mosaic of habitats including ephemeral – short perennial vegetation, tall herbs, scrub and immature tree planting. A recently diverted watercourse flows around the southern and western boundary of the site. The watercourse corridor has been landscaped with trees and shrubs.

19.4.4 The assessment has identified a number of ecological interest features on site, of which foraging bats utilising the southern peripheral landscape are the most important in both legislative and nature conservation terms. There is evidence that this part of the site may be important for the maintenance of a small population of common pipistrelle in the local area, and it is used regularly but less intensively by small numbers of greater horseshoe bat. Another rare species, barbastelle, was recorded on one of the three survey occasions, and is unlikely to be dependent on habitat quality or connectivity within the site. *Myotis* bats and soprano pipistrelle also use the site, with occasional overflights by noctule.

19.4.5 The southern landscape corridor also supports a number of breeding birds, with whitethroat the most abundant. Breeding bird density in the western part of the site may be influenced by the proximity of the M5.

19.4.6 Other interest features, notably little ringed plover, utilise more open habitats on the cleared site. These habitats are ephemeral in nature and likely to lose their value for this species in the absence of development.

Construction Impacts

19.4.7 With the exception of species dependent on ephemeral, open habitats, the development would maintain the favourable conservation status of the protected and priority species identified on site. The design of the site has enabled the watercourse corridor that runs along the southern and western boundary of the site to be maintained. In addition the assessment has shown that the development would comply with protected species legislation.

Operational Impacts

19.4.8 No significant ecological impacts were identified as a result of the operation of the facility. A detailed assessment of air quality impacts has demonstrated that the development can proceed without a likely significant effect on European conservation sites. This has been determined both by dispersion modelling and by the assessment of the ecological status and sensitivity of Cotswold Beechwoods SAC.

19.4.9 Ecological mitigation and enhancement proposals implemented as part of the landscaping scheme are designed to link into the most valuable habitat in the south-eastern part of the site and are targeted towards achieving real benefits in habitat quality for key elements of the site's fauna. The landscaping scheme also recognises how the development relates to the wider landscape in terms of species movement, maximising the likelihood of habitat utilisation and maintenance and strengthening of existing wildlife corridors. In this way, the probability of a net positive biodiversity benefit is increased.

19.4.10 On the basis of the ecological impact assessment it can be concluded that the residual impacts resulting from the proposed development are either of negligible significance, or involve minor impacts during construction which would be mitigated or enhanced by habitat creation.

19.5 Geology, Soils and Groundwater

19.5.1 Chapter 10.0 provides an assessment of the geology, soils and groundwater impacts of the proposed facility. As part of the consideration of ground conditions the assessment considers the geological setting, designated geological sites, contaminated land, hydrogeology, geohazards and geotechnical issues associated with the proposed development and the site.

19.5.2 The assessment has been based on the information gathered from a number of desk study and ground investigation reports undertaken at the site and on the adjacent areas of Javelin Park. This includes the results of a ground investigation undertaken in 2010 specifically for this project.

19.5.3 A number of historical land uses at the site have been identified, including demolition of previous structures, which resulted in asbestos fragments and petroleum hydrocarbons being present on, and in the ground at the site. Remediation works have been conducted at the site in recent years in order to remove asbestos fragments and hydrocarbon pollution.

Construction Impacts

19.5.4 No significant impacts were identified by the assessment. However, despite the past remediation works, on the basis of the previous history of the site there remains the potential for some contamination to be present. As such it is recommended that standard best practice construction methods are employed to ensure that site operatives are not exposed to contaminants that may remain at the site.

19.5.5 Measures to prevent the contamination of soils or groundwater during the construction phase are recommended e.g. procedures for dealing with accidental oil and fuel spillage and dust suppression. These measures would be fully detailed within the Construction Environmental Management Plan.

Operational Impacts

19.5.6 No significant operational impacts have been identified by the assessment. However, mitigation measures are recommended for protection of buried concrete and water pipes due to aggressive ground conditions.

19.6 Surface Water and Flooding

19.6.1 Chapter 11.0 provides an assessment of the surface water and flooding impacts of the proposed facility. The assessment has been based on the information gathered from the ground investigation desk study, topographic survey, Environment Agency data and previous flood risk assessments undertaken at the site.

19.6.2 A Flood Risk Assessment has been undertaken taking into account Planning Policy Statement 25 (PPS 25), watercourse analysis using Flood Estimation Handbook (FEH), and surface water runoff analysis using Microdrainage WinDes software.

Construction Impacts

19.6.3 The existing flood risk to the site from all sources is low. On the basis that the construction phase of the project would be limited in duration, the statistical probability of a flood event occurring during this phase is further reduced. It has been demonstrated that the drainage ditch at the site has sufficient capacity to accommodate flows for a 1 in 1000 year flood event. Therefore during the limited construction phase of the development there is a low overall impact of flood risk to the site.

19.6.4 Potential adverse impacts associated with the construction phase include the potential for pollution of the drainage ditch from suspended solids, oils and hydrocarbons, cement and concrete products, heavy metals and metalloids, bentonite and solvents/paints among others. Standard best practice construction methods would be implemented at site to ensure that no water quality impacts result from the construction works. These would be documented in the Construction Environmental Management Plan and would include measures such as storage of fuel, oils and chemicals in bunded areas and use of settlement lagoons.

Operational Impacts

19.6.5 The proposed development does not lie within an identified area of flood plain and the assessment has shown that there is low risk of flooding from all sources including the watercourse that flows around the southern and western boundary of the site. As such the risks posed to the development from fluvial and groundwater flooding sources are considered to be negligible.

19.6.6 Surface water runoff from the proposed buildings and hardstandings would be managed in such a fashion so as to ensure that the resulting flows are regulated to the equivalent ‘green field’ runoff rate via the on-site detention basins. This, in turn, would ensure there would be no adverse disturbance to the existing hydrological regime local to the site.

19.6.7 The proposed development would not affect the water quality of the surrounding area as a result of the infrastructure that would be installed to service the site e.g. appropriately designed storage areas for fuels, chemicals and oils and provision of interceptor tanks within the surface water drainage system.

19.7 Noise and Vibration

19.7.1 Chapter 12.0 provides an assessment of the noise and vibration impacts of the proposed EfW facility. To establish any likely impact from noise a baseline noise survey was undertaken to establish the existing noise climate at the site. Relevant and appropriate noise guidance and standards have been used to determine the potential noise impact from the proposal. Impacts from both the plant operations and vehicle movements have been assessed. Observations undertaken during the monitoring indicate that the local noise climate is dominated by road traffic noise from the nearby M5.

Construction Impacts

19.7.2 The assessment of potential noise effects during the construction phase has shown that there is a potential for noise to cause nuisance at the nearest noise sensitive receptor to the development site. However, through the programming of the works, implementation of suitable mitigation measures and good site practice, the effects from construction can be controlled and there would be no residual significant impact. An assessment of potential vibration effects has indicated that receptors in the vicinity of the site would not be adversely affected by vibration inducing construction activities and therefore would not result in a significant impact.

Operational Impacts

19.7.3 During the operation of the site it is concluded that with the implementation of appropriate mitigation within the detailed design, there would be no significant effects from the facility.

19.7.4 The assessment has shown that the facility would adhere with the Local Authority criteria at the surrounding noise sensitive receptors and that the predicted noise levels are not expected to cause a significant impact to the current noise climate at surrounding residential and commercial receptors.

19.7.5 The assessment of noise change due to variation in traffic flows on the local road network has shown that the noise levels would not result in a significant impact.

19.8 Air Quality

19.8.1 Chapter 13.0 provides an assessment of the air quality impacts of the proposed EfW facility. The assessment has identified that the operation of the facility would give rise to a number of substances that would be emitted to the atmosphere. As a result, the potential environmental effects of these emissions have been assessed using detailed dispersion modelling. The results of the modelling have been assessed against relevant air quality objectives and guidelines identified from national legislation and Environment Agency guidance documents.

19.8.2 The assumptions that have been adopted to determine the predicted emission levels from the plant, maximum ground level concentrations and background levels in the vicinity of the plant have been based on a ‘worst-case’ scenario.

Construction Impacts

19.8.3 During the construction there would be the potential for short-term effects to occur, mainly in the form of dust emissions generated by earthmoving activities.

19.8.4 Standard best practice construction methods would be implemented at site to reduce emissions to the air. These would be documented in the Construction Environmental Management Plan and would include measures such as use of water mists during dry periods, closed sheeting of vehicles and washing of road surfaces leading to the construction site. With the implementation of these measures no significant construction impacts are anticipated.

Operational Impacts

19.8.5 The results of the modelling have indicated that the proposed stack would provide more than adequate dispersion to atmosphere and that the operation of the facility is predicted to have a negligible impact on local air quality. No operational impacts relating to dust or odour have been identified. As a result, no significant effects on air quality are predicted.

Greenhouse Gases

19.8.6 The Environment Agency’s Waste and Resources Assessment Tool for the Environment (WRATE) was used to evaluate the Global Warming Potential (GWP) of the facility, expressed in tonnes of CO_2 equivalent per annum.

19.8.7 The assessment estimates greenhouse gas emissions generated as a result of construction and operation, transportation and estimates the reduction in greenhouse gas emissions as a result of the displacement of power generation from fossil fuel based power stations and from the avoidance of the production of landfill gases (carbon dioxide and methane) as a result of diversion of waste from landfill. The result of this assessment has shown that implementing the EfW facility as opposed to not operating the plant would result in a net annual reduction of 40,480 tonnes of CO_2 equivalent per annum.

19.9 Human Health

19.9.1 Chapter 14.0 provides an assessment of the human health impacts of the proposed EfW facility. The assessment has identified that the operation of the facility would give rise to a number of substances that would be emitted to the atmosphere and that these substances have the potential to accumulate in the environment and have an impact on human health. As a result, the risk to human health of these emissions has been assessed.

19.9.2 A detailed health risk assessment has been carried out using the Industrial Risk Assessment Program-Human Health (IRAP-h View – Version 4.0). The programme, created by Lakes Environmental is based on the United States Environment Protection Agency (USEPA) Human Health Risk Assessment Protocol. In addition an assessment was undertaken to consider the impacts of on agriculture in the area.

Operational Impacts

19.9.3 Advice from human health specialists such as the Health Protection Agency states that the damage to health is likely to be very small, and probably not detectable from the operation of Permitted Energy from Waste facilities.

19.9.4 The results of the modelling have indicated that the emissions from the facility would have a negligible effect on human health and agriculture.

19.9.5 It is recognised that there is the potential for the proposal result in anxiety and concern in the local population due to the perception of health effects from emissions. However, on the basis of the health assessment there is no evidence to suggest that the health of the local population would be at risk and consultation activities have been undertaken in order to keep local residents informed of the project and its potential effects.

19.10 Archaeology and Cultural Heritage

19.10.1 Chapter 15.0 provides an assessment of the cultural heritage impacts of the proposed EfW facility. The assessment included an appraisal of cultural heritage resources in a study area of 2km (for all cultural heritage features recorded on the Gloucestershire County Council Historic Environment Record) and 5km (all World Heritage Sites, Scheduled Monuments, Grade I and Grade II* Listed Buildings and Registered Parks and Gardens, excluding Historic Environment Record data).

Construction Impacts

19.10.2 Due to past development of the site from the mid 20th century onwards it is likely that any archaeological remains that may have been present have been removed. As such it is considered that the construction of the proposed EfW would have no direct or indirect impact on known or potential cultural heritage receptors within the site.

Operational Impacts

19.10.3 A number of cultural heritage receptors were identified in the surrounding landscape, these included Grade I, II and II* listed buildings and Scheduled Monuments. The operation of the facility would not result in any direct impacts on the identified cultural heritage receptors but the facility does give rise to potential indirect impacts on setting.

19.10.4 The setting from many of the receptors has already been influenced by built structures e.g. the M5 and from many of the receptors the facility would be screened, wholly or partially, by vegetation and intervening structures. The assessment has concluded that the facility would result in minor residual impacts on the setting of five cultural heritage receptors in the area surrounding the site, these impacts are not considered to be significant.

19.11 Socio-Economic and Community Effects

19.11.1 Chapter 16.0 of the ES considered the socio-economic and community effects of the proposed development. It identified background information for the County of Gloucestershire, its districts and wards, in particular the District of

Stroud, within which the Javelin Park site is located. It then identified the main socio-economic and community effects of the proposed development.

19.11.2 The key issue addressed in the assessment was to understand the existing situation and consider whether the proposed development would result in any adverse socio-economic impacts.

Construction Impacts

19.11.3 The construction of the facility would take circa 33 months to complete and would provide up to 300 temporary jobs. It is expected that a large proportion of these temporary jobs would be locally sourced.

19.11.4 It is anticipated that a minimum of 8% of the workforce during construction would be apprentices. The apprenticeships would be targeted at local young people and would therefore have a positive impact on raising the skills-base within the local community.

Operational Impacts

19.11.5 The County Council has undertaken financial appraisals of the costs of the residual waste project. The results showed that continuing to landfill compared to the development of a residual waste recovery facility would cost the Council in the region of up to an estimated £150 million over 25 years. This therefore demonstrates that the option of developing an EfW facility is more affordable, as well as being more sustainable and environmentally acceptable, than disposal of waste to landfill.

19.11.6 In addition the plant would provide a local sustainable renewable source of energy that would meet the domestic needs of circa 26,000 homes and produce saleable by-products, in the form of secondary aggregates, for local businesses to benefit from.

19.11.7 During the operational phase the facility would create 40 new permanent jobs. The majority of the employees would be skilled operatives (electricians/fitters/crane operatives) or technical engineers (control and plant), with a small number of low skilled jobs also created. It is anticipated that a new apprenticeship would be provided every two years throughout the operation of the facility.

19.11.8 Community benefit would also be provided as a result of the integrated visitor and education centre within the facility. The centre would be a valuable education resource and would provide local residents with information on the operation of the facility and educate school children on sustainable waste management and taking responsibility for their own waste. The visitor centre would also available for use by other local groups as a meeting space.

19.11.9 The proposal would not have any significant adverse impact further to the existing situation. The proposal would in fact create a number of social and economic benefits for Gloucestershire and its residents as identified above.

19.12 Cumulative Effects

19.12.1 Five projects were identified that could have the potential to result in material cumulative effects with the proposed development. The key effects from these developments are considered to be landscape, traffic and air quality related effects. The assessments undertaken conclude that significant cumulative environmental effects are unlikely to result from the proposed development.

19.13 Grid Connection

19.13.1 The proposed EfW would generate electricity for export to the local electricity distribution network. The grid connection works do not form part of the Planning Application. However, on the basis that export of electricity is an integral part of the scheme it is considered appropriate that the potential environmental impacts associated with the connection to the local electricity grid are assessed within the ES.

19.13.2 Two grid connection options are presently under consideration. One is derived from a grid connection study undertaken by UBB the other from E.ON Central Networks. For the purposes of this ES, both options have been assessed.

19.13.3 The assessment concludes that no significant residual adverse impacts are likely to arise from the construction or operation of either option. Some minor adverse impacts have been identified and mitigation measures have been proposed to avoid or reduce these impacts. Both connection options are considered acceptable in terms of environmental impacts and advantages and disadvantages to both grid routes have been identified. Neither option is considered favourable to the other in terms of environmental impact.

19.14 Summary

19.14.1 In considering the results of this ES, it can be concluded that the proposed development would provide a sustainable waste management solution for Gloucestershire's residual non-hazardous waste. The project would assist in diverting the County's waste from landfill, provide a source of low carbon and renewable energy, create local job opportunities and provide a local community resource in terms of a visitor centre. The assessments contained in this ES have demonstrated that the only potentially significant effects relate to visual impacts on a limited number of receptors located within 2.5 km of the site, this includes views from three residential properties. The assessments have shown that the proposal would not result in a significant impact on local landscape character or unacceptable impacts on the Cotswolds AONB. No other significant residual adverse environmental impacts have been identified.